

RESPONSE TO FREEDOM OF
INFORMATION ACT (FOIA) REQUEST

2016-0474

1

RESPONSE
TYPE

INTERIM



FINAL

REQUESTER:

David Lochbaum

DATE:

JUL 27 2016

DESCRIPTION OF REQUESTED RECORDS:

All records not already publicly available in ADAMS related to the petition for rulemaking submitted by Mark Edward Leyse and designated as PRM-50-108 and NRC-2014-0171 by the staff

PART I. -- INFORMATION RELEASED

- ☐ Agency records subject to the request are already available in public ADAMS or on microfiche in the NRC Public Document Room.
- ☒ Agency records subject to the request are enclosed.
- ☐ Records subject to the request that contain information originated by or of interest to another Federal agency have been referred to that agency (see comments section) for a disclosure determination and direct response to you.
- ☒ We are continuing to process your request.
- ☐ See Comments.

PART I.A -- FEES

AMOUNT*

\$

- ☐ You will be billed by NRC for the amount listed.
- ☒ None. Minimum fee threshold not met.
- ☐ You will receive a refund for the amount listed.
- ☐ Fees waived.

*See Comments for details

PART I.B -- INFORMATION NOT LOCATED OR WITHHELD FROM DISCLOSURE

- ☐ We did not locate any agency records responsive to your request. *Note:* Agencies may treat three discrete categories of law enforcement and national security records as not subject to the FOIA ("exclusions"). 5 U.S.C. 552(c). This is a standard notification given to all requesters; it should not be taken to mean that any excluded records do, or do not, exist.
- ☐ We have withheld certain information pursuant to the FOIA exemptions described, and for the reasons stated, in Part II.
- ☒ Because this is an interim response to your request, you may not appeal at this time. We will notify you of your right to appeal any of the responses we have issued in response to your request when we issue our final determination.
- ☐ You may appeal this final determination within 30 calendar days of the date of this response by sending a letter or email to the FOIA Officer, at U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001, or FOIA.Resource@nrc.gov. Please be sure to include on your letter or email that it is a "FOIA Appeal."

PART I.C COMMENTS (Use attached Comments continuation page if required)

Due to the voluminous documents associated with your FOIA request, we are providing an interim release of releaseable records. We will provide status updates of future interim releases.

SIGNATURE - FREEDOM OF INFORMATION ACT OFFICER

Nina Argent, Acting FOIA Officer

From: Entz, Kathleen
Sent: 29 Jul 2015 15:33:11 -0400
To: RidsNrrDpr Resource;RidsNrrDss Resource;Bladey, Cindy;Spencer, Mary;Monninger, John;Case, Michael;RidsNRRJLD Resource;Casto, Greg;Inverso, Tara;Doyle, Daniel;Mizuno, Geary;Borges, Jennifer;Hernandez, Raul;Esmaili, Hossein;Greenleaf, Michael;Witt, Kevin
Subject: 05/27/2015 PRM-50-108 Petition Review Board Presentation RE: Fuel Cladding Issues in Postulated Spent Fuel Pool Accidents

Please follow the link below for the electronic distribution of:

DATE: July 2, 2015

TO: Lawrence Kokajko

FROM: Daniel Doyle

SUBJECT: 05/27/2015 PRM-50-108 Petition Review Board Presentation RE: Fuel Cladding Issues in Postulated Spent Fuel Pool Accidents

[View ADAMS P8 Properties ML15175A026](#)

[Open ADAMS P8 Document \(05/27/2015 PRM-50-108 Petition Review Board Presentation RE: Fuel Cladding Issues in Postulated Spent Fuel Pool Accidents.\)](#)

Kathy Entz

Administrative Assistant (DPR/PGCB)

Office of Nuclear Reactor Regulation

U.S. Nuclear Regulatory Commission

Phone: 301-415-8501

Email: Kathleen.entz@nrc.gov

Location: O-12D19

Mailstop: O-12D20

From: Borges, Jennifer
Sent: 4 May 2015 23:02:30 +0000
To: Doyle, Daniel
Subject: Accepted: Petition Review Board Meeting for PRM-50-108

From: Borges, Jennifer
Sent: 18 May 2015 16:51:55 +0000
To: Doyle, Daniel
Subject: Accepted: PRM-50-108 - dry run for PRB

From: DeJesus, Anthony
Sent: 23 Feb 2016 10:57:07 -0500
To: RidsOgcMailCenter Resource
Cc: Borges, Jennifer; Terry, Leslie; Bladey, Cindy; Spencer, Mary; Gendelman, Adam; England, Christina
Subject: ACTION: NLO for PRM Status Report
Attachments: Status Report on PRMs March 2016.docx, PRM Status Report March 2016 FINAL DRAFT_Compare.docx, Memo to OEDO FINAL 2-23-16.docx

Good morning OGC Mailroom,

By March 7, 2016, please review and provide your NLO on the following attached documents:

- The March 2016 Status Report on Petitions for Rulemaking, and
- The transmittal memo to the EDO.

On February 18, 2016, Christina England provided comments on the package. We have resolved or responded to all of those comments (please see compare file). In addition, staff in NRR, NMSS, and NRO provided comments and changes on the previous draft. This version includes all changes received since February 18th.

Please provide me with your NLO by **March 7, 2016**. If you have any questions concerning this matter, please contact me at 301-415-1106 (Anthony.deJesus@nrc.gov) or Jennifer Borges at 301-415-3647 (Jennifer.Borges@nrc.gov).

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STATUS REPORT ON PETITIONS FOR RULEMAKING

March 2016

Enclosure

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INTRODUCTION

The status report on petitions for rulemaking (PRM) is provided to the Executive Director for Operations (EDO) bi-annually. The purpose of this report is to inform the EDO of PRMs currently before the agency and to provide an update on progress toward their completion. This report includes petitions docketed since the last report, dated October 2, 2015 (Accession No. ML15217A434 in the U.S. Nuclear Regulatory Commission's (NRC) Agencywide Documents Access and Management System (ADAMS)). In addition, this report informs the EDO of PRMs completed since the last report. The Office of Administration, in consultation with the Office of Nuclear Reactor Regulation (NRR), the Office of Nuclear Material Safety and Safeguards (NMSS), the Office of New Reactors (NRO), and the Office of the General Counsel (OGC), compiles the information for each open petition.

The report presents open petitions by office, beginning with the newest dockets and ending with the oldest dockets. The report captures the progression of each petition as it moves through the agency's process. The report includes hyperlinks to the docket for each petition on <http://www.regulations.gov>, thereby making additional pertinent documentation, including any public comments received, readily available. All reports since 2010 are available on [The NRC Rulemaker](#).¹ For comments or suggestion for additional improvements to this report, please contact Anthony de Jesús at 301-415-1106.

¹ <http://fusion.nrc.gov/adm/team/DAS/RADB/resource/Lists/Status%20Report%20on%20Petitions%20for%20Rulemaking/AllItems.aspx>.

LIST OF COMMON ABBREVIATIONS

| | |
|--------|--|
| 10 CFR | Title 10 of the <i>Code of Federal Regulations</i> |
| ADAMS | Agencywide Documents Access and Management System |
| ASME | American Society of Mechanical Engineers |
| ASR | alkali-silica reaction |
| COL | combined operating license |
| ECCS | Emergency Core Cooling System |
| EDO | Executive Director for Operations |
| EP | emergency preparedness |
| FR | <i>Federal Register</i> |
| FRN | <i>Federal Register</i> notice |
| ISFSI | independent spent fuel storage installations |
| LOCA | loss-of-coolant accident |
| NEI | Nuclear Energy Institute |
| NMSS | Office of Nuclear Material Safety and Safeguards |
| NPP | nuclear power plant |
| NRC | U.S. Nuclear Regulatory Commission |
| NRO | Office of New Reactors |
| NRDC | Natural Resources Defense Council |
| NRR | Office of Nuclear Reactor Regulation |
| NTTF | Near-Term Task Force |
| OGC | Office of the General Counsel |
| PRM | petition for rulemaking |
| PRB | Petition Review Board |
| rem | roentgen equivalent man |
| RIN | Regulation Identification Number |
| SECY | Office of the Secretary |
| SFP | spent fuel pool |
| SRM | staff requirements memorandum |
| WG | working group |

DEFINITIONS

Open PRM: Any docketed² petition for rulemaking that the NRC staff is actively working on.

Closed PRM: The PRM docket is closed, either through publication of a notice of denial or a notice stating that the petition will be fully or partially considered in the rulemaking process.

Estimated Date for Submission to Commission: Four months after the date of the meeting of the Petition Review Board (PRB).

Pending PRM: A notice has not been published indicating the closure of the petition docket.

Status of Petition since the Last PRM Report: A brief statement of the actions that have occurred or will occur in the near future. (For example: "Notice of docketing and request for public comment is under development.")

Date of PRB: The date that the PRB and petition working group (WG) determine the regulatory decision on a PRM (i.e., denial, consideration in a current or future rulemaking, or partial consideration in a current or future rulemaking).

Target PRB Date: The PRB and petition WG determine the regulatory decision on a PRM within 12 months from the date the notice of docketing is published in the *Federal Register* (FR).

Undetermined: A date has not been established at this time.

Withdrawn: The petitioner no longer wants to pursue the requested action and has notified the NRC. The change in status includes the date that the *Federal Register* notice (FRN) was published to notify the public that the petition was withdrawn.

Public Comments on the Petition: A brief summary of the comments received from the public or any interested party regarding a PRM, including the number received, type (individual, form letter, etc.), commenters (individual, industry, State organization, etc.), and whether the comments were generally in support of or generally in disagreement of the petition.

Background or Items of Interest (if applicable): Pertinent information related to the PRM that the staff wants to document throughout the process (e.g., congressional interest, changes in the regulatory environment).

² A PRM is docketed by the NRC if it meets the docketing criteria in 2.802 of Title 10 of the *Code of Federal Regulations*, "Petition for Rulemaking—Requirements for Filing."

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OPEN PETITIONS BY OFFICE

Enclosure

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~~OFFICIAL USE ONLY SENSITIVE INTERNAL INFORMATION~~

**OPEN PETITIONS FOR THE OFFICE OF NUCLEAR MATERIAL SAFETY AND
SAFEGUARDS**

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PRM NOS.: PRM-20-28, PRM-20-29, and PRM-20-30

PETITION SUBJECT: Linear No-Threshold Model and Standards for Protection Against Radiation

PETITIONERS: Carol S. Marcus, Mark L. Miller, and Mohan Doss

DOCKET ID: NRC-2015-0057

NRC CONTACT: Vanessa Cox, NMSS, 301-415-8342

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--|--|-----------------|--------------|-------------------|---|
| February 9, 2015 February 13, 2015 February 24, 2015 | June 23, 2015 80 FR 35870 August 21, 2015 80 FR 50804; Extension of comment period | June2016 | Undetermined | Undetermined | October 2016 |

PRM-20-28, PRM-20-29, and PRM-20-30 (continued)

PETITION SUMMARY:

On February 9, 2015, February 13, 2015, and February 24, 2015, Carol S. Marcus, Mark L. Miller, and Mohan Doss, respectively, submitted nearly identical petitions requesting that the Commission amend its regulations in Part 20 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Standards for Protection Against Radiation," to take radiation hormesis into account and end the NRC's reliance on the linear no-threshold hypothesis used to determine dose standards in its regulations. The concept of radiation hormesis claims that low doses of radiation have "no effects or protective effects" on population groups. Consequently, the petitioners request that: (1) worker dose remain at present levels, with allowances up to 100 millisievert (10 roentgen equivalent man (rem)); (2) the use of the "as low as is reasonably achievable" principle be removed entirely from the NRC's regulations; (3) public doses be raised to match worker doses; and (4) the NRC end differential doses to pregnant women, embryos, fetuses, and children under 18 years of age.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition and the public comments received.

PUBLIC COMMENTS ON THE PETITION:

The public comment period was scheduled to close on September 8, 2015; however, the NRC received requests for an extension of the comment period. The staff extended the comment period by 90 days (80 FR 50804; August 21, 2015). The comment period closed on November 19, 2015. The NRC received 635 individual public comments and 2,627 form letter comments on these PRMs. 543 of the individual public comments disagreed with the petition or were out of scope. 92 comments agreed with the petitioners.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The staff is evaluating three nearly identical PRMs as one activity under Docket ID NRC-2015-0057.

PRM NO.: PRM-51-30

PETITION SUBJECT: Spent Fuel Storage and Disposal

PETITIONER: Diane Curran, on behalf of 34 environmental organizations

DOCKET ID: NRC-2014-0014

NRC CONTACT: Keith McDaniel, NMSS, 301-415-5252

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--------------------------------------|--|--------------------|----------------|----------------------|---|
| December 20, 2013 January 7, 2014 | April 21, 2014 79 FR 22055 | March 2015 | April 14, 2015 | Denied | October 2015 |

PETITION SUMMARY:

On December 20, 2013, as corrected on January 7, 2014, Diane Curran, on behalf of 34 environmental organizations, submitted a PRM requesting that the Commission revise and integrate all safety and environmental regulations related to spent fuel storage and disposal. The petitioner requests that the NRC conduct a comprehensive review of these regulations and environmental studies, revise them to be consistent with the current state of knowledge, and integrate them into one cohesive regulatory framework to comply with the National Environmental Policy Act.

PRM-51-30 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

In the Staff Requirements Memorandum (SRM) to SECY-15-0136, dated February XX, 2016, the Commission approved the staff's recommendation to deny the PRM. Staff is finalizing and preparing the FRN for publication).

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC formed a working group (WG) to address both PRM-51-30 and PRM-51-31 (Environmental Impacts of Spent Fuel Storage during Reactor Operation) because both petitions make similar rulemaking requests.

PRM NO.: PRM-72-6

PETITION SUBJECT: Dry Cask Storage of Spent Fuel

PETITIONER: C-10 Research and Education Foundation, Inc.

DOCKET ID: NRC-2008-0649

NRC CONTACT: Torre Taylor, NMSS, 301-415-7900

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Date of Final Action/<i>Federal Register</i> Notice Citation |
|--------------------------|---|---|---|--|---|
| November 24, 2008 | March 3, 2009 74 FR 9178 | First PRB: January 2010 Second PRB: May 2015 | First PRB: January 2010 Second PRB: May 18, 2015 | First Review: Denied, Partial Consideration in the Rulemaking Process, and Undetermined (See Background Below) Remaining Two Issues: Denied | First publication: October 16, 2012 77 FR 63254 Publication on Remaining Two Issues after Commission Direction |

PRM-72-6 (continued)

PETITION SUMMARY:

On November 24, 2008, C-10 Research and Education Foundation, Inc. (C-10), submitted a PRM that requests that the Commission amend its regulations governing onsite dry cask storage of spent fuel. The petitioner believes that the current regulations do not provide sufficient requirements for safe storage of spent nuclear fuel in dry cask storage at independent spent fuel storage installations (ISFSIs). The petitioner requests the following 12 changes:

1. The NRC should prohibit the production of nonconforming pre-built full scale casks specifically built for NRC certification testing.
2. The NRC certification of casks should be based on upgraded code requirements that include design criteria and technical specifications for a 100-year minimum age-related degradation timeframe.
3. The NRC should approve, as part of the original ISFSI certification process and construction license, a method for dry cask transfer capacity that would allow for immediate and safe maintenance on a faulty or failing cask.
4. The NRC should require that dry casks be qualified for transport at the time of onsite storage approval certification.
5. The NRC should require mandatory compliance with the American Society of Mechanical Engineers (ASME) codes and standards "without exception."
6. The NRC should require ASME Code stamping for fabrication.
7. All materials for fabrication should be supplied by ASME-approved material suppliers.
8. Current ASME codes and standards for conservative heat treatment and leak tightness should be adopted and enforced.
9. A safe and secure hot cell transfer station, coupled with an auxiliary pool, should be built as part of an upgraded ISFSI design certification and licensing process.
10. The NRC should require real-time heat and radiation monitoring at ISFSIs.
11. The NRC should require hardened onsite storage at all nuclear power plants (NPP).
12. The NRC should establish funding to conduct ongoing studies to provide the data required to accurately define and monitor for age-related material degradation.

PRM-72-6 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is preparing a denial package to be submitted to the Commission for approval in April 2016.

PUBLIC COMMENTS ON THE PETITION:

The NRC received approximately 9,000 comments, the vast majority of which were in postcard format and supported the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC published an FRN on October 16, 2012 (77 FR 63254), acknowledging that the petition would be partially considered in the rulemaking process. The FRN stated that the Commission denied nine of the petitioner's requests (Requests 1, 2, 3, 5 through 8, 10, and 12), as listed in the "Petition Summary," and would consider one request in the rulemaking process (Request 11). The FRN stated that the NRC was deferring action on two requests (Requests 4 and 9) for future rulemaking determinations.

The docket for PRM-72-6 remains open until the Commission acts on Requests 4 and 9.

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OPEN PETITIONS FOR THE OFFICE OF NUCLEAR REACTOR REGULATION

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PRM NO.: PRM-50-113

PETITION SUBJECT: Uninterruptible Monitoring of Coolant and Fuel in Reactors and Spent Fuel Pools

PETITIONER: Alexander DeVolpi

DOCKET ID: NRC-2015-0230

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--------------------|--|-------------------------|-------------------------|-------------------------|---|
| September 10, 2015 | December 1, 2015 80 FR 75009 | PRB Will Not Be Held | PRB Will Not Be Held | PRB Will Not Be Held | March 2016 |

PETITION SUMMARY:

On September 10, 2015, Dr. Alexander DeVolpi submitted a PRM that requests that the Commission amend its regulations in 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," to require "installation of ex-vessel instrumentation for uninterrupted monitoring of coolant and fuel in reactors and spent-fuel pools." The petitioner cites a 2014 National Research Council report titled, "Lessons Learned from the Fukushima Nuclear Accident for Improving Safety of U.S. Nuclear Plants," which gave high priority to Recommendation 5.1A.

PRM-50-113 (continued)

This recommendation stated that greater “[a]ttention to availability, reliability, redundancy, and diversity of plant systems and equipment is specifically needed for . . . [i]nstrumentation for monitoring critical thermodynamic parameters in reactors, containments, and spent fuel pools.” In addition, the petitioner cites Section 5.1.1.4 of the report, “Instrumentation for Monitoring Critical Thermodynamic Parameters,” which states that “robust and diverse monitoring instrumentation that can withstand severe accident conditions is essential for diagnosing problems, selecting and implementing accident mitigation strategies, and monitoring their effectiveness.”

STATUS OF PETITION SINCE THE LAST PRM REPORT:

This is the first entry for this PRM. The staff is continuing to analyze the specific issues raised in the petition.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC published a notice of docketing in the *Federal Register* on December 1, 2015 (80 FR 75009). The NRC did not have a public comment period or a Petition Review Board because the issues raised in the petition have already been considered in the Mitigation of Beyond-Design-Basis Events rulemaking, the agency’s response to the National Academies of Science report related to lessons learned from Fukushima, and the closure of Tier 2 and 3 action items in the NTTF report.

PRM NO.: PRM-50-112

PETITION SUBJECT: Defining "Important to Safety"

PETITIONER: Kurt T. Schaefer

DOCKET ID: NRC-2015-0213

NRC CONTACT: Robert Beall, NRR, 301-415-3874

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|----------------------------------|--|-----------------|--------------|----------------------|---|
| July 20, 2015 August 31, 2015 | January 6, 2016 | Undetermined | Undetermined | Undetermined | January 2017 |

PETITION SUMMARY:

On July 20, 2015, and supplemented on August 31, 2015, Kurt T. Schaefer submitted a PRM that requests that the Commission amend 10 CFR Part 50 by defining and providing a set of criteria "for determining which structures, systems, components and functions are 'important to safety.'"

PRM-50-112 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The petition was published for public comment on January 6, 2016 (81 FR 410). The staff is continuing to analyze the specific issues raised in the petition and reviewing the comments received to date.

PUBLIC COMMENTS ON THE PETITION:

The public comment period closes on March 21, 2016.

BACKGROUND/ITEMS OF INTEREST (if applicable):

On January 5, 1984, the NRC issued Generic Letter (GL) 84-01, "NRC Use of the Terms, 'Important to Safety' and Safety Related'," which provided the current Commission practice concerning graded quality assurance for the two classes of equipment. As part of Commission review of the Shoreham Nuclear Power Station licensing proceedings later that year, the Commission directed the staff to initiate rulemaking to resolve the issue concerning the definition and usage of the terms safety related (SR) and important to safety (ITS). In April 1985, the staff issued SECY-85-119, "Issuance of Proposed Rule on the Important-To-Safety Issue," requesting Commission approval of a proposed rule that would clarify the terms "important to safety" and "safety related." In December 1985, the Commission voted 5-0 to disapprove the proposed rule in SECY-85-119. In SRM-SECY-85-119, "Issuance of Proposed Rule on the Important-To-Safety Issue," the Commission informed the staff that the proposed rule did not adequately differentiate nor clarify the terms "Important-to-Safety" and "Safety Related." The Commission reiterated in the SRM that it continues to believe that it is necessary to resolve the apparent confusion surrounding the usage of ITS and a new proposed rule should be resubmitted for approval. In May 1986, the staff issued SECY-86-164, "Proposed Rule on the Important-To-Safety," to address the Commission comments in the SRM on SECY-85-119. In a memo from the Secretary of the Commission dated June 24, 1991, the staff requested that the proposed rulemaking in SECY-86-164 be withdrawn.

PRM NO.: PRM-50-111

PETITION SUBJECT: In-Core Temperature Monitoring at Nuclear Power Plants

PETITIONER: Mark Edward Leyse

DOCKET ID: NRC-2015-0124

NRC CONTACT: Natreon Jordan, NRR, 301-415-7410

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|----------------|--|-----------------|--------------|----------------------|---|
| March 13, 2015 | July 16, 2015 80 FR 42067 | July 2016 | Undetermined | Undetermined | November 2016 |

PETITION SUMMARY:

On July 16, 2015, Mark Edward Leyse submitted a PRM requesting that the Commission amend its regulations to require all NPP licensees to use in-core monitoring devices at different elevations and radial positions throughout a reactor.

PRM-50-111 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

PRM-50-111, which applies to boiling-water reactors, is an extension of the issues raised in PRM-50-105, which also was submitted by Mr. Leyse. The NRC interpreted PRM-50-105 as limited to pressurized-water reactors and denied the PRM (78 FR 56174; September 12, 2013).

PRM NO.: PRM-50-109

PETITION SUBJECT: Improved Identification Techniques Against Alkali-Silica Reaction Concrete Degradation at Nuclear Power Plants

PETITIONER: Sandra Gavutis, on behalf of C-10

DOCKET ID: NRC-2014-0257

NRC CONTACT: Jessica Kratchman, NRR, 301-415-5112

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--------------------|--|-----------------|----------------------|----------------------|---|
| September 25, 2014 | January 12, 2015 80 FR 1476 | January 2016 | February 11, 2016 | Denied | June 2016 |

PETITION SUMMARY:

On September 25, 2014, Sandra Gavutis, on behalf of C-10, submitted a PRM requesting that the Commission amend its regulations to provide improved identification techniques against alkali-silica reaction (ASR) concrete degradation at NPPs. The petitioner asserts that current NRC regulations, which rely on visual inspection to identify ASR degradation, do not adequately identify ASR without petrographic analysis. The petitioner is requesting that the NRC revise applicable regulations to require adherence with current American Concrete Institute standards and ASME codes.

PRM-50-109 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG met with the PRB on February 11, 2016, and the PRB approved the staff's recommendation to deny the PRM. The staff is preparing a denial package to be submitted to the Commission for approval in June 2016.

PUBLIC COMMENTS ON THE PETITION:

The public comment period closed on March 30, 2015. The NRC received 10 public comments on the petition, five in support of the petition, three opposing the proposed changes, and two that were determined to be outside the scope of the petition review.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-50-108

PETITION SUBJECT: Fuel-Cladding Issues in Postulated Spent Fuel Pool (SFP) Accidents

PETITIONER: Mark Edward Leyse

DOCKET ID: NRC-2014-0171

NRC CONTACT: Daniel Doyle, NRR, 301-415-3748

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------|--|-----------------|--------------|----------------------|---|
| June 19, 2014 | October 7, 2014 79 FR 60383 | October 2015 | May 27, 2015 | Denied | November 2015 |

PETITION SUMMARY:

On June 19, 2014, Mark Edward Leyse submitted a PRM requesting that the Commission make new regulations stipulating the following:

1. The rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction should be calculated by SFP accident evaluation models using data from multirod bundle (assembly) severe accident experiments.

PRM-50-108 (continued)

2. The rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction should be calculated by SFP accident evaluation models using data from multirod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding.
3. SFP accident evaluation models should be required to conservatively model nitrogen-induced breakaway oxidation behavior.
4. Licensees should be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The Commission is reviewing the staff's recommendation to deny the petition (SECY-15-0146, dated November 19, 2015).

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-73-18

PETITION SUBJECT: Protection of Digital Computer and Communication Systems and Networks

PETITIONER: Anthony Pietrangelo, on behalf of the Nuclear Energy Institute (NEI)

DOCKET ID: NRC-2014-0165

NRC CONTACT: Jason Carneal, NRR, 301-415-1451

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------|--|-----------------|--------------|----------------------|---|
| June 12, 2014 | September 22, 2014 79 FR 56525 | June 2016 | Undetermined | Undetermined | October 2016 |

PETITION SUMMARY:

On June 12, 2014, Anthony Pietrangelo, on behalf of NEI, submitted a PRM that requests that the Commission revise certain cybersecurity language in its regulations to ensure that the rules are consistent with the NRC's original intent, are less burdensome for NRC licensees, and adequately protect public health and safety and common defense and security.

PRM-73-18 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition and the public comments received.

PUBLIC COMMENTS ON THE PETITION:

The public comment period closed on December 8, 2014. The NRC received 19 public comments on the petition, 15 in support, 2 opposing the proposed changes, and 2 suggesting alternatives to the changes proposed in the petition. The public comments in support of the proposed changes cited detailed examples of specific equipment that the commenters believe should be out of the scope of the cybersecurity rule. The public comments that opposed the proposed changes and those that suggested alternatives were very detailed and provided suggestions for alternative approaches to regulating cybersecurity at NPPs.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-51-31

PETITION SUBJECT: Environmental Impacts of Spent Fuel Storage During Reactor Operation

PETITIONER: Diane Curran, on behalf of 34 environmental organizations

DOCKET ID: NRC-2014-0055

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|------------------------------------|--|-----------------|----------------|----------------------|---|
| February 18, 2014 June 26, 2014 | May 1, 2014 79 FR 24595 July 24, 2014 79 FR 42989 | May 2015 | April 14, 2015 | Denied | October 2015 |

PETITION SUMMARY:

On February 18, 2014 (received by the Office of the Secretary (SECY) on March 12, 2014), Diane Curran, on behalf of 34 environmental organizations, submitted a PRM requesting that the Commission revise its regulations and consider,

PRM-51-31 (continued)

in all pending and future licensing and re-licensing decisions, what the petitioners consider to be new and significant information bearing on the environmental impacts of high-density spent fuel storage in reactor pools and the costs and benefits for avoiding or mitigating those impacts.

On June 26, 2014, Ms. Curran submitted a document, characterized as an "amended petition" for rulemaking, requesting that the NRC "add to the record of the February 18, 2014, petition the observations made by Chairman Macfarlane in her dissenting comments" on the NRC staff document designated COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel," dated November 12, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13273A601). The NRC does not consider the June 26, 2014, document to be an amendment to the February 18, 2014, petition as the petitioner does not request that the NRC take any rulemaking actions that were not otherwise requested in the February 18, 2014, petition. Therefore, the NRC will consider the June 26, 2014, document to be a supplement to PRM-51-31 and, accordingly, include it in the docket for PRM-51-31 (NRC-2014-0055).

STATUS OF PETITION SINCE THE LAST PRM REPORT:

In the SRM to SECY-15-0136, dated February XX, 2016, the Commission approved the staff's recommendation to deny the PRM. Staff is finalizing and preparing the FRN for publication).

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC formed a WG to address both PRM-51-30 and PRM-51-31 (Environmental Impacts of Spent Fuel Storage during Reactor Operation) because both petitions make similar rulemaking requests.

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PRM NO.: PRM-73-17

PETITION SUBJECT: Malware and Programmable Logic Computers in Nuclear Power Plant Systems

PETITIONER: Alan Morris of Morris and Ward, Consulting Engineers

DOCKET ID: NRC-2013-0214

NRC CONTACT: Natreon Jordan, NRR, 301-415-7410

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--|---|------------------------|--------------------|------------------------------|--|
| March 14, 2013 August 17, 21, 23, and 27, 2013 December 19, 2013 | February 7, 2014 79 FR 7406 | February 2015 | May 5, 2015 | Denied | November 2016 |

PRM-73-17 (continued)

PETITION SUMMARY:

On March 14, 2013, as supplemented by additional information through December 19, 2013, Alan Morris submitted a PRM requesting that the Commission require "new-design programmable logic computers" be installed in the control systems of NPPs to block malware attacks on the industrial control systems of those facilities. In addition, the petitioner requests that NPP staff be trained in "the programming and handling of the non-rewriteable memories" for NPPs.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

A Commissioners' assistants briefing was held on January 11, 2016. At this meeting, the Commissioners' assistants requested that additional detail be provided to ensure that the basis was adequately documented. The WG is making changes to the FRN to address the concerns.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC received the original request on March 14, 2013. The NRC staff determined that the original request did not meet the requirements in 10 CFR 2.802, "Petition for Rulemaking—Requirements for Filing," for docketing of a PRM. It notified the petitioner on August 9, 2013. The petitioner supplemented his original petition on August 17, 21, 23, and 27, 2013. In addition, the petitioner provided additional supplemental information through December 19, 2013. On June 12, 2014, the NRC staff sent a letter to the petitioner requesting additional information. The petitioner responded with several e-mails on June 18 and 19, 2014.

PRM NO.: PRM-50-106

PETITION SUBJECT: Environmental Qualification of Electrical Equipment Applicable to Existing and New Reactors

PETITIONER: Paul M. Blanch and C. Jordan Weaver, Natural Resources Defense Council (NRDC)

DOCKET ID: NRC-2012-0177

NRC CONTACT: Margaret S. Ellenson, NRR, 301-415-0894

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------|--|-----------------|--------------------|----------------------|---|
| June 18, 2012 | September 27, 2012 77 FR 59345 | September 2013 | September 18, 2013 | Denied | August 2015 |

PETITION SUMMARY:

On June 18, 2012, Paul M. Blanch and C. Jordan Weaver, of NRDC, jointly submitted a PRM requesting that the Commission "initiate rulemaking to revise its regulations to clearly and unequivocally require the environmental qualification of all safety-related cables, wires, splices, connections, and other ancillary electrical equipment that may be subjected to submergence and/or moisture intrusion during normal operating conditions, severe weather, seasonal flooding, and seismic events, and post-accident conditions, both inside and outside of containment."

PRM-50-106 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

In SRM-SECY-15-0098, dated January 11, 2016 (ADAMS Accession No. ML16012A138), the Commission approved the staff's recommendation to deny the petition for rulemaking.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-50-103

PETITION SUBJECT: Measurement and Control of Combustible Gas Generation and Dispersal

PETITIONER: NRDC and Mark Edward Leyse

DOCKET ID: NRC-2011-0189

NRC CONTACT: Richard Dudley, NRR, 301-415-1116

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|-------------------------|---|------------------------|---------------------|------------------------------|--|
| October 14, 2011 | January 5, 2012 77 FR 441 | Undetermined | Undetermined | Undetermined | Undetermined |

PETITION SUMMARY:

On October 14, 2011, the NRDC submitted a PRM that requests that the Commission amend its regulations regarding the measurement and control of combustible gas generation and dispersal within a power reactor system.

PRM-50-103 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

Action on this petition has been postponed pending further action on Recommendation 6 of the Fukushima Near-Term Task Force (NTTF) report.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not institute a public comment period, because the hydrogen control issue raised by this petition is being considered by the Commission under Recommendation 6 of the Fukushima NTTF report.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-50-99

PETITION SUBJECT: Enhancing Reactor Safety

PETITIONER: NRDC

DOCKET ID: NRC-2011-0189

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|----------------------|---|------------------------|---------------------|------------------------------|--|
| July 26, 2011 | September 20, 2011 76 FR 58165 | Undetermined | Undetermined | Undetermined | Undetermined |

PETITION SUMMARY:

On July 26, 2011, the NRDC submitted six PRMs (five of which have already been closed) requesting that the Commission amend its regulations to require: (1) emergency preparedness (EP) enhancements for prolonged station blackouts, (2) EP enhancements for multiunit events, and (3) licensee confirmation of seismic hazards and flooding hazards every 10 years that addresses any new and significant information. All of the PRMs cite the Fukushima NTTF report as the rationale and bases for the PRMs.

PRM-50-99 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

Action on PRM-50-99 has been postponed pending further action on the NTTF report.

PUBLIC COMMENTS ON THE PETITION:

Because the issues raised by these PRMs are being considered by the Commission under its review of the Fukushima NTTF report, the NRC did not institute a separate public comment period.

BACKGROUND/ITEMS OF INTEREST (if applicable):

PRM NO.: PRM-50-93 and PRM-50-95

PETITION SUBJECT: Calculated Maximum Fuel Element Cladding Temperature

PETITIONER: Mark Edward Leyse, on behalf of the New England Coalition

DOCKET ID: NRC-2009-0554

NRC CONTACT: Daniel Doyle, NRR, 301-415-3748

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|-----------------------------------|--|-----------------|--------------|----------------------|--|
| November 17, 2009 June 7, 2010 | January 25, 2010 75 FR 3876 | September 2016 | Undetermined | Undetermined | March 2017 |

PETITION SUMMARY:

On November 17, 2009, and June 7, 2010, Mark Edward Leyse, on behalf of the New England Coalition, submitted PRMs that request that the Commission revise 10 CFR 50.46(b)(1) to require that the calculated maximum fuel element cladding temperature not exceed a limit based on data from multirod (assembly) severe fuel damage experiments. The petitioner also requests revision of Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," to 10 CFR Part 50.

PRM-50-93 and PRM-50-95 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petitions. RES is developing a draft technical analysis to support the staff's recommendation. The WG requested and received an extension to August 2016.

PUBLIC COMMENTS ON THE PETITION:

The NRC received 20 comments, the majority of which were in support of the petition. The NRC published a second FRN on October 27, 2010 (75 FR 66007), to consolidate PRM-50-93 and PRM-50-95 and re-open the public comment period. The NRC received an additional 12 public comments.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The duration of the NRC's review will exceed the typical review period of PRMs because of the extremely large amount of information in PRMs 50-93 and 50-95. As a result, the NRC staff has implemented a special enhanced-transparency review process to increase the visibility of its review to the public. The NRC will publicly release its draft determinations regarding each group or category of issues on a periodic basis as the review progresses. In addition, the NRC will communicate preliminary review information to the petitioners and to other persons or organizations known to be interested in this activity. However, the NRC's conclusions on the issues raised in PRMs 50-93 and 50-95 will not be final until the Commission formally acts on the staff's recommendations and publishes an FRN on this action. The staff will place a disclaimer on all preliminary findings to clearly indicate their non-final status.

The NRC explained this special process to the petitioner in a letter on August 25, 2011. The preliminary analyses are included in the docket on <http://www.regulations.gov>

PRM NO.: PRM-26-3, PRM-26-5, and PRM-26-6

PETITION SUBJECT: "Managing Fatigue" and Options for Implementing an Alternative Interim Regulatory Approach to the Minimum Days Off Provisions

PETITIONERS: Robert N. Meyer, on behalf of the Professional Reactor Operator Society; Anthony R. Pietrangelo, on behalf of the Nuclear Energy Institute; and Erik Erb

DOCKET ID: NRC-2009-0482, NRC-2010-0304, and NRC-2010-0310

NRC CONTACT: Stewart Schneider, NRR, 301-415-4123

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|-------------------|--|-----------------|--------------|----------------------|--|
| October 16, 2009 | November 27, 2009 74 FR 62257 | Undetermined | Undetermined | Undetermined | Undetermined |
| September 3, 2010 | October 22, 2010 75 FR 65249 | | | | |
| August 17, 2010 | November 23, 2010 75 FR 71368 | | | | |

PRM-26-3, PRM-26-5, and PRM-26 (continued)

PETITION SUMMARY:

On October 29, 2009, Robert N. Meyer, on behalf of the Professional Reactor Operator Society, submitted a PRM requesting that the NRC change the term "unit outage" to "site outage" in 10 CFR Part 26 and that the definition of "site outage" read "up to 1 week prior to disconnecting the reactor unit from the grid and up to 75-percent turbine power following reconnection to the grid." On September 3, 2010, Anthony R. Pietrangelo, on behalf of the Nuclear Energy Institute (NEI), submitted a PRM requesting that the NRC amend its regulations regarding fitness-for-duty programs to refine existing requirements based on experience gained since the regulations were last amended in 2008. On August 17, 2010, Erik Erb submitted a PRM requesting that the NRC amend its fitness-for-duty regulations to decrease the minimum days off requirement from an average of 3 days per week to 2.5 or 2 days per week for security officers working 12-hour shifts.

In the SRM to SECY-11-0003/0028, "Status of Enforcement Discretion Request and Rulemaking Activities Related to 10 CFR part 26, subpart I, 'Managing Fatigue' and Options for Implementing an Alternative Interim Regulatory Approach to the Minimum Days Off Provisions of 10 CFR part 26, subpart I, 'Managing Fatigue,'" the Commission directed the NRC staff to address these PRMs in a rulemaking effort separate from the alternative to the minimum days off (MDO) rulemaking. The scope of the alternative MDO rulemaking was limited solely to providing an alternative to the then-current requirements for minimum days off in 10 CFR part 26, subpart I. On May 16, 2011, the NRC published three documents in the *Federal Register* (one for each PRM) informing the public that the issues raised in each PRM would be considered in a planned QC/QV rulemaking (76 FR 28192).

STATUS OF PETITION SINCE THE LAST PRM REPORT:

In the "Status Report on Petitions for Rulemaking as of August 2011," dated September 12, 2011 (ML112580409), the docket for this PRM was closed because staff determined that it would be considered in the proposed rulemaking titled "Fitness-for-Duty Programs" (previously titled "Part 26, Subpart I" and "Quality Control/Quality Verification") (Docket ID: NRC-2009-0090). On December 9, 2015, a notice discontinuing the "Fitness-for-Duty Programs" rulemaking was published in the *Federal Register* and staff determined that these PRMs would be resolved by the NRC in a separate action.

PRM-26-3, PRM-26-5, and PRM-26 (continued)

PUBLIC COMMENTS ON THE PETITION:

The NRC published a notice of receipt of, and request for public comment on PRM-26-3 on November 27, 2009. The public comment period ended on February 10, 2010, and the NRC received 4 comment letters from NEI, nuclear power plant operators and managers, and a private citizen. The comments generally supported the petition.

The NRC published a notice of receipt of, and request for public comment on the PRM-26-5 on October 22, 2010. The public comment period ended on January 5, 2011, and the NRC received 39 comment letters from corporations, professional organizations, and private citizens. Of these 39 comment letters, 11 specifically voiced support for the petition, while 13 voiced opposition. Those comment letters that voiced neither support for nor opposition to the petition itself discussed a diverse range of perspectives on the fatigue management provisions contained in 10 CFR part 26, subpart I.

The NRC published a notice of receipt of, and request for public comment on PRM-26-6 on November 23, 2010. The public comment period ended on February 7, 2011, and the NRC received 5 comment letters from corporations, professional organizations, and private citizens. The comments generally supported the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The staff will hold a public meeting on February 25, 2016, to discuss the path forward for resolving these petitions in light of the discontinuation of the discontinuation of the "Fitness-for-Duty Programs" rulemaking.

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OPEN PETITIONS FOR THE OFFICE OF NEW REACTORS

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PRM NO.: PRM-50-110

PETITION SUBJECT: Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors

PETITIONER: Michael D. Tschiltz, on behalf of the NEI

DOCKET ID: NRC-2015-0028

NRC CONTACT: Rollie Berry, NRO, 301-415-8162

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------------|--|-----------------------|-------------------|---------------------------|---|
| January 15, 2015 | March 27, 2015 80 FR 16308 | May 2016 | December 21, 2015 | Consider in Rulemaking | September 2016 |

PETITION SUMMARY:

On January 15, 2015, Michael D. Tschiltz, on behalf of NEI, submitted a PRM requesting that the Commission amend its regulations to clarify the scope of applicability of 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors," to include holders of combined operating licenses (COL). The applicability

PRM-50-110 (continued)

and scope of the NRC's regulations in 10 CFR 50.69 currently applies to a holder of an operating license under 10 CFR Part 50; a holder of a renewed operating license under 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants"; an applicant for a construction permit or operating license under 10 CFR Part 50; or an applicant for a design approval, a combined license, or manufacturing license under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." The petitioner is requesting that the rule be amended to include holders of COLs in the scope of applicability.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG met with the PRB on December 21, 2015, and the PRB approved the staff's recommendation to consider the petition. The WG will submit a SECY paper to the Commission recommending that rulemaking be initiated, as well as additional options that the Commission may consider during its review of the PRM.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC staff discussed this topic at public meetings held during the 2 years before NEI filed this PRM. The staff held a public meeting on September 16, 2015, to gain further understanding of the scope and bases for the petition. During the public meeting, NEI clarified that holders of COLs be included in the scope of applicability of 10 CFR 50.69, which could lead to a need for additional guidance.

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OPEN PETITIONS FOR THE OFFICE OF THE GENERAL COUNSEL

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PRM NO.: PRM-2-15

PETITION SUBJECT: Agency Procedures for Responding to Adverse Court Decisions and Addressing Funding Shortfalls

PETITIONER: Jeffrey M. Skov

DOCKET ID: NRC-2015-0264

NRC CONTACT: Ian Irvin, OGC, 301-415-1933

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|------------------|--|-----------------|--------------|----------------------|---|
| October 22, 2015 | February 17, 2016; 81 FR 8021 | February 2017 | Undetermined | Undetermined | June 2017 |

PETITION SUMMARY:

On October 22, 2015, Jeffrey M. Skov submitted a PRM requesting that the Commission amend its rules of practice and procedure to establish procedures for responding to adverse court decisions and to annually report to the public each instance in which the NRC does not receive "sufficient funds reasonably necessary to implement in good faith its statutory mandates."

PRM-2-15 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

This is the first entry for this PRM. The staff is analyzing the issues raised in the petition.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

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PETITIONS COMPLETED SINCE LAST REPORT

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| PRM No. | PRM Date | Petitioner | Subject | Docket ID | Resolution |
|-----------|------------|------------|---|----------------------|--|
| PRM-50-97 | 07/26/2011 | NRDC | Emergency Preparedness Enhancements for Prolonged Station Blackouts | <u>NRC-2011-0189</u> | Petition will be resolved in Mitigation of Beyond-Design-Basis Events rulemaking <u>[NRC-2014-0240;</u> RIN 3150-AJ49] |
| PRM-50-98 | 07/26/2011 | NRDC | Emergency Preparedness Enhancements for Multiunit Events | <u>NRC-2011-0189</u> | Petition will be resolved in Mitigation of Beyond-Design-Basis Events rulemaking <u>[NRC-2014-0240;</u> RIN 3150-AJ49] |

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STATUS REPORT ON PETITIONS FOR RULEMAKING

March 2016

Enclosure

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INTRODUCTION

The ~~Status Report~~status report on ~~Petitions~~petitions for ~~Rulemaking~~rulemaking (PRM) is provided to the Executive Director for Operations (EDO) bi-annually. The purpose of this report is to inform the EDO of ~~petitions~~PRMs currently before the agency and to provide an update on progress toward their completion. This report includes petitions docketed since the last report, dated October 2, 2015 (Accession No. ML15217A434 in the U.S. Nuclear Regulatory Commission's (NRC'sNRC) Agencywide Documents Access and Management System) (ADAMS)). In addition, this report informs the EDO of ~~petitions~~PRMs completed since the last report. The Office of Administration, in consultation with the Office of Nuclear Reactor Regulation (NRR), the Office of Nuclear Material Safety and Safeguards (NMSS), the Office of New Reactors (NRO), and the Office of the General Counsel (OGC), compiles the information for each open petition.

The report presents open petitions by office, beginning with the newest dockets and ending with the oldest dockets. The report captures the progression of each petition as it moves through the agency's process. The report includes hyperlinks to the docket for each petition on <http://www.regulations.gov>, thereby making additional pertinent documentation, including any public comments received, readily available to the reader. All reports since 2010 are available on The NRC Rulemaker.¹ ~~If you have a comment~~For comments or suggestion for additional improvements to this report, please contact Anthony de Jesús at 301-415-1106.

¹ <http://fusion.nrc.gov/adm/team/DAS/RADB/resource/Lists/Status%20Report%20on%20Petitions%20for%20Rulemaking/AllItems.aspx>.

LIST OF COMMON ABBREVIATIONS

| | |
|--------|--|
| 10 CFR | Title 10 of the <i>Code of Federal Regulations</i> |
| ADAMS | Agencywide Documents Access and Management System |
| ASLB | Atomic Safety Licensing Board |
| ASME | American Society of Mechanical Engineers |
| ASR | alkali-silica reaction |
| COL | combined operating license |
| ECCS | Emergency Core Cooling System |
| EDO | Executive Director for Operations |
| EP | emergency preparedness |
| FR | <i>Federal Register</i> |
| FRN | <i>Federal Register</i> notice |
| ISFSI | independent spent fuel storage installations |
| LOCA | loss-of-coolant accident |
| mSv | millisievert |
| NEI | Nuclear Energy Institute |
| NMSS | Office of Nuclear Material Safety and Safeguards |
| NPP | nuclear power plant |
| NRC | U.S. Nuclear Regulatory Commission |
| NRO | Office of New Reactors |
| NRDC | Natural Resources Defense Council |
| NRR | Office of Nuclear Reactor Regulation |
| NTTF | Near-Term Task Force |
| OGC | Office of the General Counsel |
| PRM | petition for rulemaking |
| PRB | Petition Review Board |
| rem | roentgen equivalent in-man |
| RIN | Regulation Identification Number |
| SECY | Office of the Secretary |
| SFP | spent fuel pool |
| SRM | staff requirements memorandum |
| WG | working group |

DEFINITIONS

Open PRM: Any docketed² petition for rulemaking that the NRC staff is actively working on.

Closed PRM: The PRM docket is closed, either through publication of a notice of denial or a notice stating that the petition will be fully or partially considered in the rulemaking process.

Estimated Date for Submission to Commission: Four months after the date of the meeting of the Petition Review Board (PRB).

Pending PRM: A notice has not been published indicating the closure of the petition docket.

Status of Petition since the Last PRM Report: A brief statement of the actions that have occurred or will occur in the near future. (For example: "Notice of docketing and request for public comment is under development.")

Date of PRB: The date that the PRB and petition working group (WG) determine the regulatory decision on a PRM (i.e., denial, consideration in a current or future rulemaking, or partial consideration in a current or future rulemaking).

Target PRB Date: The PRB and petition WG determine the regulatory decision on a petition PRM within 12 months from the date the notice of docketing is published in the *Federal Register* (FR).

Undetermined: A date has not been established at this time.

Withdrawn: The petitioner no longer wants to pursue the requested action and has notified the NRC. The change in status includes the date that the *Federal Register* notice (FRN) was published to notify the public that the petition was withdrawn.

Public Comments on the Petition: A brief summary of the comments received from the public or any interested party regarding a PRM, including the number received, type (individual, form letter, etc.), commenters (individual, industry, State organization, etc.), and whether the comments were generally in support of or generally in disagreement of the petition.

Background or Items of Interest (if applicable): Pertinent information related to the PRM that the staff wants to document throughout the process (e.g., congressional interest, changes in the regulatory environment).

Comment [BJ]: OGC: This footnote is confusing. Is it referring to the "Commission" as the "NRC official" indicated by the footnote? That doesn't make sense. Is it trying to say something about the PRB as a decisionmaker? Let's talk about what this footnote is trying to say and then we can revise it for clarity.

AdJ Response: FN was artifact of previous report when OEDO could sign some PRMs. This FN is no longer necessary.

² _____ A PRM is docketed by the NRC if it meets the docketing criteria in §-2.802 of Title 10 of the *Code of Federal Regulations*, "Petition for rulemaking—requirementsRulemaking—Requirements for filingFiling."

³ NRC official who has the ultimate authority to determine whether a PRM will be denied or considered in whole or in part in the rulemaking process.

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OPEN PETITIONS BY OFFICE

Enclosure

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**OPEN PETITIONS FOR THE OFFICE OF NUCLEAR MATERIAL SAFETY AND
SAFEGUARDS**

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againstAgainst

PRM NOS.: PRM-20-28, PRM-20-29, and PRM-20-30

PETITION SUBJECT: Linear No-Threshold Model and Standards for Protection againstAgainst Radiation

PETITIONERS: Carol S. Marcus, Mark L. Miller, and Mohan Doss

DOCKET ID: NRC-2015-0057

NRC CONTACT: Vanessa Cox, NMSS, 301-415-8342

Comment [TL]: This report will be submitted in March. NMSS should firm up PRB plans.

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--|--|---|--------------|-------------------|---|
| February 9, 2015 February 13, 2015 February 24, 2015 | June 23, 2015 80 FR 35870 <u>August 21, 2015</u> 80 FR 50804; <u>Extension of comment period</u> | March 2016 <u>June 2016</u> | Undetermined | Undetermined | July <u>October</u> 2016 |

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PRM-20-28, PRM-20-29, and PRM-20-30 (continued)

PETITION SUMMARY:

On February-9,-2015, February-13,-2015, and February-24,-2015, Carol S. Marcus, Mark L. Miller, and Mohan Doss, respectively, submitted nearly identical petitions requesting that the Commission amend its regulations in Part 20 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Standards for Protection against ~~Against~~ Radiation," to take radiation hormesis into account and end the NRC's reliance on the linear no-threshold hypothesis used to determine dose standards in its regulations. The concept of radiation hormesis claims that low doses of radiation have "no effects or protective effects" on population groups. Consequently, the petitioners request that: (1)-worker dose remain at present levels, with allowances up to 100 millisievert (10 roentgen equivalent man (rem);); (2)-the use of the "as low as is reasonably achievable" principle be removed entirely from the NRC's regulations; (3) public doses be raised to match worker doses; and (4)-the NRC end differential doses to pregnant women, embryos-and, fetuses, and children under 18 years of age.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition and the public comments received.

PUBLIC COMMENTS ON THE PETITION:

The public comment period was scheduled to close on September-8,-2015; however, the NRC received requests for an extension of the comment period. The staff extended the comment period by 90-days (80 FR 50804; August 21, 2015). The comment period closed on November 19, 2015. The NRC received 561635 individual public comments and 2,514627 form letter comments on these PRMs. The majority 543 of the individual public comments disagreed with the petition or were opposed to the changes requested by out of scope. 92 comments agreed with the petitioners.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The staff is evaluating three nearly identical petitions PRMs as one activity under Docket ID NRC-2015-0057.

Comment [AdJ]: NMSS, check for accuracy. Do we have a break down of number opposed, number in support, etc? If so, please provide that breakdown here.

PRM NO.: PRM-51-30

PETITION SUBJECT: Spent Fuel Storage and Disposal

PETITIONER: Diane Curran, on behalf of 34 environmental organizations

DOCKET ID: NRC-2014-0014

NRC CONTACT: Keith McDaniel, NMSS, 301-415-5252

| Date Received | Notice of Docketing Published in the Federal Register | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--------------------------------------|---|-----------------|----------------|-------------------|---|
| December 20, 2013 January 7, 2014 | April 21, 2014 79 FR 22055 | March 2015 | April 14, 2015 | Denied | September 2015 October 2015 |

PETITION SUMMARY:

On December 20, 2013, as corrected on January 7, 2014, Diane Curran, on behalf of 34 environmental organizations, submitted a PRM that requests requesting that the Commission revise and integrate all safety and environmental regulations related to spent fuel storage and disposal. The petitioner requests that the NRC conduct a comprehensive review of these regulations and environmental

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studies, revise them to be consistent with the current state of knowledge, and integrate them into one cohesive regulatory framework in order to comply with the National Environmental Policy Act.

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PRM-51-30 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is finalizing the denial package to be submitted for Commission approval. In the Staff Requirements Memorandum (SRM) to SECY-15-0136, dated February XX, 2016, the Commission approved the staff's recommendation to deny the PRM. Staff is finalizing and preparing the FRN for publication.

Comment [TL]: Should only be status since last report.

Comment [AdJ]: NRR Update

Comment [AdJ]: Final commission vote approving recommendation issued on 2/17. Staff still awaiting SRM.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC formed a working group (WG) to address both PRM-51-30 and PRM-51-31 (Environmental Impacts of Spent Fuel Storage during Reactor Operation) because both petitions make similar rulemaking requests.

PRM NO.: PRM-72-6

PETITION SUBJECT: Dry Cask Storage of Spent Fuel

PETITIONER: C-10 Research and Education Foundation, Inc.

DOCKET ID: NRC-2008-0649

NRC CONTACT: Torre Taylor, NMSS, 301-415-7900

Comment [BJ]: OGC: This PRM is no longer listed as an "Open" petition on the PRM website (<http://www.nrc.gov/reading-rm/doc-collections/rulemaking-ruleforum/petitions-by-year/open-petitions-all-years.html>), but it is listed as "open" here?

AdJ Response: It should be there. We will add this to the Open petitions page.

| Date Received | Notice of Docketing Published in the Federal Register | Target PRB Date | Date of PRB | PRB Determination | Date of Final Action/Federal Register Notice Citation |
|-------------------|---|---|---|--|--|
| November 24, 2008 | March 3, 2009 74 FR 9178 | First PRB: January 2010 Second PRB: May 2015 | First PRB: January 2010 Second PRB: May 18, 2015 | First Review: Denied, Partial Consideration in the Rulemaking Process, and Undetermined (see See Background belowBelow) Remaining two | First publication: October 16, 2012 77 FR 63254 Publication on remaining two issuesRemaining Two Issues after Commission Direction |

| | | | | | |
|--|--|--|--|-------------------------------------|--|
| | | | | issues <u>Two Issues:</u> Denied | |
|--|--|--|--|-------------------------------------|--|

PRM-72-6 (continued)

PETITION SUMMARY:

On November 24, 2008, C-10 Research and Education Foundation, Inc. (C-10), submitted a PRM that requests that the Commission amend its regulations governing onsite dry cask storage of spent fuel. The petitioner believes that the current regulations do not provide sufficient requirements for safe storage of spent nuclear fuel in dry cask storage at independent spent fuel storage installations (ISFSIs). The petitioner requests the following 12 changes:

1. The NRC should prohibit the production of nonconforming pre-built full scale casks specifically built for NRC certification testing.
2. The NRC certification of casks should be based on upgraded code requirements that include design criteria and technical specifications for a 100-year minimum age-related degradation timeframe.
3. The NRC should approve, as part of the original ISFSI certification process and construction license, a method for dry cask transfer capacity that ~~will~~would allow for immediate and safe maintenance on a faulty or failing cask.
4. The NRC should require that dry casks be qualified for transport at the time of onsite storage approval certification.
5. The NRC should require mandatory compliance with the American Society of Mechanical Engineers (ASME) codes and standards "without exception."
6. The NRC should require ASME ~~code~~Code stamping for fabrication.
7. All materials for fabrication should be supplied by ASME-approved material suppliers.
8. Current ASME codes and standards for conservative heat treatment and leak tightness should be adopted and enforced.
9. A safe and secure hot cell transfer station, coupled with an auxiliary pool, should be built as part of an upgraded ISFSI design certification and licensing process.
10. The NRC should require real-time heat and radiation monitoring at ISFSIs.

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11. The NRC should require hardened onsite storage at all nuclear power plants (NPPsNPP).
12. The NRC should establish funding to conduct ongoing studies to provide the data required to accurately define and monitor for age-related material degradation.

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PRM-72-6 (continued)_____

Comment [Adj]: Update

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is preparing a denial package to be submitted to the Commission for approval in ~~October 2015~~ April 2016.

PUBLIC COMMENTS ON THE PETITION:

The NRC received approximately 9,000 comments, the vast majority of which were in postcard format and supported the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC published an FRN on October 16, 2012 (77 FR 63254), acknowledging that the petition would be partially considered in the rulemaking process. The FRN stated that the Commission denied nine of the petitioner's requests (Requests 1, 2, 3, 5 through 8, 10, and 12), as listed in the "Petition Summary," and would consider one request in the rulemaking process (Request 11). The FRN stated that the NRC was deferring action on two requests (Requests 4 and 9) for future rulemaking determinations.

The docket for PRM-72-6 remains open until the Commission acts on Requests 4 and 9.

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OPEN PETITIONS FOR THE OFFICE OF NUCLEAR REACTOR REGULATION

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Comment [AdJ]: Report goes to EDO in March. Important this is accurate

PRM NO.: PRM-50-113

PETITION SUBJECT: Uninterruptible Monitoring of Coolant and Fuel in Reactors and Spent Fuel Pools

PETITIONER: Alexander DeVolpi

DOCKET ID: NRC-2015-0230

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--------------------|--|-------------------------|-------------------------|-------------------------|---|
| September 10, 2015 | December 1, 2015 80 FR 75009 | PRB Will Not Be Held | PRB Will Not Be Held | PRB Will Not Be Held | March 2016 |

PETITION SUMMARY:

On September 10, 2015, Dr. Alexander DeVolpi submitted a PRM that requests that the Commission amend its regulations in 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," to require "installation of ex-vessel instrumentation for uninterrupted monitoring of coolant and fuel in reactors and spent-fuel pools." The petitioner cites a 2014 National Research Council report titled, "Lessons Learned from the Fukushima Nuclear Accident for Improving Safety of U.S. Nuclear Plants," that which gave high priority to Recommendation 5.1A, which stated that greater

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Comment [Ad.I]: NRR should briefly discuss the other activities related to this PRM. Including explain why a PRB is not being held.

PRM-50-113 (continued)

This recommendation stated that greater "[a]ttention to availability, reliability, redundancy, and diversity of plant systems and equipment is specifically needed for . . . instrumentation. . . [i]nstrumentation for monitoring critical thermodynamic parameters in reactors, containments, and spent fuel pools." In addition, the petitioner cites to Section 5.1.1.4 of the report, "Instrumentation for Monitoring Critical Thermodynamic Parameters," which states that "robust and diverse monitoring instrumentation that can withstand severe accident conditions is essential for diagnosing problems, selecting and implementing accident mitigation strategies, and monitoring their effectiveness."

STATUS OF PETITION SINCE THE LAST PRM REPORT:

This is the first entry for this PRM in this report. The staff is continuing to analyze the specific issues raised in the petition.

PUBLIC COMMENTS ON THE PETITION:

~~The NRC did not request public comment on this petition as the~~ The staff believed determined it had has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC published a notice of docketing in the *Federal Register* on December 1, 2015 (80 FR 75009). The NRC did not have a public comment period or a Petition Review Board because the issues raised in the petition have already been considered in the Mitigation of Beyond-Design-Basis Events rulemaking, the agency's response to the National Academies of Science report related to lessons learned from Fukushima, and the closure of Tier 2 and 3 action items in the NTTF report.

PRM NO.: PRM-50-112

PETITION SUBJECT: Defining "Important to Safety"

PETITIONER: Kurt T. Schaefer

DOCKET ID: NRC-2015-0213

NRC CONTACT: Robert Beall, NRR, 301-415-3874

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|----------------------------------|--|-----------------|--------------|----------------------|---|
| July 20, 2015 August 31, 2015 | January 6, 2016 | Undetermined | Undetermined | Undetermined | January 2017 |

PETITION SUMMARY:

On July 20, 2015, and supplemented on August 31, 2015, Kurt T. Schaefer submitted a PRM that requests that the Commission amend 10 CFR Part 50, "~~Domestic Licensing of Production and Utilization Facilities,~~" by defining and providing a set of criteria "for determining which structures, systems, components and functions are 'important to safety.'"

PRM-50-112 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The petition was published for public comment on January 6, 2016 (81 FR 410). 6, 2016 (81 FR 410). The staff is continuing to analyze the specific issues raised in the petition and reviewing the comments received to date.

PUBLIC COMMENTS ON THE PETITION:

The public comment period closes on March 21, 2016.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

On January 5, 1984, the NRC issued Generic Letter (GL) 84-01, "NRC Use of the Terms, 'Important to Safety' and Safety Related'," which provided the current Commission practice concerning graded quality assurance for the two classes of equipment. As part of Commission review of the Shoreham Nuclear Power Station licensing proceedings later that year, the Commission directed the staff to initiate rulemaking to resolve the issue concerning the definition and usage of the terms safety related (SR) and important to safety (ITS). In April 1985, the staff issued SECY-85-119, "Issuance of Proposed Rule on the Important-To-Safety Issue," requesting Commission approval of a proposed rule that would clarify the terms "important to safety" and "safety related." In December 1985, the Commission voted 5-0 to disapprove the proposed rule in SECY-85-119. In SRM-SECY-85-119, "Issuance of Proposed Rule on the Important-To-Safety Issue," the Commission informed the staff that the proposed rule did not adequately differentiate nor clarify the terms "Important-to-Safety" and "Safety Related." The Commission reiterated in the SRM that it continues to believe that it is necessary to resolve the apparent confusion surrounding the usage of ITS and a new proposed rule should be resubmitted for approval. In May 1986, the staff issued SECY-86-164, "Proposed Rule on the Important-To-Safety," to address the Commission comments in the SRM on SECY-85-119. In a memo from the Secretary of the Commission dated June 24, 1991, the staff requested that the proposed rulemaking in SECY-86-164 be withdrawn.

Power Reactor Temperature at Nuclear Power Plants

PRM NO.: PRM-50-111

PETITION SUBJECT: ~~Power Reactor~~ In-Core Temperature Monitoring at Nuclear Power Plants

PETITIONER: Mark Edward Leyse

DOCKET ID: NRC-2015-0124

NRC CONTACT: Natreon Jordan, NRR, 301-415-7410

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|----------------|--|-----------------|--------------|----------------------|---|
| March 13, 2015 | July 16, 2015 80 FR 42067 | July 2016 | Undetermined | Undetermined | November 2016 |

PETITION SUMMARY:

On July 16, 2015, Mark Edward Leyse submitted a PRM that requests ~~requesting~~ that the Commission amend its regulations to require all NPP licensees to use in-core monitoring devices at different elevations and radial positions throughout the reactor.

PRM-50-111 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

PRM-50-111, which applies to boiling-water reactors, is an extension of the issues raised in PRM-50-105, which also was submitted by Mr. Leyse. The NRC interpreted PRM-50-105 as limited to pressurized-water reactors, and denied the PRM (78-FR-56174; September 12, 2013).

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againstAgainst

Reaction

Comment [AdJ]: Will need to update as soon as PRB takes place on 2/11

PRM NO.: PRM-50-109

PETITION SUBJECT: Improved Identification Techniques againstAgainst Alkali-Silica Reaction Concrete Degradation at Nuclear Power Plants

PETITIONER: Sandra Gavutis, on behalf of C-10

DOCKET ID: NRC-2014-0257

NRC CONTACT: Jessica Kratchman, NRR, 301-415-5112

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--------------------|--|-----------------|----------------------|---------------------------------|---|
| September 25, 2014 | January 12, 2015 80 FR 1476 | January 2016 | February 11, 2016 | (Undetermined) <u>Denied</u> | May <u>June</u> 2016 |

PETITION SUMMARY:

On September 25, 2014, Sandra Gavutis, on behalf of C-10, submitted a PRM that requestsrequesting that the Commission amend its regulations to provide improved identification techniques against alkali-silica reaction (ASR) concrete degradation at NPPs. The petitioner asserts that current NRC regulations, which rely on visual inspection to identify ASR degradation, do not adequately

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identify ASR without petrographic analysis. The petitioner is requesting that the NRC revise applicable regulations to require adherence with current American Concrete Institute standards and ASME codes.

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PRM-50-109 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

[The WG met with the PRB on February 11, 2016, and the PRB approved the staff's recommendation to... deny the PRM. The staff is preparing a denial package to be submitted to the Commission for approval in May/June 2016.]

Comment [AdJ]: NRR should update this to reflect current status.

Comment [AdJ]: NRR should update with actual numbers in support, against, etc.

PUBLIC COMMENTS ON THE PETITION:

The public comment period closed on March 30, 2015. The NRC received 10 public comments on the petition, XXfive in support of the petition; XXthree opposing the proposed changes; and XXsuggesting alternatives two that were determined to be outside the changes proposed in scope of the petition review.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

The staff confirmed with the petitioner that the petitioner did not intend a portion of the PRM to be treated as an allegation against the licensee.

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PRM NO.: PRM-50-108

PETITION SUBJECT: Fuel-Cladding Issues in Postulated Spent Fuel Pool (SFP) Accidents

PETITIONER: Mark Edward Leyse

DOCKET ID: NRC-2014-0171

NRC CONTACT: Daniel Doyle, NRR, 301-415-3748

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimate for SFP to C |
|---------------|--|-----------------|--------------|----------------------|-----------------------------|
| June 19, 2014 | October 7, 2014 79 FR 60383 | October 2015 | May 27, 2015 | Denied | Nov |

PETITION SUMMARY:

On June 19, 2014, Mark Edward Leyse submitted a PRM that requests requesting that the Commission make new regulations stipulating the following:

1. The rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction should be calculated by SFP accident evaluation models using data from multirod bundle (assembly) severe accident experiments.

PRM-50-108 (continued)

2. The rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction should be calculated by SFP accident evaluation models using data from multirod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding.

3. SFP accident evaluation models should be required to conservatively model nitrogen-induced breakaway oxidation behavior.

4. Licensees should be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

Comment [Guidance]: Update.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

~~The WG is finalizing the denial package to be submitted for Commission approval.~~

The Commission is reviewing the staff's recommendation to deny the petition (SECY-15-0146, dated November 19, 2015).

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-73-18

PETITION SUBJECT: Protection of Digital Computer and Communication Systems and Networks

PETITIONER: Anthony Pietrangelo, on behalf of the Nuclear Energy Institute (NEI)

DOCKET ID: NRC-2014-0165

NRC CONTACT: Jason Carneal, NRR, 301-415-1451

Comment [Guidance]: Report goes to EDO in March, make sure accurate.

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------|--|----------------------------|--------------|----------------------|---|
| June 12, 2014 | September 22, 2014 79 FR 56525 | March June 2016 | Undetermined | Undetermined | July October 2016 |

PETITION SUMMARY:

On June 12, 2014, Anthony Pietrangelo, on behalf of the NEI, submitted a PRM that requests that the Commission revise certain cybersecurity language in its regulations to ensure that the rules are consistent with the NRC's original intent, are less burdensome for NRC licensees, and adequately protect the public health and safety and common defense and security.

PRM-73-18 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition and the public comments received.

PUBLIC COMMENTS ON THE PETITION:

The public comment period closed on December 12, 8, 2014. The NRC received 19 public comments on the petition, 15 in support of the petition, 2 opposing the proposed changes, and 2 suggesting alternatives to the changes proposed in the petition. The public comments in support of the proposed changes cited detailed examples of specific equipment that the commenters believe should be out of the scope of the ~~cyber security~~cybersecurity rule. The public comments that opposed the proposed changes and those that suggested alternatives were very detailed and provided suggestions for alternative approaches to regulating ~~cyber security~~cybersecurity at NPPs.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

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Comment [Guidance]: Update

PRM NO.: PRM-51-31

PETITION SUBJECT: Environmental Impacts of Spent Fuel Storage during During Reactor Operation

PETITIONER: Diane Curran, on behalf of 34 environmental organizations

DOCKET ID: NRC-2014-0055

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|------------------------------------|--|-----------------|----------------|----------------------|---|
| February 18, 2014 June 26, 2014 | May 1, 2014 79 FR 24595 July 24, 2014 79 FR 42989 | May 2015 | April 14, 2015 | Denied | September <u>October</u> 2015 |

PETITION SUMMARY:

On February 18, 2014 (received by the Office of the Secretary (SECY) on March 12, 2014), Diane Curran, on behalf of 34 environmental organizations, submitted a PRM that ~~requests~~ requesting that the Commission revise its regulations and consider, ~~in all pending~~

PRM-51-31 (continued)

in all pending and future licensing and re-licensing decisions, what the petitioners consider to be new and significant information bearing on the environmental impacts of high-density spent fuel storage in reactor pools and the costs and benefits for avoiding or mitigating those impacts.

On June 26, 2014, Ms. Curran submitted a document, characterized as an "amended petition" for rulemaking, requesting that the NRC "add to the record of the February 18, 2014, petition the observations made by Chairman Macfarlane in her dissenting comments" on the NRC staff document designated COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel," dated November 12, 2013

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(Agencywide Documents Access and Management System (ADAMS) Accession No. ML13273A601). The NRC does not consider the June 26, 2014, document to be an amendment to the February 18, 2014, petition as the petitioner does not request that the NRC take any rulemaking actions that were not otherwise requested in the February 18, 2014, petition. Therefore, the NRC will consider the June 26, 2014, document to be a supplement to PRM-51-31, and, accordingly, included it in the docket for PRM-51-31 (NRC-2014-0055).

Comment [Guidance]: Update

Comment [Adj]: Final commission vote approving recommendation issued on 2/17. Staff still awaiting SRM.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

~~(The WG is finalizing the denial package to be submitted for Commission approval. In the SRM to SECY-15-0136, dated February XX, 2016, the Commission approved the staff's recommendation to deny the PRM. Staff is finalizing and preparing the FRN for publication).~~

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC formed a WG to address both PRM-51-30 (Spent Fuel Storage and Disposal) and PRM-51-31.

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and PRM-51-31 (Environmental Impacts of Spent Fuel Storage during Reactor Operation) because both petitions make similar rulemaking requests.

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in-

Comment [Guidance]: Update

PRM NO.: PRM-73-17

PETITION SUBJECT: Malware and Programmable Logic in Computers in Nuclear Power Plant Systems

PETITIONER: Alan Morris of Morris and Ward, Consulting Engineers

DOCKET ID: NRC-2013-0214

NRC CONTACT: Natreon Jordan, NRR, 301-415-7410

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---|--|-----------------|-------------|----------------------|--|
| March 14, 2013; August 17, 21, 23, and 27, 2013 <u>December 19, 2013</u> | February 7, 2014 79 FR 7406 | February 2015 | May 5, 2015 | Denied | February 2016 <u>November 2016</u> |

PRM-73-17 (continued)

PETITION SUMMARY:

On March 14, 2013, as supplemented by additional information through December 19, 2013, Alan Morris submitted a PRM that requests requesting that the Commission require "new-design programmable logic computers" be installed in the control systems of NPPs to

PRM-73-17 (continued)

block malware attacks on the industrial control systems of those facilities. In addition, the petitioner requests that NPP staff be trained in "the programming and handling of the non-rewriteable memories" for NPPs.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

A ~~Commission assistant~~ Commissioners' assistants briefing was held on January 11, 2016. At this meeting, the Commissioners' assistants requested that additional detail be provided to ensure that the basis was adequately documented. The WG is making changes to the FRN identified in this meeting to address the concerns.

Comment [Guidance]: Make sure this reflects any Commission/EDO criticisms of the FRN.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC received the original request on March 14, 2013. The NRC staff determined that the original request did not meet the requirements in 10 CFR 2.802, "Petition for Rulemaking—Requirements for Filing," for docketing of a PRM, and it. It notified the petitioner on August 9, 2013. The petitioner supplemented his original petition on August 17, 21, 23, and 27, 2013. In addition, the petitioner provided additional supplemental information through December 19, 2013. On June 12, 2014, the NRC staff sent a letter to the petitioner requesting additional information. The petitioner responded with several e-mails on June 18 and 19, 2014.

PRM NO.: PRM-50-106

PETITION SUBJECT: Environmental Qualification of Electrical Equipment Applicable to Existing and New Reactors

PETITIONER: Paul M. Blanch and C. Jordan Weaver, Natural Resources Defense Council (NRDC)

DOCKET ID: NRC-2012-0177

NRC CONTACT: Margaret S. Ellenson, NRR, 301-415-0894

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination |
|---------------|--|-----------------|--------------------|----------------------|
| June 18, 2012 | September 27, 2012 77 FR 59345 | September 2013 | September 18, 2013 | Denied |

PETITION SUMMARY:

On June 18, 2012, Paul M. Blanch and C. Jordan Weaver, of NRDC, jointly submitted a PRM that requests requesting that the Commission "initiate rulemaking to revise its regulations to clearly and unequivocally require the environmental qualification of all safety-related cables, wires, splices, connections, and other ancillary electrical equipment that may be subjected to submergence and/or moisture intrusion during normal operating conditions, severe weather, seasonal flooding, and seismic events, and post-accident conditions, both inside and outside of containment."

PRM-50-106 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff submitted the denial package to the Commission for approval (In SRM-SECY-15-0098, "Denial of Petition for Rulemaking related to Environmental Qualifications of Electrical Equipment (PRM-50-106)," dated August 5, 2015 January 11, 2016 (ADAMS Accession No. ML14071A279)). ML16012A138), the Commission approved the staff's recommendation to deny the petition for rulemaking.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-50-103

PETITION SUBJECT: Measurement and Control of Combustible Gas Generation and Dispersal

PETITIONER: NRDC and Mark Edward Leyse

DOCKET ID: NRC-2011-0189

NRC CONTACT: Richard Dudley, NRR, 301-415-1116

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date Submitted Committee |
|------------------|--|-----------------|--------------|----------------------|---|
| October 14, 2011 | January 5, 2012 77 FR 441 | Undetermined | Undetermined | Undetermined | Undetermined |

PETITION SUMMARY:

On October 14, 2011, the NRDC submitted a PRM that requests that the Commission amend its regulations regarding the measurement and control of combustible gas generation and dispersal within a power reactor system.

PRM-50-103 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

Action on this petition has been postponed pending further action on Recommendation 6 of the Fukushima Near-Term Task Force (NTTF) report.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not institute a public comment period, because the hydrogen control issue raised by this petition is being considered by the Commission under Recommendation 6 of the Fukushima NTTF report.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-50-99

PETITION SUBJECT: Enhancing Reactor Safety

PETITIONER: NRDC

DOCKET ID: NRC-2011-0189

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

Comment [BJ]: OGC: Information for PRMs 50-97 and 98 are listed here, making this entry very confusing because it is actually being treated differently than those PRMs. Additionally, this is inconsistent with other grouped PRM treatment in this report.

AdJ Response: PRM-50-97 and 98 can't be here because those are no longer open (and appear in the closed section of this document). That said, since the resolution of those PRMs is described in the closed section, I see no reason to include them here so I'm deleting the info related to those PRMs.

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------|--|--------------------------------|-------------|----------------------|---|
| July 26, 2011 | September 20, 2011 76 FR 58165 | PRM-50-97 and PRM-50-98: NA | | | |

| | | | |
|----------------------------|--|--|--|
| PRM-50-99: Undetermined | PRM-50-97 and PRM-50-98: NA PRM-50-99: Undetermined | PRM-50-97 and PRM-50-98: Consider in Rulemaking PRM-50-99: Undetermined | PRM-50-97 and PRM-50- 98: September 2015 PRM-50-99: Undetermined |
|----------------------------|--|--|--|

~~PRM-50-97, PRM-50-98, and PRM-50-99 (continued)~~

PETITION SUMMARY:

On July 26, 2011, the NRDC submitted six PRMs (~~three~~five of which have already been closed) that ~~request~~requesting that the Commission amend its regulations to require: (1) ~~Emergency Preparedness~~emergency preparedness (EP) enhancements for prolonged station blackouts, (2) EP enhancements for multiunit events, and (3) ~~licensees to confirm~~licensee confirmation of seismic hazards and flooding hazards every 10 years and ~~addressthat~~addresses any new and significant information. All of the PRMs cite the Fukushima NTTF report as the rationale and bases for the PRMs.

PRM-50-99 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

~~PRM-50-97 and PRM-50-98 are being considered within the Mitigation Strategies for Beyond-Design-Basis Events (RIN 3150-AJ49) proposed rule and the staff is preparing letters to the petitioner for EDO signature.~~

Action on PRM-50-99 has been postponed pending further action on the NTTF report.

PUBLIC COMMENTS ON THE PETITION:

Because the issues raised by these PRMs are being considered by the Commission under its review of the Fukushima NTTF report, the NRC did not institute a separate public comment period.

BACKGROUND/ITEMS OF INTEREST (if applicable):

~~In the SRM to SECY-15-0065, "Proposed Rule: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)," dated August 27, 2015 (ADAMS Accession No. ML15239A767), the Commission approved the staff's recommendation that these three petitions be addressed through the Mitigation of Beyond-Design-Basis Events proposed rulemaking.~~

PRM NO.: PRM-50-93 and PRM-50-95

PETITION SUBJECT: Calculated Maximum Fuel Element Cladding Temperature

PETITIONER: Mark Edward Leyse, on behalf of the New England Coalition

DOCKET ID: NRC-2009-0554

NRC CONTACT: Daniel Doyle, NRR, 301-415-3748

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | SM C |
|-----------------------------------|--|-----------------|--------------|----------------------|---------|
| November 17, 2009 June 7, 2010 | January 25, 2010 75 FR 3876 | September 2016 | Undetermined | Undetermined | M |

PETITION SUMMARY:

On November 17, 2009, and June 7, 2010, Mark Edward Leyse, on behalf of the New England Coalition, submitted PRMs that request that the Commission revise 10 CFR 50.46(b)(1) to require that the calculated maximum fuel element cladding temperature not exceed a limit based on data from multirod (assembly) severe fuel damage experiments. The petitioner also requests revision of Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," to 10 CFR Part 50. ~~Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," to 10 CFR Part 50.~~

PRM-50-93 and PRM-50-95 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

[The staff is continuing to analyze the specific issues raised in the petitions. Specific items from RES is developing a draft technical analysis to support the petitions include 7, 8, 11, 13, and 14 staff's recommendation. The WG requested and received an extension to August 2016.]

PUBLIC COMMENTS ON THE PETITION:

The NRC received 20 comments, the majority of which were in support of the petition, and is preparing to make a presentation in the fall of 2015 to the PRB on dispositioning this PRM. The NRC published a second FRN on October 27, 2010 (75 FR 66007), to consolidate PRM-50-93 and PRM-50-95 and re-open the public comment period. The NRC received an additional 12 public comments.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The duration of the NRC's review will exceed the typical review period of PRMs because of the extremely large amount of information in PRMs 50-93/ and 50-95. As a result, the NRC staff has implemented a special enhanced-transparency review process to increase the visibility of its review to the public. The NRC will publicly release its draft determinations regarding each group or category of issues on a periodic basis as the review progresses. In addition, the NRC will communicate preliminary review information to the petitioners and to other persons or organizations known to be interested in this activity. [However, the NRC's conclusions on the issues raised in PRMs 50-93/ and 50-95 will not be final until the Commission formally acts on the staff's recommendations and publishes a notice of an FRN on this action in the FR. The staff will place a disclaimer on all preliminary findings to clearly indicate their non-final status.]

The NRC explained this special process to the petitioner in a letter on August 25, 2011. The preliminary analyses are included in the docket on www.regulations.gov.

Comment [AdJ]: NRR, Has there been a PRB?

Comment [AdJ]: NRR, please update. Was a PRB held in fall 2015?

Comment [AdJ]: NRR, should we mention the back-and-forth email correspondence with Leyse?

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<http://www.regulations.gov>

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PRM-26-3, PRM-26-5, and PRM-26-6: "Managing Fatigue" and Options for Implementing an Alternative Interim Regulatory Approach to the Minimum Days Off Provisions

PRM NO.: PRM-26-3, PRM-26-5, and PRM-26-6

Comment [AdJ]: This is a newly added entry added back into the report and was not in the previous report submitted to OGC. These will be added to Open Petitions page.

PETITION SUBJECT: "Managing Fatigue" and Options for Implementing an Alternative Interim Regulatory Approach to the Minimum Days Off Provisions

PETITIONERS: Robert N. Meyer, on behalf of the Professional Reactor Operator Society; Anthony R. Pietrangelo, on behalf of the Nuclear Energy Institute; and Erik Erb

DOCKET ID: NRC-2009-0482, NRC-2010-0304, and NRC-2010-0310

NRC CONTACT: Stewart Schneider, NRR, 301-415-4123

| <u>Date Received</u> | <u>Notice of Docketing Published in the Federal Register</u> | <u>Target PRB Date</u> | <u>Date of PRB</u> | <u>PRB Determination</u> | <u>Estimated Date for Submission to Commission</u> |
|--------------------------|--|------------------------|---------------------|------------------------------|--|
| <u>October 16, 2009</u> | <u>November 27, 2009 74 FR 62257</u> | <u>Undetermined</u> | <u>Undetermined</u> | <u>Undetermined</u> | <u>Undetermined</u> |
| <u>September 3, 2010</u> | <u>October 22, 2010 75 FR 65249</u> | | | | |
| <u>August 17, 2010</u> | <u>November 23, 2010 75 FR 71368</u> | | | | |

PRM-26-3, PRM-26-5, and PRM-26 (continued)

PETITION SUMMARY:

On October 29, 2009, Robert N. Meyer, on behalf of the Professional Reactor Operator Society, submitted a PRM requesting that the NRC change the term "unit outage" to "site outage" in 10 CFR Part 26 and that the definition of "site outage" read "up to 1 week prior to disconnecting the reactor unit from the grid and up to 75-percent turbine power following reconnection to the grid." On September 3, 2010, Anthony R. Pietrangelo, on behalf of the Nuclear Energy Institute (NEI), submitted a PRM requesting that the NRC amend its regulations regarding fitness-for-duty programs to refine existing requirements based on experience gained since the regulations were last amended in 2008. On August 17, 2010, Erik Erb submitted a PRM requesting that the NRC amend its fitness-for-duty regulations to decrease the minimum days off requirement from

an average of 3 days per week to 2.5 or 2 days per week for security officers working 12-hour shifts.

In the SRM to SECY-11-0003/0028, "Status of Enforcement Discretion Request and Rulemaking Activities Related to 10 CFR part 26, subpart I, 'Managing Fatigue' and Options for Implementing an Alternative Interim Regulatory Approach to the Minimum Days Off Provisions of 10 CFR part 26, subpart I, 'Managing Fatigue,'" the Commission directed the NRC staff to address these PRMs in a rulemaking effort separate from the alternative to the minimum days off (MDO) rulemaking. The scope of the alternative MDO rulemaking was limited solely to providing an alternative to the then-current requirements for minimum days off in 10 CFR part 26, subpart I. On May 16, 2011, the NRC published three documents in the *Federal Register* (one for each PRM) informing the public that the issues raised in each PRM would be considered in a planned QC/QV rulemaking (76 FR 28192).

STATUS OF PETITION SINCE THE LAST PRM REPORT:

In the "Status Report on Petitions for Rulemaking as of August 2011," dated September 12, 2011 (ML112580409), the docket for this PRM was closed because staff determined that it would be considered in the proposed rulemaking titled "Fitness-for-Duty Programs" (previously titled "Part 26, Subpart I" and "Quality Control/Quality Verification") (Docket ID: NRC-2009-0090). On December 9, 2015, a notice discontinuing the "Fitness-for-Duty Programs" rulemaking was published in the *Federal Register* and staff determined that these PRMs would be resolved by the NRC in a separate action.

PRM-26-3, PRM-26-5, and PRM-26 (continued)

PUBLIC COMMENTS ON THE PETITION:

The NRC published a notice of receipt of, and request for public comment on PRM-26-3 on November 27, 2009. The public comment period ended on February 10, 2010, and the NRC received 4 comment letters from NEI, nuclear power plant operators and managers, and a private citizen. The comments generally supported the petition.

The NRC published a notice of receipt of, and request for public comment on the PRM-26-5 on October 22, 2010. The public comment period ended on January 5, 2011, and the NRC received 39 comment letters from corporations, professional organizations, and private citizens. Of these 39 comment letters, 11 specifically voiced support for the petition, while 13 voiced opposition. Those comment letters that voiced neither support for nor opposition to the petition itself discussed a diverse range of perspectives on the fatigue management provisions contained in 10 CFR part 26, subpart I.

The NRC published a notice of receipt of, and request for public comment on PRM-26-6 on November 23, 2010. The public comment period ended on February 7, 2011, and the NRC

received 5 comment letters from corporations, professional organizations, and private citizens. The comments generally supported the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The staff will hold a public meeting on February 25, 2016, to discuss the path forward for resolving these petitions in light of the discontinuation of the discontinuation of the "Fitness-for-Duty Programs" rulemaking.

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OPEN PETITIONS FOR THE OFFICE OF NEW REACTORS

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PRM NO.: PRM-50-110

PETITION SUBJECT: Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors

PETITIONER: Michael D. Tschiltz, on behalf of the NEI

DOCKET ID: NRC-2015-0028

NRC CONTACT: Rollie Berry, NRO, 301-415-8162

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------------|--|-----------------------|-------------------|---------------------------|---|
| January 15, 2015 | March 27, 2015 80 FR 16308 | May 2016 | December 21, 2015 | Consider in Rulemaking | September 2016 |

PETITION SUMMARY:

On January 15, 2015, Michael D. Tschiltz, on behalf of NEI, submitted a PRM that ~~requests~~requesting that the Commission amend its regulations to clarify the scope of applicability of 10 CFR 50.69, "~~Risk-informed categorization~~Informed Categorization and ~~treatment~~Treatment of structures, systems~~Structures, Systems, and components~~Components for nuclear power reactors~~Nuclear~~

Power Reactors," to include holders of COLs combined operating licenses (COL). The applicability and scope of the NRC's regulations in

PRM-50-110 (continued)

§and scope of the NRC's regulations in 10 CFR 50.69 currently applies to a holder of an operating license under 10 CFR Part 50; a holder of a renewed operating license under 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants,"; an applicant for a construction permit or operating license under 10 CFR Part 50; or an applicant for a design approval, a combined license, or manufacturing license under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." The petitioner is requesting that the rule be amended to include holders of COLs in the scope of applicability.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG met with the PRB on December 21, 2015, and the PRB approved the staff's recommendation to consider the petition. The WG will submit a SECY paper to the Commission recommending that rulemaking be initiated, as well as additional options that the Commission may consider during its review of the PRM.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition; therefore, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC staff discussed this topic at public meetings held during the two 2 years before NEI filed this PRM. [The staff held a public meeting on September 16, 2015, to gauge gain further understanding of the needs scope and bases for the proposed amendment petition. During the public meeting, NEI clarified that holders of COLs be included in the scope of applicability of 10 CFR 50.69, which could lead to a need for additional guidance.]

Comment [AdJ]: NRO, is this accurate? Or should we delete this sentence.

Comment [BJ]: OGC: This sentence is really confusing. Reviewed the applicability of what? Please review and revise.

AdJ: Done

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OPEN PETITIONS FOR THE OFFICE OF THE GENERAL COUNSEL

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Comment [TL]: Insert cite when FRN published.

PRM NO.: PRM-2-15

PETITION SUBJECT: Agency Procedures for Responding to Adverse Court Decisions and Addressing Funding Shortfalls

PETITIONER: Jeffrey M. Skov

DOCKET ID: NRC-2015-0264

NRC CONTACT: Ian Irvin, OGC, 301-415-1933

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|------------------|--|-----------------|--------------|----------------------|---|
| October 22, 2015 | February 17, 2016 <u>81 FR 8021</u> | February 2017 | Undetermined | Undetermined | June 2017 |

PETITION SUMMARY:

PETITION SUMMARY:

On October 22, 2015, Jeffrey M. Skov submitted a PRM that requests requesting that the Commission amend its rules of practice and procedure to establish procedures for responding to adverse court decisions and to annually report to the public each instance where in which the NRC does not receive "sufficient funds reasonably necessary to implement in good faith its statutory mandates."

PRM-2-15 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

This is the first entry for this PRM in this report. The staff is analyzing the issues raised in the petition.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

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PETITIONS COMPLETED SINCE LAST REPORT

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| PRM No. | PRM Date | Petitioner | Subject | Docket ID | Resolution |
|-----------|------------|------------|---|----------------------|---|
| PRM-50-97 | 07/26/2011 | NRDC | Emergency Preparedness Enhancements for Prolonged Station Blackouts | <u>NRC-2011-0189</u> | Petition will be resolved in Mitigation of Beyond-Design-Basis Events rulemaking [NRC-2014-0240; RIN 3150-AJ49] |
| PRM-50-98 | 07/26/2011 | NRDC | Emergency Preparedness Enhancements for Multiunit Events | <u>NRC-2011-0189</u> | Petition will be resolved in Mitigation of Beyond-Design-Basis Events rulemaking [NRC-2014-0240; RIN 3150-AJ49] |

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**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
WASHINGTON, D.C. 20555-0001

March XX, 2016

MEMORANDUM TO: Victor M. McCree
Executive Director for Operations

FROM: Glenn M. Tracy -
Deputy Executive Director
for Materials, Waste, Research, State, Tribal,
Compliance, Administration, and Human Capital Programs

SUBJECT: STATUS REPORT ON PETITIONS FOR RULEMAKING
(MARCH 2016)

In conjunction with my oversight responsibility for ensuring consistency of rulemaking activities in the program offices, I have reviewed the enclosed status report on petitions for rulemaking (PRM) and approved the scheduled completion dates included in the report.

I last provided the report to you on October 2, 2015 (Accession No. ML15217A434 in the U.S. Nuclear Regulatory Commission's (NRC's) Agencywide Documents Access and Management System). The report captures the progression of each petition as it moves through the agency's process. The NRC staff is reviewing 23 open petitions; currently, all are on schedule for resolution. Since the last report, the agency docketed the following new petitions:

| PRM No. | PRM Date | Petitioner | Subject |
|------------|------------|-------------------|---|
| PRM-2-15 | 10/22/2015 | Jeffrey M. Skov | Agency Procedures for Responding to Adverse Court Decisions and Addressing Funding Shortfalls |
| PRM-50-113 | 9/10/2015 | Alexander DeVolpi | Uninterruptible Monitoring of Coolant and Fuel in Reactors and Spent Fuel Pools |

CONTACT: Jennifer Borges, ADM/DAS
301-415-3647

Anthony de Jesús, ADM/DAS
301-415-1106

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V. McCree

- 2 -

All Fukushima-related PRMs are under Docket ID NRC-2011-0189.

Prior status reports on PRMs can be accessed from the NRC Rulemaker SharePoint site,
<http://fusion.nrc.gov/adm/team/DAS/RADB/resource/Lists/Status%20Report%20on%20Petitions%20for%20Rulemaking/AllItems.aspx>.

Enclosure:
Status Report on Petitions for
Rulemaking – March 2016

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V. McCree

- 2 -

All Fukushima related PRMs are under Docket ID NRC-2011-0189.

Prior status reports on PRMs can be accessed from the NRC Rulemaker SharePoint site,
<http://fusion.nrc.gov/adm/team/DAS/RADB/resource/Lists/Status%20Report%20on%20Petitions%20for%20Rulemaking/AllItems.aspx>.

Enclosure:
Status Report on Petitions for
Rulemaking - March 2016

DISTRIBUTION: WITS200800173, ADM201500063

| | | | |
|-------------------|--------------|-------------------|-------------------|
| Non-Public | CBladey, ADM | LTerry, ADM | DMeyer, ADM |
| AdeJesus, ADM | JBorges, ADM | RidsEdoMailCenter | RidsAdmMailCenter |
| RidsOgcMailCenter | RidsNrrOd | RidsNmssOd | RidsNroOd |

ADAMS Accession No.: ML15103A131

***concurrence via e-mail**

| OFFICE | ADM/DAS/RADB | ADM/DAS/RADB/TL | ADM/DAS/RADB/BC | QTE | NRR |
|--------|--------------|----------------------------|-----------------|-----------|-------------------------|
| NAME | A. deJesus | L. Terry | C. Bladey | C. Hsu* | B. Dean (M. Evans for)* |
| DATE | 2/5/2016 | 2/ /2016 | 2/ /2016 | 2/18/2016 | 2/18/2016 |
| OFFICE | NMSS | NRO | OGC | ADM/DAS:D | ADM:DD |
| NAME | S. Moore* | J. Uhle (M. Mayfield for)* | C. England* | S. Salter | S. Stewart-Clark |
| DATE | 2/18/2016 | 2/18/2016 | 2/18/2016 | 2/ /2016 | 2/ /2016 |
| OFFICE | ADM:D | DEDM | | | |
| NAME | C. Carpenter | G. Tracy | | | |
| DATE | 2/ /2016 | 2/ /2016 | | | |

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From: Borges, Jennifer
Sent: 11 Aug 2014 20:02:33 +0000
To: RidsNrrMailCenter Resource;RidsNroMailCenter Resource;RidsOgcMailCenter Resource
Cc: Shepherd, Jill;Mizuno, Geary;Doyle, Daniel;Jones, Bradley;Baum, Robin;Inverso, Tara;Colaccino, Joseph;Bladey, Cindy
Subject: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Hello,

Below is a link to the notice of docketing package for a petition for rulemaking prepared for PRM-50-108 filed with the Commission by Mr. Mark Edward Leyse. Also, for your information, I have provided the link to the incoming petition. Please review and provide me with your concurrence by **August 25, 2014**.

If you have any questions concerning this matter, please let me know or contact Jill Shepherd at 301-287-0950 (Jill.Shepherd@nrc.gov).

PACKAGE:

(*Federal Register* Notice, Congressional Letters, & Letter to Petitioner)

[View ADAMS P8 Properties ML14223B127](#)

[Open ADAMS P8 Package \(PRM-50-108 Notice of Docketing RE: Fuel-Cladding Issues in Postulated SFP Accidents\)](#)

INCOMING:

[View ADAMS P8 Properties ML14008A427](#)

[Open ADAMS P8 Document \(Spent Fuel Pool \(Fuel Cladding\) Rulemaking Petition submitted by Atomic Safety Organization\)](#)

INCOMING:

(Additional Information)

[View ADAMS P8 Properties ML14195A388](#)

[Open ADAMS P8 Document \(PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents.\)](#)

Thank you,

Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

301-287-0999

From: DeJesus, Anthony
Sent: 27 Jan 2016 11:13:50 -0500
To: Barczy, Theresa;Borges, Jennifer;DeJesus, Anthony;Forder, Dawn;Gallagher, Carol;Leatherbury (Daniels), Christian;Love-Blair, Angella;Mendiola, Doris;Shepherd, Jill
Cc: Terry, Leslie
Subject: ACTION: Review PRM Status Report March 2016
Attachments: PRM Status Report March 2016.docx

Good morning,

Could you all please take a look at the attached PRM status report and provide me with any changes or updates specific to the PRMs that you are working on. Let me know if there is anything that you are working on that is missing or if any of these activities has been completed.

Please get this back to me by next Tuesday, February 2nd.

Thanks,
anthony

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STATUS REPORT ON PETITIONS FOR RULEMAKING

March 2016

Enclosure

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INTRODUCTION

The Status Report on Petitions for Rulemaking (PRM) is provided to the Executive Director for Operations (EDO) bi-annually. The purpose of this report is to inform the EDO of petitions currently before the agency and to provide an update on progress toward their completion. This report includes petitions docketed since the last report dated April 2, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14280A029). The Office of Administration, in consultation with the Office of Nuclear Reactor Regulation (NRR), the Office of Nuclear Material Safety and Safeguards (NMSS), the Office of New Reactors (NRO), and the Office of the General Counsel, compiles the information for each open petition. Since the last report, the staff has docketed two new petitions. During the reporting period 18 petitions were closed.

The report presents open petitions by office, beginning with the newest dockets and ending with the oldest dockets. The report captures the progression of each petition as it moves through the agency's process. The report includes hyperlinks to the docket for each petition on <http://www.regulations.gov>, thereby making additional pertinent documentation, including any public comments received, readily available to the reader. All reports since 2010 are available on [The NRC Rulemaker](#).¹ If you have a comment or suggestion for additional improvements to this report, please contact Dawn Forder at 301-415-3407.

¹<http://fusion.nrc.gov/adm/team/DAS/RADB/resource/Lists/Status%20Report%20on%20Petitions%20for%20Rulemaking/AllItems.aspx>.

LIST OF COMMON ABBREVIATIONS

| | |
|--------|--|
| 10 CFR | Title 10 of the <i>Code of Federal Regulations</i> |
| ADAMS | Agencywide Documents Access and Management System |
| ASLB | Atomic Safety Licensing Board |
| ASME | American Society of Mechanical Engineers |
| COL | combined operating license |
| EP | emergency preparedness |
| FR | <i>Federal Register</i> |
| FRN | <i>Federal Register</i> notice |
| ISFSI | independent spent fuel storage installations |
| LOCA | loss-of-coolant accident |
| mSv | millisievert |
| NEI | Nuclear Energy Institute |
| NMSS | Office of Nuclear Material Safety and Safeguards |
| NPP | nuclear power plant |
| NRC | U.S. Nuclear Regulatory Commission |
| NRO | Office of New Reactors |
| NRR | Office of Nuclear Reactor Regulation |
| NTTF | Near-Term Task Force |
| PRM | petition for rulemaking |
| PRB | Petition Review Board |
| rem | Roentgen equivalent in man |
| SFP | spent fuel pool |
| SRM | staff requirements memorandum |
| WG | working group |

DEFINITIONS

Open PRM: Any docketed² petition for rulemaking (PRM) that the U.S. Nuclear Regulatory Commission (NRC) staff is actively working on.

Closed PRM: The PRM docket is closed, either through publication of a notice of denial or a notice stating that the petition will be fully or partially considered in the rulemaking process.

Estimated Date for Submission to Signature Authority:³ Four months after the date of the meeting of the Petition Review Board (PRB).

Pending PRM: A notice has not been published indicating the closure of the petition docket.

Status of Petition since the Last PRM Report: A brief statement of the actions that have occurred or will occur in the near future. (For example: "Notice of receipt and request for public comment is under development.")

Date of PRB: The date that the PRB and petition working group (WG) determine the regulatory decision on a PRM (i.e., denial, consideration in a current or future rulemaking, or partial consideration in a current or future rulemaking).

Target PRB Date: The PRB and petition WG determine the regulatory decision on a petition within 12 months from the date the notice of receipt is published in the *Federal Register* (FR).

Undetermined: A date has not been established at this time.

Withdrawn: The petitioner no longer wants to pursue the requested action and has notified the NRC. The change in status includes the date that the FR notice (FRN) was published to notify the public that the petition was withdrawn.

Public Comments on the Petition: A brief summary of the comments received from the public or any interested party regarding a PRM, including the number received, type (individual, form letter, etc.), commenters (individual, industry, State organization, etc.), and whether the comments were generally in support of or generally in disagreement of the petition.

Background or Items of Interest (if applicable): Pertinent information related to the PRM that the staff wants to document throughout the process (e.g., congressional interest, changes in the regulatory environment).

² A PRM is docketed by the NRC if it meets the docketing criteria in Title 10 of the *Code of Federal Regulations* (10 CFR) 2.802, "Petition for rulemaking."

³ NRC official who has the ultimate authority to determine whether a PRM will be denied or considered in whole or in part in the rulemaking process.

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OPEN PETITIONS BY OFFICE

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**OPEN PETITIONS FOR THE OFFICE OF NUCLEAR MATERIAL SAFETY AND
SAFEGUARDS**

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PRM-20-28, PRM-20-29, and PRM-20-30: Linear No-Threshold Model and Standards for Protection against Radiation

DOCKET ID: NRC-2015-0057

PRM NOS.: PRM-20-28, PRM-20-29, and PRM-20-30

PETITIONER: Various

PETITION SUBJECT: Linear No-Threshold Model and Standards for Protection against Radiation

NRC CONTACT: Vanessa Cox, NMSS, 301-415-8342

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|--|--|--------------------|--------------|----------------------|---|
| February 9, 2015 February 13, 2015 February 24, 2015 | June 23, 2015 80 FR 35870 | March 2016 | Undetermined | Undetermined | July 2016 |

PRM-20-28, PRM-20-29, and PRM-20-30 (continued)

PETITION SUMMARY:

On February 9, 2015, February 13, 2015, and February 24, 2015, Carol S. Marcus, Mark L. Miller, and Mohan Doss, respectively, submitted nearly identical petitions requesting that the Commission amend its regulations in 10 CFR Part 20, "Standards for Protection against Radiation," to take radiation hormesis into account and end the NRC's reliance on the linear no-threshold hypothesis used to determine dose standards in its regulations. The concept of radiation hormesis claims that low doses of radiation have "no effects or protective effects" on population groups. Consequently, the petitioners request that: (1) worker dose remain at present levels, with allowances up to 100 millisievert (10 rem); (2) the use of the "as low as reasonably achievable" principle be removed entirely from the NRC's regulations; (3) public doses be raised to match worker doses; and (4) the NRC end differential doses to pregnant women, embryos and fetuses, and children under 18 years of age.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG is analyzing the specific issues raised in the petitions and the public comments received in November 2015.

PUBLIC COMMENTS ON THE PETITION:

The public comment period was scheduled to close on September 8, 2015; however, the NRC received requests for an extension of the comment period. The staff extended the comment period by 90 days (80 FR 50804; August 21, 2015). The comment period closed on November 19, 2015. The NRC received 561 individual public comments and 2,511 form letter comments on these PRMs.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The staff is evaluating three nearly identical petitions as one activity.

PRM-51-30: Uninterruptible Monitoring of Coolant and Fuel in Reactors and Spent Fuel Pools

DOCKET ID: NRC-2014-0014

PRM NO.: PRM-51-30

PETITIONER: Diane Curran, on behalf of 34 environmental organizations

PETITION SUBJECT: Spent Fuel Storage and Disposal

NRC CONTACT: Keith McDaniel, NMSS, 301-415-5252

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|--|---|----------------------------|-----------------------|------------------------------|---|
| December 20, 2013 January 7, 2014 | April 21, 2014 79 FR 22055 | March 2015 | April 14, 2015 | Denied | September 2015 |

PETITION SUMMARY:

On December 20, 2013, as corrected on January 7, 2014, Diane Curran, on behalf of 34 environmental organizations, submitted a PRM that requests that the Commission revise and integrate all safety and environmental regulations related to spent fuel storage and disposal. The petitioner requests that the NRC conduct a comprehensive review of these regulations and environmental studies, revise them to be consistent with the current state of knowledge, and integrate them into one cohesive regulatory framework in order to comply with the National Environmental Policy Act.

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PRM-51-30 (continued)

Comment [Adj]: Update

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The NRC formed a WG to address both PRM-51-30 and PRM-51-31 (Environmental Impacts of Spent Fuel Storage during Reactor Operation) because both petitions make similar rulemaking requests. The WG met with the PRB on April 14, 2015, and the PRB approved the staff's recommendation to deny the petition. The WG is finalizing the denial package to be submitted for Commission approval.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None

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PRM-72-6: Dry Cask Storage of Spent Fuel

DOCKET ID: NRC-2008-0649

PRM NO.: PRM-72-6

PETITIONER: C-10 Research and Education Foundation, Inc.

PETITION SUBJECT: Dry Cask Storage of Spent Fuel

NRC CONTACT: Torre Taylor, NMSS, 301-415-7900

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Date of Final Action/<i>Federal Register</i> Notice Citation |
|------------------------------|---|--|--|---|--|
| November 24, 2008 | March 3, 2009 74 FR 9178 | First PRB: January 2010 Second PRB: May 2015 | First PRB: January 2010 (see also Status of Petition since the last PRM report below) Second PRB: May 18, 2015 | First Review: Denied, Partial Consideration in the Rulemaking Process, and Undetermined (see Background below) Remaining two issues: Denial | First publication: October 16, 2012 77 FR 63254 Publication on remaining two issues after Commission Direction |

PRM-72-6 (continued)

PETITION SUMMARY:

On November 24, 2008, C-10 Research and Education Foundation, Inc. (C-10), submitted a PRM that requests that the Commission amend its regulations governing onsite dry cask storage of spent fuel. The petitioner believes that the current regulations do not provide sufficient requirements for safe storage of spent nuclear fuel in dry cask storage at independent spent fuel storage installations (ISFSIs). The petitioner requests the following 12 changes:

1. The NRC should prohibit the production of nonconforming pre-built full scale casks specifically built for NRC certification testing.
2. The NRC certification of casks should be based on upgraded code requirements that include design criteria and technical specifications for a 100-year minimum age-related degradation timeframe.
3. The NRC should approve, as part of the original ISFSI certification process and construction license, a method for dry cask transfer capacity that will allow for immediate and safe maintenance on a faulty or failing cask.
4. The NRC should require that dry casks be qualified for transport at the time of onsite storage approval certification.
5. The NRC should require mandatory compliance with the American Society of Mechanical Engineers (ASME) codes and standards "without exception."
6. The NRC should require ASME code stamping for fabrication.
7. All materials for fabrication should be supplied by ASME-approved material suppliers.
8. Current ASME codes and standards for conservative heat treatment and leak tightness should be adopted and enforced.
9. A safe and secure hot cell transfer station coupled with an auxiliary pool should be built as part of an upgraded ISFSI design certification and licensing process.
10. The NRC should require real-time heat and radiation monitoring at ISFSIs.
11. The NRC should require hardened onsite storage at all nuclear power plants (NPPs).
12. The NRC should establish funding to conduct ongoing studies to provide the data required to accurately define and monitor for age-related material degradation.

PRM-72-6 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG met with the PRB on May 18, 2015, and the PRB approved the staff's recommendation to deny both open issues (Requests 4 and 9). The staff is preparing a denial package to be submitted to the Commission for approval in October 2015.

PUBLIC COMMENTS ON THE PETITION:

The NRC received approximately 9,000 comments, the vast majority of which were in postcard format and supported the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC published an FRN on October 16, 2012 (77 FR 63254), acknowledging that the petition would be partially considered in the rulemaking process. The FRN stated that the Commission denied nine of the petitioner's requests (Requests 1, 2, 3, 5 through 8, 10, and 12), as listed in the "Petition Summary," and would consider one request in the rulemaking process (Request 11). The FRN stated that the NRC was deferring action on two requests (Requests 4 and 9) for future rulemaking determinations.

The docket for PRM-72-6 remains open until the Commission acts on Requests 4 and 9.

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OPEN PETITIONS FOR THE OFFICE OF NUCLEAR REACTOR REGULATION

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PRM-50-113: Uninterruptible Monitoring of Coolant and Fuel in Reactors and Spent Fuel Pools

DOCKET ID: NRC-2015-0230

PRM NO.: PRM-50-113

PETITIONER: Alexander DeVolpi

PETITION SUBJECT: Uninterruptible Monitoring of Coolant and Fuel in Reactors and Spent Fuel Pools

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|---------------------------|---|---------------------------------|---------------------------------|---------------------------------|---|
| September 10, 2015 | December 1, 2015 80 FR 75009 | PRB Will Not Be Held | PRB Will Not Be Held | PRB Will Not Be Held | March 2016 |

PETITION SUMMARY:

On September 10, 2015, Dr. Alexander DeVolpi submitted a PRM that requests that the Commission amend its regulations in 10 CFR part 50 to require "installation of ex-vessel instrumentation for uninterrupted monitoring of coolant and fuel in reactors and spent-fuel pools." The petitioner cites a 2014 National Research Council report titled, "Lessons Learned from the Fukushima Nuclear Accident for Improving Safety of U.S. Nuclear Plants," that gave high priority to recommendation 5.1A, which stated that greater

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PRM-50-113 (continued)

"[a]ttention to availability, reliability, redundancy, and diversity of plant systems and equipment is specifically needed for . . . Instrumentation for monitoring critical thermodynamic parameters in reactors, containments, and spent fuel pools." (1) In addition, the petitioner cites to section 5.1.1.4 of the report, "Instrumentation for Monitoring Critical Thermodynamic Parameters," which states that "robust and diverse monitoring instrumentation that can withstand severe accident conditions is essential for diagnosing problems, selecting and implementing accident mitigation strategies, and monitoring their effectiveness."

STATUS OF PETITION SINCE THE LAST PRM REPORT:

This is the first entry for this PRM in this report. A WG has been established to analyze the issues raised in this petition.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not request public comment on this petition as the staff believed it had sufficient information to fully evaluate the issues raised in the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

NRR should briefly discuss the other activities related to this PRM. Perhaps explain why a PRB is not being held.

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PRM-50-112: Determining Which Structures, Systems, and Components and Functions are Important to Safety

DOCKET ID: NRC-2015-0213

PRM NO.: PRM-50-112

PETITIONER: Kurt T. Schaefer

PETITION SUBJECT: Defining "Important to Safety"

NRC CONTACT: Robert Beall, NRR, 301-415-3874

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|----------------------------------|--|-----------------|--------------|----------------------|---|
| July 20, 2015 August 31, 2015 | September 2015 | September 2016 | Undetermined | Undetermined | January 2017 |

PETITION SUMMARY:

On July 20, 2015, and supplemented on August 31, 2015, Kurt T. Schaefer submitted a PRM that requests that the Commission amend 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," by defining and providing a set of criteria "for determining which structures, systems, components and functions are 'important to safety.'"

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PRM-50-112 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The petition was published for public comment on January 6, 2016 (81 FR 410). The public comment period closes on March 21, 2016.

PUBLIC COMMENTS ON THE PETITION:

The public comment period closes on March 21, 2016.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM-50-111: Power Reactor In-Core Monitoring

DOCKET ID: NRC-2015-0124

PRM NO.: PRM-50-111

PETITIONER: Mark Edward Leyse

PETITION SUBJECT: Power Reactor In-Core Monitoring

NRC CONTACT: Natreon Jordan, NRR, 301-415-7410

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|-----------------------|---|------------------------|---------------------|------------------------------|---|
| March 13, 2015 | July 16, 2015 80 FR 42067 | July 2016 | Undetermined | Undetermined | November 2016 |

PETITION SUMMARY:

On July 16, 2015, Mark Edward Leyse submitted a PRM that requests that the Commission amend its regulations to require all NPP licensees to use in-core monitoring devices at different elevations and radial positions throughout the reactor.

PRM-50-111 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is analyzing the issues raised in the petition.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

PRM-50-111, which applies to boiling water reactors, is an extension of the issues raised in PRM-50-105, which also was submitted by Mr. Leyse. The NRC interpreted PRM-50-105 as limited to pressurized water reactors, and denied the PRM (78 FR 56174; September 12, 2013).

PRM-50-109: Improved Identification Techniques against Alkali-Silica Concrete Degradation at Nuclear Power Plants

DOCKET ID: NRC-2014-0257

PRM NO.: PRM-50-109

PETITIONER: Sandra Gavutis, on behalf of C-10

PETITION SUBJECT: Improved Identification Techniques against Alkali-Silica Concrete Degradation at Nuclear Power Plants

NRC CONTACT: Jessica Kratchman, NRR, 301-415-5112

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|--------------------|--|-----------------|--------------|----------------------|---|
| September 25, 2014 | January 12, 2015 80 FR 1476 | January 2016 | Undetermined | Undetermined | May 2016 |

PETITION SUMMARY:

On September 25, 2014, Sandra Gavutis, on behalf of C-10, submitted a PRM that requests that the Commission amend its regulations to provide improved identification techniques against alkali-silica reaction (ASR) concrete degradation at NPPs. The petitioner asserts that current NRC regulations, which rely on visual inspection to identify ASR degradation, do not adequately identify ASR without petrographic analysis. The petitioner is requesting that the NRC revise applicable regulations to require adherence with current American Concrete Institute standards and ASME codes.

PRM-50-109 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition and the public comments received.

PUBLIC COMMENTS ON THE PETITION:

The public comment period closed on March 30, 2015. The NRC received 10 comments on the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The staff confirmed with the petitioner that the petitioner did not intend a portion of the PRM to be treated as an allegation against the licensee.

PRM-50-108: Fuel-Cladding Issues in Postulated Spent Fuel Pool (SFP) Accidents

DOCKET ID: NRC-2014-0171

PRM NO.:

PETITIONER: Mark Edward Leyse

PETITION SUBJECT: Fuel-Cladding Issues in Postulated Spent Fuel Pool (SFP) Accidents

NRC CONTACT: Daniel Doyle, NRR, 301-415-3748

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|---------------|--|-----------------|--------------|----------------------|---|
| June 19, 2014 | October 7, 2014 79 FR 60383 | October 2015 | May 27, 2015 | Denied | November 2015 |

PETITION SUMMARY:

On June 19, 2014, Mark Edward Leyse submitted a PRM that requests that the Commission make new regulations stipulating the following:

1. The rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction should be calculated by SFP accident evaluation models using data from multirod bundle (assembly) severe accident experiments.

PRM-50-108 (continued)

2. The rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction should be calculated by SFP accident evaluation models using data from multirod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding.
3. SFP accident evaluation models should be required to conservatively model nitrogen-induced breakaway oxidation behavior.
4. Licensees should be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG met with the PRB on May 27, 2015, and the PRB approved the staff's recommendation to deny the petition. The WG is finalizing the denial package to be submitted for Commission approval.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None

PRM-73-18: Protection of Digital Computer and Communication Systems and Networks

DOCKET ID: NRC-2014-0165

PRM NO.: PRM-73-18

PETITIONER: Anthony Pietrangelo, on behalf of the Nuclear Energy Institute (NEI)

PETITION SUBJECT: Protection of Digital Computer and Communication Systems and Networks

NRC CONTACT: Jason Carneal, NRR, 301-415-1451

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|----------------------|---|------------------------|---------------------|------------------------------|---|
| June 12, 2014 | September 22, 2014 79 FR 56525 | March 2016 | Undetermined | Undetermined | July 2016 |

PETITION SUMMARY:

On June 12, 2014, Anthony Pietrangelo, on behalf of the NEI, submitted a PRM that requests that the Commission revise certain cybersecurity language in its regulations to ensure that the rules are consistent with the NRC's original intent, are less burdensome for NRC licensees, and adequately protect the public health and safety and common defense and security.

PRM-73-18 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG is currently addressing significant and numerous public comments received on the petition.

PUBLIC COMMENTS ON THE PETITION:

The public comment period closed on December 12, 2014. The NRC received 19 public comments on the petition, 15 in support of the petition, 2 opposing the proposed changes, and 2 suggesting alternatives to the changes proposed in the petition. The public comments in support of the proposed changes cited detailed examples of specific equipment that the commenters believe should be out of the scope of the cyber security rule. The public comments that opposed the proposed changes and those that suggested alternatives were very detailed and provided suggestions for alternative approaches to regulating cyber security at NPPs.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None

PRM-51-31: Uninterruptible Monitoring of Coolant and Fuel in Reactors and Spent Fuel Pools

DOCKET ID: NRC-2014-0055

PRM NO.: PRM-51-31

PETITIONER: Diane Curran, on behalf of 34 environmental organizations

PETITION SUBJECT: Environmental Impacts of Spent Fuel Storage during Reactor Operation

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|--|---|------------------------|-----------------------|------------------------------|---|
| February 18, 2014 June 26, 2014 | May 1, 2014 79 FR 24595 July 24, 2014 79 FR 42989 | May 2015 | April 14, 2015 | Denied | September 2015 |

PETITION SUMMARY:

On February 18, 2014 (received by the Office of the Secretary (SECY) on March 12, 2014), Diane Curran, on behalf of 34 environmental organizations, submitted a PRM that requests that the Commission revise its regulations and consider, in all pending

PRM-51-31 (continued)

and future licensing and re-licensing decisions, what the petitioners consider to be new and significant information bearing on the environmental impacts of high-density spent fuel storage in reactor pools and the costs and benefits for avoiding or mitigating those impacts.

On June 26, 2014, Ms. Curran submitted a document, characterized as an "amended petition" for rulemaking, requesting that the NRC "add to the record of the February 18, 2014, petition the observations made by Chairman Macfarlane in her dissenting comments" on the NRC staff document designated COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel," dated November 12, 2013 (ADAMS Accession No. ML13273A601). The NRC does not consider the June 26, 2014, document to be an amendment to the February 18, 2014, petition as the petitioner does not request that the NRC take any rulemaking actions that were not otherwise requested in the February 18, 2014, petition. Therefore, the NRC will consider the June 26, 2014, document to be a supplement to PRM-51-31, and accordingly, included it in the docket for PRM-51-31 (NRC-2014-0055).

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The NRC formed a WG to address both PRM-51-30 (Spent Fuel Storage and Disposal) and PRM-51-31. The WG met with the PRB on April 14, 2015, and the PRB approved the staff's recommendation to deny the petition. The WG is finalizing the denial package to be submitted for Commission approval.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None

PRM-73-17: Malware and Programmable Logic in Computers in Nuclear Power Plant Systems

DOCKET ID: NRC-2013-0214

PRM NO.: PRM-73-17

PETITIONER: Alan Morris of Morris and Ward, Consulting Engineers

PETITION SUBJECT: Malware and Programmable Logic in Computers in Nuclear Power Plant Systems

NRC CONTACT: Natreon Jordan, NRR, 301-415-7410

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|--|---|------------------------|--------------------|------------------------------|---|
| March 14, 2013; August 17, 21, 23, and 27, 2013 | February 7, 2014 79 FR 7406 | February 2015 | May 5, 2015 | Denied | October 2015 |

PETITION SUMMARY:

On March 14, 2013, as supplemented by additional information through December 19, 2013, Alan Morris submitted a PRM that requests that the Commission require "new-design programmable logic computers" be installed in the control systems of NPPs to

PRM-73-17 (continued)

block malware attacks on the industrial control systems of those facilities. In addition, the petitioner requests that NPP staff be trained in "the programming and handling of the non-rewriteable memories" for NPPs.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG met with the PRB on May 5, 2015, and the PRB approved the staff's recommendation to deny the petition. The WG is finalizing the denial package to be submitted for Commission approval.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC received the original request on March 14, 2013. The NRC staff determined that the original request did not meet the requirements in 10 CFR 2.802 for docketing of a PRM, and it notified the petitioner on August 9, 2013. The petitioner supplemented his original petition on August 17, 21, 23, and 27, 2013. In addition, the petitioner provided additional supplemental information through December 19, 2013. On June 12, 2014, the NRC staff sent a letter to the petitioner requesting additional information. The petitioner responded with several e-mails on June 18 and 19, 2014.

PRM-50-106: Environmental Qualification of Electrical Equipment

DOCKET ID: NRC-2012-0177

PRM NO.: PRM-50-106

PETITIONER: Paul M. Blanch and C. Jordan Weaver, Natural Resources Defense Council (NRDC)

PETITION SUBJECT: Environmental Qualification of Electrical Equipment Applicable to Existing and New Reactors

NRC CONTACT: Margaret S. Ellenson, NRR, 301-415-0894

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|----------------------|---|------------------------|---------------------------|------------------------------|---|
| June 18, 2012 | September 27, 2012 77 FR 59345 | September 2013 | September 18, 2013 | Denied | August 2015 |

PETITION SUMMARY:

On June 18, 2012, Paul M. Blanch and C. Jordan Weaver, of NRDC, jointly submitted a PRM that requests that the Commission "initiate rulemaking to revise its regulations to clearly and unequivocally require the environmental qualification of all safety-related cables, wires, splices, connections, and other ancillary electrical equipment that may be subjected to submergence and/or moisture intrusion during normal operating conditions, severe weather, seasonal flooding, and seismic events, and post-accident conditions, both inside and outside of containment."

PRM-50-106 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff submitted the denial package to the Commission for approval (SECY-15-0098, "Denial of Petition for Rulemaking related to Environmental Qualifications of Electrical Equipment (PRM-50-106)," dated August 5, 2015 (ADAMS Accession No. ML14071A279)).

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None

PRM-50-103: Measurement and Control of Combustible Gas Generation and Dispersal

DOCKET ID: NRC-2011-0189

PRM NO.: PRM-50-103

PETITIONER: NRDC and Mark Leyse

PETITION SUBJECT: Measurement and Control of Combustible Gas Generation and Dispersal

NRC CONTACT: Richard Dudley, NRR, 301-415-1116

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|-------------------------|---|------------------------|---------------------|------------------------------|---|
| October 14, 2011 | January 5, 2012 77 FR 441 | Undetermined | Undetermined | Undetermined | Undetermined |

PETITION SUMMARY:

On October 14, 2011, the NRDC submitted a PRM that requests that the Commission amend its regulations regarding the measurement and control of combustible gas generation and dispersal within a power reactor system.

PRM-50-103 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

Action on this petition has been postponed pending further action on Recommendation 6 of the Fukushima Near-Term Task Force (NTTF) report.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not institute a public comment period, because the hydrogen control issue raised by this petition is being considered by the Commission under Recommendation 6 of the Fukushima NTTF report.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None

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PRM-50-97, PRM-50-98, and PRM-50-99: Enhancing Reactor Safety

Comment [AdJ]: Should PRMs 50-97/98 be removed from this report since they are being resolved in the MBDDE rule?

DOCKET ID: NRC-2011-0189

PRM NO.: PRM-50-97, PRM-50-98, and PRM-50-99

PETITIONER: NRDC

PETITION SUBJECT: Enhancing Reactor Safety

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|---------------|--|--|--|--|--|
| July 26, 2011 | September 20, 2011 76 FR 58165 | PRM-50-97 and PRM-50-98: NA PRM-50-99: Undetermined | PRM-50-97 and PRM-50- 98: NA PRM-50-99: Undetermined | PRM-50-97 and PRM-50- 98: Consider in Rulemaking PRM-50-99: Undetermined | PRM-50-97 and PRM-50- 98: September 2015 PRM-50-99: Undetermined |

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PRM-50-97, PRM-50-98, and PRM-50-99 (continued)

PETITION SUMMARY:

On July 26, 2011, the NRDC submitted six PRMs (three of which have already been closed) that request that the Commission amend its regulations to require: (1) Emergency Preparedness (EP) enhancements for prolonged station blackouts, (2) EP enhancements for multiunit events, and (3) licensees to confirm seismic hazards and flooding hazards every 10 years and address any new and significant information. All of the PRMs cite the Fukushima NTTF report as the rationale and bases for the PRMs.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

PRM-50-97 and PRM-50-98 are being considered within the Mitigation Strategies for Beyond-Design-Basis Events (RIN 3150-AJ49) proposed rule and the staff is preparing letters to the petitioner for EDO signature.

Action on PRM-50-99 has been postponed pending further action on the NTTF report.

PUBLIC COMMENTS ON THE PETITION:

Because the issues raised by these PRMs are being considered by the Commission under its review of the Fukushima NTTF report, the NRC did not institute a separate public comment period.

BACKGROUND/ITEMS OF INTEREST (if applicable):

In the SRM to SECY-15-0065, "Proposed Rule: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)," dated August 27, 2015 (ADAMS Accession No. ML15239A767), the Commission approved the staff's recommendation that these three petitions be addressed through the Mitigation of Beyond-Design-Basis Events proposed rulemaking.

PRM-50-93 and PRM-50-95: Calculated Maximum Fuel Element Cladding Temperature

DOCKET ID: NRC-2009-0554

PRM NO.: PRM-50-93 and PRM-50-95

PETITIONER: Mark Edward Leyse, on behalf of the New England Coalition

PETITION SUBJECT: Calculated Maximum Fuel Element Cladding Temperature

NRC CONTACT: Daniel Doyle, NRR, 301-415-3748

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|---|---|------------------------|---------------------|------------------------------|---|
| November 17, 2009 June 7, 2010 | January 25, 2010 75 FR 3876 | November 2015 | Undetermined | Undetermined | April 2016 |

PETITION SUMMARY:

On November 17, 2009, and June 7, 2010, Mark Edward Leyse, on behalf of the New England Coalition, submitted PRMs that request that the Commission revise 10 CFR 50.46(b)(1) to require that the calculated maximum fuel element cladding temperature not exceed a limit based on data from multirod (assembly) severe fuel damage experiments. The petitioner also requests revision of Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," to 10 CFR Part 50.

PRM-50-93 and PRM-50-95 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petitions. Specific items from the petitions include 7, 8, 11, 13, and 14. The WG requested and received an extension to August 2016.

PUBLIC COMMENTS ON THE PETITION:

The NRC received 20 comments, the majority of which were in support of the petition, and is preparing to make a presentation in the fall of 2015 to the PRB on dispositioning this PRM. The NRC published a second FRN on October 27, 2010 (75 FR 66007), to consolidate PRM-50-93 and PRM-50-95 and re-open the public comment period. The NRC received an additional 12 public comments.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The duration of the NRC's review will exceed the typical review period of PRMs because of the extremely large amount of information in PRMs 50-93/95. As a result, the NRC staff has implemented a special enhanced-transparency review process to increase the visibility of its review to the public. The NRC will publicly release its draft determinations regarding each group or category of issues on a periodic basis as the review progresses. In addition, the NRC will communicate preliminary review information to the petitioners and to other persons or organizations known to be interested in this activity. However, the NRC's conclusions on the issues raised in PRMs 50-93/95 will not be final until the Commission formally acts on the staff's recommendations and publishes a notice of this action in the FR. The staff will place a disclaimer on all preliminary findings to clearly indicate their non-final status.

The NRC explained this special process to the petitioner in a letter on August 25, 2011. The preliminary analyses are included in the docket on www.regulations.gov.

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OPEN PETITIONS FOR THE OFFICE OF NEW REACTORS

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PRM-50-110: Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors

DOCKET ID: NRC-2015-0028

PRM NO.: PRM-50-110

PETITIONER: Michael D. Tschiltz, on behalf of the NEI

PETITION SUBJECT: Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors

NRC CONTACT: Rollie Berry, NRO, 301-415-8162

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|-------------------------|---|------------------------|---------------------|------------------------------|---|
| January 15, 2015 | March 27, 2015 80 FR 16308 | May 2016 | Undetermined | Undetermined | September 2016 |

PETITION SUMMARY:

On January 15, 2015, Michael D. Tschiltz, on behalf of NEI, submitted a PRM that requests that the Commission amend its regulations to clarify the scope of applicability of 10 CFR 50.69, "Risk-informed categorization and treatment of structures, systems, and components for nuclear power reactors," to include holders of COLs. The applicability and scope of the NRC's regulations in

PRM-50-110 (continued)

§ 50.69 currently applies to a holder of an operating license under 10 CFR Part 50; a holder of a renewed operating license under 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," an applicant for a construction permit or operating license under 10 CFR Part 50; or an applicant for a design approval, a combined license, or manufacturing license under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." The petitioner is requesting that the rule be amended to include holders of COLs in the scope of applicability.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG met with the PRB on MONTH XX, 2015 and the PRB approved the staff's recommendation to consider the petition. The WG will submit a SECY paper to the Commission recommending that rulemaking be initiated, as well as additional options that the Commission may consider during its review of the PRM.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC staff has engaged with NEI on this topic in public meetings over the past 2 years before this PRM was filed. The staff is considering a public meeting to determine the need for the proposed amendment.

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OPEN PETITIONS FOR OFFICE OF THE GENERAL COUNSEL

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PRM-2-15: Agency Procedures for Responding to Adverse Court Decisions and Addressing Funding Shortfalls

DOCKET ID: NRC-2015-0264

PRM NO.: PRM-2-15

PETITIONER: Jeffrey M. Skov

PETITION SUBJECT: Agency Procedures for Responding to Adverse Court Decisions and Addressing Funding Shortfalls

NRC CONTACT: Ian Irvin, OGC, 301-415-1933

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|------------------|--|-----------------|--------------|----------------------|---|
| October 22, 2015 | February 2016 | Undetermined | Undetermined | Undetermined | ???? |

PETITION SUMMARY:

On October 22, 2015, Jeffrey M. Skov submitted a PRM that requests that the Commission amend its rules of practice and procedure to establish procedures for responding to adverse court decisions and to annually report to the public each instance where the NRC does not receive "sufficient funds reasonably necessary to implement in good faith its statutory mandates."

PRM-2-15 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

This is the first entry for this PRM in this report. The staff published a notice of docketing in the FR on February XX, 2016.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not request public comment on this petition as the staff believed it had sufficient information to fully evaluate the issues raised in the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

From: DeJesus, Anthony
Sent: 5 Feb 2016 15:47:40 -0500
To: RidsNrrMailCenter Resource;RidsNmssOd Resource;RidsNroMailCenter Resource;RidsOgcMailCenter Resource;QTE Resource
Cc: Doyle, Daniel;Whaley, Sheena;Smith, Tanya;Spencer, Mary;Bladey, Cindy;Terry, Leslie;Borges, Jennifer
Subject: ACTION: Review Status Report on Petitions for Rulemaking - March 2016
Attachments: Memo to OEDO FINAL DRAFT_2-5-16.docx, PRM Status Report March 2016 FINAL DRAFT_2-5-16.docx

By February 18, 2016, please review and provide your concurrence on the following attached documents:

- The March 2016 Status Report on Petitions for Rulemaking, and
- The transmittal memo to the EDO.

We are requesting Office Director level concurrence on these documents.

Background

Each February and August, the Status Report on Petitions for Rulemaking is prepared for the Executive Director for Operations' (EDO) information. The information contained in this report is for the use of the EDO and is not made available to the general public. The current report covers the period of August 31, 2015 - February 1, 2016. The last report, dated October 2, 2015, is available in the U.S. Nuclear Regulatory Commission's Agencywide Documents Access and Management System under Accession No. ML15217A434.

Your Review and Response

Please verify that this report contains an entry for all of the active petitions for which your office is responsible and that each entry is accurate and contains the most current information (i.e., all communication with the petitioner). If a contact person is not listed, or has changed, please identify a member of your staff who will serve as the contact person for your office.

Please provide me with your concurrence by **February 18, 2016**. If you have any questions concerning this matter, please contact me at 301-415-1106 (Anthony.deJesus@nrc.gov) or Jennifer Borges at 301-415-3647 (Jennifer.Borges@nrc.gov).



Anthony de Jesús, Sr. Regulations Specialist
Agency 2.802 Petition Coordinator
Rules, Announcements, and Directives Branch
U.S Nuclear Regulatory Commission
OWFN 12- G09
Washington, DC 20555-0001
301-415-1106
Anthony.deJesus@nrc.gov



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March XX, 2016

MEMORANDUM TO: Victor M. McCree
Executive Director for Operations

FROM: Glenn M. Tracy
Deputy Executive Director
for Materials, Waste, Research, State, Tribal,
Compliance, Administration, and Human Capital Programs

SUBJECT: STATUS REPORT ON PETITIONS FOR RULEMAKING
(MARCH 2016)

In conjunction with my oversight responsibility for ensuring consistency of rulemaking activities in the program offices, I have reviewed the enclosed Status Report on Petitions for Rulemaking (PRM) and approved the scheduled completion dates included in the report.

I last provided the report to you on October 2, 2015 (Accession No. ML15217A434 in the U.S. Nuclear Regulatory Commission's (NRC) Agencywide Documents Access and Management System). The report captures the progression of each petition as it moves through the agency's process. The NRC staff is reviewing 22 open petitions; currently, all are on schedule for resolution. Since the last report the agency docketed the following new petitions:

| PRM No. | PRM Date | Petitioner | Subject |
|------------|------------|-------------------|---|
| PRM-2-15 | 10/22/2015 | Jeffrey M. Skov | Agency Procedures for Responding to Adverse Court Decisions and Addressing Funding Shortfalls |
| PRM-50-113 | 9/10/2015 | Alexander DeVolpi | Uninterruptible Monitoring of Coolant and Fuel in Reactors and Spent Fuel Pools |

CONTACT: Jennifer Borges, ADM/DAS
301-415-3647

Anthony de Jesús , ADM/DAS
301-415-1106

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V. McCree

- 2 -

All Fukushima related PRMs are under Docket ID NRC-2011-0189.

Prior status reports on PRMs can be accessed from the NRC Rulemaker SharePoint site,
<http://fusion.nrc.gov/adm/team/DAS/RADB/resource/Lists/Status%20Report%20on%20Petitions%20for%20Rulemaking/AllItems.aspx>.

Enclosure:
Status Report on Petitions for
Rulemaking – March 2016

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V. McCree

- 2 -

All Fukushima related PRMs are under Docket ID NRC-2011-0189.

Prior status reports on PRMs can be accessed from the NRC Rulemaker SharePoint site,
<http://fusion.nrc.gov/adm/team/DAS/RADB/resource/Lists/Status%20Report%20on%20Petitions%20for%20Rulemaking/AllItems.aspx>.

Enclosure:
Status Report on Petitions for
Rulemaking - March 2016

DISTRIBUTION: WITS200800173, ADM201500063

| | | | |
|-------------------|--------------|-------------------|-------------------|
| Non-Public | CBladey, ADM | LTerry, ADM | DMeyer, ADM |
| AdeJesus, ADM | JBorges, ADM | RidsEdoMailCenter | RidsAdmMailCenter |
| RidsOgcMailCenter | RidsNrrOd | RidsNmssOd | RidsNroOd |

ADAMS Accession No.: ML15103A131

***concurrence via e-mail**

| OFFICE | ADM/DAS/RAD B | ADM/DAS/RADB/TL | ADM/DAS/RADB/B C | QTE | NRR |
|--------|------------------|-----------------|---------------------|-----------|----------------|
| NAME | AdeJesus | LTerry | CBladey | | BDean |
| DATE | 2/ 5 /2016 | 2/ /2016 | 2/ /2016 | 2/ /2016 | 2/ /2016 |
| OFFICE | NMSS | NRO | OGC | ADM/DAS:D | ADM:DD |
| NAME | SMoore | JUhle | | DMeyer | SStewart-Clark |
| DATE | 2/ /2016 | 2/ /2016 | 2/ /2016 | 2/ /2016 | 2/ /2016 |
| OFFICE | ADM:D | DEDM | | | |
| NAME | CCarpenter | GTracy | | | |
| DATE | 2/ /2016 | 2/ /2016 | | | |

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STATUS REPORT ON PETITIONS FOR RULEMAKING

March 2016

Enclosure

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INTRODUCTION

The Status Report on Petitions for Rulemaking (PRM) is provided to the Executive Director for Operations (EDO) bi-annually. The purpose of this report is to inform the EDO of petitions currently before the agency and to provide an update on progress toward their completion. This report includes petitions docketed since the last report dated October 2, 2015 (Accession No. ML15217A434 in the U.S. Nuclear Regulatory Commission's (NRC's) Agencywide Documents Access and Management System). In addition, this report informs the EDO of petitions completed since the last report. The Office of Administration, in consultation with the Office of Nuclear Reactor Regulation (NRR), the Office of Nuclear Material Safety and Safeguards (NMSS), the Office of New Reactors (NRO), and the Office of the General Counsel (OGC), compiles the information for each open petition.

The report presents open petitions by office, beginning with the newest dockets and ending with the oldest dockets. The report captures the progression of each petition as it moves through the agency's process. The report includes hyperlinks to the docket for each petition on <http://www.regulations.gov>, thereby making additional pertinent documentation, including any public comments received, readily available to the reader. All reports since 2010 are available on [The NRC Rulemaker](#).¹ If you have a comment or suggestion for additional improvements to this report, please contact Anthony de Jesús at 301-415-1106.

¹<http://fusion.nrc.gov/adm/team/DAS/RADB/resource/Lists/Status%20Report%20on%20Petitions%20for%20Rulemaking/AllItems.aspx>.

LIST OF COMMON ABBREVIATIONS

| | |
|--------|--|
| 10 CFR | Title 10 of the <i>Code of Federal Regulations</i> |
| ADAMS | Agencywide Documents Access and Management System |
| ASLB | Atomic Safety Licensing Board |
| ASME | American Society of Mechanical Engineers |
| ASR | alkali-silica reaction |
| COL | combined operating license |
| ECCS | Emergency Core Cooling System |
| EDO | Executive Director for Operations |
| EP | emergency preparedness |
| FR | <i>Federal Register</i> |
| FRN | <i>Federal Register</i> notice |
| ISFSI | independent spent fuel storage installations |
| LOCA | loss-of-coolant accident |
| mSv | millisievert |
| NEI | Nuclear Energy Institute |
| NMSS | Office of Nuclear Material Safety and Safeguards |
| NPP | nuclear power plant |
| NRC | U.S. Nuclear Regulatory Commission |
| NRO | Office of New Reactors |
| NRDC | Natural Resources Defense Council |
| NRR | Office of Nuclear Reactor Regulation |
| NTTF | Near-Term Task Force |
| PRM | petition for rulemaking |
| PRB | Petition Review Board |
| rem | roentgen equivalent in man |
| RIN | Regulation Identification Number |
| SECY | Office of the Secretary |
| SFP | spent fuel pool |
| SRM | staff requirements memorandum |
| WG | working group |

DEFINITIONS

Open PRM: Any docketed² petition for rulemaking that the NRC staff is actively working on.

Closed PRM: The PRM docket is closed, either through publication of a notice of denial or a notice stating that the petition will be fully or partially considered in the rulemaking process.

Estimated Date for Submission to Commission:³ Four months after the date of the meeting of the Petition Review Board (PRB).

Pending PRM: A notice has not been published indicating the closure of the petition docket.

Status of Petition since the Last PRM Report: A brief statement of the actions that have occurred or will occur in the near future. (For example: "Notice of docketing and request for public comment is under development.")

Date of PRB: The date that the PRB and petition working group (WG) determine the regulatory decision on a PRM (i.e., denial, consideration in a current or future rulemaking, or partial consideration in a current or future rulemaking).

Target PRB Date: The PRB and petition WG determine the regulatory decision on a petition within 12 months from the date the notice of docketing is published in the *Federal Register* (FR).

Undetermined: A date has not been established at this time.

Withdrawn: The petitioner no longer wants to pursue the requested action and has notified the NRC. The change in status includes the date that the *Federal Register* notice (FRN) was published to notify the public that the petition was withdrawn.

Public Comments on the Petition: A brief summary of the comments received from the public or any interested party regarding a PRM, including the number received, type (individual, form letter, etc.), commenters (individual, industry, State organization, etc.), and whether the comments were generally in support of or generally in disagreement of the petition.

Background or Items of Interest (if applicable): Pertinent information related to the PRM that the staff wants to document throughout the process (e.g., congressional interest, changes in the regulatory environment).

² A PRM is docketed by the NRC if it meets the docketing criteria in § 2.802 of Title 10 of the *Code of Federal Regulations*, "Petition for rulemaking—requirements for filing."

³ NRC official who has the ultimate authority to determine whether a PRM will be denied or considered in whole or in part in the rulemaking process.

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OPEN PETITIONS BY OFFICE

Enclosure

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**OPEN PETITIONS FOR THE OFFICE OF NUCLEAR MATERIAL SAFETY AND
SAFEGUARDS**

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PRM NOS.: PRM-20-28, PRM-20-29, and PRM-20-30

PETITION SUBJECT: Linear No-Threshold Model and Standards for Protection against Radiation

PETITIONERS: Carol S. Marcus, Mark L. Miller, and Mohan Doss

DOCKET ID: NRC-2015-0057

NRC CONTACT: Vanessa Cox, NMSS, 301-415-8342

Comment [TL]: This report will be submitted in March. NMSS should firm up PRB plans.

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--|--|-----------------|--------------|-------------------|---|
| February 9, 2015 February 13, 2015 February 24, 2015 | June 23, 2015 80 FR 35870 | March 2016 | Undetermined | Undetermined | July 2016 |
| | | | | | |

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PRM-20-28, PRM-20-29, and PRM-20-30 (continued)

PETITION SUMMARY:

On February 9, 2015, February 13, 2015, and February 24, 2015, Carol S. Marcus, Mark L. Miller, and Mohan Doss, respectively, submitted nearly identical petitions requesting that the Commission amend its regulations in Part 20 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Standards for Protection against Radiation," to take radiation hormesis into account and end the NRC's reliance on the linear no-threshold hypothesis used to determine dose standards in its regulations. The concept of radiation hormesis claims that low doses of radiation have "no effects or protective effects" on population groups. Consequently, the petitioners request that: (1) worker dose remain at present levels, with allowances up to 100 millisievert (10 rem); (2) the use of the "as low as reasonably achievable" principle be removed entirely from the NRC's regulations; (3) public doses be raised to match worker doses; and (4) the NRC end differential doses to pregnant women, embryos and fetuses, and children under 18 years of age.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition and the public comments received.

PUBLIC COMMENTS ON THE PETITION:

The public comment period was scheduled to close on September 8, 2015; however, the NRC received requests for an extension of the comment period. The staff extended the comment period by 90 days (80 FR 50804; August 21, 2015). The comment period closed on November 19, 2015. The NRC received 561 individual public comments and 2,511 form letter comments on these PRMs. [The majority of comments were opposed to the changes requested by the petitioners.]

BACKGROUND/ITEMS OF INTEREST (if applicable):

The staff is evaluating three nearly identical petitions as one activity.

Comment [AdJ]: NMSS, check for accuracy. Do we have a break down of number opposed, number in support, etc? If so, please provide that breakdown here.

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Comment [TL]: Update

PRM NO.: PRM-51-30

PETITION SUBJECT: Spent Fuel Storage and Disposal

PETITIONER: Diane Curran, on behalf of 34 environmental organizations

DOCKET ID: NRC-2014-0014

NRC CONTACT: Keith McDaniel, NMSS, 301-415-5252

| Date Received | Notice of Docketing Published in the Federal Register | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--------------------------------------|---|-----------------|----------------|-------------------|---|
| December 20, 2013 January 7, 2014 | April 21, 2014 79 FR 22055 | March 2015 | April 14, 2015 | Denied | September 2015 |

PETITION SUMMARY:

On December 20, 2013, as corrected on January 7, 2014, Diane Curran, on behalf of 34 environmental organizations, submitted a PRM that requests that the Commission revise and integrate all safety and environmental regulations related to spent fuel storage and disposal. The petitioner requests that the NRC conduct a comprehensive review of these regulations and environmental studies, revise them to be consistent with the current state of knowledge, and integrate them into one cohesive regulatory framework in order to comply with the National Environmental Policy Act.

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PRM-51-30 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is finalizing the denial package to be submitted for Commission approval.

Comment [TL]: Should only be status since last report.

Comment [AdJ]: NRR Update

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC formed a WG to address both PRM-51-30 and PRM-51-31 (Environmental Impacts of Spent Fuel Storage during Reactor Operation) because both petitions make similar rulemaking requests.

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PRM NO.: PRM-72-6

PETITION SUBJECT: Dry Cask Storage of Spent Fuel

PETITIONER: C-10 Research and Education Foundation, Inc.

DOCKET ID: NRC-2008-0649

NRC CONTACT: Torre Taylor, NMSS, 301-415-7900

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Date of Final Action/<i>Federal Register</i> Notice Citation |
|------------------------------|---|--|--|---|--|
| November 24, 2008 | March 3, 2009 74 FR 9178 | First PRB: January 2010 Second PRB: May 2015 | First PRB: January 2010 Second PRB: May 18, 2015 | First Review: Denied, Partial Consideration in the Rulemaking Process, and Undetermined (see Background below) Remaining two issues: Denied | First publication: October 16, 2012 77 FR 63254 Publication on remaining two issues after Commission Direction |

PRM-72-6 (continued)

PETITION SUMMARY:

On November 24, 2008, C-10 Research and Education Foundation, Inc. (C-10), submitted a PRM that requests that the Commission amend its regulations governing onsite dry cask storage of spent fuel. The petitioner believes that the current regulations do not provide sufficient requirements for safe storage of spent nuclear fuel in dry cask storage at independent spent fuel storage installations (ISFSIs). The petitioner requests the following 12 changes:

1. The NRC should prohibit the production of nonconforming pre-built full scale casks specifically built for NRC certification testing.
2. The NRC certification of casks should be based on upgraded code requirements that include design criteria and technical specifications for a 100-year minimum age-related degradation timeframe.
3. The NRC should approve, as part of the original ISFSI certification process and construction license, a method for dry cask transfer capacity that will allow for immediate and safe maintenance on a faulty or failing cask.
4. The NRC should require that dry casks be qualified for transport at the time of onsite storage approval certification.
5. The NRC should require mandatory compliance with the American Society of Mechanical Engineers (ASME) codes and standards "without exception."
6. The NRC should require ASME code stamping for fabrication.
7. All materials for fabrication should be supplied by ASME-approved material suppliers.
8. Current ASME codes and standards for conservative heat treatment and leak tightness should be adopted and enforced.
9. A safe and secure hot cell transfer station coupled with an auxiliary pool should be built as part of an upgraded ISFSI design certification and licensing process.
10. The NRC should require real-time heat and radiation monitoring at ISFSIs.
11. The NRC should require hardened onsite storage at all nuclear power plants (NPPs).
12. The NRC should establish funding to conduct ongoing studies to provide the data required to accurately define and monitor for age-related material degradation.

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PRM-72-6 (continued)

Comment [Adj]: Update

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is preparing a denial package to be submitted to the Commission for approval in October 2015.

PUBLIC COMMENTS ON THE PETITION:

The NRC received approximately 9,000 comments, the vast majority of which were in postcard format and supported the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC published an FRN on October 16, 2012 (77 FR 63254), acknowledging that the petition would be partially considered in the rulemaking process. The FRN stated that the Commission denied nine of the petitioner's requests (Requests 1, 2, 3, 5 through 8, 10, and 12), as listed in the "Petition Summary," and would consider one request in the rulemaking process (Request 11). The FRN stated that the NRC was deferring action on two requests (Requests 4 and 9) for future rulemaking determinations.

The docket for PRM-72-6 remains open until the Commission acts on Requests 4 and 9.

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OPEN PETITIONS FOR THE OFFICE OF NUCLEAR REACTOR REGULATION

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PRM NO.: PRM-50-113

PETITION SUBJECT: Uninterruptible Monitoring of Coolant and Fuel in Reactors and Spent Fuel Pools

PETITIONER: Alexander DeVolpi

DOCKET ID: NRC-2015-0230

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

Comment [AdJ]: Report goes to EDO in March. Important this is accurate

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--------------------|--|-------------------------|-------------------------|-------------------------|---|
| September 10, 2015 | December 1, 2015 80 FR 75009 | PRB Will Not Be Held | PRB Will Not Be Held | PRB Will Not Be Held | March 2016 |

PETITION SUMMARY:

On September 10, 2015, Dr. Alexander DeVolpi submitted a PRM that requests that the Commission amend its regulations in 10 CFR Part 50 to require "installation of ex-vessel instrumentation for uninterrupted monitoring of coolant and fuel in reactors and spent-fuel pools." The petitioner cites a 2014 National Research Council report titled, "Lessons Learned from the Fukushima Nuclear Accident for Improving Safety of U.S. Nuclear Plants," that gave high priority to Recommendation 5.1A, which stated that greater

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PRM-50-113 (continued)

"[a]ttention to availability, reliability, redundancy, and diversity of plant systems and equipment is specifically needed for . . . Instrumentation for monitoring critical thermodynamic parameters in reactors, containments, and spent fuel pools." In addition, the petitioner cites to Section 5.1.1.4 of the report, "Instrumentation for Monitoring Critical Thermodynamic Parameters," which states that "robust and diverse monitoring instrumentation that can withstand severe accident conditions is essential for diagnosing problems, selecting and implementing accident mitigation strategies, and monitoring their effectiveness."

STATUS OF PETITION SINCE THE LAST PRM REPORT:

This is the first entry for this PRM in this report. The staff is continuing to analyze the specific issues raised in the petition..

PUBLIC COMMENTS ON THE PETITION:

The NRC did not request public comment on this petition as the staff believed it had sufficient information to fully evaluate the issues raised in the petition..

BACKGROUND/ITEMS OF INTEREST (if applicable):

Comment [AdJ]: NRR should briefly discuss the other activities related to this PRM. Including explain why a PRB is not being held.

PRM NO.: PRM-50-112

PETITION SUBJECT: Defining "Important to Safety"

PETITIONER: Kurt T. Schaefer

DOCKET ID: NRC-2015-0213

NRC CONTACT: Robert Beall, NRR, 301-415-3874

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|----------------------------------|--|-----------------|--------------|----------------------|---|
| July 20, 2015 August 31, 2015 | January 6, 2016 | Undetermined | Undetermined | Undetermined | January 2017 |

PETITION SUMMARY:

On July 20, 2015, and supplemented on August 31, 2015, Kurt T. Schaefer submitted a PRM that requests that the Commission amend 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," by defining and providing a set of criteria "for determining which structures, systems, components and functions are 'important to safety.'"

PRM-50-112 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The petition was published for public comment on January 6, 2016 (81 FR 410).

PUBLIC COMMENTS ON THE PETITION:

The public comment period closes on March 21, 2016.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-50-111

PETITION SUBJECT: Power Reactor In-Core Monitoring

PETITIONER: Mark Edward Leyse

DOCKET ID: NRC-2015-0124

NRC CONTACT: Natreon Jordan, NRR, 301-415-7410

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|----------------|--|-----------------|--------------|----------------------|---|
| March 13, 2015 | July 16, 2015 80 FR 42067 | July 2016 | Undetermined | Undetermined | November 2016 |

PETITION SUMMARY:

On July 16, 2015, Mark Edward Leyse submitted a PRM that requests that the Commission amend its regulations to require all NPP licensees to use in-core monitoring devices at different elevations and radial positions throughout the reactor.

PRM-50-111 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

PRM-50-111, which applies to boiling water reactors, is an extension of the issues raised in PRM-50-105, which also was submitted by Mr. Leyse. The NRC interpreted PRM-50-105 as limited to pressurized water reactors, and denied the PRM (78 FR 56174; September 12, 2013).

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PRM NO.: PRM-50-109

PETITION SUBJECT: Improved Identification Techniques against Alkali-Silica Concrete Degradation at Nuclear Power Plants

PETITIONER: Sandra Gavutis, on behalf of C-10

DOCKET ID: NRC-2014-0257

NRC CONTACT: Jessica Kratchman, NRR, 301-415-5112

Comment [AdJ]: Will need to update as soon as PRB takes place on 2/11

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--------------------|--|-----------------|----------------------|----------------------|---|
| September 25, 2014 | January 12, 2015 80 FR 1476 | January 2016 | February 11, 2016 | Undetermined | May 2016 |

PETITION SUMMARY:

On September 25, 2014, Sandra Gavutis, on behalf of C-10, submitted a PRM that requests that the Commission amend its regulations to provide improved identification techniques against alkali-silica reaction (ASR) concrete degradation at NPPs. The petitioner asserts that current NRC regulations, which rely on visual inspection to identify ASR degradation, do not adequately identify ASR without petrographic analysis. The petitioner is requesting that the NRC revise applicable regulations to require adherence with current American Concrete Institute standards and ASME codes.

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PRM-50-109 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

[The WG met with the PRB on February 11, 2016, and the PRB approved the staff's recommendation to... The staff is preparing a package to be submitted to the Commission for approval in May 2016.]

Comment [AdJ]: NRR should update this to reflect current status.

Comment [AdJ]: NRR should update with actual numbers in support, against, etc.

PUBLIC COMMENTS ON THE PETITION:

The public comment period closed on March 30, 2015. The NRC received 10 public comments on the petition, XX in support of the petition, XX opposing the proposed changes, and XX suggesting alternatives to the changes proposed in the petition.]

BACKGROUND/ITEMS OF INTEREST (if applicable):

The staff confirmed with the petitioner that the petitioner did not intend a portion of the PRM to be treated as an allegation against the licensee.

PRM NO.: PRM-50-108

PETITION SUBJECT: Fuel-Cladding Issues in Postulated Spent Fuel Pool (SFP) Accidents

PETITIONER: Mark Edward Leyse

DOCKET ID: NRC-2014-0171

NRC CONTACT: Daniel Doyle, NRR, 301-415-3748

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------|--|-----------------|--------------|----------------------|---|
| June 19, 2014 | October 7, 2014 79 FR 60383 | October 2015 | May 27, 2015 | Denied | November 2015 |

PETITION SUMMARY:

On June 19, 2014, Mark Edward Leyse submitted a PRM that requests that the Commission make new regulations stipulating the following:

1. The rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction should be calculated by SFP accident evaluation models using data from multirod bundle (assembly) severe accident experiments.

PRM-50-108 (continued)

Comment | Guidance | Update

2. The rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction should be calculated by SFP accident evaluation models using data from multirod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding.
3. SFP accident evaluation models should be required to conservatively model nitrogen-induced breakaway oxidation behavior.
4. Licensees should be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

(The WG is finalizing the denial package to be submitted for Commission approval.)

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

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PRM NO.: PRM-73-18

PETITION SUBJECT: Protection of Digital Computer and Communication Systems and Networks

PETITIONER: Anthony Pietrangelo, on behalf of the Nuclear Energy Institute (NEI)

DOCKET ID: NRC-2014-0165

NRC CONTACT: Jason Carneal, NRR, 301-415-1451

Comment [Guidance]: Report goes to EDO in March, make sure accurate.

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------|--|-----------------|--------------|----------------------|---|
| June 12, 2014 | September 22, 2014 79 FR 56525 | March 2016 | Undetermined | Undetermined | July 2016 |

PETITION SUMMARY:

On June 12, 2014, Anthony Pietrangelo, on behalf of the NEI, submitted a PRM that requests that the Commission revise certain cybersecurity language in its regulations to ensure that the rules are consistent with the NRC's original intent, are less burdensome for NRC licensees, and adequately protect the public health and safety and common defense and security.

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PRM-73-18 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition and the public comments received..

PUBLIC COMMENTS ON THE PETITION:

The public comment period closed on December 12, 2014. The NRC received 19 public comments on the petition, 15 in support of the petition, 2 opposing the proposed changes, and 2 suggesting alternatives to the changes proposed in the petition. The public comments in support of the proposed changes cited detailed examples of specific equipment that the commenters believe should be out of the scope of the cyber security rule. The public comments that opposed the proposed changes and those that suggested alternatives were very detailed and provided suggestions for alternative approaches to regulating cyber security at NPPs.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

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Comment | Guidance | Update

PRM NO.: PRM-51-31

PETITION SUBJECT: Environmental Impacts of Spent Fuel Storage during Reactor Operation

PETITIONER: Diane Curran, on behalf of 34 environmental organizations

DOCKET ID: NRC-2014-0055

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|------------------------------------|--|-----------------|----------------|----------------------|---|
| February 18, 2014 June 26, 2014 | May 1, 2014 79 FR 24595 July 24, 2014 79 FR 42989 | May 2015 | April 14, 2015 | Denied | September 2015 |

PETITION SUMMARY:

On February 18, 2014 (received by the Office of the Secretary (SECY) on March 12, 2014), Diane Curran, on behalf of 34 environmental organizations, submitted a PRM that requests that the Commission revise its regulations and consider, in all pending

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PRM-51-31 (continued)

and future licensing and re-licensing decisions, what the petitioners consider to be new and significant information bearing on the environmental impacts of high-density spent fuel storage in reactor pools and the costs and benefits for avoiding or mitigating those impacts.

On June 26, 2014, Ms. Curran submitted a document, characterized as an "amended petition" for rulemaking, requesting that the NRC "add to the record of the February 18, 2014, petition the observations made by Chairman Macfarlane in her dissenting comments" on the NRC staff document designated COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel," dated November 12, 2013 (ADAMS Accession No. ML13273A601). The NRC does not consider the June 26, 2014, document to be an amendment to the February 18, 2014, petition as the petitioner does not request that the NRC take any rulemaking actions that were not otherwise requested in the February 18, 2014, petition. Therefore, the NRC will consider the June 26, 2014, document to be a supplement to PRM-51-31, and accordingly, included it in the docket for PRM-51-31 (NRC-2014-0055).

STATUS OF PETITION SINCE THE LAST PRM REPORT:

[The WG is finalizing the denial package to be submitted for Commission approval.]

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC formed a WG to address both PRM-51-30 (Spent Fuel Storage and Disposal) and PRM-51-31.

Comment | Guidance | Update

PRM NO.: PRM-73-17

PETITION SUBJECT: Malware and Programmable Logic in Computers in Nuclear Power Plant Systems

PETITIONER: Alan Morris of Morris and Ward, Consulting Engineers

DOCKET ID: NRC-2013-0214

NRC CONTACT: Natreon Jordan, NRR, 301-415-7410

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---|--|-----------------|-------------|----------------------|---|
| March 14, 2013; August 17, 21, 23, and 27, 2013 | February 7, 2014 79 FR 7406 | February 2015 | May 5, 2015 | Denied | February 2016 |

PETITION SUMMARY:

On March 14, 2013, as supplemented by additional information through December 19, 2013, Alan Morris submitted a PRM that requests that the Commission require "new-design programmable logic computers" be installed in the control systems of NPPs to

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PRM-73-17 (continued)

block malware attacks on the industrial control systems of those facilities. In addition, the petitioner requests that NPP staff be trained in "the programming and handling of the non-rewriteable memories" for NPPs.

Comment [Guidance]: Make sure this reflects any Commission/EDO criticisms of the FRN.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

A Commission assistant briefing was held on January 11, 2016. The WG is making changes to the FRN identified in this meeting.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC received the original request on March 14, 2013. The NRC staff determined that the original request did not meet the requirements in 10 CFR 2.802 for docketing of a PRM, and it notified the petitioner on August 9, 2013. The petitioner supplemented his original petition on August 17, 21, 23, and 27, 2013. In addition, the petitioner provided additional supplemental information through December 19, 2013. On June 12, 2014, the NRC staff sent a letter to the petitioner requesting additional information. The petitioner responded with several e-mails on June 18 and 19, 2014.

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PRM NO.: PRM-50-106

PETITION SUBJECT: Environmental Qualification of Electrical Equipment Applicable to Existing and New Reactors

PETITIONER: Paul M. Blanch and C. Jordan Weaver, Natural Resources Defense Council (NRDC)

DOCKET ID: NRC-2012-0177

NRC CONTACT: Margaret S. Ellenson, NRR, 301-415-0894

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------|--|-----------------|--------------------|----------------------|---|
| June 18, 2012 | September 27, 2012 77 FR 59345 | September 2013 | September 18, 2013 | Denied | August 2015 |

PETITION SUMMARY:

On June 18, 2012, Paul M. Blanch and C. Jordan Weaver, of NRDC, jointly submitted a PRM that requests that the Commission "initiate rulemaking to revise its regulations to clearly and unequivocally require the environmental qualification of all safety-related cables, wires, splices, connections, and other ancillary electrical equipment that may be subjected to submergence and/or moisture intrusion during normal operating conditions, severe weather, seasonal flooding, and seismic events, and post-accident conditions, both inside and outside of containment."

PRM-50-106 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff submitted the denial package to the Commission for approval (SECY-15-0098, "Denial of Petition for Rulemaking related to Environmental Qualifications of Electrical Equipment (PRM-50-106)," dated August 5, 2015 (ADAMS Accession No. ML14071A279)).

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-50-103

PETITION SUBJECT: Measurement and Control of Combustible Gas Generation and Dispersal

PETITIONER: NRDC and Mark Leyse

DOCKET ID: NRC-2011-0189

NRC CONTACT: Richard Dudley, NRR, 301-415-1116

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|------------------|--|-----------------|--------------|----------------------|--|
| October 14, 2011 | January 5, 2012 77 FR 441 | Undetermined | Undetermined | Undetermined | Undetermined |

PETITION SUMMARY:

On October 14, 2011, the NRDC submitted a PRM that requests that the Commission amend its regulations regarding the measurement and control of combustible gas generation and dispersal within a power reactor system.

PRM-50-103 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

Action on this petition has been postponed pending further action on Recommendation 6 of the Fukushima Near-Term Task Force (NTTF) report.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not institute a public comment period, because the hydrogen control issue raised by this petition is being considered by the Commission under Recommendation 6 of the Fukushima NTTF report.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-50-99

PETITION SUBJECT: Enhancing Reactor Safety

PETITIONER: NRDC

DOCKET ID: NRC-2011-0189

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|----------------------|---|--|---|---|--|
| July 26, 2011 | September 20, 2011 76 FR 58165 | PRM-50-97 and PRM-50-98: NA PRM-50-99: Undetermined | PRM-50-97 and PRM-50- 98: NA PRM-50-99: Undetermined | PRM-50-97 and PRM-50- 98: Consider in Rulemaking PRM-50-99: Undetermined | PRM-50-97 and PRM-50-98: September 2015 PRM-50-99: Undetermined |

PRM-50-97, PRM-50-98, and PRM-50-99 (continued)

PETITION SUMMARY:

On July 26, 2011, the NRDC submitted six PRMs (three of which have already been closed) that request that the Commission amend its regulations to require: (1) Emergency Preparedness (EP) enhancements for prolonged station blackouts, (2) EP enhancements for multiunit events, and (3) licensees to confirm seismic hazards and flooding hazards every 10 years and address any new and significant information. All of the PRMs cite the Fukushima NTTF report as the rationale and bases for the PRMs.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

PRM-50-97 and PRM-50-98 are being considered within the Mitigation Strategies for Beyond-Design-Basis Events (RIN 3150-AJ49) proposed rule and the staff is preparing letters to the petitioner for EDO signature.

Action on PRM-50-99 has been postponed pending further action on the NTTF report.

PUBLIC COMMENTS ON THE PETITION:

Because the issues raised by these PRMs are being considered by the Commission under its review of the Fukushima NTTF report, the NRC did not institute a separate public comment period.

BACKGROUND/ITEMS OF INTEREST (if applicable):

In the SRM to SECY-15-0065, "Proposed Rule: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)," dated August 27, 2015 (ADAMS Accession No. ML15239A767), the Commission approved the staff's recommendation that these three petitions be addressed through the Mitigation of Beyond-Design-Basis Events proposed rulemaking.

PRM NO.: PRM-50-93 and PRM-50-95

PETITION SUBJECT: Calculated Maximum Fuel Element Cladding Temperature

PETITIONER: Mark Edward Leyse, on behalf of the New England Coalition

DOCKET ID: NRC-2009-0554

NRC CONTACT: Daniel Doyle, NRR, 301-415-3748

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|-----------------------------------|--|-----------------|--------------|----------------------|--|
| November 17, 2009 June 7, 2010 | January 25, 2010 75 FR 3876 | September 2016 | Undetermined | Undetermined | March 2017 |

PETITION SUMMARY:

On November 17, 2009, and June 7, 2010, Mark Edward Leyse, on behalf of the New England Coalition, submitted PRMs that request that the Commission revise 10 CFR 50.46(b)(1) to require that the calculated maximum fuel element cladding temperature not exceed a limit based on data from multirod (assembly) severe fuel damage experiments. The petitioner also requests revision of Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," to 10 CFR Part 50.

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PRM-50-93 and PRM-50-95 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

[The staff is continuing to analyze the specific issues raised in the petitions. Specific items from the petitions include 7, 8, 11, 13, and 14. The WG requested and received an extension to August 2016.]

PUBLIC COMMENTS ON THE PETITION:

The NRC received 20 comments, the majority of which were in support of the petition, and is preparing to make a presentation in the fall of 2015 to the PRB on dispositioning this PRM. The NRC published a second FRN on October 27, 2010 (75 FR 66007), to consolidate PRM-50-93 and PRM-50-95 and re-open the public comment period. The NRC received an additional 12 public comments.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The duration of the NRC's review will exceed the typical review period of PRMs because of the extremely large amount of information in PRMs 50-93/95. As a result, the NRC staff has implemented a special enhanced-transparency review process to increase the visibility of its review to the public. The NRC will publicly release its draft determinations regarding each group or category of issues on a periodic basis as the review progresses. In addition, the NRC will communicate preliminary review information to the petitioners and to other persons or organizations known to be interested in this activity. However, the NRC's conclusions on the issues raised in PRMs 50-93/95 will not be final until the Commission formally acts on the staff's recommendations and publishes a notice of this action in the FR. The staff will place a disclaimer on all preliminary findings to clearly indicate their non-final status.

The NRC explained this special process to the petitioner in a letter on August 25, 2011. The preliminary analyses are included in the docket on www.regulations.gov.

Comment [AdJ]: NRR, Has there been a PRB?

Comment [AdJ]: NRR, please update. Was a PRB held in fall 2015?

Comment [AdJ]: NRR, should we mention the back-and-forth email correspondence with Leyse?

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OPEN PETITIONS FOR THE OFFICE OF NEW REACTORS

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PRM NO.: PRM-50-110

PETITION SUBJECT: Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors

PETITIONER: Michael D. Tschiltz, on behalf of the NEI

DOCKET ID: NRC-2015-0028

NRC CONTACT: Rollie Berry, NRO, 301-415-8162

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------------|--|-----------------------|-------------------|---------------------------|---|
| January 15, 2015 | March 27, 2015 80 FR 16308 | May 2016 | December 21, 2015 | Consider in Rulemaking | September 2016 |

PETITION SUMMARY:

On January 15, 2015, Michael D. Tschiltz, on behalf of NEI, submitted a PRM that requests that the Commission amend its regulations to clarify the scope of applicability of 10 CFR 50.69, "Risk-informed categorization and treatment of structures, systems, and components for nuclear power reactors," to include holders of COLs. The applicability and scope of the NRC's regulations in

PRM-50-110 (continued)

§ 50.69 currently applies to a holder of an operating license under 10 CFR Part 50; a holder of a renewed operating license under 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," an applicant for a construction permit or operating license under 10 CFR Part 50; or an applicant for a design approval, a combined license, or manufacturing license under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." The petitioner is requesting that the rule be amended to include holders of COLs in the scope of applicability.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG met with the PRB on December 21, 2015, and the PRB approved the staff's recommendation to consider the petition. The WG will submit a SECY paper to the Commission recommending that rulemaking be initiated, as well as additional options that the Commission may consider during its review of the PRM.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition; therefore, the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC staff discussed this topic at public meetings held during the two years before NEI filed this PRM. The staff held a public meeting on September 16, 2015, to gauge the need for the proposed amendment. During the public meeting, NEI clarified the applicability, which could lead to a need for additional guidance.

Comment [Adj]: NRO, is this accurate? Or should we delete this sentence.

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OPEN PETITIONS FOR THE OFFICE OF THE GENERAL COUNSEL

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PRM NO.: PRM-2-15

PETITION SUBJECT: Agency Procedures for Responding to Adverse Court Decisions and Addressing Funding Shortfalls

PETITIONER: Jeffrey M. Skov

DOCKET ID: NRC-2015-0264

NRC CONTACT: Ian Irvin, OGC, 301-415-1933

Comment [TL]: Insert cite when FRN published.

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|------------------|--|-----------------|--------------|----------------------|---|
| October 22, 2015 | February 2016 | February 2017 | Undetermined | Undetermined | June 2017 |

PETITION SUMMARY:

On October 22, 2015, Jeffrey M. Skov submitted a PRM that requests that the Commission amend its rules of practice and procedure to establish procedures for responding to adverse court decisions and to annually report to the public each instance where the NRC does not receive "sufficient funds reasonably necessary to implement in good faith its statutory mandates."

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PRM-2-15 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

This is the first entry for this PRM in this report. The staff is analyzing the issues raised in the petition.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

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PETITIONS COMPLETED SINCE LAST REPORT

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| PRM No. | PRM Date | Petitioner | Subject | Docket ID | Resolution |
|-----------|------------|------------|---|----------------------|--|
| PRM-50-97 | 07/26/2011 | NRDC | Emergency Preparedness Enhancements for Prolonged Station Blackouts | <u>NRC-2011-0189</u> | Petition will be resolved in Mitigation of Beyond-Design-Basis Events rulemaking [NRC-2014-0240 ; RIN 3150-AJ49] |
| PRM-50-98 | 07/26/2011 | NRDC | Emergency Preparedness Enhancements for Multiunit Events | <u>NRC-2011-0189</u> | Petition will be resolved in Mitigation of Beyond-Design-Basis Events rulemaking [NRC-2014-0240 ; RIN 3150-AJ49] |

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1

From: Remsburg, Kristy
Sent: 3 May 2016 12:53:51 -0400
To: Borges, Jennifer
Subject: Automatic reply: Electronic Transmittal: Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents" (PRM-50-108; NRC-2014-0171)

I am currently out of the office. If you need assistance, please contact:

Antoinette Lewis at 415-1674
Patti Craver at 415-1513
Bridin McClosky at 415-3519

From: DeJesus, Anthony
Sent: 20 May 2016 09:44:18 -0400
To: Bellosi, Susan;Gibson, Byron
Cc: Terry, Leslie;Bladey, Cindy;Shepherd, Jill;Borges, Jennifer
Subject: CA Note Tickets Due to ADM FO Today
Attachments: DASSPEC090216_FY1718 RAP_CLEAN.doc, 201100275_DASSPEC000275 - CA Note for FY1718 Rulemaking Process (002).docx

Good Morning Susan,
Attached is a CA note and its enclosure transmitting the Rulemaking Activity Plan (RAP).

These are ticketed items due to ADM FO today and due to the OEDO on May 27. They have separate ticket numbers, but are related to the same topic and will go to the OEDO together. Susan Salter has reviewed the items and we are briefing Cindi and Sharon about these documents on Tuesday morning.

These documents should not be submitted to the OEDO until next Friday (May 27) because the OEDO wants us to continue to provide up-to-the-minute revisions so that the Commission has the most recent information available. So we will have to make additional changes next week (which is why we will need to brief Cindi and Sharon). It is due to the Commission on June 3rd.

The CA note is for the following ticket: **Ticket # DASSPEC000275 – SRM SECY-11-0032 – Consideration of the Cumulative Effects of Regulation in the Rulemaking Process (ML112840466)**

The Enclosure to the CA note is for this ticket: **Ticket # DASSPEC090216 - W19950048 - Provide annual update to Rulemaking Activity Plan**

I'm on leave today so if you have any questions please email both Leslie and me. I will monitor my email, but Leslie can probably respond more quickly to any questions you may have.

Thanks,
Anthony

Begin Forwarded Message:

From: "DeJesus, Anthony"
Subject: Tickets Due to ADM FO Today
Date: 20 May 2016 05:24
To: "Bowman, Adriane" , "Salter, Susan" , "Widdup, Joseph"

Cc: "Shepherd, Jill" , "Borges, Jennifer" , "Terry, Leslie" , "Bladey, Cindy" ,
"Gallagher, Carol"

Good morning Susan/Joe,

The attached documents are due to the ADM FO today. We provided them earlier in the week and I wasn't sure if you had any comments.

I'm attaching the CA note on rulemaking activities, which transmits the Rulemaking Activity Plan. Because these documents are supposed to contain up-to-the-minute updates, I will probably have to make some changes to the rule count described in the CA note next week once we see OEDO budget changes that was sent to staff this week. The CA note responds to DASSPEC000275.

I'm also attaching the RAP (also in ADAMS-see below). The RAP will definitely have additional changes made next week, because I'm certain budgetary information will change (as a result of OEDO review of the budget). Also, it's possible we may get some SRMs and some documents may get published next week. However, rulemaking offices have provided me updated information as of yesterday, and we have incorporated updates in response to comments received from OEDO ETAs. The RAP enclosure responds to DASSPEC090216.

Because these documents continue to be in a state of flux, we will be briefing Cindi and Sharon on Tuesday morning. That scheduler should be on your outlook calendar. Both of these documents are due to the OEDO next Friday.

If you have any questions please let me know. I'm off today, but I will be checking my email. If you have any changes to the CA note please respond to all. Jennifer is in the office today and will help make changes to the documents.

Thanks,

Anthony

[View ADAMS P8 Properties ML16137A374](#)

[Open ADAMS P8 Document \(W19950048/201100275-Enclosure 1: 2017-2018 RULEMAKING ACTIVITY PLAN\)](#)

Rulemaking Activity Plan (FY 2017 - 2018)

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Rulemaking Activity Plan (FY 2017 - 2018)

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Rulemaking Activity Plan (FY 2017 - 2018)

Summary Report of All Rulemaking Activities

| Row Labels | FY 17 FTE | FY 17 \$K | FY 18 FTE | FY 18 \$K |
|--|-------------|-------------|-----------|-------------|
| 1. Funded | 87.2 | 2704 | 81 | 2416 |
| Operating Reactors | 51 | 1230 | 46 | 1080 |
| <i>High</i> | 32.4 | 375 | 25.8 | 325 |
| Mitigation of Beyond Design Basis Events (MBDBE) | 4 | 50 | 0 | 0 |
| Performance-Based Emergency Core Cooling System Acceptance Criteria | 4.2 | 0 | 0 | 0 |
| Enhanced Weapons, Firearms Background Checks, and Security Event Notifications | 1 | 0 | 0 | 0 |
| Drug and Alcohol Testing; Technical Issues and Editorial Changes | 1.2 | 250 | 1.4 | 250 |
| Defense Against Common Mode Failures in Digital Instrumentation and Control Systems | 2.9 | 0 | 2.5 | 0 |
| Fitness-for-Duty (Health and Human Services (HHS) Requirements) | 0.6 | 0 | 1 | 0 |
| 2015 Edition of the American Society of Mechanical Engineers Code | 2.8 | 0 | 3.1 | 0 |
| 2016 Edition of the American Society of Mechanical Engineers Operations and Maintenance Code | 1.6 | 0 | 2.4 | 0 |
| 2017 Edition of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code | 1.5 | 0 | 1.9 | 0 |
| Regulatory Guide (RG) 1.84, Rev. 38; RG 1.147, Rev. 19; and RG 1.192, Rev. 3; Approval of American Society of Mechanical Engineers Code Cases | 1.2 | 0 | 1.3 | 0 |
| Regulatory Guide (RG) 1.84, Rev. 39; and RG 1.147, Rev. 20; and 1.192, Rev. 4; Approval of American Society of Mechanical Engineers Code Cases | 0.9 | 0 | 1 | 0 |
| Regulatory Improvements for Power Reactors Transitioning to Decommissioning | 10.5 | 75 | 11.2 | 75 |
| <i>Medium</i> | 3.6 | 505 | 4.2 | 405 |
| Non-Power Production or Utilization Facility License Renewal | 1.5 | 505 | 1.8 | 305 |
| Revisions to Reactor Vessel Material Surveillance Program Requirements | 2.1 | 0 | 2.4 | 100 |
| <i>N/A</i> | 15 | 350 | 16 | 350 |
| Rulemaking Support - Operating Reactors (Will not be publicly available) | 15 | 350 | 16 | 350 |
| New Reactors | 5.2 | 100 | 7 | 100 |
| <i>High</i> | 0 | 0 | 1.3 | 0 |
| Advanced Power Reactor (APR)-1400 (KEPCO) Design Certification | 0 | 0 | 1.3 | 0 |
| <i>Medium</i> | 4.2 | 100 | 4.7 | 100 |
| Emergency Preparedness Requirements for Small Modular Reactors | 1.4 | 100 | 1.6 | 100 |
| Financial Qualifications for Reactor Licensing | 2.8 | 0 | 3.1 | 0 |
| <i>N/A</i> | 1 | 0 | 1 | 0 |
| Rulemaking Support - New Reactors (Will not be publicly available) | 1 | 0 | 1 | 0 |
| Materials Users | 8 | 0 | 8 | 0 |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | | | |
|--|-----------|------------|----------|------------|
| <i>Medium</i> | 5 | 0 | 5 | 0 |
| Part 37 Rulemaking | 1.6 | 0 | 1.9 | 0 |
| Radiation Protection | 0.4 | 0 | 0.4 | 0 |
| Cyber Security for Byproduct Material Licensees | 2.5 | 0 | 2.2 | 0 |
| Items Containing Byproduct Material Incidental to Production (formerly Polymer (Polycarbonate or Polyester) Track Etched (PCTE) Membranes) | 0.5 | 0 | 0.5 | 0 |
| <i>N/A</i> | 3 | 0 | 3 | 0 |
| Rulemaking Support - Nuclear Materials Users (Will not be publicly available) | 3 | 0 | 3 | 0 |
| Fuel Facilities | 7 | 194 | 7 | 196 |
| <i>High</i> | 7 | 194 | 6.4 | 196 |
| Enhanced Security for Special Nuclear Material (formerly Physical Protection for Category I, II, and III Special Nuclear Material) | 1.1 | 0 | 1.5 | 0 |
| Enhanced Weapons for Spent Fuel Storage Installations and Transportation--Section 161A Authority | 0.3 | 0 | 0.4 | 0 |
| Cyber Security for Fuel Facilities | 3.4 | 194 | 4.5 | 196 |
| Modified Small Quantities Protocol (SQP) | 2.2 | 0 | 0 | 0 |
| <i>Medium</i> | 0 | 0 | 0.6 | 0 |
| Amendments to Material Control and Accounting Regulations | 0 | 0 | 0.6 | 0 |
| Spent Fuel Storage and Transportation | 10 | 940 | 7 | 800 |
| <i>High</i> | 2 | 0 | 2 | 0 |
| List of Approved Spent Fuel Storage Cask [This is a placeholder for several annually recurring rules.] | 1 | 0 | 1 | 0 |
| Independent Spent Fuel Storage Installation Security Requirements for Radiological Sabotage | 1 | 0 | 1 | 0 |
| <i>Medium</i> | 3 | 0 | 3 | 0 |
| Part 71, Compatibility with International Atomic Energy Agency (IAEA) Transportation Standards, SSR-6, 2012 Edition | 3 | 0 | 3 | 0 |
| <i>N/A</i> | 5 | 940 | 2 | 800 |
| Rulemaking Support - Spent Fuel, Storage and Transportation (Will not be publicly available) | 1 | 0 | 1 | 0 |
| Rulemaking Support - Ultimate Disposal (Will not be publicly available) | 4 | 940 | 1 | 800 |
| Decommissioning and Low-Level Waste | 3 | 240 | 3 | 240 |
| <i>Medium</i> | 1.1 | 240 | 0.6 | 120 |
| Groundwater Protection In Situ Leach Uranium Recovery Facilities | 1.1 | 240 | 0.6 | 120 |
| <i>Low</i> | 0.9 | 0 | 1.4 | 120 |
| Dodd-Frank Act of 2010 Rulemaking | 0.9 | 0 | 1.4 | 120 |
| <i>N/A</i> | 1 | 0 | 1 | 0 |
| Rulemaking Support - Decommissioning and Low-Level Waste (Will not be publicly available) | 1 | 0 | 1 | 0 |
| Corporate Support | 3 | 0 | 3 | 0 |
| <i>High</i> | 2 | 0 | 2 | 0 |
| Revision of Fee Schedules: Fee Recovery for FY 2017 | 2 | 0 | 0 | 0 |
| Revision of Fee Schedules: Fee Recovery for FY 2018 | 0 | 0 | 2 | 0 |
| <i>Medium</i> | 1 | 0 | 1 | 0 |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | | | |
|--|------|---|-----|---|
| 10 CFR Part 110, Export and Import of Nuclear Equipment and Material; Updates and Clarifications | 0 | 0 | 0 | 0 |
| Adjustment of Civil Penalties for Inflation for FY 2017 | 0 | 0 | 0 | 0 |
| Adjustment of Civil Penalties for Inflation for FY 2018 | 0 | 0 | 0 | 0 |
| Miscellaneous Administrative Rulemaking [This is a placeholder for annual recurring rule to, e.g. update administrative or organizational information] | 0.25 | 0 | 0.5 | 0 |
| Miscellaneous Technical Correction [This is a placeholder for annual recurring rule to, e.g. correct inadvertent omitted information or typos] | 0.25 | 0 | 0.5 | 0 |
| U.S. Nuclear Regulatory Commission Acquisition Regulation (NRCAR) – 48 CFR Chap. 20 | 0.5 | 0 | 0 | 0 |

2. Completed in Current FY

Operating Reactors

High

2009-2013 Editions and Addenda of the American Society of Mechanical Engineers Code

Incorporation by Reference of Revisions of ASME Regulatory Guides (Regulatory Guide (RG) 1.84, Rev. 37; RG 1.147, Rev. 18; and RG 1.192, Rev. 2; Approval of American Society of Mechanical Engineers Code Cases)

Materials Users

High

Medical Use of Byproduct Material--Medical Event Definitions, Training and Experience, and Clarifying Amendments

Spent Fuel Storage and Transportation

High

Decommissioning and Low-Level Waste

High

Low-Level Radioactive Waste Disposal

Corporate Support

High

Revision of Fee Schedules: Fee Recovery for FY 2016

Medium

Adjustment of Civil Penalties for Inflation for FY 2016

Variable Annual Fee Structure for Small Modular Reactors

3. Unfunded

Operating Reactors

Medium

Approach to Risk-Inform, Performance-Base Requirements for Nuclear Power Plants

Decoupling of Assumed Loss of Offsite Power (LOOP) From Loss-of-Coolant Accidents (LOCA)

Requirement to Submit Complete and Accurate Information

New Reactors

High

U.S. Advanced Pressurized Water Reactor (US-APWR) Design Certification

Medium

Incorporation of Lessons Learned From New Reactor Licensing Process (Parts 50 and 52 Licensing Process Alignment)

Materials Users

Medium

Sabotage of Nuclear Facilities, Fuel, or Designated Material

Low

Rulemaking Activity Plan (FY 2017 - 2018)

| |
|--|
| Transfers of Certain Source Materials by Specific Licensees |
| Expansion of the National Source Tracking System |
| Industrial Radiographic Operations and Training |
| Fuel Facilities |
| <i>High</i> |
| Fitness for Duty - Security Force Fatigue at Nuclear Facilities |
| <i>Medium</i> |
| Spent Fuel Reprocessing |
| Domestic Licensing of Source Material—Amendments/Integrated Safety Analysis |
| Spent Fuel Storage and Transportation |
| <i>Medium</i> |
| Geologic Repository Operations Area Security and Material Control and Accounting Requirements |
| Spent Fuel Cask Certificate of Compliance Format and Content |
| Geologic Repository Operations Area (GROA) Fitness-For-Duty Requirements |
| Decommissioning and Low-Level Waste |
| <i>Medium</i> |
| Controlling the Disposition of Solid Materials |
| Prompt Remediation of Residual Radioactivity During Operations |
| <i>Low</i> |
| Entombment Options for Power Reactors |
| Corporate Support |
| <i>Medium</i> |
| Receipts-Based Small Business Size Standards |
| 4. Petitions for Rulemaking |
| NMSS |
| Dry Cask Storage of Spent Fuel |
| Linear No-Threshold Model and Standards for Protection against Radiation |
| Spent Fuel Storage and Disposal |
| NRO |
| Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors |
| NRR |
| Calculated Maximum Fuel Element Cladding Temperature |
| Determining Which Structures, Systems, and Components and Functions are Important to Safety |
| Enhancing Reactor Safety |
| Environmental Impacts of Spent Fuel Storage During Reactor Operation |
| Erik Erb – Minimum Day Off Requirement for Security Officers |
| Improved Identification Techniques against Alkali-Silica Concrete Degradation at Nuclear Power Plants |
| In-Core Temperature Monitoring at Nuclear Power Plants |
| Malware and Programmable Logic in Computers in Nuclear Power Plant Systems |
| Measurement and Control of Combustible Gas Generation and Dispersal |
| Nuclear Energy Institute – Fitness-for-Duty Programs |
| Professional Reactor Operator Society - Fitness-for-Duty Programs |
| Protection of Digital Computer and Communication Systems and Networks |
| Uninterruptible Monitoring of Coolant and Fuel in Reactors and Spent Fuel Pools |
| OGC |

Rulemaking Activity Plan (FY 2017 - 2018)

Agency Procedures for Responding to Adverse Court Decisions and Addressing Funding Shortfalls

5. Completed

Final Action Published in the Federal Register (Rulemaking Activities)

List of Approved Spent Fuel Storage Casks: Holtec International HI-STORM Flood/Wind Multipurpose Storage System, Certificate of Compliance No. 1032, Amendment No. 0, Revision 1

List of Approved Spent Fuel Storage Casks: MAGNASTOR Cask System, Certificate of Compliance No. 1031, Amendment Nos. 0-3, Revision 1

List of Approved Spent Fuel Storage Casks: Holtec International HI-STORM 100 Cask System, Certificate of Compliance No. 1014, Amendment No. 9, Revision 1

List of Approved Spent Fuel Storage Casks: Holtec International HI-STORM 100 Cask System, Certificate of Compliance No. 1014, Amendment No. 10

Final Action Published in the Federal Register (Petitions for Rulemaking)

Environmental Qualification of Electrical Equipment Applicable to Existing and New Reactors

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

Activities No Longer Being Pursued

2015 Edition of the American Society of Mechanical Engineers Operations and Maintenance Code

Clarifying Requirements in Part 21, Reporting of Defects and Noncompliance

Dose Assessments for Radioactive Effluents

Radiation Protection

Risk-Informed Changes to Loss-of-Coolant Accident Technical Requirements

Risk Management Regulatory Framework

Institute of Electrical and Electronics Engineers (IEEE) Standard 603-2009

Rulemaking Activity Plan (FY 2017 - 2018)

1. Funded

Operating Reactors

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|--------------------|-------------------|------------------------------|---|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Mitigation of Beyond Design Basis Events (MBDBE) | 50, 52 | Operating Reactors | NRR | NRC-2011-0189, NRC-2014-0240 | PRM-50-96, PRM-50-97, PRM-50-98, PRM-50-100, PRM-50-101, and PRM-50-102 | AJ49 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRR | 2 | 50 | 0 | 0 |
| | | | | | | | | NSIR | 1 | 0 | 0 | 0 |
| | | | | | | | | OGC | 1 | 0 | 0 | 0 |
| | | | | | | | | Total | 4 | 50 | 0 | 0 |

Abstract

This rule would enhance mitigation strategies for nuclear power reactors for beyond-design-basis external events. This rulemaking addresses recommendations from the Near-Term Task Force (NTTF) related to station blackout, spent fuel pool long-term cooling, and emergency preparedness (NTTF Recommendations 4, 7, 8, and portions of 9, 10, and 11). In SRM-SECY-11-0124, the Commission directed the staff to initiate the station blackout rulemaking as a high-priority activity. The staff's proposal is intended to produce a more seamless accident response capability that includes emergency operating procedures, the newly imposed strategies and guidelines for beyond-design-basis external events, and the extensive damage mitigation guidelines. In SRM-SECY-14-0046, the Commission approved the consolidation of the rulemaking activities. The rulemaking would make generically applicable the requirements in the Mitigation Strategies Order EA-12-049 and Spent Fuel Pool Instrumentation Order EA-12-051 from 2012. This rulemaking would partially address PRM-50-96 for long-term cooling capabilities in the event of a solar storm. Additionally, this rule would fully addresses PRMs 50-97, 50-98, 50-100, 50-101, and 50-102.

Priority Justification

The rule scores 45 points (20, 10, 10, 5) because of the following reasons: A) Significant contributor toward the safety goal (strategies 1 and 5); B) Significant contributor toward the regulatory effectiveness goal (strategies 1 and 2); C) Commission direction in SRM-SECY-11-0124, SRM-SECY-11-0137, and SRM-SECY-14-0046; also a Congressional priority; and D) Partially addresses PRM-50-96 and addresses five other PRMs with significant public interest following the Fukushima event.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 10/18/2011 | 10/07/2013 | 04/30/2015 | 11/13/2015 | 12/16/2016 | 10/13/2017 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------------------|--|
| 09/09/2011 | SECY-11-0124 (ADAMS) | Request Commission approval to initiate rulemaking: On September 9, 2011, the staff requested Commission approval to initiate both the station |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|---|--|
| | Accession No. ML11245A127) | blackout mitigation strategies portion (associated with NTTF Recommendation 4) and the onsite emergency response capabilities portion (associated with NTTF Recommendation 8) of what would become the MBDDE rulemaking. The staff requested approval to publish advance notices of proposed rulemaking (ANPRs). |
| 10/18/2011 | SRM-SECY-11-0124 (ADAMS Accession No. ML112911571) | Commission approves rulemaking initiation: On October 18, 2011, the Commission approved initiation of the rulemaking. Specifically, the Commission directed staff to begin rulemaking activities in the form of ANPRs for NTTF Recommendations 4 and 8. |
| 12/15/2011 | SRM-SECY-11-0137 (ADAMS Accession No. ML113490055) | The Commission provided additional direction about staff's proposed prioritization of the NTTF recommendations. This direction was with regard to the overall prioritization of Tier 1, 2, and 3 tasks. Since both NTTF Recommendations 4 and 8 were Tier 1 (near-term tasks) addressed by SECY-11-0124, this direction did not expand upon the previous SRM-SECY-11-0124 direction in a significant manner for this rulemaking. |
| 03/20/2012 | 77 FR 16175 | Station Blackout ANPR published. |
| 04/18/2012 | 77 FR 23161 | Onsite Emergency Response Capabilities ANPR published. |
| 04/25/2012 | Public meeting transcript (ADAMS Accession No. ML12139A053) | Held a public meeting on the Station Blackout ANPR to support more informed stakeholder feedback on the ANPR. |
| 05/04/2012 | N/A | Public comment period on Station Blackout ANPR closed and staff began reviewing the public comments. |
| 05/23/2012 | Meeting minutes (ADAMS Accession No. ML12165A627) | Held a public meeting on the Onsite Emergency Response Capabilities ANPR to support more informed stakeholder feedback. |
| 06/18/2012 | N/A | Public comment period on Onsite Emergency Response Capabilities ANPR closed and staff began reviewing the public comments. |
| 01/08/2013 | 78 FR 1154 | Requested public comments on the draft Onsite Emergency Response Capabilities regulatory basis. |
| 01/25/2013 | COMSECY-13-0002 (ADAMS Accession No. ML13011A037) | The staff recommended consolidating the NTTF Recommendations 4 and 7 rules into one rulemaking. |
| 02/22/2013 | N/A | Public comment period on draft Onsite Emergency Response Capabilities regulatory basis closed and the staff began reviewing public comments. |
| 03/04/2013 | SRM-COMSECY-13-0002 (ADAMS Accession No. ML13063A548) | The Commission approved combining the NTTF Recommendations 4 and 7 rules into one rulemaking. |
| 04/10/2013 | 78 FR 21275 | Requested public comments on the Station Blackout Mitigating Strategies (SBOMS) draft regulatory basis. |
| 05/28/2013 | N/A | Public comment period on SBOMS draft regulatory basis closed and staff began reviewing the public comments. |
| 07/16/2013 | CA Note (ADAMS Accession No. ML13196A501-Nonpublic) | Informed Commission of regulatory basis completion: CA note informed the Commission of SBOMS regulatory basis completion, and that the staff intends to publish notice of availability of the final regulatory basis in the Federal Register. |
| 07/23/2013 | 78 FR 44035 | SBOMS regulatory basis published in the Federal Register. |
| 10/07/2013 | CA Note (ADAMS Accession No. ML13277A634) | CA Note informed the Commission of Onsite Emergency Response Capabilities regulatory basis completion, and that the staff planned to publish notice of availability of the final regulatory basis in the Federal Register. |
| 10/25/2013 | 78 FR 63901 | Onsite Emergency Response Capabilities regulatory basis published in the Federal Register. |
| 02/21/2014 | N/A | Conceptual construct of consolidated preliminary proposed rule language presented to steering committee. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|--|--|
| 07/09/2014 | SRM-SECY-14-0046 (ADAMS Accession No. ML14190A347) | The Commission approved combining the NTTF Recommendations 4 and 7 rulemaking with the Recommendation 8 rulemaking. |
| 08/26/2014 | N/A | Public meeting to discuss draft proposed rule language. |
| 03/16/2015 | N/A | Advisory Committee on Reactor Safeguards (ACRS) subcommittee meeting. |
| 04/09/2015 | N/A | ACRS full committee meeting. |
| 04/30/2015 | SECY-15-0065 (ADAMS Accession No. ML15049A201) | Proposed rule provided to the Commission. |
| 05/06/2015 | N/A | ACRS subcommittee meeting. |
| 06/10/2015 | N/A | ACRS subcommittee meeting. |
| 07/09/2015 | N/A | Staff met with the Commission on the proposed rule and associated guidance. |
| 08/27/2015 | SRM-SECY-15-0065 (ADAMS Accession No. ML15239A767) | The Commission approved publication of the draft proposed rule in the Federal Register subject to the removal of the proposed requirements for Severe Accident Management Guidelines (SAMGs) (10 CFR 50.155(b)(3)) and the proposed design requirements for new reactor applicants (10 CFR 50.155(d)). |
| 11/13/2015 | 80 FR 70609 | Publication of proposed rule in the Federal Register for a 90-day public comment period. |
| 01/21/2016 | Meeting minutes (ADAMS accession No. ML16029A337) | Staff held a public meeting to support more informed public comment on the proposed rule. |
| 02/11/2016 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments. |
| 04/22/2016 | N/A | ACRS subcommittee meeting. |
| 11/30/2016 | N/A | ACRS subcommittee meeting. (projected date) |
| 12/10/2016 | N/A | ACRS full committee meeting. (projected date) |
| 12/16/2016 | N/A | Final rule due to the Commission. (projected date) |
| 10/13/2017 | N/A | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|--------------------|-------------------|---------------|----------------------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Performance-Based Emergency Core Cooling System Acceptance Criteria | 50 | Operating Reactors | NRR | NRC-2008-0332 | PRM-50-71, PRM-50-84 | AH42 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRR | 2.5 | 0 | 0 | 0 |
| | | | | | | | | OGC | 0.2 | 0 | 0 | 0 |
| | | | | | | | | RES | 1.5 | 0 | 0 | 0 |
| | | | | | | | | Total | 4.2 | 0 | 0 | 0 |

Abstract

This rule would amend the regulations in 10 CFR 50.46 that specify the fuel cladding acceptance criteria for emergency core cooling system (ECCS) loss-of-coolant accidents (LOCA) evaluations. The proposed ECCS acceptance criteria are performance-based, and reflect recent research findings that identified new embrittlement mechanisms for fuel rods with zirconium alloy cladding under LOCA conditions. Addresses PRM-50-71 and PRM-50-84. Previously titled "50.46b Fuel Cladding." This rule would also contain a risk-informed alternative to address the effects of debris in the long-term.

Priority Justification

The rule scores 45 points (20, 10, 10, 5) because of the following reasons: A) Significant contributor toward the safety goal (strategies 1 and 2); B) Significant contributor to the regulatory effectiveness goal (strategies 1 and 2); C) Commission direction in SRM-SECY-02-0057; and D) Resolves PRM-50-71 and PRM-50-84 and there is significant interest in this rule from the public.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 03/31/2003 | 05/26/2008 | 03/01/2012 | 03/24/2014 | 03/16/2016 | 01/31/2017 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|---|--|
| 07/31/2001 | SECY-01-0133 (ADAMS Accession No. ML011800524) | Requested Commission approval to initiate rulemaking: On July 31, 2001, the staff requested Commission approval to initiate the rulemaking. In particular, the staff recommended that the Commission approve proceeding with rulemaking for modification of the existing 10 CFR 50.46 and Appendix K, and development of a risk-informed alternative to 10 CFR 50.46, Appendix K, and GDC 35. The staff subsequently provided an update to the information found in this SECY on March 29, 2002, in SECY-02-0057 (on which the Commission provided direction). |
| 10/09/2002 | ACRS meeting transcript (ADAMS Accession No. ML023030246) | ACRS subcommittee meeting. |
| 10/10/2002 | ACRS meeting transcript (ADAMS Accession No. ML022980190) | ACRS full committee meeting. |
| 03/31/2003 | SRM-SECY-02-0057 (ADAMS Accession No. ML022980190) | Commission approved rulemaking initiation: On March 31, 2003, the Commission approved initiation of the rulemaking. Specifically, the Commission approved the staff's recommendation to proceed with modifications to 10 CFR 50.46 to provide for a more performance-based approach to meeting |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|---|--|
| | ML030910476) | ECCS acceptance criteria. This SRM included additional guidance concerning various aspects of ECCS rulemaking and approved "unbundling" the proposals and proceeding with the development of separate rulemakings; the SRM noted separate rulemaking plans would not be necessary for each of these actions. |
| 09/29/2003 | ACRS meeting transcript (ADAMS Accession No. ML032940296) | ACRS subcommittee meeting. |
| 07/27/2005 | ACRS meeting transcript (ADAMS Accession No. ML052230093) | ACRS subcommittee meeting. |
| 09/08/2005 | ACRS meeting transcript (ADAMS Accession No. ML052710235) | ACRS full committee meeting. |
| 06/04/2015 | Public meeting (ADAMS Accession No. ML15169A004) | Public meeting. |
| 02/02/2007 | ACRS meeting transcript (ADAMS Accession No. ML070430485) | ACRS full committee meeting. |
| 05/30/2008 | RIL-0801 (ADAMS Accession No. ML081350225) | Regulatory Basis completed. |
| 07/31/2008 | 73 FR 44778 | Requested public comments on the regulatory basis: The Nuclear Regulatory Commission published in the Federal Register a notice of availability of RIL-0801 and NUREG/CR-6967, together with a request for comment. In that notice, the Nuclear Regulatory Commission stated that these documents and comments on the documents would be discussed at a public workshop to be scheduled in September 2008. |
| 09/24/2008 | Public meeting summary (ADAMS Accession No. ML083010496) | Held public meeting on the regulatory basis documents. |
| 12/02/2008 | ACRS meeting transcripts (ADAMS Accession Nos. ML083520501 & ML083530449) | ACRS subcommittee meeting. |
| 12/04/2008 | ACRS meeting transcript (ADAMS Accession No. ML083540616) | ACRS full committee meeting. |
| 08/13/2009 | 74 FR 40765 | Publication of advance notice of proposed rulemaking in the Federal Register. |
| 10/27/2009 | N/A | Public comment period on advance notice of proposed rulemaking closed and staff began reviewing the public comments. |
| 05/10/2011 | ACRS meeting transcript (ADAMS Accession No. ML111450409) | ACRS subcommittee meeting. |
| 06/08/2011 | ACRS meeting transcript (ADAMS Accession No. ML11166A181) | ACRS full committee meeting. |
| 06/23/2011 | ACRS meeting transcript (ADAMS Accession No. ML11193A035) | ACRS subcommittee meeting. |
| 07/13/2011 | ACRS meeting transcript (ADAMS Accession No. ML11221A059) | ACRS full committee meeting. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|---|---|
| 12/15/2011 | ACRS meeting transcript (ADAMS Accession No. ML120100268) | ACRS subcommittee meeting. |
| 01/19/2012 | ACRS meeting transcript (ADAMS Accession No. ML12032A048) | ACRS full committee meeting. |
| 03/01/2012 | SECY-12-0034 (ADAMS Accession No. ML112520186) | Proposed rule provided to the Commission: The proposed rule was provided to the Commission in March 2012, in SECY-12-0034, "Proposed Rulemaking – 10 CFR 50.46c Emergency Core Cooling System Performance During Loss of Coolant Accidents." |
| 01/07/2013 | SRM-SECY-12-0034 (ADAMS Accession No. ML13007A478) | Commission approved publication of proposed rule. |
| 03/04/2013 | COMSECY-13-0006 (ADAMS Accession No. ML13050A167) | Staff requested approval to defer draft guidance development related to GSI-191 until after the 50.46c proposed rule is published and approval to extend due date for the final rule/guidance document to February 28, 2016, and June 14, 2016, respectively. |
| 05/09/2013 | COMSECY-13-0006 (ADAMS Accession No. ML13129A401) | Commission approved request to defer draft guidance and extension request for final rule and final guidance. |
| 03/24/2014 | 79 FR 16105 | Publication of proposed rule in the Federal Register. |
| 04/22/2014 | 79 FR 22456 | Extension of public comment period published. |
| 08/21/2014 | N/A | Public comment period on proposed rule closed and staff began reviewing the public comments. |
| 12/02/2014 | ACRS meeting transcript (ADAMS Accession No. ML14351A368) | ACRS subcommittee meeting. |
| 03/17/2015 | Public meeting (ADAMS Accession No. ML15071A272) | Public meeting. |
| 04/20/2015 | 80 FR 2658 | Draft regulatory guide (DG-1322), "Alternate Risk-Informed Approach for Addressing the Effects of Debris on Post-Accident Long-Term Core Cooling," published for comment. |
| 04/23/2015 | Public meeting summary (ADAMS Accession No. ML15132A743) | Public meeting. |
| 04/29/2015 | Public meeting summary (ADAMS Accession No. ML15138A434) | Public meeting. |
| 05/07/2015 | Public meeting summary (ADAMS Accession No. ML15156A891) | Public meeting. |
| 06/04/2015 | Public meeting (ADAMS Accession No. ML15169A004) | Public meeting. |
| 06/06/2015 | N/A | Public comment period on DG-1322 closed and staff began reviewing the public comments. |
| 06/09/2015 | Public meeting summary (ADAMS Accession No. ML15174A155) | Public meeting. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|--|---|
| 10/14/2015 | N/A | Closed public meeting. |
| 10/22/2015 | Public meeting summary (ADAMS Accession No. ML15321A004) | Public meeting. |
| 11/02/2015 | N/A | Closed public meeting. |
| 11/03/2015 | N/A | ACRS subcommittee meeting. |
| 11/23/2015 | N/A | Public meeting. |
| 12/03/2015 | N/A | ACRS full committee meeting. |
| 01/19/2016 | Public meeting summary (ADAMS Accession No. ML16049A065) | Public meeting held. |
| 03/16/2016 | SECY-16-0033 (ADAMS Accession No. ML15238A933) | Draft final rule provided to the Commission. |
| 01/31/2017 | N/A | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|--------------------|-------------------|-------------------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Enhanced Weapons, Firearms Background Checks, and Security Event Notifications | 73 | Operating Reactors | NRR | NRC-2008-0465/2011-0018 | N/A | AI49 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 0.1 | 0 | 0 | 0 |
| | | | | | | | | NRR | 0.4 | 0 | 0 | 0 |
| | | | | | | | | NSIR | 0.4 | 0 | 0 | 0 |
| | | | | | | | | OGC | 0.1 | 0 | 0 | 0 |
| | | | | | | | | Total | 1 | 0 | 0 | 0 |

Abstract

This rule would amend the Commission's regulations by implementing the authority in Section 161A of the Atomic Energy Act of 1954, as amended, which includes access to enhanced weapons and associated firearms background checks, and would modify physical security event notifications at power reactor facilities, at-reactor Independent Spent Fuel Storage Installations (ISFSIs), and Category I strategic special nuclear materials facilities. One of the Section 161A authorities implemented by this rulemaking is the authority to use certain weapons that would otherwise be prohibited by other State, local or other Federal laws (known as preemption authority).

Priority Justification

This rule scores 40 points (15, 10, 10, 5) because of the following reasons: A) Significant contributor to the security goal (objective 1, strategies 1 and 2); B) Significant contributor to the regulatory effectiveness goal (strategies 1 and 3); C) Directed by Congress in the Energy Policy Act of 2005. Commission direction regarding schedule in SRM-SECY-12-0125; and D) Significant public interest.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 08/08/2005 | N/A | 03/16/2015 | 09/22/2015 | 11/14/2016 | 9/30/2017 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|---|
| 08/08/2005 | Energy Policy Act of 2005 (EPAct), Public Law 109-58, 119 Stat. 594 (2005) | Energy Policy Act of 2005 added Section 161A to the Atomic Energy Act, as amended, providing new authorities to the Nuclear Regulatory Commission with regard to the use of weapons and preemption authority. Rulemaking initiated to implement the new authorities. |
| 10/26/2006 | 71 FR 62664 | Publication of proposed rule in the Federal Register: In parallel with the development of the 2009 Firearms Guidelines, the Nuclear Regulatory Commission published proposed regulations as one part of the Power Reactor Security Requirements Rulemaking to implement the provisions of Section 161A as one component of a larger proposed amendment to its regulations under Parts 50, 72, and 73 of Title 10 of the Code of Federal Regulations (10 CFR). These proposed implementing regulations were consistent to the extent possible with discussions between the Nuclear Regulatory Commission and the Department of Justice (DOJ) on the implementation of the statute. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|--|---|
| 09/11/2009 | 74 FR 46800 | The Nuclear Regulatory Commission published the Firearms Guidelines with the approval of the U.S. Attorney General. |
| 06/27/2010 | SECY-10-0085 (ADAMS Accession No. ML101110121) | Proposed rule provided to the Commission: The enhanced weapons portion of the Power Reactor Security Requirements Rulemaking was separated out to be treated as a stand-alone rulemaking. This proposed rule updated the proposed 2006 requirements to reflect the 2009 Firearms Guidelines and to make several changes to the security event notification requirements in 10 CFR part 73 to address imminent attacks or threats against power reactors as well as suspicious events that could be indicative of potential preoperational reconnaissance, surveillance, or challenges to security systems by adversaries. The rulemaking is now known as the Enhanced Weapons, Firearms Background Checks, and Security Event Notifications Rulemaking (the "Enhanced Weapons Rulemaking"). |
| 10/19/2010 | SRM-SECY-10-0085 (ADAMS Accession No. ML102920342) | Commission approved publication of proposed rule. |
| 02/03/2011 | 76 FR 6200 | Publication of proposed rule in the Federal Register. |
| 04/27/2011 | 76 FR 23515 | Comment period extended. |
| 08/02/2011 | N/A | Public comment period on proposed rule closed and staff began reviewing the public comments. |
| 08/30/2012 | SECY-12-0118 (ADAMS Accession No. ML12229A177) | Staff provided to the Commission resource estimates for the enhanced weapons rulemaking and requested that the Commission delegate signature authority to the EDO to issue a supplemental proposed rule that would expand the scope of the rulemaking to include ISFSIs located at reactor sites. |
| 10/31/2012 | SRM-SECY-12-0118 (ADAMS Accession No. ML11205A369) | Commission approved delegation of signature authority to the EDO for the supplemental proposed rule addressing at-reactor ISFSIs. |
| 11/21/2012 | SRM-SECY-12-0125 (ADAMS Accession No. ML12326A653) | Commission directed the staff to work with the DOJ to revise the Firearms Guidelines with respect to the implementation of firearms background checks provisions of Section 161A. |
| 01/10/2013 | 78 FR 2214 | Publication of supplemental proposed rule in the Federal Register: The scope of the rulemaking was expanded to include ISFSI licensees located at reactor sites. |
| 02/25/2013 | N/A | Public comment period on supplemental proposed rule closed and staff continued reviewing the public comments. |
| 06/25/2014 | 79 FR 36100 | The Nuclear Regulatory Commission published updated Firearms Guidelines with the approval of the U.S. Attorney General. |
| 03/16/2015 | SECY-15-0036 (ADAMS Accession No. ML14344A534) | Second supplemental proposed rule to the Commission: The second supplemental proposed rule conformed the rulemaking to the 2014 Firearms Guidelines. Proposed requirements were changed such that only applicants for Section 161A authorities would conduct firearms background checks. |
| 07/09/2015 | SRM-SECY-15-0036 (ADAMS Accession No. ML15191A062) | Commission approved publication of supplemental proposed rule. |
| 09/22/2015 | 80 FR 57106 | Publication of second supplemental proposed rule in the Federal Register. |
| 11/19/2015 | N/A | Public meeting. |
| 12/07/2015 | N/A | Public comment period on supplemental proposed rule closed and staff continued reviewing the public comments. |
| 11/14/2016 | TBD | Final rule due to the Commission. (projected date) |
| 9/30/2017 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|--------------------|-------------------|---------------|----------------------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Drug and Alcohol Testing; Technical Issues and Editorial Changes | 26 | Operating Reactors | NRR | NRC-2012-0079 | PRM-26-4, 26-7, 26-8 | AJ15 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRO | 0.1 | 0 | 0.1 | 0 |
| | | | | | | | | NRR | 0.3 | 0 | 0.3 | 0 |
| | | | | | | | | NSIR | 0.3 | 250 | 0.5 | 250 |
| | | | | | | | | OGC | 0.2 | 0 | 0.2 | 0 |
| | | | | | | | | RES | 0.3 | 0 | 0.3 | 0 |
| | | | | | | | | Total | 1.2 | 250 | 1.4 | 250 |

Abstract

This rule would amend the Commission's regulations to strengthen technical provisions associated with drug testing requirements and enhance other requirements necessary to provide reasonable assurance that persons who have unescorted access to Nuclear Regulatory Commission-licensed facilities are fit for duty. Specifically, this rulemaking will propose to address marijuana, synthetic marijuana, cathinones, and semi-synthetic opiates (that are being proposed for testing by the U.S. Department and Health and Human Services (HHS)); prescription shopping; drug cocktailing; access to state databases for prescription medications; use of a spouse's prescription; point-of-collection testing; use of oral fluids and hair as test matrices (both being proposed by HHS); expansion of for-cause testing provisions; clarification of the 50-percent random testing rate; synthetic urine and other adulteration/subversion issues; two petitions for rulemaking associated with substance abuse professionals; one petition for rulemaking (PRM) associated with synthetic drug use; and other issues identified through inspector and licensee lessons learned. Conforming changes will also be assessed to better align the 10 CFR Part 26 requirements with similar requirements in 10 CFR Parts 55 and 73.

Priority Justification

The rule scores 37 points (14, 10, 8, 5) because of the following reasons: A) Significant contributor to the safety goal (strategies 1 and 4); B) Significant contributor to the regulatory effectiveness goal (strategies 1, 2, and 3); C) Significant contributor to one or more considerations (significant regulatory gap and future regulatory benefit); and D) Addresses PRM-26-4, PRM-26-7, and PRM-26-8.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 09/01/2011 | 05/01/2017 | 12/01/2018 | 06/01/2019 | 06/01/2020 | 12/01/2020 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|--|
| 09/01/2011 | | Since 2011 the staff has been developing the regulatory basis to develop a risk-informed and performance-based Part 26 regulatory framework that will improve program effectiveness and efficiency while minimizing the need for future rulemakings. |
| 09/30/2016 | TBD | Request Commission approval to initiate rulemaking: the staff plans to submit a rulemaking plan for Commission approval. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|-----|--|
| 12/30/2016 | TBD | Commission approves rulemaking initiation. (projected date) |
| 02/01/2017 | TBD | Submit regulatory basis to rulemaking office for approval: includes NRR and NSIR. (projected date) |
| 05/01/2017 | TBD | Regulatory basis completed. (projected date) |
| 04/28/2017 | TBD | Inform Commission of regulatory basis completion. (projected date) |
| 12/01/2018 | TBD | Proposed rule due to the Commission. (projected date) |
| 06/01/2019 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 06/01/2020 | TBD | Final rule due to the Commission. (projected date) |
| 12/01/2020 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|--------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Fitness-for-Duty Drug Testing Program Requirements | 26 | Operating Reactors | NRR | NRC-2009-0225 | N/A | AI67 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRR | 0.2 | 0 | 0.3 | 0 |
| | | | | | | | | NSIR | 0.1 | 0 | 0.3 | 0 |
| | | | | | | | | OGC | 0.1 | 0 | 0.2 | 0 |
| | | | | | | | | RES | 0.2 | 0 | 0.2 | 0 |
| | | | | | | | | Total | 0.6 | 0 | 1 | 0 |

Abstract

This rule would align 10 CFR Part 26 drug testing requirements with the guidelines issued by HHS. This rulemaking would strengthen the fitness-for-duty programs at nuclear power plants (and other Nuclear Regulatory Commission licensees and applicants) by testing for additional illegal drugs, lowering drug testing cutoffs, and enhancing the effectiveness of reviews conducted by Medical Review Officers.

Priority Justification

The rule scores 34 points (11, 10, 8, 5) because of the following reasons: A) Moderate contributor to the safety goal (strategies 1 and 4); B) Significant contributor to the regulatory effectiveness goal (Strategies 1, 2, and 3); C) Significant contributor to one or more considerations (significant regulatory gap and future regulatory benefit); and D) Significant public interest.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 09/01/2012 | 07/01/2013 | 07/31/2016 | 11/30/2016 | 07/31/2017 | 11/30/2017 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|---|-----------------|
| 02/24/2009 | Public meeting summary (ADAMS Accession No. ML090771060). | Public Meeting. |
| 06/24/2009 | Public meeting summary (ADAMS Accession No. ML091910511). | Public Meeting. |
| 10/11/2011 | Public meeting summary (ADAMS Accession No. ML112930153). Presentation slides (ADAMS Accession No. | Public Meeting. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|---|--|
| | ML112980389). Proposed rule changes (ADAMS Accession No. 112980140). Public comments (ADAMS Accession No. 112980153). | |
| 09/01/2012 | CPR Report | This rule was initiated when added to the CPR. High priority rulemaking activity. Rulemaking would align the Nuclear Regulatory Commission's regulations with other Federal agencies (U.S. Department of Health and Human Services). |
| 05/03/2013 | Memo transmitting regulatory basis (ADAMS Accession No. ML13094A183) | Submitted regulatory basis to rulemaking office for approval. |
| 07/01/2013 | Regulatory basis (ADAMS Accession No. ML13066A703) | Regulatory basis completed. |
| 09/11/2013 | Public meeting summary (ADAMS Accession No. ML13290A236) | Public meeting. |
| 07/31/2016 | TBD | Proposed rule due to the Commission. (projected date) |
| 11/30/2016 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 07/31/2017 | TBD | Final rule due to the Commission. (projected date) |
| 11/30/2017 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|--------------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | 2015 Edition of the American Society of Mechanical Engineers Code [Boiler and Pressure Vessel Code and Operations and Maintenance Code] | 50 | Operating Reactors | NRR | N/A | N/A | AJ74 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRO | 0.2 | 0 | 0 | 0 |
| | | | | | | | | NRR | 2 | 0 | 2.5 | 0 |
| | | | | | | | | OGC | 0.2 | 0 | 0.2 | 0 |
| | | | | | | | | RES | 0.4 | 0 | 0.4 | 0 |
| | | | | | | | | Total | 2.8 | 0 | 3.1 | 0 |

Abstract

This rule would amend the Nuclear Regulatory Commission's regulations to incorporate by reference the American Society of Mechanical Engineers (ASME) 2015 edition of the Boiler and Pressure Vessel Code (BPV) and the 2015 edition of the Operations and Maintenance Code (OM). This is a non-discretionary rule directed by SECY-10-0016. The Nuclear Regulatory Commission has a well-established practice of approving and/or mandating the use of certain parts of editions and addenda of ASME Codes in 10 CFR 50.55a through the rulemaking process of incorporation by reference. This practice assures consistency across the industry and that the Nuclear Regulatory Commission will continue to support the use of the most updated and technically sound techniques developed by the ASME to provide adequate protection to the public. This rulemaking also enhances the efficiency and effectiveness of Nuclear Regulatory Commission regulations by making use of current voluntary consensus standards and is consistent with applicable requirements of the National Technology Transfer and Advancement Act.

Priority Justification

The rule scores 33 points (10, 10, 10, 3) because of the following reasons: A) Moderate contributor to the safety goal (strategy 1); B) Significant contributor to the regulatory effectiveness goal (strategies 1 and 2); C) Commission direction in SECY-10-0016 and implements applicable requirements of the National Technology Transfer and Advancement Act; and D) Moderate stakeholder interest.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 07/01/2015 | 01/15/2016 | 10/17/2016 | 11/15/2016 | 08/30/2017 | 12/18/2017 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|--|
| 04/13/2000 | SRM-SECY-00-0011 (ADAMS Accession No. ML003702722) | Since 1971, the Nuclear Regulatory Commission has incorporated by reference certain ASME codes in 10 CFR 50.55a and updated the regulation periodically to reflect more recent versions of ASME codes. On April 13, 2000, the Commission disapproved a proposal to eliminate the 120-month update requirement in 10 CFR 50.55a for inservice inspection and inservice testing. In a Federal Register notice dated August 3, 2001, the Nuclear Regulatory Commission stated that the Commission disapproved the elimination of this requirement because the ASME codes are subject to continuing refinement and improvement and it would be inappropriate to freeze these still evolving requirements (66 FR 40635). This rulemaking is a continuation of this well-established practice. |
| 01/28/2010 | SECY-10-0016 (ADAMS | Authority for signing these rules is delegated to the Director of NRR. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | Accession No. ML092730529) | |
|------------|-------------------------------|--|
| 07/01/2015 | N/A | ASME issued the 2015 BPV code. |
| 10/28/2015 | N/A | The Nuclear Regulatory Commission Steering Committee approved the consolidation of this rulemaking with the rulemaking to incorporate by reference the 2015 ASME Operations and Maintenance (OM) code. Future editions of this report will contain only this entry for the combined rulemaking. The reflected resources in this entry accounts for rulemaking for both the OM code and the BPV code in FY2017. |
| 10/17/2016 | TBD | Proposed rule due to the NRR Office Director. (projected date) |
| 11/15/2016 | TBD | Proposed rule published in the Federal Register (projected date) |
| 08/30/2017 | TBD | Final rule due to the NRR Office Director. (projected date) |
| 12/18/2017 | TBD | Final rule published in the Federal Register (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

DRAFT

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|--------------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | 2016 Edition of the American Society of Mechanical Engineers Operations and Maintenance Code | 50 | Operating Reactors | NRR | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRO | 0 | 0 | 0.2 | 0 |
| | | | | | | | | NRR | 1.2 | 0 | 1.4 | 0 |
| | | | | | | | | OGC | 0.4 | 0 | 0.4 | 0 |
| | | | | | | | | RES | 0 | 0 | 0.4 | 0 |
| | | | | | | | | Total | 1.6 | 0 | 2.4 | 0 |

Abstract

This rule would amend the Nuclear Regulatory Commission's regulations to incorporate by reference the 2016 ASME Operations and Maintenance (OM) Code. This is a non-discretionary rule directed by SECY-10-0016. The Nuclear Regulatory Commission has a well-established practice for approving and/or mandating the use of certain parts of editions and addenda of ASME Codes in 10 CFR 50.55a through the rulemaking process for incorporation by reference. This practice assures consistency across the industry and that the Nuclear Regulatory Commission will continue to support the use of the most updated and technically sound techniques developed by the ASME to provide adequate protection to the public. This rulemaking also enhances the efficiency and effectiveness of Nuclear Regulatory Commission regulations by making use of current voluntary consensus standards and is consistent with applicable requirements of the National Technology Transfer and Advancement Act.

Priority Justification

The rule scores 33 points (10, 10, 10, 3) because of the following reasons: A) Moderate contributor to the safety goal (strategy 1); B) Significant contributor to regulatory effectiveness goal (strategies 1 and 2), C) Commission direction in SECY-10-0016 and implements applicable requirements of the National Technology Transfer and Advancement Act; and D) Moderate stakeholder interest.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 07/01/2016 | 03/02/2017 | 10/01/2017 | 11/01/2017 | 10/01/2018 | 02/01/2019 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|--|
| 04/13/2000 | SRM-SECY-00-0011 (ADAMS Accession No. ML003702722) | Since 1971, the Nuclear Regulatory Commission has incorporated by reference certain ASME codes in 10 CFR 50.55a and updated the regulation periodically to reflect more recent versions of ASME codes. On April 13, 2000, the Commission disapproved a proposal to eliminate the 120-month update requirement in 10 CFR 50.55a for inservice inspection and inservice testing. In a Federal Register notice dated August 3, 2001, the Nuclear Regulatory Commission stated that the Commission disapproved the elimination of this requirement because the ASME codes are subject to continuing refinement and improvement and it would be inappropriate to freeze these still evolving requirements (66 FR 40635). This rulemaking is a continuation of this well-established practice. |
| 01/28/2010 | SECY-10-0016 (ADAMS Accession No. ML092730529) | Authority for signing these rules is delegated to the Director of NRR. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|-----|--|
| 07/01/2016 | N/A | Staff will initiate this rulemaking once the preceding ASME OM edition rules are complete or have progressed sufficiently so as to not present a scope conflict. Initiation date is based on an estimate of when the ASME might publish the 2016 OM code edition. (projected date) |
| 10/01/2017 | TBD | Proposed rule due to the NRR Office Director. (projected date) |
| 11/01/2017 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 10/01/2018 | TBD | Final rule due to the NRR Office Director. (projected date) |
| 02/01/2019 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|--------------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | 2017 Edition of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code | 50 | Operating Reactors | NRR | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRO | 0 | 0 | 0.2 | 0 |
| | | | | | | | | NRR | 0.8 | 0 | 1 | 0 |
| | | | | | | | | OGC | 0.3 | 0 | 0.3 | 0 |
| | | | | | | | | RES | 0.4 | 0 | 0.4 | 0 |
| | | | | | | | | Total | 1.5 | 0 | 1.9 | 0 |

Abstract

This rule would amend the Nuclear Regulatory Commission's regulations to incorporate by reference the 2017 ASME Boiler and Pressure Vessel (BPV) Code. This is a non-discretionary rule directed by SECY-10-0016. The Nuclear Regulatory Commission has a well-established practice for approving and/or mandating the use of certain parts of editions and addenda of ASME Codes in 10 CFR 50.55a through the rulemaking process for incorporation by reference. This practice assures consistency across the industry and that the Nuclear Regulatory Commission will continue to support the use of the most updated and technically sound techniques developed by the ASME to provide adequate protection to the public. This rulemaking also enhances the efficiency and effectiveness of Nuclear Regulatory Commission regulations by making use of current voluntary consensus standards and is consistent with applicable requirements of the National Technology Transfer and Advancement Act.

Priority Justification

The rule scores 33 points (10, 10, 10, 3) because of the following reasons: A) Moderate contributor to the safety goal (strategy 1); B) Significant contributor to the regulatory effectiveness goal (strategies 1 and 2); C) Commission direction in SECY-10-0016 and implements applicable requirements of the National Technology Transfer and Advancement Act; and D) Moderate stakeholder interest.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 07/01/2017 | 03/01/2018 | 10/01/2018 | 11/01/2018 | 10/01/2019 | 02/01/2020 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|--|
| 04/13/2000 | SRM-SECY-00-0011 (ADAMS Accession No. ML003702722) | Since 1971, the Nuclear Regulatory Commission has incorporated by reference certain ASME codes in 10 CFR 50.55a and updated the regulation periodically to reflect more recent versions of ASME codes. On April 13, 2000, the Commission disapproved a proposal to eliminate the 120-month update requirement in 10 CFR 50.55a for inservice inspection and inservice testing. In a Federal Register notice dated August 3, 2001, the Nuclear Regulatory Commission stated that the Commission disapproved the elimination of this requirement because the ASME codes are subject to continuing refinement and improvement and it would be inappropriate to freeze these still evolving requirements (66 FR 40635). This rulemaking is a continuation of this well-established practice. |
| 01/28/2010 | SECY-10-0016 (ADAMS | Authority for signing these rules is delegated to the Director of NRR. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | Accession No. ML092730529) | |
|------------|-------------------------------|---|
| 07/01/2017 | TBD | Staff will initiate this rulemaking once the preceding ASME BPV code edition rules are complete or have progressed sufficiently so as to not present a scope conflict. Initiation date is based on an estimate of when the ASME might publish the 2017 BPV code edition. (projected date) |
| 10/01/2018 | TBD | Proposed rule due to the NRR Office Director. (projected date) |
| 11/01/2018 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 10/01/2019 | TBD | Final rule due to the NRR Office Director.. (projected date) |
| 02/01/2020 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|--------------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Regulatory Guide (RG) 1.84, Rev. 38; RG 1.147, Rev. 19; and RG 1.192, Rev. 3; Approval of American Society of Mechanical Engineers Code Cases | 50 | Operating Reactors | NRR | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRO | 0.1 | 0 | 0.1 | 0 |
| | | | | | | | | NRR | 0.7 | 0 | 0.8 | 0 |
| | | | | | | | | OGC | 0.2 | 0 | 0.2 | 0 |
| | | | | | | | | RES | 0.2 | 0 | 0.2 | 0 |
| | | | | | | | | Total | 1.2 | 0 | 1.3 | 0 |

Abstract

The Nuclear Regulatory Commission lists the code cases that it finds to be acceptable or conditionally acceptable in Nuclear Regulatory Commission RGs, which are also incorporated by reference in 10 CFR 50.55a. The Nuclear Regulatory Commission has a well-established practice of approving and/or mandating the use of certain parts of editions and addenda of ASME Codes in 10 CFR 50.55a through the rulemaking process of incorporation by reference. This practice assures consistency across the industry and that the Nuclear Regulatory Commission will continue to support the use of the most updated and technically sound techniques developed by the ASME to provide adequate protection to the public. This rulemaking also enhances the efficiency and effectiveness of Nuclear Regulatory Commission regulations by making use of current voluntary consensus standards and is consistent with applicable requirements of the National Technology Transfer and Advancement Act. This is a non-discretionary rule directed by SECY-10-0016.

Priority Justification

The rule scores 33 points (10, 10, 10, 3) because of the following reasons: A) Moderate contributor to the safety goal (strategy 1); B) Significant contributor to the regulatory effectiveness goal (strategies 1, 2 and 3); C) Commission direction in SECY-10-0016 and implements applicable requirements of the National Technology Transfer and Advancement Act; and D) Moderate stakeholder interest.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 07/01/2014 | 04/01/2016 | 04/01/2017 | 12/01/2017 | 04/01/2018 | 12/01/2018 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|--|
| 04/13/2000 | SRM-SECY-00-0011 (ADAMS Accession No. ML003702722) | Since 1971, the NRC has incorporated by reference certain ASME codes in 10 CFR 50.55a and updated the regulation periodically to reflect more recent versions of ASME codes. On April 13, 2000, the Commission disapproved a proposal to eliminate the 120-month update requirement in 10 CFR 50.55a for inservice inspection and inservice testing. In a Federal Register notice dated August 3, 2001, the NRC stated that the Commission disapproved the elimination of this requirement because the ASME codes are subject to continuing refinement and improvement and it would be inappropriate to freeze these still evolving requirements (66 FR 40635). This rulemaking is a continuation of this well-established practice. |
| 07/06/2001 | SRM-SECY-01-0110 (ADAMS Accession No. ML003702722) | Commission approves rulemaking initiation. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|--|--|
| | ML011910369) | |
| 01/28/2010 | SECY-10-0016 (ADAMS Accession No. ML092730529) | Authority for signing these rules is delegated to the Director of NRR. |
| 07/01/2014 | N/A | Initiate development of the regulatory basis: Each code case rulemaking addresses code cases from multiple code review cycles. July 1, 2014 represents the date that RES staff received code cases to review for the first cycle of code cases that the rule will address. |
| 04/01/2016 | N/A | Regulatory basis completed: NRC staff review of code cases completed. |
| 04/01/2017 | TBD | Proposed rule due to the NRR Office Director. (projected date) |
| 07/01/2017 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 10/15/2017 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments. (projected date) |
| 04/01/2018 | TBD | Final rule due to the NRR Office Director. (projected date) |
| 07/01/2018 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|--------------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Regulatory Guide (RG) 1.84, Rev. 39; and RG 1.147, Rev. 20; and 1.192, Rev. 4; Approval of American Society of Mechanical Engineers Code Cases | 50 | Operating Reactors | NRR | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRO | 0.1 | 0 | 0.1 | 0 |
| | | | | | | | | NRR | 0.4 | 0 | 0.5 | 0 |
| | | | | | | | | OGC | 0.2 | 0 | 0.2 | 0 |
| | | | | | | | | RES | 0.2 | 0 | 0.2 | 0 |
| | | | | | | | | Total | 0.9 | 0 | 1 | 0 |

Abstract

The Nuclear Regulatory Commission lists the code cases that it finds to be acceptable or conditionally acceptable in Nuclear Regulatory Commission RGs, which are also incorporated by reference in 10 CFR 50.55a. The Nuclear Regulatory Commission has a well-established practice of approving and/or mandating the use of certain parts of editions and addenda of ASME Codes in 10 CFR 50.55a through the rulemaking process of incorporation by reference. This practice assures consistency across the industry and that the Nuclear Regulatory Commission will continue to support the use of the most updated and technically sound techniques developed by the ASME to provide adequate protection to the public. This rulemaking also enhances the efficiency and effectiveness of Nuclear Regulatory Commission regulations by making use of current voluntary consensus standards and is consistent with applicable requirements of the National Technology Transfer and Advancement Act. This is a non-discretionary rule directed by SECY-10-0016.

Priority Justification

The rule scores 33 points (10, 10, 10, 3) because of the following reasons: A) Moderate contributor to the safety goal (strategy 1); B) Significant contributor to the regulatory effectiveness goal (Strategies 1 and 2); C) Commission direction in SECY-10-0016 and implements applicable requirements of the National Technology Transfer and Advancement Act; and D) Moderate stakeholder interest.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 05/01/2016 | 07/01/2018 | 02/28/2019 | 03/31/2019 | 02/28/2020 | 03/31/2020 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|--|
| 04/13/2000 | SRM-SECY-00-0011 (ADAMS Accession No. ML003702722) | Since 1971, the Nuclear Regulatory Commission has incorporated by reference certain ASME codes in 10 CFR 50.55a and updated the regulation periodically to reflect more recent versions of ASME codes. On April 13, 2000, the Commission disapproved a proposal to eliminate the 120-month update requirement in 10 CFR 50.55a for inservice inspection and inservice testing. In a Federal Register notice dated August 3, 2001, the Nuclear Regulatory Commission stated that the Commission disapproved the elimination of this requirement because the ASME codes are subject to continuing refinement and improvement and it would be inappropriate to freeze these still evolving requirements (66 FR 40635). This rulemaking is a continuation of this well-established practice. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|--|---|
| 07/06/2001 | SRM-SECY-01-0110 (ADAMS Accession No. ML011910369) | Commission approves rulemaking initiation. |
| 01/28/2010 | SECY-10-0016 (ADAMS Accession No. ML092730529) | Authority for signing these rules is delegated to the Director of NRR. |
| 05/01/2016 | N/A | Initiate development of the regulatory basis: Each code case rulemaking addresses code cases from multiple code review cycles. May 1, 2016, represents the date that RES staff expects to receive code cases to review for the first cycle of code cases that the rule will address. (projected date) |
| 07/01/2018 | N/A | Regulatory basis completed: Nuclear Regulatory Commission staff review of code cases completed. (projected date) |
| 02/28/2019 | TBD | Proposed rule due to the NRR Office Director. (projected date) |
| 03/31/2019 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 06/14/2019 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments. (projected date) |
| 02/28/2020 | TBD | Final rule due to the NRR Office Director. (projected date) |
| 03/31/2020 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|---------------------|--------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Regulatory Improvements for Power Reactors Transitioning to Decommissioning | 26, 50, 52, 73, 140 | Operating Reactors | NRR | NRC-2015-0070 | N/A | AJ59 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 2.9 | 0 | 3 | 0 |
| | | | | | | | | NRR | 2.5 | 0 | 3 | 0 |
| | | | | | | | | NSIR | 4.2 | 75 | 4.2 | 75 |
| | | | | | | | | OGC | 0.3 | 0 | 0.3 | 0 |
| | | | | | | | | RES | 0.6 | 0 | 0.7 | 0 |
| | | | | | | | | Total | 10.5 | 75 | 11.2 | 75 |

Abstract

As power reactors transition from an operational status to the permanently shut down and defueled condition, a significant reduction of risk to public health and safety is achieved. These shutdown reactors remain subject to many of the same requirements as operating reactors. Because the development of regulations for operating nuclear power plants often did not consider decommissioning, the requirements imposed on decommissioning nuclear power reactors may be inappropriate, may not be applicable, or may not align with safety significance. The Commission has directed the Nuclear Regulatory Commission staff to proceed with rulemaking on decommissioning and set an objective of early 2019 for completion of this rulemaking. The Commission also stated that this rulemaking should address: issues discussed in SECY-00-0145 such as the graded approach to emergency preparedness; lessons learned from the plants that have already (or are currently) going through the decommissioning process; the advisability of requiring a licensee's Post-Shutdown Decommissioning Activity Report to be approved by the Nuclear Regulatory Commission; the appropriateness of maintaining the three existing options for decommissioning and the timeframes associated with those options; the appropriate role of State and local governments and non-governmental stakeholders in the decommissioning process; and any other issues deemed relevant by the Nuclear Regulatory Commission staff.

Priority Justification

The rule scores 33 points (8, 10, 10, 5) because of the following reasons: A) Moderate contributor to the security goal (objective 1, strategy 1); B) Significant contributor to regulatory effectiveness (strategies 1 and 2); C) Commission directed (SRM/SECY-14-0118); and D) Significant contributor: public interest and reduction in regulatory burden.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 12/30/2014 | 06/30/2017 | 04/30/2018 | 07/31/2018 | 09/30/2019 | 03/31/2020 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|---|
| 08/07/2014 | SECY-16-0066 (ADAMS Accession No. ML14219A366) | Commission requested staff views on the need for an integrated decommissioning rulemaking and requested a plan with schedule and resources by January 2015. |
| 12/30/2014 | SRM-SECY-14-0118 | Commission approved rulemaking initiation: On December 30, 2014, the Commission approved initiation of the rulemaking. Specifically, the |

Rulemaking Activity Plan (FY 2017 - 2018)

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|------------|---|--|
| | (ADAMS Accession No. ML14364A111) | Commission requested that this rulemaking address: issues discussed in SECY-00-0145 such as the graded approach to emergency preparedness; lessons learned from the plants that have already (or are currently) going through the decommissioning process; the advisability of requiring a licensee's Post-Shutdown Decommissioning Activity Report to be approved by Nuclear Regulatory Commission; the appropriateness of maintaining the three existing options for decommissioning and the timeframes associated with those options; the appropriate role of state and local governments and non-governmental stakeholders in the decommissioning process; and any other issues deemed relevant by the Nuclear Regulatory Commission staff. The Commission directed the staff to set an objective of early 2019 for completion of the rulemaking, and to inform the Commission of any changes to the schedule. |
| 01/30/2015 | SECY-15-0014 (ADAMS Accession No. ML15082A089) | Staff provided an initial estimate of resources necessary to provide a final rule to the Commission in calendar year 2019. |
| 10/01/2015 | N/A | Initiated development of the regulatory basis. |
| 10/07/2015 | SECY-15-0127 (ADAMS Accession No. ML15211A122, OUO) | Staff provided an initial estimate of resources, schedule, and impacts of the power reactor decommissioning rulemaking in order to provide a final rule to the Commission in calendar year 2019. |
| 11/19/2015 | 80 FR 72358 | Advance notice of proposed rulemaking published in Federal Register. |
| 12/09/2015 | Public meeting notice (ADAMS Accession No. ML15306A003) | Public meeting. |
| 12/28/2015 | 80 FR 80709 | Public comment period extended to March 18, 2016. |
| 03/15/2016 | Transcript (ADAMS Accession No. ML16078A034) | Commission Meeting on Power Reactor Decommissioning Rulemaking |
| 11/15/2016 | TBD | Request public comments on the draft regulatory basis. (projected date) |
| 01/24/2017 | TBD | Hold public meeting on draft regulatory basis. (projected date) |
| 05/31/2017 | TBD | Submit regulatory basis to rulemaking office for approval. (projected date) |
| 06/30/2017 | TBD | Regulatory basis completed. (projected date) |
| 06/30/2017 | TBD | Inform Commission of regulatory basis completion. (projected date) |
| 04/30/2018 | TBD | Proposed rule due to the Commission. (projected date) |
| 07/31/2018 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 10/15/2018 | TBD | Public comment period on proposed rule closes and staff begins reviewing the public comments. (projected date) |
| 09/30/2019 | TBD | Final rule due to the Commission. (projected date) |
| 03/31/2020 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|--------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Non-Power Production or Utilization Facility License Renewal | 50 | Operating Reactors | NRR | NRC-2011-0087 | N/A | AI96 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRR | 1.4 | 505 | 1.5 | 305 |
| | | | | | | | | OGC | 0.1 | 0 | 0.3 | 0 |
| | | | | | | | | Total | 1.5 | 505 | 1.8 | 305 |

Abstract

This rule would: 1) eliminate license renewal for non-power production or utilization facilities (NPUFs) licensed under section 50.21a or c, other than testing facilities; 2) define the license renewal process for NPUFs licensed under section 50.22 and testing facilities; 3) revise the timely renewal provision for NPUFs subject to license renewal; 4) require all NPUFs to submit updates to the final safety analysis reports every five years; 5) clarify other existing regulations applicable to NPUFs; and 6) establish accident dose criteria for NPUFs.

Priority Justification

The rule scores 30 points (5, 10, 10, 5) because of the following reasons: A) Less substantial or indirect contributor to the safety goal (strategy 1); B) Significant contributor toward regulatory effectiveness (strategies 1 and 2); C) Commission direction (SECY-09-0095, SRM-M09-0811, and SRM-SECY-08-161); and D) Significant public participation.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 08/26/2009 | 10/02/2012 | 04/07/2016 | 06/30/2016 | 09/07/2018 | 07/18/2019 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|--|
| 10/24/2008 | SECY-08-0161 (ADAMS Accession No. ML082550140) | Staff provided information on plans to improve NPUF license renewals. |
| 03/26/2009 | SRM-SECY-08-0161 (ADAMS Accession No. ML090850159) | Commission approved staff's plan to improve NPUF license renewal process. |
| 06/24/2009 | SECY-09-0095 (ADAMS Accession No. ML091410581-Nonpublic) | Staff provided the Commission a long term plan to improve NPUF license renewals per SRM-SECY-08-0161. |
| 08/26/2009 | SRM-M09-0811 (ADAMS Accession No. ML092380046) | Commission approved rulemaking initiation: On August 26, 2009, the Commission directed staff to look for ways to accelerate the rulemaking to establish a more efficient, effective, and focused regulatory framework. |
| 12/19/2011 | 76 FR 78173 | Public meeting. |

Rulemaking Activity Plan (FY 2017 - 2018)

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| 03/27/2012 | N/A | Public meeting. |
| 06/20/2012 | Meeting notice (ADAMS Accession No. ML121170353). | Public meeting. |
| 06/29/2012 | 77 FR 38742 | Request public comments on the draft regulatory basis. |
| 09/19/2012 | Memo (ADAMS Accession No. ML12240A678-Nonpublic). | Submit regulatory basis to rulemaking office for approval. |
| 10/02/2012 | N/A | Regulatory basis completed. |
| 10/02/2012 | 77 FR 60039 | Publication of regulatory basis in the Federal Register. |
| 08/13/2014 | N/A | Public meeting. |
| 12/16/2014 | N/A | Public meeting. |
| 10/07/2015 | N/A | Public meeting. |
| 04/08/2016 | TBD | Proposed rule due to the Commission. (projected date) |
| 06/30/2016 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 09/07/2018 | TBD | Final rule due to the Commission. (projected date) |
| 07/18/2019 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|--------------------|-------------------|---------------|-----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Revisions to Reactor Vessel Material Surveillance Program Requirements | 50 | Operating Reactors | NRR | NRC-2008-0582 | PRM-50-69 | AG98 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRO | 0.1 | 0 | 0.1 | 0 |
| | | | | | | | | NRR | 1.5 | 0 | 1.7 | 100 |
| | | | | | | | | OGC | 0.4 | 0 | 0.4 | 0 |
| | | | | | | | | RES | 0.1 | 0 | 0.2 | 0 |
| | | | | | | | | Total | 2.1 | 0 | 2.4 | 100 |

Abstract

This rule would revise 10 CFR Part 50, Appendix H, to incorporate the latest edition of both ASTM Standards E-185 and E-2215. There are a number of optional features in ASTM E-185 that would permit future licensees to significantly improve future surveillance programs by allowing them to use more advanced test specimens. The Nuclear Regulatory Commission staff expects that as a result of this rulemaking, licensees will expend fewer resources and accumulate lower occupational dose collecting test specimens. The Nuclear Regulatory Commission staff also expects that fewer resources will be expended by licensee and Nuclear Regulatory Commission staffs to prepare, submit, and review requests for extension of time to submit capsule reports. The rulemaking would also incorporate the most up-to-date version of referenced consensus standards and clarify surveillance program guidance for license renewal.

Priority Justification

The rule scores 28 points (5, 9, 9, 5) because of the following reasons: A) Less substantial contributor to the safety goal (strategies 1 and 3); B) Significant contributor to regulatory effectiveness (strategy 1); C) Commission direction in SRM-COMSECY-14-0027; and D) Significant contributor: burden reduction and public interest.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 08/08/2014 | 05/15/2017 | 03/31/2018 | 06/30/2018 | 06/30/2019 | 09/30/2019 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|---|---|
| 06/25/2014 | COMSECY-14-0027 (ADAMS Accession No. ML14077A472 Non-public) | Request Commission approval to initiate rulemaking: On June 25, 2014, the staff requested Commission approval to bifurcate the rulemaking to revise 10 CFR 50, Appendix H, from the rulemaking to revise 10 CFR 50, Appendix G, "Fracture Toughness Requirements." The Appendix H rulemaking would propose several burden reduction features for licensees. |
| 08/08/2014 | SRM-COMSECY-14-0027 (ADAMS Accession No. ML14220A184 Nonpublic) | Commission approves rulemaking initiation: On August 8, 2014, the Commission approved bifurcating the rulemaking to revise 10 CFR 50, Appendix H, from the rulemaking to revise 10 CFR 50, Appendix G, "Fracture Toughness Requirements." |
| 07/16/2015 | N/A | Initiate development of the regulatory basis: Working group stood up and kickoff meeting was held on July 16, 2015, to discuss roles and |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|---|---|
| | | responsibilities and to initiate development of the draft regulatory basis. |
| 01/19/2016 | Public meeting notice (ADAMS Accession No. ML15300A125) | Held public meeting on draft regulatory basis: Nuclear Regulatory Commission staff held a public meeting on January 19, 2016, to discuss the draft regulatory basis and proposed changes to Appendix H and to solicit feedback from industry (e.g., costs/savings on proposed changes). |
| 12/30/2016 | TBD | Request public comments on the draft regulatory basis. (projected date) |
| 02/28/2017 | N/A | Submit regulatory basis to rulemaking office for approval. (projected date) |
| 05/15/2017 | TBD | Inform Commission of regulatory basis completion. (projected date) |
| 05/15/2017 | TBD | Regulatory basis completed and published in Federal Register. (projected date) |
| 03/31/2018 | TBD | Proposed rule due to the Commission. (projected date) |
| 06/30/2018 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 07/31/2018 | TBD | Hold public meeting on proposed rule. (projected date) |
| 08/31/2018 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments. (projected date) |
| 06/30/2019 | TBD | Final rule due to the Commission. (projected date) |
| 09/30/2019 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

New Reactors

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|---------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Advanced Power Reactor (APR)-1400 (KEPCO/KHNP) Design Certification | 52 | New Reactors | NRO | N/A | N/A | AJ67 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRO | 0 | 0 | 1.1 | 0 |
| | | | | | | | | OGC | 0 | 0 | 0.2 | 0 |
| | | | | | | | | Total | 0 | 0 | 1.3 | 0 |

Abstract

The APR-1400 (KEPCO/KHNP) Design Certification rule would amend the Commission's regulations in 10 CFR Part 52 by issuing a new appendix for the initial certification of the APR-1400 standard plant design. Applicants intending to construct and operate a nuclear power plant using the APR-1400 design may do so by referencing this design certification rule. Note that the regulatory basis for this rule is the staff's final safety evaluation report.

Priority Justification

This rule scores 31 points (15, 10, 4, 2) because of the following reasons: A) Moderate contributor toward one or more goals AND implements multiple strategies in one or more goals (Safety Strategies 2, and 3; security strategy 1); B) Moderate contributor toward multiple strategies (Regulatory Effectiveness Strategies 1, 2, and 3; Openness Strategies 3); C) Less substantial or indirect contributor toward one or more considerations. Supports a Nuclear Regulatory Commission licensing initiative with a future regulatory benefit; and D) Moderate contributor toward one or more considerations. Moderate public interest and participation.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 11/17/2017 | 09/12/2018 | 08/07/2018 | 09/20/2018 | 03/04/2019 | 05/15/2019 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|--|
| 11/17/2017 | TBD | Prepare Proposed Rulemaking Package |
| 09/12/2018 | TBD | Completion of Regulatory Basis |
| 08/07/2018 | TBD | Proposed rule due to the Commission. (projected date) |
| 09/20/2018 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 03/04/2019 | TBD | Final rule due to the Commission. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|-----|---|
| 05/15/2019 | TBD | Publication of final rule in the Federal Register. (projected date) |
|------------|-----|---|

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Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|---------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Emergency Preparedness Requirements for Small Modular Reactors | 52 | New Reactors | NRO | NRC-2015-0225 | N/A | AJ68 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRO | 0.5 | 0 | 0.6 | 0 |
| | | | | | | | | NSIR | 0.9 | 100 | 1 | 100 |
| | | | | | | | | Total | 1.4 | 100 | 1.6 | 100 |

Abstract

This rule would amend the Nuclear Regulatory Commission regulations regarding emergency preparedness for small modular reactors and other new technologies. This rulemaking would establish emergency preparedness requirements commensurate with the potential consequences to public health and safety and the common defense and security. This rulemaking would provide regulatory stability, predictability, and clarity in the licensing process and minimize or eliminate uncertainty for applicants who may otherwise have to seek exemptions from the regulations.

Priority Justification

This rule scores 30 points (14, 4, 7, 5) because of the following reasons: A) Moderate contributor toward one or more goals and implements multiple strategies in one or more goals (Safety Strategies 2, 3, and 5; Security Strategy 1); B) Moderate contributor toward one strategy (Regulatory Effectiveness Strategies 1, 2, and 3); C) Significant contributor toward one or more considerations. Supports a Nuclear Regulatory Commission licensing initiative with a future regulatory benefit. Commission and Congressional interest in SMRs and EP; and D) Significant contributor toward one or more considerations. Significant public interest and participation at public meetings held on this topic.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 08/30/2016 | 03/30/2017 | 03/30/2018 | 09/30/2018 | 10/30/2019 | 04/30/2020 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|---|---|
| 07/30/2016 | Rulemaking Plan (ADAMS Accession No. ML16020A433) | Request Commission approval to initiate rulemaking: Submit rulemaking plan requesting Commission approval to initiate rulemaking. |
| 08/30/2016 | TBD | Commission approves rulemaking initiation. |
| 03/30/2017 | TBD | Regulatory basis completed. (projected date) |
| 03/30/2018 | TBD | Proposed rule due to the Commission. (projected date) |
| 09/30/2018 | TBD | Publication of proposed rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|-----|---|
| 10/30/2019 | TBD | Final rule due to the Commission. (projected date) |
| 04/30/2020 | TBD | Publication of final rule in the Federal Register. (projected date) |

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Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|---------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Financial Qualifications for Reactor Licensing | 50 | New Reactors | NRO | NRC-2014-0161 | N/A | AJ43 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRO | 1.5 | 0 | 1.5 | 0 |
| | | | | | | | | NRR | 0.7 | 0 | 1 | 0 |
| | | | | | | | | OGC | 0.6 | 0 | 0.6 | 0 |
| | | | | | | | | Total | 2.8 | 0 | 3.1 | 0 |

Abstract

This rule would amend the 10 CFR Part 50 financial qualifications demonstration requirements for initial license issuance of nuclear power reactors as discussed in SECY-13-0124, "Policy Options for Merchant Plant Financial Qualification." This action would resolve the industry-asserted impediment to licensing which currently exists for some non-electric utility (merchant plant) applicants.

Priority Justification

The rule scores 23 points (7, 5, 6, 5) because of the following reasons: A) Moderate contributor toward one goal and implements one goal strategy (safety strategy 2); B) Moderate contributor toward one strategy (regulatory effectiveness strategy 1); C) Moderate contributor toward one or more considerations. Supports a Nuclear Regulatory Commission licensing initiative with a future regulatory benefit and has Commission and Congressional interest; and D) Significant industry interest and regulatory burden reduction in financial qualification for merchant plants.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 04/24/2014 | 07/01/2016 | 03/01/2017 | 09/01/2017 | 08/01/2018 | 02/01/2019 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|---|
| 11/22/2013 | SECY-13-0124 (ADAMS Accession No. ML13057A006) | Request Commission approval to initiate rulemaking: On November 22, 2013, the staff provided the Commission with policy options relating to the process for evaluating the financial qualifications for merchant plant initial license applicants. The staff recommended that the Commission authorize the staff to begin a rulemaking effort to amend or rescind, as appropriate, the financial qualifications regulations for initial license issuance. |
| 04/24/2014 | SRM-SECY-13-0124 (ADAMS Accession No. ML14114A358) | Commission approves rulemaking initiation: On April 24, 2014, the Commission approved recommendation Option 2 to engage in a rulemaking to amend 10 CFR Part 50 financial qualifications demonstration requirements and Approach C to conform reactor financial qualifications requirements to 10 CFR Part 70 standards. The rulemaking would allow a 10 CFR Part 50 or Part 52 license to be issued with license conditions addressing financial qualifications. |
| 06/02/2014 | N/A | Kick-off meeting for financial qualifications working group: On June 2, 2014, the staff held a kick-off meeting for the working group with representative members from NRO, NRR, NMSS (previously FSME), OGC, ADM, and OIS. |
| 08/08/2014 | N/A | Establish the steering committee for the financial qualifications rulemaking: On August 8, 2014, the staff established a steering committee with representatives from NRO, NRR, OGC, and ADM to assist the working group in its objectives to respond to the SRM and to provide guidance on critical issues related to the rulemaking. |

Rulemaking Activity Plan (FY 2017 - 2018)

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| 04/29/2015 | Meeting notice (ADAMS Accession No. ML15118A477) | Held public meeting on a portion of the draft regulatory basis: On April 29, 2015, the staff conducted a public meeting to discuss draft Section 7, "Proposed Financial Qualifications Requirement," of the draft regulatory basis. |
| 06/17/2015 | 80 FR 34559 | Issued draft regulatory basis for public comment and held public meeting on the draft regulatory basis: On June 17, 2015, the staff published a notice in the Federal Register of the availability of the draft regulatory basis for public comment by August 3, 2015, and its plans to conduct a public meeting on July 8, 2015, to discuss the draft regulatory basis. |
| 06/10/2016 | TBD | Submit regulatory basis to rulemaking office for approval. |
| 07/01/2016 | TBD | Regulatory basis completed. (projected date) |
| 07/08/2016 | TBD | Inform Commission of regulatory basis completion. |
| 03/01/2017 | TBD | Proposed rule due to the Commission. (projected date) |
| 09/01/2017 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 08/01/2018 | TBD | Final rule due to the Commission. (projected date) |
| 02/01/2019 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

Materials Users

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--------------------|--------------|-----------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Part 37 Rulemaking | 37 | Materials Users | NMSS | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 1.1 | 0 | 1.1 | 0 |
| | | | | | | | | NSIR | 0.2 | 0 | 0.5 | 0 |
| | | | | | | | | OGC | 0.3 | 0 | 0.3 | 0 |
| | | | | | | | | Total | 1.6 | 0 | 1.9 | 0 |

Abstract

This rule would clarify and correct discrepancies in the existing rule. This action is necessary because the current rule is not clear in several areas, including but not limited to requirements for service providers for unescorted access to Category 1 and 2 material; overall applicability of 10 CFR Part 37 to large components and robust structures at commercial power reactors; and clarifying the timing of license verification before a transfer of material. In addition, the Commission has committed in a letter to Congress to collect 2 years of operational experience, through inspection data, and to identify any additional needed rule changes.

Priority Justification

The rule scores 27 points (13 , 6, 5, 3) because of the following reasons: A) Moderate contributor toward one goal and implements one goal strategy (security strategy 1); B) Moderate contributor toward one strategy (regulatory effectiveness strategy 2); C) Moderate contributor toward one or more considerations of the Commission has provided specific direction with no priority/schedule on the rulemaking, staff-identified activity with Commission support, and commitment to Congress; and D) Moderate contributor toward one or more considerations. Responds to issues identified in PRM 37-1. Substantial public participation is expected.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 02/01/2017 | 11/01/2017 | 02/01/2019 | 08/01/2019 | 08/01/2020 | 02/01/2021 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|--|
| 11/30/2016 | TBD | Request Commission approval to initiate rulemaking: Staff will submit a rulemaking plan and request Commission's approval to initiate rulemaking that would address issues identified in PRM-37-1. |
| 02/01/2017 | TBD | Commission approves rulemaking initiation: The Commission has not yet approved rulemaking initiation. (projected date) |
| 03/01/2017 | N/A | Initiate development of the regulatory basis: The 10 CFR Part 37 regulatory basis would support (among other things): 1) revision of 10 CFR 37.11(b) to clarify what action, if any, a licensee with a 10 CFR Part 73 security plan needs to take to use this exemption; 2) revision of 10 CFR 37.11(c) to clarify OEDO-15-00714 - OEDO Ticket - OIG Final Report on the Audit of Nuclear Regulatory Commission's Oversight of Medical Uses of Nuclear Material (OIG-16-A-02) what type of waste to which the exemption applies; and 3) addressing the issues identified in Enforcement Guidance |

Rulemaking Activity Plan (FY 2017 - 2018)

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| | | Memorandum (EGM) EGM-14-001, "Interim Guidance for Dispositioning 10 CFR Part 37 Inspection Findings with Respect to Large Components and Robust Structures at Facilities Licensed Under 10 CFR Parts 50 and 52" (ADAMS Accession No. ML14056A151), regarding large components and storage of radioactive material in robust structures. The Nuclear Regulatory Commission indicated (80 FR 33450; June 12, 2015) that while the issues would be considered in rulemaking, the exact wording of revisions to section 37.11, if any, and the associated implications for the guidance document (NUREG-2155), would be determined during the rulemaking process. |
| 07/01/2017 | N/A | Request public comments on the draft regulatory basis. (projected date) |
| 08/01/2017 | N/A | Hold public meeting on draft regulatory basis: The staff plans to hold public meetings during the public comment period for the Part 37 regulatory basis document. The public meeting will provide a forum for the Nuclear Regulatory Commission staff to discuss potential amendments to the Part 37 regulatory basis that would address the issues identified in PRM-37-1. The staff does not intend to provide detailed responses to comments or other information submitted during the public meetings. (projected date) |
| 11/01/2017 | N/A | Submit regulatory basis to rulemaking office for approval. (projected date) |
| 12/01/2017 | CA note | Notify Commission that the regulatory basis is completed. (projected date) |
| 02/01/2019 | TBD | Proposed rule due to the Commission. (projected date) |
| 08/01/2019 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 12/01/2019 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments. (projected date) |
| 08/01/2020 | TBD | Final rule due to the Commission. (projected date) |
| 02/01/2021 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|-----------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Cyber Security for Byproduct Material Licensees | 37 | Materials Users | NMSS | N/A | N/A | AJ56 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 1.3 | 0 | 1.3 | 0 |
| | | | | | | | | NSIR | 0.8 | 0 | 0.5 | 0 |
| | | | | | | | | OGC | 0.4 | 0 | 0.4 | 0 |
| | | | | | | | | Total | 2.5 | 0 | 2.2 | 0 |

Abstract

This rule would assure that Nuclear Regulatory Commission's byproduct material licensees provide reasonable assurance that digital assets associated with safety, security, emergency preparedness, and material control and accountability are adequately protected from cyber-attacks. The staff plans to gather information and conduct a consequence analysis to obtain preliminary information that will be used to determine whether it should proceed with rulemaking. Staff has established a working group to coordinate and perform these preliminary activities. This rule has been recommended to be deferred.

Priority Justification

The rule scores 18 points (10, 5, 1, 2) because of the following reasons: A) Moderate contributor toward one goal and implements one goal strategy (security strategy 6); B) Moderate contributor toward one strategy (regulatory effectiveness strategy 2); C) Less substantial or indirect contributor toward one or more considerations and the Commission has provided no specific direction and priority/schedule on the rulemaking. Indirect contributor to closing a regulatory gap in cyber security for byproduct material licensees. The Commission has provided no specific direction or schedule for the rule; and D) Moderate contributor toward one or more considerations. Significant interest of the Department of Homeland Security.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 09/30/2016 | 03/30/2018 | 03/30/2019 | 09/30/2019 | 03/30/2020 | 09/30/2020 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|--|
| 06/25/2012 | SECY-12-0088 (ADAMS Accession No. ML15201A509) | Staff developed a plan to evaluate the need for cyber security requirements for nuclear materials licensees. The paper discussed plans to form a working group, with Agreement State participation, to focus on developing self-assessment tools to gather information on a representative sample of materials licensees. |
| 07/30/2013 | N/A | The Nuclear Regulatory Commission established the Materials Cyber Security Working Group (working group) to identify potential cyber security vulnerabilities among commercial, medical, industrial, and academic users of risk-significant radioactive materials and propose regulatory action. |
| 02/28/2014 | N/A | The working group distributed an initial voluntary questionnaire to a representative cross-section of category 1 and 2 Nuclear Regulatory Commission licensees. The results from that initial questionnaire helped to revise the questionnaire to be disseminated to all of the Nuclear Regulatory Commission and Agreement State materials licensees that possess category 1 and 2 quantities of radioactive materials. |
| 12/30/2014 | N/A | The working group conducted information gathering visits to two manufacturers and two panoramic irradiator licensees to observe what digital systems are present and how they interface to other systems, both internally and externally. |

Rulemaking Activity Plan (FY 2017 - 2018)

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|------------|---|--|
| 01/30/2015 | N/A | The working group conducted information gathering visits to two manufacturers and two panoramic irradiator licensees to observe what digital systems are present and how they interface to other systems, both internally and externally. |
| 04/30/2015 | N/A | The working group conducted information gathering visits to two manufacturers and two panoramic irradiator licensees to observe what digital systems are present and how they interface to other systems, both internally and externally. |
| 05/30/2015 | N/A | The working group conducted information gathering visits to two manufacturers and two panoramic irradiator licensees to observe what digital systems are present and how they interface to other systems, both internally and externally. |
| 07/15/2015 | N/A | Staff briefed OEDO on the status of activities related to the evaluation of materials cyber security vulnerabilities. |
| 12/14/2015 | (ADAMS Accession No. ML15201A509) | Staff submitted a memo to the Commission regarding staff's activities related to the evaluation of materials cyber security vulnerabilities. |
| 02/01/2016 | Questionnaire (ADAMS Accession No. ML15246A306) | The working group distributed a follow-up questionnaire to all of the Nuclear Regulatory Commission and Agreement State materials licensees that possess category 1 and 2 quantities of radioactive materials. The purpose of the questionnaire is to identify what key digital systems exist at each licensee type, how they are connected to internal/external networks and the internet, and identify the technical and procedural security measures in place for protection and operation of these systems and devices. This information will allow the working group to screen out unrealistic and unreasonable scenarios and consequences, and will allow the working group to identify potential vulnerabilities for further consideration. |
| 06/30/2016 | N/A | The working group will complete its evaluation of the questionnaire responses and conduct any follow-up site visits or conference calls. |
| 09/30/2016 | TBD | Request Commission approval to initiate rulemaking: On September 30, 2016, the staff will submit recommendations for a path forward to the Commission. The recommendations to the Commission will be based on consideration of the threat, credible scenarios and consequences, and will document the bases for future actions. Dependent on the outcome of the information gathering, the staff may request Commission's approval to initiate the rulemaking to include cyber security requirements for materials licensees. If the staff requests Commission approval to initiate rulemaking they will submit a rulemaking plan. (projected date) |
| 03/30/2017 | TBD | Commission approves rulemaking initiation. (projected date) |
| 04/30/2017 | N/A | Initiate development of the regulatory basis: If the Commission approves initiation of the rulemaking, the staff plans to develop a regulatory basis document that supports the revision of the 10 CFR Part 37 regulations, to include cyber security requirements for materials licensees. |
| 09/30/2017 | N/A | Request public comments on the draft regulatory basis: Duration of the public comment period is 60 days. (projected date) |
| 10/30/2017 | N/A | Hold public meeting on draft regulatory basis: The staff plans to hold public meetings during the public comment period for the Part 37 cyber security regulatory basis document. The public meeting will provide a forum for the Nuclear Regulatory Commission staff to discuss potential amendments to the Part 37 regulatory basis that would include cyber security requirements for materials licensees. The staff does not intend to provide detailed responses to comments or other information submitted during the public meetings. |
| 11/30/2017 | N/A | Public comment period on draft regulatory basis closes and staff begins reviewing the public comments. (projected date) |
| 02/28/2018 | N/A | Submit regulatory basis to rulemaking office for approval. (projected date) |
| 03/30/2018 | CA note | Regulatory basis completed: Inform Commission that regulatory basis completed. (projected date) |
| 07/30/2018 | N/A | Request public comments on the preliminary proposed rule language: Duration of the public comment period is 60 days. (projected date) |
| 08/30/2018 | N/A | Hold public meeting on the preliminary proposed rule language: The staff does not intend to provide detailed responses to comments or other information submitted during the public meetings. (projected date) |
| 03/30/2019 | TBD | Proposed rule due to the Commission. (projected date) |
| 09/30/2019 | TBD | Publication of proposed rule in the Federal Register: Duration of the public comment period is 60 days. (projected date) |
| 11/30/2019 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

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| 03/30/2020 | TBD | Final rule due to the Commission. (projected date) |
| 09/30/2020 | TBD | Publication of final rule in the Federal Register. (projected date) |

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Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|-----------------|-------------------|-----------|-----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Items Containing Byproduct Material Incidental to Production (formerly Polymer (Polycarbonate or Polyester) Track Etched (PCTE) Membranes) | 30 | Materials Users | NMSS | N/A | PRM-30-65 | AJ54 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 0.4 | 0 | 0.4 | 0 |
| | | | | | | | | OGC | 0.1 | 0 | 0.1 | 0 |
| | | | | | | | | Total | 0.5 | 0 | 0.5 | 0 |

Abstract

This rule would amend requirements for track-etched membranes that have been irradiated with mixed fission products as part of the membrane production process. The rule would also accommodate the licensing and distribution of other irradiated products (e.g. gemstones) without the need for a specific exemption for each distributor.

Priority Justification

The rule scores 17 points (6, 4, 3, 4) because of the following reasons: A) Less substantial or indirect contributor toward one goal (safety strategy 6); B) Moderate contributor toward one strategy (regulatory effectiveness strategy 2); C) Moderate contributor toward one or more strategy or the Commission has provided specific direction with no priority/schedule on the rulemaking. Commission has approved development of a regulatory basis to support the rule; and D) Significant contributor toward one or more considerations. Addresses PRM-30-65. There is interest in this rule in three States where the petitioner has operations. There is substantial interest by the petitioner, whose operations in Texas are shut down, pending resolution of the regulatory change and submittal of the license amendment.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 08/13/2012 | 05/29/2017 | 05/29/2018 | 11/29/2018 | 11/29/2019 | 05/29/2020 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|---|--|
| 06/22/2011 | 76 FR 36386 | Notice of receipt of PRM-30-65 and request for public comment published in the Federal Register. |
| 07/09/2012 | COMSECY-12-0015 | Request Commission approval to initiate rulemaking: On July 9, 2012, the staff requested Commission approval to initiate the rulemaking. Staff requests Commission authorization to work on this rulemaking under the reduced budget guidance that the staff should only work on high-priority rulemakings. |
| 08/13/2012 | SRM-COMSECY-12-0015 (ADAMS Accession No. ML122260251-Nonpublic) | Commission approves rulemaking initiation: On August 13, 2012, the Commission approved initiation of the rulemaking. Specifically, the Commission approves the staff's recommendation to consider PRM-30-65 in the rulemaking process, with the condition that resources could not be diverted from higher priority rulemaking efforts to consider the petition. |
| 09/14/2014 | 77 FR 56793 | Closure of the petition docket. Issues raised will be considered in the rulemaking process. |
| 12/01/2014 | N/A | Initiate development of the regulatory basis: Regulatory basis supports potential amendments to add a new exemption from licensing requirements |

Rulemaking Activity Plan (FY 2017 - 2018)

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| | | and associated distribution requirements in 10 CFR Parts 30 and 32. The new exemption would be for items containing byproduct material incidental to their production, using dose criteria as the primary means of protecting health and safety. It would allow for the commercial distribution and redistribution of polymer track-etch membranes that have been irradiated with mixed fission products, as requested by a petition for rulemaking from GE Osmonics Inc. These membranes have many proven uses in a wide variety of applications. The rule would potentially allow the use, under exemption, of future products that contain byproduct material incidental to their production. The staff plans to hold a public meeting to promote full understanding of the action and facilitate public participation. |
| 01/01/2016 | N/A | Regulatory Basis development on hold until FY17. |
| 11/11/2016 | N/A | Publish Federal Register notice requesting public comments on the draft regulatory basis; duration of the public comment period is 60 days. |
| 12/12/2016 | N/A | Hold public meeting on draft regulatory basis. The staff plans to hold a public meeting during the public comment period for the Parts 30/32 regulatory basis document. The public meeting will provide a forum for the Nuclear Regulatory Commission staff to discuss potential amendments to the regulatory basis that would add—(1) a new exemption from licensing requirements, and (2) associated distribution requirements. The public meeting will be in webinar format. |
| 04/29/2017 | N/A | Submit regulatory basis to rulemaking office for approval. (projected date) |
| 05/29/2017 | TBD | Regulatory basis completed: Inform Commission that regulatory basis completed. (projected date) |
| 05/29/2018 | TBD | Proposed rule due to the Commission. (projected date) |
| 11/29/2018 | N/A | Publication of proposed rule in the Federal Register. (projected date) |
| 01/29/2019 | TBD | Public comment period on proposed rule closes and staff begins reviewing the public comments. (projected date) |
| 11/29/2019 | TBD | Final rule due to the Commission. (projected date) |
| 05/29/2020 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

Fuel Facilities

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|-----------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Enhanced Security for Special Nuclear Material (formerly Physical Protection for Category I, II, and III Special Nuclear Material) | 73 | Fuel Facilities | NMSS | NRC-2014-0118 | N/A | AJ41 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 0 | 0 | 0.4 | 0 |
| | | | | | | | | NSIR | 0.9 | 0 | 0.9 | 0 |
| | | | | | | | | OGC | 0.2 | 0 | 0.2 | 0 |
| | | | | | | | | Total | 1.1 | 0 | 1.5 | 0 |

Abstract

This rule would update fuel cycle and SNM security regulations in 10 CFR Part 73 to make generically applicable security requirements imposed in post 9/11 Security Orders. This rulemaking would also enhance existing security requirements through continued monitoring of threat information and updated technical analyses. In particular, risk insights from recent studies have led the Nuclear Regulatory Commission to consider the benefits of using a more risk-informed material attractiveness approach for SNM in the grading of physical protection requirements for fixed sites and transportation. Staff activities on this rule are currently suspended.

Priority Justification

This rule scores 40 points (15, 10, 10, 5) because of the following reasons: A) Significant contributor toward one or more goals (security strategy 1); B) Significant contributor toward one or more strategy (regulatory effectiveness strategies 1, 2, and 3); C) Significant contributor toward one or more considerations or the Commission has provided specific direction and priority/schedule on the rulemaking. SRM-COMSECY-05-0058 and SRM-SECY-09-0123 provide Commission direction to prepare this rule. In addition, it codifies security orders and provides future regulatory benefit; and D) Significant contributor to one or more considerations. There is significant interest in this rule from industry and stakeholders.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 02/08/2006 | 02/25/2015 | 09/02/2016 | 03/02/2017 | 03/15/2018 | 09/15/2018 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|---|
| 11/16/2005 | Memo from EDO to Commission (ADAMS Accession No. ML052770346-Nonpublic) | Memorandum responds to an SRM associated with SECY-05-0048 (ML051790404), issued on June 28, 2005. In the SRM, the Commission directed the staff to provide a schedule for conducting security rulemakings with proposed priorities and resource estimates. |
| 11/30/2005 | Memo from SECY to Commission (ADAMS Accession No. ML052770346-Nonpublic) | Converted memorandum (dated November 16, 2005, from the EDO to the Commission) to a COMSECY for formal vote. |

Rulemaking Activity Plan (FY 2017 - 2018)

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|------------|---|---|
| | ML060390484-Nonpublic) | |
| 02/08/2006 | SRM-COMSECY-05-0058 (ADAMS Accession No. ML060390527-Nonpublic) | Commission approves rulemaking initiation: On February 8, 2006, the Commission approved the staff's schedules and resources for security rulemakings. |
| 09/04/2009 | SECY-09-0123 (ADAMS Accession No. ML092230634-Nonpublic) | Seek early Commission direction on consideration of a risk-informed and graded material attractiveness approach to the categorization of SNM, to be incorporated in upcoming fuel cycle security-related rulemaking. |
| 07/08/2010 | SRM-SECY-09-0123 (ADAMS Accession No. ML101890711-Nonpublic) | The Commission provided further direction regarding the preparation of this rulemaking: The Commission approved staff's request to pursue a revised categorization scheme for SNM, which includes a material attractiveness approach. |
| 02/24/2011 | N/A | Steering Committee kick-off meeting: Initiate development of the regulatory basis. |
| 06/12/2014 | Draft regulatory basis (ADAMS Accession No. ML14113A468) | Held public meeting on draft regulatory basis. |
| 06/18/2014 | 79 FR 34641; 79 FR 42474 | Request public comments on the draft regulatory basis. On July 22, 2014 the comment period was extended. |
| 09/17/2014 | Draft regulatory basis (ADAMS Accession No. ML14113A468) | Held public meeting on draft regulatory basis. |
| 09/24/2014 | Draft regulatory basis (ADAMS Accession No. ML14113A468) | Held public meeting on draft regulatory basis. |
| 10/17/2014 | N/A | Public comment period closed. |
| 02/03/2015 | Regulatory Basis User Need Request (ADAMS Accession No. ML14317A037-Nonpublic) | NSIR submits the regulatory basis to NMSS for approval. |
| 02/25/2015 | Regulatory Basis (ADAMS Accession No. ML14321A007) | Regulatory basis completed and NMSS accepts the regulatory basis. |
| 03/25/2015 | CA Note (ADAMS Accession No. ML15077A483-Nonpublic) | Inform Commission of regulatory basis completion and stakeholder interaction. |
| 04/22/2015 | 80 FR 22434 | Publication of regulatory basis in the Federal Register. |
| 07/14/2015 | N/A | Requested 6-month extension. |
| 09/23/2015 | N/A | EDO/DEDO alignment meeting with NMSS and NSIR. Directed staff to prepare a COMSECY reassessing need for rulemaking. Extension and reset request denied. |
| 02/19/2016 | TBD | Communicate to the Commission regarding the need for rulemaking. Staff is currently assessing the need for a COMSECY. |
| 03/30/2016 | Commission Briefing | Communicate to the Commission the staff's views on whether and to what extent the concept of special nuclear material attractiveness should be included. |
| 05/30/2016 | TBD | Commission direction on whether to proceed with rulemaking. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

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| 09/02/2016 | TBD | Proposed rule due to the Commission: Staff anticipates further direction from the Commission in response to COMSECY. (projected date) |
| 03/02/2017 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 03/15/2018 | TBD | Final rule due to the Commission. (projected date) |
| 09/15/2018 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|-----------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | | | | | | | | | FTE | \$K | FTE | \$K |
| High | Enhanced Weapons for Spent Fuel Storage Installations and Transportation--Section 161A Authority | 73 | Fuel Facilities | NMSS | N/A | N/A | AJ55 | | | | | |
| | | | | | | | | NMSS | 0 | 0 | 0.1 | 0 |
| | | | | | | | | NSIR | 0.1 | 0 | 0.1 | 0 |
| | | | | | | | | OGC | 0.2 | 0 | 0.2 | 0 |
| | | | | | | | | Total | 0.3 | 0 | 0.4 | 0 |

Abstract

This rule would amend the Commission's regulations by implementing the new authority in Section 161A of the Atomic Energy Act of 1954, as amended, for access to covered weapons, enhanced weapons, and associated firearms background checks at facilities storing spent nuclear fuel (SNF) and high-level radioactive waste (HLW) and the associated transportation security escort activities for the transport of SNF, HLW, and Category I strategic special nuclear material (SSNM) (from aged SNF) to such storage facilities. This rulemaking supports a potential national strategy for the secure transportation and storage of SNF at a consolidated interim storage facility (CISF). There is significant public interest in this rulemaking because one of the authorities allowed under Section 161A is the authority to use certain weapons that would be otherwise prohibited by other State, local or other Federal laws (known as preemption authority). This rulemaking is a follow-on to the initial enhanced weapons rulemaking (RIN AI49) that implements Section 161A authority for several classes of facilities (i.e., power reactor), Category I strategic special nuclear material (SSNM, and at-reactor independent spent fuel storage installation).

Priority Justification

This rule scores 36 points (15, 6, 10, 5) because of the following reasons: A) Significant contributor toward one or more goals (security strategies 1); B) Moderate contributor toward one strategy (regulatory effectiveness strategy 2); C) Significant contributor toward one or more considerations or the Commission has provided specific direction and priority/schedule on the rulemaking; and D) There is significant interest in this rule from industry and stakeholders.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 08/15/2008 | 07/01/2018 | 07/01/2019 | 11/01/2019 | 11/01/2020 | 03/01/2021 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|---|
| 04/17/2008 | SECY-08-0050 (ADAMS Accession No. ML072920478) | Request Commission approval to initiate rulemaking: On April 17, 2008, the staff requested Commission approval to initiate the rulemaking. The rulemaking would implement the provisions of Section 161A of the AEA involving stand-alone preemption authority, combined enhanced weapons authority and preemption authority, and firearms background checks for all spent fuel and high-level radioactive waste storage facilities and the associated transportation security activities for spent fuel and Category I SSNM (contained in aged spent fuel). This rulemaking would follow after the initial enhanced weapons rulemaking (see RIN AI49). Staff's proposed additional classes of facilities and activities as appropriate for Section 161A authority (in addition to the initial classes of power reactor and Category I SSNM facilities) are described in Enclosure 3 of SECY-08-0050 (ADAMS Accession No. ML072920527). |
| 07/08/2008 | SECY-08-0050A (ADAMS | Provided Commission additional information to consider during review of SECY-08-0050. |

Rulemaking Activity Plan (FY 2017 - 2018)

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| | Accession No. ML081910195-Nonpublic) | |
| 08/15/2008 | SRM-SECY-08-0050/0050A (ADAMS Accession No. ML082280364) | Commission approves rulemaking initiation: On August 15, 2008, the Commission approved initiation of the rulemaking. Specifically, the Commission approved rulemaking to implement the provisions of Section 161A of the AEA. The Commission approved this follow-on rulemaking to commence after the initial enhanced weapons rulemaking for power reactor and Category I SSNM facilities. |
| 07/01/2009 | N/A | U.S. Attorney General approved Guidelines on Use of Firearms by Security Personnel (i.e., firearms guidelines). |
| 08/12/2009 | COMSECY-09-0020 (ADAMS Accession No. ML092250087-Nonpublic) | Firearms guidelines submitted to the Commission for approval. |
| 08/31/2009 | SRM-COMSECY-09-0020 (ADAMS Accession No. ML092430125-Nonpublic) | Commission approved firearms guidelines. |
| 09/11/2009 | 74 FR 46800 | Publication of Firearms Guidelines in the Federal Register. Section 161A of the AEA takes effect as of this date. |
| 09/20/2012 | SECY-12-0125 (ADAMS Accession No. ML12161A839-Nonpublic) | Provided the Commission with draft orders for preemption authority under Section 161A for several licensees. Identified need for changes to firearms guidelines in the area of firearms background checks. These issues were identified in the course of development of the draft orders. |
| 11/21/2012 | SRM-SECY-12-0125 (ADAMS Accession No. ML12326A653) | Commission directed the staff to work with the Department of Justice (DOJ) to revise the Firearms Guidelines to address changes in firearms background checks. |
| 03/21/2014 | NA | U.S. Attorney General approved Revision 1 to the firearms guidelines. |
| 04/18/2014 | SECY-14-0048 (ADAMS Accession No. ML14108A403-Nonpublic) | Provided revised firearms guidelines (Revision 1) to Commission for approval. |
| 05/28/2014 | SRM-SECY-14-0048 (ADAMS Accession No. ML14148A040-Nonpublic) | Commission approved Revision 1 to the firearms guidelines. |
| 06/25/2014 | 79 FR 36100 | Revision 1 to the firearms guidelines published in the Federal Register. |
| 10/17/2014 | N/A | EDO approved extension of follow-on enhanced weapons rule and guidance. The staff plans to request another extension for the final rule due date (05/23/2016) to the Commission for the rulemaking (RIN 3150-AI49) that must be completed before this rulemaking (RIN 3150-AJ55) can begin. As a result all the dates for this rulemaking must also be extended. |
| 07/30/2017 | TBD | In response to SRM-SECY-15-0129 staff plans to prepare the SECY paper and rulemaking plan describing options to be considered by the Commission for this rulemaking. |
| N/A | N/A | Request public comments on the draft regulatory basis. |
| N/A | N/A | Hold public meeting on draft regulatory basis. |
| N/A | N/A | Submit regulatory basis to rulemaking office for approval. |
| 07/01/2018 | TBD | Regulatory basis complete. (projected date) |
| 07/01/2018 | TBD | Inform Commission of regulatory basis completion. (projected date) |
| 07/01/2019 | TBD | Proposed rule due to the Commission. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

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|------------|-----|---|
| 11/01/2019 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 01/16/2020 | TBD | Public comment period on proposed rule closes and staff begins reviewing the public comment. (projected date) |
| 11/01/2020 | TBD | Final rule due to the Commission. (projected date) |
| 03/01/2021 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|------------------------------------|--------------|-----------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Cyber Security for Fuel Facilities | 73 | Fuel Facilities | NMSS | NRC-2015-0179 | N/A | AJ64 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 2 | 23 | 3 | 23 |
| | | | | | | | | NSIR | 1 | 171 | 1 | 173 |
| | | | | | | | | OGC | 0.4 | 0 | 0.5 | 0 |
| | | | | | | | | Total | 3.4 | 194 | 4.5 | 196 |

Abstract

This rule would assure that Nuclear Regulatory Commission licensed fuel cycle facilities provide reasonable assurance that digital assets associated with safety, security, emergency preparedness, and material control and accountability are adequately protected from cyber-attacks.

Priority Justification

This rule scores 35 points (14, 10, 8, 3) because of the following reasons: A) Moderate contributor toward one or more goals and implements multiple strategies in one or more goals (security strategies 1, 3, and 5); B) Significant contributor toward one or more strategies (regulatory effectiveness strategies 1 and 2); C) Significant contributor toward one or more considerations or the Commission has provided specific direction and priority/schedule on the rulemaking. Significant contributor to future regulatory benefit; and D) Significant interest of the U.S. Department of Homeland Security.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 03/24/2015 | 03/24/2016 | 03/17/2017 | 09/17/2017 | 06/11/2018 | 10/16/2018 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|---|--|
| 06/25/2012 | SECY-12-0088 (ADAMS Accession No. ML12135A050) | Information paper provided to the Commission documenting the Agency's path forward on evaluation of cyber security for various types of licensees. |
| 12/30/2014 | SECY-14-0147 (ADAMS Accession No. ML14177A261, Nonpublic) | Request Commission approval to initiate rulemaking: In SECY-14-0147, the staff requested Commission approval to initiate the rulemaking. |
| 03/24/2015 | SRM-SECY-14-0147 (ADAMS Accession No. ML15083A175) | Commission approves rulemaking initiation: In SRM to SECY-14-0147 the Commission approved initiation of the rulemaking. |
| 09/04/2015 | 80 FR 53478 (ADAMS Accession No. | Request public comments on the draft regulatory basis. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|--|---|
| | ML15198A024) | |
| 09/23/2015 | Public meeting summary (ADAMS Accession No. ML15306A267) | Hold public meeting on draft regulatory basis. |
| 10/22/2015 | Public meeting documents (ADAMS Accession No. ML15288A514) | Public meeting held. |
| 12/10/2015 | Public meeting summary (ADAMS Accession No. ML15356A313 & ML15356A336) | Public meeting held. |
| 02/18/2016 | Public meeting documents (ADAMS Accession No. ML16048A038) | Public meeting held. |
| 03/17/2016 | Public meeting documents (ADAMS Accession No. ML16092A124) | Public meeting held. |
| 03/24/2016 | (ADAMS Accession No. ML15355A466) | Regulatory basis completed. |
| 03/31/2016 | (ADAMS Accession No. ML16025A140) | Inform Commission of regulatory basis completion. |
| 04/12/2016 | 81 FR 21449 | Publication of final regulatory basis in the Federal Register. |
| 03/17/2017 | TBD | Proposed rule due to the Commission. (projected date) |
| 09/17/2017 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 11/17/2017 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments. |
| 06/11/2018 | N/A | Final rule due to the Commission. (projected date) |
| 10/16/2018 | N/A | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

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Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|-----------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Modified Small Quantities Protocol (SQP) | 40, 70, 75 | Fuel Facilities | NMSS | NRC-2015-0263 | N/A | AJ70 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 2 | 0 | 0 | 0 |
| | | | | | | | | OGC | 0.2 | 0 | 0 | 0 |
| | | | | | | | | Total | 2.2 | 0 | 0 | 0 |

Abstract

The rule would amend the Nuclear Regulatory Commission regulations to make changes to 10 CFR 40, 70, and 75 as needed to ensure that the U.S. Government can meet its international obligations under INFCIRC/366 and the modified Small Quantities Protocol. The Nuclear Regulatory Commission is responsible for ensuring compliance by the licensees in the U.S. Caribbean Territories. Changes will go into effect as a final rule, issued without notice and comment under 5 U.S.C. 553(a)(1), which allows agencies to issue rules involving the foreign affairs functions of the United States without notice and comment. These rule changes must be in effect before the U.S. Government can bring the modified Small Quantities Protocol to INFCIRC/366 into force.

Priority Justification

The rule scores 35 points (10, 10, 10, 5) because of the following reasons: A) Moderate contributor toward one goal and implements one goal strategy (security strategies 1); B) Significant contributor toward one or more strategy (regulatory effectiveness strategies 1 and 2); C) Significant contributor toward one or more considerations or the Commission has provided specific direction and priority/schedule on the rulemaking; and D) Significant contributor toward one or more considerations. Significant interest in this rule from IAEA and stakeholders.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 07/21/2015 | N/A | N/A | N/A | 10/27/2016 | 01/24/2017 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|--|
| 07/21/2015 | SRM-SECY-15-0080 (ADAMS Accession No. ML15202A484-Nonpublic) | Commission approves rulemaking initiation. Specifically, the Commission authorized Department of State to negotiate and conclude the modified SQP to INFCIRC/366. |
| 05/27/2016 | SECY | In response to SRM-SECY-15-0129 staff plans to prepare the SECY paper and rulemaking plan describing options to be considered by the Commission for this rulemaking. |
| 10/27/2016 | TBD | Final rule to the Commission. (projected date) |
| 01/24/2017 | TBD | Publication of the final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|---------------------|-----------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Amendments to Material Control and Accounting Regulations | 40, 70, 72, 74, 150 | Fuel Facilities | NMSS | NRC-2009-0096 | N/A | AI61 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 0 | 0 | 0.5 | 0 |
| | | | | | | | | OGC | 0 | 0 | 0.1 | 0 |
| | | | | | | | | Total | 0 | 0 | 0.6 | 0 |

Abstract

This rule would amend the Commission's material control and accounting (MC&A) regulations. These regulations apply to the Nuclear Regulatory Commission licensees who are authorized to hold special nuclear material (SNM) and to certain licensees within the jurisdiction of the Agreement States that hold SNM and submit material status reports to the Nuclear Regulatory Commission. The amendments would revise and consolidate the MC&A requirements.

Priority Justification

The rule scores 18 points (5, 7, 5, 1) because of the following reasons: A) Moderate contributor toward one goal and implements one goal strategy (security strategy 4); B) Moderate contributor toward one strategy (regulatory effectiveness strategy 2); C) Significant contributor toward one or more considerations or the Commission has provided specific direction with and priority/schedule on the rulemaking. SRM on SECY-08-0059 dated February 5, 2009, provides Commission direction to proceed with the rule. Commission approved publication of the proposed rule; and D) Less substantial or indirect contributor toward one or more considerations. Little stakeholder interest has been expressed in the rule.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 02/05/2009 | 04/08/2010 | 09/30/2013 | 11/08/2013 | 10/27/2017 | 03/16/2018 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|---|---|
| 08/05/2005 | SECY-05-0143 (ADAMS Accession No. ML050870212, Nonpublic) | Proposed changes to the MC&A program. The staff provides recommendations to the Commission and seeks Commission approval for proposed changes to the Nuclear Regulatory Commission's framework for MC&A, including regulatory requirements and licensing and inspection practices. |
| 11/08/2005 | SRM-SECY-05-0143 (ADAMS Accession No. ML053220618, Nonpublic) | The Commission approved the staff continuing to improve the MC&A program. In addition, the Commission approved development of a rulemaking plan to address the pertinent issues. |
| 09/27/2007 | User need memo (ADAMS Accession No. ML072680857) | NMSS provided the user need memorandum and technical basis on September 27, 2007 to D. Rathbun and requested that a rulemaking be initiated as directed by SRM-SECY-05-0143. |
| 04/25/2008 | SECY-08-0059 (ADAMS Accession No. ML080580273) | Request Commission approval to initiate rulemaking: On April 25, 2008, in SECY-08-0059, Rulemaking Plan: Part 74 - Material Control and Accounting of Special Nuclear Material, the staff requested Commission approval to initiate the rulemaking. The rulemaking would provide a more risk-informed MC&A regulatory framework commensurate with the post-9/11 threat environment. The staff recommended that Part 74 be amended |

Rulemaking Activity Plan (FY 2017 - 2018)

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| | | to revise and consolidate all MC&A requirements for SNM. |
| 02/05/2009 | SRM-SECY-08-0059- (ADAMS Accession No. ML090360473) | Commission approves rulemaking initiation: On February 5, 2009, the Commission approved initiation of the rulemaking. Specifically, the Commission approved rulemaking plan (Option 4), which limited rulemaking to revising and consolidating the current MC&A regulations in Part 74. |
| 03/23/2010 | User need memo (ADAMS Accession No. ML100690472, Nonpublic) | Regulatory basis completed: On March 23, 2010, NMSS provided to FSME the User-Need Memorandum - Developing Rulemaking To Update And Consolidate Requirements For Material Control And Accounting For Special Nuclear Material. NMSS clarified that the revised technical basis dated September 27, 2007, was unchanged and supports the proposed rule described in Option 4 of the rulemaking plan. |
| 04/08/2010 | Memorandum (ADAMS Accession No. ML100970187) | Regulatory basis accepted: On April 8, 2010, the memorandum from FSME accepted the revised technical basis dated September 27, 2007, and agreed to begin developing the proposed rule to revise and consolidate the current MC&A regulations as indicated in SRM-SECY-08-0059 that stated the Commission's approval of Option 4 in the rulemaking plan. |
| 05/16/2011 | 76 FR 28193 | Publication of notice in the Federal Register: On May 16, 2011, the Commission made available for comment preliminary proposed rule language concerning the Nuclear Regulatory Commission's proposed amendments to the MC&A regulations. The comment period ended on June 30, 2011. The public comments and supporting materials related to the notice, including the preliminary proposed rule language, were available at http://www.regulations.gov by searching on Docket ID NRC-2009-0096. |
| 09/13/2011 | SECY-11-0126 (ADAMS Accession No. ML11210B382) | Proposed rule package provided to the Commission. On September 13, 2011, in SECY-11-0126, Proposed Rule: Amendments to Material Control and Accounting Regulations (RIN 3150-AI-61), the staff requested Commission approval to publish a proposed rule that would amend 10 CFR Parts 40, 70, 72, 74, and 150 to revise and consolidate within 10 CFR Part 74 requirements for MC&A of SNM. The proposed changes would primarily affect 10 CFR Part 70 licensees. Minor conforming changes would be made to 10 CFR Parts 40, 70, 72 and 150. The changes are intended to update, clarify, and strengthen the MC&A requirements. |
| 11/02/2011 | Memo (ADAMS Accession No. ML113050600) | FSME requested withdrawal of proposed rule: On November 2, 2011, the staff requested Commission approval to withdraw from consideration SECY-11-0126, Proposed Rule: Amendments to Material Control and Accounting Regulations (RIN 3150-AI-61). The staff requested to (1) revise the draft proposed rule text to reconsider a potential difference in requirements applicable to Nuclear Regulatory Commission licensees and Agreement State licensees that possess small quantities of SNM; and (2) submit a revised proposed rule package to the Commission within 6 weeks of approval of the request. |
| 11/08/2011 | SRM-SECY-11-0126 (ADAMS Accession No. ML113130077) | Commission approved withdrawal request: On November 8, 2011, the Commission approved the staff's request of November 2, 2011. |
| 12/15/2011 | SECY-11-0175 (ADAMS Accession No. ML113400134) | Request Commission approval to publish a proposed rule in the Federal Register. On December 15, 2011, the staff requested Commission approval to publish a proposed rule to revise and consolidate within 10 CFR Part 74 requirements for MC&A of SNM. The proposed changes would primarily affect 10 CFR Part 70 licensees. The proposed changes are intended to update, clarify, and strengthen the MC&A requirements. Minor conforming changes would be made to 10 CFR Parts 40, 70, 72, and 150. This paper replaces SECY-11-0126 that was withdrawn after the Commission's approval and this paper does not address any new commitments. The proposed changes would apply to licensees authorized to possess quantities of SNM greater than 350 grams. Licensees authorized to possess SNM in quantities limited to 350 grams or less, whether licensed by the Nuclear Regulatory Commission or by an Agreement State, would not be affected by this rulemaking. |
| 04/12/2012 | SRM-SECY-11-0175 (ADAMS Accession No. ML121030104) | Commission approves publishing a proposed rule: On April 12, 2012, the Commission approved publication of the proposed rule subject to changes and comments noted: The Commission directed staff to provide a revised FRN addressing the seven issues that are given in the SRM. The revised FRN is due to the Commission five days prior to publication. |
| 10/12/2012 | Revised FRN (ADAMS Accession No. ML12264A201, Nonpublic) | Provide FRN five days prior to publication in the Federal Register: On October 12, 2012, FSME sent the revised FRN responding to SRM-SECY-11-0175 that stated the Commission's approval to publish a proposed rule subject to noted issues and comments in the SRM. Additional information responding to the issues and comments was included in the memo transmitting the revised FRN to the Commission. |
| 11/06/2012 | COMSECY-12-0026 (ADAMS Accession No. ML12311A439) | Revised FRN provided to the Commission for vote. On November 6, 2012, SECY converted the revised proposed rule to a COMSECY and requested votes by November 21, 2012. |
| 05/10/2013 | SRM-COMSECY-12-0026 (ADAMS Accession No. ML13130A077) | SRM disapproving publication of the revised proposed rule. On May 10, 2013, the Commission disapproved publishing the proposed revisions to the MC&A requirements and pointed out that the staff should conduct a backfit analysis on the proposed two-person rule provision and include the results in the rulemaking package. Alternatively, if the staff believes significantly more time is needed to address this backfit issue, the staff could remove the two-person rule provision from the rulemaking package and consider the issue in a future rulemaking. Before the FRN is issued, the staff should provide the draft FRN and regulatory analysis to the Commission for information. For future proposed revisions or additions to the requirements in 10 CFR Part 74, if the staff concludes that the proposed revision or addition does not involve any provisions that impose backfits, the staff should explain its conclusion in the FRN. |
| 09/30/2013 | Proposed rule package | Proposed rule package provided to SECY: On September 30, 2013, the Office of Administration sent an e-mail transmitting the proposed rule |

Rulemaking Activity Plan (FY 2017 - 2018)

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| | (ADAMS Accession No. ML13228A184-Nonpublic) | package to SECY with instructions for publication in the Federal Register. The package included an e-mail from the staff to make the Commission aware that, in accordance with SRM-COMSECY-12-0026, the staff believes significantly more time and resources are needed to address the backfit issue on the proposed two-person rule provision and thus removed the two-person rule provision from this rulemaking package. |
| 11/08/2013 | 78 FR 67225 | Publication of proposed rule in the Federal Register: On November 8, 2013, the notice stated that the Nuclear Regulatory Commission is proposing to amend its regulations for MC&A of SNM. The goal is to revise and consolidate the MC&A requirements in order to update, clarify, and strengthen them. The proposed amendments add new requirements that would apply to Nuclear Regulatory Commission licensees who are authorized to possess SNM in a quantity greater than 350 grams. Comments on the rule were to be submitted by February 11, 2014, and comments specific to the information collections aspects of this rule were to be submitted by December 9, 2013. |
| 11/20/2013 | Agreement State letter (ADAMS Accession No. ML13324A225) | FSME letter issued: On November 20, 2013, the staff issued FSME-13-119 to all Agreement State radiation control program directors to notify the Agreement States that the Nuclear Regulatory Commission is proposing to amend its regulations for MC&A of SNM including provisions in Part 150, Exemptions and Continued Regulatory Authority in Agreement States and in Offshore Waters under Section 274. The letter provided the hyperlink for the proposed rule and the draft associated regulatory guidance documents that were published at 78 FR 67225. The letter noted that Nuclear Regulatory Commission is seeking specific input whether the regulatory threshold should be higher or lower than 350 grams, and if so, why? If this threshold amount is lower than 350 grams, the Nuclear Regulatory Commission would add a similar set of requirements to 10 CFR Part 150 to apply to Agreement State licensees. If that were done, how could the Nuclear Regulatory Commission best ensure compliance with the general performance objectives in the Agreement States? The letter also included details about the public meeting on December 10, 2013, to discuss the proposed rule and associated regulatory guidance. |
| 11/29/2013 | 78 FR 71532 | Publication of notice of a public meeting in the Federal Register: On November 29, 2013, the notice stated that the Nuclear Regulatory Commission staff plans to hold a public meeting on December 10, 2013, from 1:00 p.m. to 5:00 p.m. (EST), in Rockville, Maryland. The meeting is planned to facilitate understanding of the issues and the submission of comments by the public and other stakeholders. The meeting notice can be accessed through the Nuclear Regulatory Commission's public web site at http://meetings.nrc.gov/pmns/mtg . The final agenda and the meeting materials will be posted at the web site. Pertinent information for members of the public to participate in the meeting via teleconference or webinar is also available in the meeting notice. |
| 12/30/2013 | 78 FR 79328 | Publication of notice in the Federal Register to reschedule a public meeting and extend the comment period: On December 30, 2013, the notice stated that due to inclement weather, the public meeting that was scheduled to be held on December 10, 2013, had been rescheduled to be held on January 9, 2014. The Nuclear Regulatory Commission received a request to extend the comment period to 60 days after the rescheduled public meeting. The Nuclear Regulatory Commission extended the comment period to end on March 10, 2014. |
| 01/09/2014 | Public meeting summary (ADAMS Accession No. ML14031A355) | Public meeting: On January 9, 2014, the public meeting included 14 individuals from the Nuclear Regulatory Commission and 19 individuals from the public and stakeholders. The Nuclear Regulatory Commission presented the schedule of activities to provide the final rule to the Commission and an overview of the regulatory basis, the FRN containing the proposed rule, the draft regulatory analysis, and the five revised draft guidance documents. The presentation focused on four of the proposed requirements: (1) general performance objectives, (2) item control system, (3) tamper-safing, and 4) material balance areas, item control areas, and custodians assigned to these areas. The Nuclear Regulatory Commission summarized its position for the backfitting and issue finality provisions. |
| 02/05/2014 | Public meeting summary (ADAMS Accession No. ML14041A032) | Public meeting: On February 5, 2014, the public meeting included 12 individuals from Nuclear Regulatory Commission and 21 individuals from the public and stakeholders and Agreement States. The meeting continued in the same manner as the discussions from the meeting on January 9, 2014. |
| 03/10/2014 | N/A | Public comment period closed. Nuclear Regulatory Commission received 20 letters that included Agreement States, the Nuclear Energy Institute, and stakeholders from industry. |
| 06/27/2014 | N/A | FSME requested and the EDO approved the 12-month extension of final rule due date (to October 30, 2015) to address stakeholder comments and prepare the rulemaking package for the final rule. |
| 09/25/2014 | Public meeting summary (ADAMS Accession No. ML14297A382) | Public meeting to seek clarification on comments: On September 25, 2014, the public meeting included 13 individuals from the Nuclear Regulatory Commission and 31 individuals from the public and stakeholders. During the meeting the Nuclear Regulatory Commission staff's understanding was clarified for the cost estimates that are discussed in the letter dated March 10, 2014, from the Nuclear Energy Institute (ADAMS Accession No. ML14070A329). |
| 03/05/2015 | Public Meeting Summary (ADAMS Accession No. ML15072A391) | Public meeting to share preliminary information about the rule changes and associated hours for implementation and annual operations. |
| 10/30/2015 | Extension request approved (due to EDO on 10/28/2016) | Requested one-year extension for final rule. The extension request was entered in STARS. The OEDO approved the extension and the Commission approved the reset. |
| 01/13/2016 | SRM-COMSGB-15-005 | Commission approved the FY16 Budget Implementation Plan that defunded this rulemaking in FY16. |
| 06/01/2016 | Extension Request | Request extension to resume work on the final rule in FY17. FCSE achieved agreement with DEDM to continue the activity in FY17 and FY18. |

Rulemaking Activity Plan (FY 2017 - 2018)

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| | | Staff plans to resume the activity in October 2016 and FCSE would reprogram the funding within the FF budget line for FY17. |
| 10/27/2017 | TBD | Final rule package to EDO in FY18. (projected date) |
| 03/16/2018 | TBD | Publication of final rule in the Federal Register: (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

Spent Fuel Storage and Transportation

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|---------------------------------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | List of Approved Spent Fuel Storage Cask [This is a placeholder for several annually recurring rules.] | N/A | Spent Fuel Storage and Transportation | NMSS | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 1 | 0 | 1 | 0 |
| | | | | | | | | Total | 1 | 0 | 1 | 0 |

Abstract

These rules would approve use of new and amended cask designs for dry storage of spent fuel. Casks that have been approved for use under a general license are added to list of approved designs in 10 CFR Part 72. The Nuclear Regulatory Commission publishes a varying number of these rules each year.

Priority Justification

These rules score 36 points (15, 6, 10, 5) because of the following reasons: A) Moderate contributor towards one or more goals and implements multiple strategies in one or more goals (safety strategies 2 and 3); B) Moderate contributor towards one strategy (regulatory effectiveness strategy 2); C) Significant contributor towards one or more considerations or Commission has provided specific direction and priority/schedule on the rulemaking. The staff sent SECY-01-0226, dated December 18, 2001, identifying the streamlined process that will be used for certificate of compliance (CoC) rulemakings, about five per year; and D) Significant contributor toward one or more considerations. There is significant interest by CoC holders and licensees in timely approval of CoC rulemakings, with the Office of Nuclear Material Safety and Safeguards/Spent Fuel Storage and Transportation requiring public availability of the CoC rulemaking schedule at <http://waste/spent-fuel-storage/sfs-schedule-rulemaking.html>. The typical schedule to complete a rule is 26 weeks after completion of the Safety Evaluation Report.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|---|---|
| 09/03/1998 | SRM-SECY-98-188 (ADAMS Accession No. ML003755369) | Commission approves rulemaking initiation: On September 3, 1998, the Commission approved initiation of the rulemaking. Specifically, the Commission approved the staff's proposals for simplifying the rulemaking process for CoC rulemakings for listing storage casks in 10 CFR §72.214 |
| 04/01/1999 | SRM-SECY-99-069 (ADAMS Accession No. ML003752073) | Commission directed staff to proceed expeditiously with its plans to simplify the process for amending a CoC without the need for rulemaking. |
| 01/24/2000 | SECY-00-0018 (ADAMS Accession No. ML003673962) | Staff informed the Commission of the steps the staff has taken to expedite the rulemaking process for both new and amended CoCs. |
| 12/18/2001 | SECY-01-0226 (ADAMS Accession No. ML012890170) | Staff informed the Commission of the additional steps the staff has taken to expedite the rulemaking process for both new and amended CoC rulemakings. |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|---------------------------------------|-------------------|---------------|----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Independent Spent Fuel Storage Installation Security Requirements for Radiological Sabotage | 72 | Spent Fuel Storage and Transportation | NMSS | NRC-2009-0558 | PRM-72-6 | AI78 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NSIR | 1 | 0 | 1 | 0 |
| | | | | | | | | Total | 1 | 0 | 1 | 0 |

Abstract

This rule would amend the Commission's regulations to revise the existing security requirements that apply during the storage of SNF at an ISFSI, and during the storage of SNF and high-level waste at a Monitored Retrievable Storage Installation (MRS). This rule would require conforming changes to the ISFSI and MRS licensing requirements for security plans and programs. The specific objectives of this rule are to update the ISFSI and MRS security requirements to improve the consistency of and clarify the 10 CFR Part 73 security requirements for both types of ISFSI licensees (i.e., general and specific); make generically applicable requirements similar to those imposed on ISFSI licensees by the post September 11, 2001, security orders; and use a risk-informed, performance-based structure in ISFSI and MRS security regulations. This rulemaking would also address Issue 11 of PRM 72-6 filed by C-10 Research and Education Foundation Inc. (C-10). Issue 11 requested that the Nuclear Regulatory Commission require Hardened On-Site Storage at all nuclear power plants as well as away-from-reactor dry cask storage sites; and that all nuclear industry interim on-site or off-site dry cask storage installations or ISFSIs be fortified against terrorist attack. In addition, the petitioner requested that all sites be safeguarded against accident and age-related leakage. The Commission recently approved the staff's recommendation to delay commencing this security rulemaking for up to 5 years.

Priority Justification

The rule scores 35 points (10, 10, 10, 5) because of the following reasons: A) Moderate contributor toward one goal and implements one goal strategy (security strategies 1); B) Significant contributor toward one or more strategy (regulatory effectiveness strategies 1 and 2); C) Significant contributor toward one or more considerations or the Commission has provided specific direction and priority/schedule on the rulemaking. Commission direction to go forward with the rule. Codifies security orders thus closing a regulatory gap; and D) Significant contributor toward one or more considerations. Significant interest in this rule from industry and stakeholders and addresses PRM-72-6.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|--|
| 08/28/2007 | SECY-07-0148 (ADAMS Accession No. ML062860182-Nonpublic) | Request Commission approval to initiate rulemaking: On August 28, 2007, the staff requested Commission approval to initiate the rulemaking. The SRM included specific requests for Commission direction on policy issues necessary for the development of this proposed rulemaking on ISFSI security requirements. |
| 12/18/2007 | SRM-SECY-07-0148 (ADAMS Accession No. ML073530119) | Commission approves rulemaking initiation: On December 18, 2007, the Commission approved initiation of the rulemaking. Specifically, the Commission provided guidance on six specific policy issues. Issues addressed include proposed technical approach to the rule, development of adversary characteristics regulatory guidance for SNF storage facilities, and for the staff to aggressively encourage public comments during the development of the proposed rule so that all relevant issues are identified and unintended consequences resolved if they exist. |
| 12/16/2009 | 74 FR 66589 | Staff posted draft technical basis at http://www.regulations.gov . The Nuclear Regulatory Commission's specific objectives for this rulemaking are to: improve consistency in the existing regulations, codify the existing security orders, and make ISFSI regulations risk informed and performance based. |

Rulemaking Activity Plan (FY 2017 - 2018)

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| 01/14/2010 | N/A | Staff held webinar to discuss the draft regulatory basis. |
| 03/12/2011 | Draft Regulatory Guide 5033 | By letter to multiple addressees the staff provided DG-5033, "Security Performance (Adversary) Characteristics for Physical Security Programs for 10 CFR Part 72 Licensees," (eSAFE Accession No. ES100011507) to cleared stakeholders for comment. |
| 05/02/2011 | 76 FR 23513 | Staff held partially open/partially closed meeting to discuss comments relevant to the draft regulatory basis and request for comment on DG-5033. |
| 07/26/2011 | 76 FR 35137 | Staff held closed meeting with affected stakeholders to discuss the Safeguards Information and classified studies underpinning the proposed security requirements and adversary characteristics. |
| 10/16/2012 | 77 FR 63254 | Partial consideration of PRM-72-6 in rulemaking published. |
| 03/04/2013 | Meeting notice (ADAMS Accession No. ML13024A196) | Staff held classified meeting to discuss classified studies underpinning the proposed security requirements and adversary characteristics with newly cleared stakeholders and to discuss results of "proof of concept" testing conducted January 7-9, 2013. The OUO-SRI test plan is available in ADAMS under Accession No. ML15313A150 (Nonpublic). |
| 12/24/2013 | 78 FR 77606 | Resolution of public comments on the draft regulatory basis. Comments resolution document can be found under ADAMS Accession No. ML13085A150. |
| 09/14/2015 | COMSECY-15-0024 (ADAMS Accession No. ML15229A231) | As a result of stakeholder feedback and developments in the nuclear industry since the issuance of SRM-SECY-10-0114 and an earlier SRM-SECY-07-0148, "Independent Spent Fuel Storage Installation Security Requirements for Radiological Sabotage" (ADAMS Accession No. ML073530119), the staff recommended that the Commission delay commencing this security rulemaking for up to five years. The staff will re-evaluate the technical approach for ISFSI security in five years to determine whether rulemaking is warranted. However, the staff may conduct a technical review sooner, if necessitated by external factors. |
| 10/06/2015 | SRM-COMSECY-15-0024 (ADAMS Accession No. ML15280A105) | The Commission has approved the staff's recommendation to delay for a period of five years the commencement of a proposed rulemaking on security requirements for facilities storing spent nuclear fuel and high-level radioactive waste. At the end of the five-year period, the staff should re-evaluate whether rulemaking in this area is warranted. However, if the staff determines that acceleration of the rulemaking is warranted, the staff should provide the Commission with its basis for that determination before it reinitiates the rulemaking. |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|---------------------------------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Part 71, Compatibility with International Atomic Energy Agency (IAEA) Transportation Standards, SSR-6, 2012 Edition | 71 | Spent Fuel Storage and Transportation | NMSS | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 2 | 0 | 2 | 0 |
| | | | | | | | | OGC | 1 | 0 | 1 | 0 |
| | | | | | | | | Total | 3 | 0 | 3 | 0 |

Abstract

This rule would amend the Nuclear Regulatory Commission's regulations in 10 CFR Part 71 to harmonize domestic regulations for Type B and fissile radioactive material transportation packaging with the 2012 Edition of the IAEA Safety Standards Regulations for the Safe Transport of Radioactive Material (SSR-6). The Nuclear Regulatory Commission has periodically revised its transportation regulations to make them compatible with the IAEA, reflecting knowledge gained in scientific and technical advances and accumulated experience. Compatibility between domestic and international requirements ensures a consistent safety basis for transport. This rulemaking will be coordinated with the U.S. Department of Transportation (DOT).

Priority Justification

This rule scores 28 points (10, 10, 5, 3) because of the following reasons: A) Moderate contributor toward one goal and implements one goal strategy (safety strategy 2); B) Moderate contributor toward multiple strategies (regulatory effectiveness strategies 1 and 2; openness strategy 3); C) Moderate contributor toward one or more considerations or the Commission has provided specific direction and priority/schedule on the rulemaking. No specific Commission direction but Nuclear Regulatory Commission periodically conducts rule to be compatible with IAEA. Would be coordinated with DOT so that final rule is published at same time as DOT final rule; and D) Moderate contributor toward one or more considerations. There is some interest in this rule from industry and stakeholders.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 02/28/2017 | 02/28/2019 | TBD | TBD | TBD | TBD |

Milestones

| Milestone Date | Document | Milestone |
|----------------|-------------------------|---|
| 06/01/2016 | CA Note | The CA note informed the Commission of the staff's activities related to updates to the International Atomic Energy Agency (IAEA), "Regulations for the Safe Transport of Radioactive Material, Specific Safety Requirements, No. SSR-6" and the status of harmonization of Title 10 of the Code of Federal Regulations (10 CFR) Part 71. |
| 02/28/2017 | Rulemaking Plan | Request Commission approval to initiate rulemaking: On February 28, 2017, the staff will provide the rulemaking plan describing the options for completing the rulemaking to harmonize Part 71 and IAEA, SSR-6. |
| N/A | SRM for Rulemaking Plan | SRM from the Commission will direct staff to complete rulemaking for the option selected by the Commission. |
| N/A | N/A | Initiate development of the regulatory basis. Staff will work with the DOT and Oak Ridge National Laboratory, under a contract, to develop the regulatory basis for this rulemaking. Staff plans to publish an Advanced Notice of Proposed Rulemaking (ANPR) to gather stakeholder perspectives |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|-----|---|
| | | about harmonization of the transportation requirements, backfit issues, and cost impacts on implementation and annual operations. Comments received for the ANPR will be considered in developing the regulatory basis. |
| N/A | N/A | Request public comments on the draft regulatory basis: Staff will publish the draft regulatory basis in the Federal Register for 4-6 month public comment period. |
| N/A | TBD | Hold public meeting on draft regulatory basis: Staff will hold a public meeting to discuss the draft regulatory basis during the public comment period. Staff expects to hold a public meeting in November 2017. |
| N/A | TBD | Public comment period on the draft regulatory basis ends and staff begins analyzing public comments. |
| N/A | TBD | Submit regulatory basis to rulemaking office for approval: In April 2018, staff plans to submit a user need memorandum with the draft regulatory basis to the Rulemaking and Project Management Branch. |
| 02/28/2019 | TBD | Regulatory basis completed: Staff expects to finalize the regulatory basis.(projected date) |
| TBD | TBD | Proposed rule due to the Commission. (projected date) |
| TBD | N/A | SRM from the Commission. (projected date) |
| TBD | TBD | Publication of proposed rule in the Federal Register. Staff expects to publish the proposed rule for a 150-day (5 months) comment period due to the expected complexity of the revisions to the rule. (projected date) |
| TBD | TBD | Public comment period on proposed rule closes. |
| TBD | TBD | Final rule due to the Commission. (projected date) |
| TBD | TBD | SRM from the Commission. |
| TBD | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

Decommissioning and Low-Level Waste

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|-------------------------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Groundwater Protection In Situ Leach Uranium Recovery Facilities | 40 | Decommissioning and Low-Level Waste | NMSS | NRC-2008-0421 | N/A | AI40 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 1 | 240 | 0.5 | 120 |
| | | | | | | | | OGC | 0.1 | 0 | 0.1 | 0 |
| | | | | | | | | Total | 1.1 | 240 | 0.6 | 120 |

Abstract

This rule would amend the Commission's regulations to clarify the regulations in 10 CFR part 40, Appendix A, "Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentration of Source Material From Ores Processed Primarily for Their Source Material Content," to better ensure groundwater protection at in situ leach uranium recovery facilities. The rule would codify practices currently done through license condition to provide the industry and public with more predictability during the licensing process. The rulemaking is being delayed while the U.S. Environmental Protection Agency (EPA) revises the requirements in 40 CFR Part 192 that provide the standards for Nuclear Regulatory Commission's byproduct regulations.

Priority Justification

The rule scores 26 points (13, 6, 5, 2) because of the following reasons: A) Moderate contributor toward one goal and implements one goal strategy (safety strategy 1); B) Moderate contributor toward one strategy (regulatory effectiveness strategy 2); C) Moderate contributor toward one or more considerations of the Commission has provided specific direction and priority/schedule on the rulemaking. SRM-COMJSM-06-0001 (Rev.) provides Commission direction to prepare this rule; and D) Moderate contributor toward one or more consideration. There is interest in this rule from industry and stakeholders.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 03/24/2006 | 04/03/2006 | 11/19/2018 | 02/01/2019 | 03/20/2020 | 09/20/2020 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|---|
| 01/17/2006 | COMJSM-06-0001 (ADAMS Accession No. ML060830041) | Request Commission approval to initiate rulemaking: On January 17, 2006, Commissioner Merrifield requested fellow Commissioners to approve directing the staff to initiate a rulemaking that would be tailored to groundwater protection programs at an in situ leach (ISL) uranium recovery facilities that would focus on eliminating dual regulation by the Nuclear Regulatory Commission and EPA over groundwater protection. |
| 03/24/2006 | SRM-COMJSM-06-0001 (Revised) (ADAMS Accession No. ML060830525) | Commission approves rulemaking initiation: On March 24, 2006, the Commission approved initiation of the rulemaking. Specifically, the Commission directed the staff to develop a rulemaking specifically tailored to groundwater protection programs at ISL uranium recovery facilities that would focus on eliminating dual regulation between Nuclear Regulatory Commission and EPA over groundwater protection. |
| 04/03/2006 | Technical Basis (ADAMS Accession No. ML060890555-Nonpublic) | Regulatory basis completed: Technical (regulatory) basis submitted to rulemaking office for approval. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|---|---|
| 04/30/2007 | COMSECY-07-0015 (ADAMS Accession No. ML070930332) | On April 30, 2007, the staff updated the Commission on the status of the rulemaking and informed them that deferral to EPA was not legally allowable. The staff provided recommendations to move forward with the rulemaking. |
| 06/08/2007 | SRM-COMSECY-07-0015 (ADAMS Accession No. ML071590310) | On June 8, 2007, the Commission approved resumption of the rulemaking process for groundwater protection at ISL uranium extraction facilities to conform to 40 CFR Part 192 and directed the staff to actively engage interested stakeholders through public workshops and work closely and cooperatively with EPA. |
| 10/25/2010 | CA Note (ADAMS Accession No. ML102950502-Nonpublic) | Commissioners Assistants note to notify the Commission of staff's decision to defer rulemaking to wait for EPA rulemaking. |
| 05/20/2014 | N/A | The Nuclear Regulatory Commission comment response sent to OMB on EPA's draft 40 CFR 192 rule (incoming MI14125A010-Nonpublic). |
| 01/26/2015 | 80 FR 4155 | EPA published proposed 40 CFR 192 rulemaking for comment. |
| 05/27/2015 | N/A | EPA comment period on proposed 40 CFR 192 rulemaking closed. |
| 10/22/2015 | N/A | Extension request for proposed and final rules approved (proposed rule previously due to Commission on November 19, 2015). Extension required due to delays in EPA rulemaking. |
| 11/27/2015 | CA Note (ADAMS Accession No. ML15296A372-Nonpublic) | Staff provided a most recent status update via Commissioners Assistant note. |
| 11/19/2018 | TBD | Proposed rule due to the Commission. (projected date) |
| 02/01/2019 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 04/20/2019 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments. (projected date) |
| 03/20/2020 | TBD | Final rule due to the Commission. (projected date) |
| 09/20/2020 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|-----------------------------------|----------------|-------------------------------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Low | Dodd-Frank Act of 2010 Rulemaking | 30, 40, 50, 70 | Decommissioning and Low-Level Waste | NMSS | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 0 | 0 | 0.5 | 120 |
| | | | | | | | | OGC | 0.9 | 0 | 0.9 | 0 |
| | | | | | | | | Total | 0.9 | 0 | 1.4 | 120 |

Abstract

This rule would amend the Nuclear Regulatory Commission regulations in 10 CFR Parts 30, 40, 50, and 70 to remove any use or reference to bond rating as mandated by the Dodd-Frank Act of 2010. The rulemaking would develop alternate criteria, if any, to replace the bond rating to ensure financial tests are sufficient in evaluating guarantee as an acceptable financial instrument for decommissioning financial assurance or to evaluate if guarantee will remain as a viable financial instrument absent the bond rating criteria. Staff is currently re-evaluating the need for this rulemaking.

Priority Justification

The rule scores 6 points (0, 0, 6, 0) because of the following reasons: A) Does not contribute toward any goal; B) Does not contribute toward any strategy; C) Moderate contributor toward one or more considerations or Congress or the Commission has provided specific direction with no priority/schedule on the rulemaking. Required by the Dodd-Frank Act; and D) No contribution toward any consideration.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 09/01/2014 | N/A | N/A | N/A | 04/01/2020 | 08/01/2020 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|------------------|--|
| 04/17/2014 | Memo | A memo from OGC to the Commission on April 17, 2014, recommended that the Nuclear Regulatory Commission should conduct rulemaking. |
| 09/01/2014 | CPR Report | This rule was initiated when added to the CPR. Since this is a nondiscretionary rule required by congressional statute if rulemaking is pursued, a regulatory basis is not required. |
| 04/13/2016 | SRM-SECY-16-0009 | NMSS staff received Commission direction to work on this rulemaking in FY18 which was placed on the C list for rebaselining. The current propose FY18 budget for this rule is as follows; NMSS - 0.5 FTE and \$0K, OGC - 0.1 FTE for a total of 0.6 FTE. |
| 04/01/2019 | SECY | In response to SRM-SECY-15-0129 staff plans to prepare the SECY paper and rulemaking plan describing options to be considered by the Commission for this rulemaking. |
| 04/01/2020 | TBD | Final rule due to the Commission. (projected date) |
| 08/01/2020 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

Corporate Support

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|-------------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Revision of Fee Schedules: Fee Recovery for FY 2017 | 170, 171 | Corporate Support | OCFO | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | OCFO | 2 | 0 | 0 | 0 |
| | | | | | | | | Total | 2 | 0 | 0 | 0 |

Abstract

This rule would implement the Omnibus Budget Reconciliation Act of 1990 (OBRA-90), as amended, which requires the Nuclear Regulatory Commission to recover approximately 90 percent of its budget authority in a given fiscal year, less the amounts appropriated from the Waste Incidental to Reprocessing, generic homeland security activities, and Inspector General services for the Defense Nuclear Facilities Safety Board, through fees assessed to licensees. This rulemaking would amend the Commission's fee schedules for licensing, inspection, and annual fees charged to its applicants and licensees. The licensing and inspection fees are established under 10 CFR Part 170 and recover the Nuclear Regulatory Commission's cost of providing services to identifiable applicants and licensees. Examples of services provided by the Nuclear Regulatory Commission for which 10 CFR Part 170 fees are assessed include license application reviews, license renewals, license amendment reviews, and inspections. The annual fees established under 10 CFR Part 171 recover budgeted costs for generic (e.g., research and rulemaking) and other regulatory activities not recovered under 10 CFR Part 170 fees.

Priority Justification

The rule scores 40 points (15, 10, 10, 5) because of the following reasons: A) Moderate contributor to all safety goal strategies and security goal strategies through the monitoring and disbursement of funds to program offices; B) Direct contributor toward the openness goals - transparency (3 and 4) and participation (1); C) Direct contributor toward the effectiveness goals - regulatory processes (3 and 4); and D) Significant contributor to agency compliance with congressional mandate/priority/schedule and a significant contributor towards regulatory burden reduction.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 09/01/2016 | N/A | 03/08/2017 | 03/23/2017 | 06/08/2017 | 06/24/2017 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|--|
| 10/30/2016 | N/A | Staff initiates rulemaking activities. (projected date) |
| 03/01/2017 | N/A | Proposed rule due to the EDO. (projected date) |
| 03/08/2017 | N/A | Proposed rule due to the CFO. (projected date) |
| 03/08/2017 | N/A | Proposed rule due to the Commission. (projected date) |
| 03/23/2017 | N/A | Publication of proposed rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|-----|--|
| 04/22/2017 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments. (projected date) |
| 05/31/2017 | N/A | Final rule due to the EDO. (projected date) |
| 06/07/2017 | N/A | Final rule due to the CFO. (projected date) |
| 06/08/2017 | N/A | Final rule due to the Commission. (projected date) |
| 06/24/2017 | N/A | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

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Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|-------------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Revision of Fee Schedules: Fee Recovery for FY 2018 | 170, 171 | Corporate Support | OCFO | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | OCFO | 0 | 0 | 2 | 0 |
| | | | | | | | | Total | 0 | 0 | 2 | 0 |

Abstract

This rule would implement the Omnibus Budget Reconciliation Act of 1990 (OBRA-90), as amended, which requires the Nuclear Regulatory Commission to recover approximately 90 percent of its budget authority in a given fiscal year, less the amounts appropriated from the Waste Incidental to Reprocessing, generic homeland security activities, and Inspector General services for the Defense Nuclear Facilities Safety Board, through fees assessed to licensees. This rulemaking would amend the Commission's fee schedules for licensing, inspection, and annual fees charged to its applicants and licensees. The licensing and inspection fees are established under 10 CFR Part 170 and recover the Nuclear Regulatory Commission's cost of providing services to identifiable applicants and licensees. Examples of services provided by the Nuclear Regulatory Commission for which 10 CFR Part 170 fees are assessed include license application reviews, license renewals, license amendment reviews, and inspections. The annual fees established under 10 CFR Part 171 recover budgeted costs for generic (e.g., research and rulemaking) and other regulatory activities not recovered under 10 CFR Part 170 fees.

Priority Justification

The rule scores 40 points (15, 10, 10, 5) because of the following reasons: A) Moderate contributor to all safety goal strategies and security goal strategies through the monitoring and disbursement of funds to program offices; B) Direct contributor toward the openness goals - transparency (3 and 4) and participation (1); C) Direct contributor toward the effectiveness goals - regulatory processes (3 and 4); and D) Significant contributor to agency compliance with congressional mandate/priority/schedule and a significant contributor towards regulatory burden reduction.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 09/01/2017 | N/A | 03/08/2018 | 03/23/2018 | 06/08/2018 | 06/24/2018 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|--|
| 10/30/2017 | N/A | Staff initiates rulemaking activities. (projected date) |
| 03/01/2018 | N/A | Proposed rule due to the EDO. (projected date) |
| 03/08/2018 | N/A | Proposed rule due to the CFO. (projected date) |
| 03/08/2018 | N/A | Proposed rule due to the Commission. (projected date) |
| 03/23/2018 | N/A | Publication of proposed rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|-----|--|
| 04/22/2018 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments. (projected date) |
| 05/31/2018 | N/A | Final rule due to the EDO. (projected date) |
| 06/07/2018 | N/A | Final rule due to the CFO. (projected date) |
| 06/08/2018 | N/A | Final rule due to the Commission. (projected date) |
| 06/24/2018 | N/A | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|-------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | 10 CFR Part 110, Export and Import of Nuclear Equipment and Material; Updates and Clarifications | 110 | Corporate Support | IP | NRC-2014-0201 | N/A | AJ45 | | FTE | \$K | FTE | \$K |
| | | | | | | | | IP | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

This rule would amend the Nuclear Regulatory Commission's regulations in 10 CFR Part 110, Export and Import of Nuclear Equipment and Material. The rule would provide updates and clarifications to 10 CFR Part 110 based on recent industrial experience and technological changes. It would address logical changes to export licensing provisions brought on by technological changes involving industrial and research uses of deuterium and deuterated compounds. The action is necessary to address these technological changes in order to ensure the effectiveness and efficiency of the regulatory framework while best fulfilling the agency's security objectives. Impacts would be to export license applicants. In addition, minor errors will be corrected and language will be clarified as appropriate. This rulemaking is a staff-identified activity, prompted after receiving informal input from industry and observing increasing trends in the number of export license applications received for deuterium and deuterated products.

Priority Justification

This rule scores 27 points (14, 7, 3, 3) because of the following reasons: A) High contributor to the security goal (strategies 1 and 3); B) High contributor to the effectiveness objective (strategies 1, 2 and 3); C) Proposed clarifications would have medium Nuclear Regulatory Commission licensing initiative/future regulatory benefit in making export licensing of deuterium more efficient; and D) Issue has medium public interest from deuterium exporters due to technological changes in industry; regulatory burden would ultimately be reduced.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 09/01/2014 | 11/09/2015 | 07/01/2016 | 10/01/2016 | 12/01/2016 | 03/01/2017 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|---|---|
| 09/01/2014 | CPR Report | The date the rulemaking was added to the CPR database is considered the initiation date. Staff will prepare a SECY paper requesting Commission approval to proceed with rulemaking. |
| 06/09/2015 | N/A | Initiate development of the regulatory basis. |
| 11/09/2015 | SECY-15-0142 (ADAMS Accession No. ML15162B062, Nonpublic) | Regulatory basis completed and submitted to the Commission as an informational paper. |
| 07/01/2016 | N/A | Proposed rule due to the Commission. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|-----|--|
| 10/01/2016 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 11/15/2016 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments. (projected date) |
| 12/01/2016 | TBD | Final rule due to the Commission. (projected date) |
| 03/01/2017 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|-------------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Adjustment of Civil Penalties for Inflation for FY 2017 | N/A | Corporate Support | OGC | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | OGC | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

This rule would amend the Commission's regulations to adjust the maximum civil monetary penalty the Nuclear Regulatory Commission can assess for violation of the Atomic Energy Act of 1954, as amended, as well as the maximum civil monetary penalty the Nuclear Regulatory Commission can assess for false claims or statements under the Program Fraud Civil Remedies Act. These adjustments are mandated by Congress through the Federal Civil Penalties Inflation Adjustment Act of 1990, as amended by the Federal Civil Penalties Inflation Adjustment Act Improvements Act of 2015.

Priority Justification

This rule scores 23 points (14, 2, 7, 0) because of the following reasons: A) Moderate contributor to the safety objective (strategy 4) and security objective 1 (strategy 2); B) Indirect contributor to the regulatory effectiveness strategy (strategy 2d); C) Congressional direction and schedule; and D) No contribution toward any considerations.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 01/15/2017 | N/A | N/A | N/A | 07/01/2017 | 07/31/2017 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|-----------|
|----------------|----------|-----------|

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|-------------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Adjustment of Civil Penalties for Inflation for FY 2018 | N/A | Corporate Support | OGC | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | OGC | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

| Abstract |
|--|
| This rule would amend the Commission's regulations to adjust the maximum civil monetary penalty the Nuclear Regulatory Commission can assess for violation of the Atomic Energy Act of 1954, as amended, as well as the maximum civil monetary penalty the Nuclear Regulatory Commission can assess for false claims or statements under the Program Fraud Civil Remedies Act. These adjustments are mandated by Congress through the Federal Civil Penalties Inflation Adjustment Act of 1990, as amended by the Federal Civil Penalties Inflation Adjustment Act Improvements Act of 2015. |
| Priority Justification |
| This rule scores 23 points (14, 2, 7, 0) because of the following reasons: A) Moderate contributor to the safety objective (strategy 4) and security objective 1 (strategy 2); B) Indirect contributor to the regulatory effectiveness strategy (strategy 2d); C) Congressional direction and schedule; and D) No contribution toward any considerations. |

| Target Completion Dates | | | | | |
|-------------------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
| 01/15/2018 | N/A | N/A | N/A | 07/01/2018 | 07/31/2018 |

| Milestones | | |
|----------------|----------|-----------|
| Milestone Date | Document | Milestone |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|-------------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Miscellaneous Technical Correction [This is a placeholder for annual recurring rule to correct inadvertent omitted information or typos] | N/A | Corporate Support | ADM | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | ADM | 0.25 | 0 | 0.5 | 0 |
| | | | | | | | | Total | 0.25 | 0 | 0.5 | 0 |

Abstract

This is a placeholder for a rulemaking that corrects errors in the Nuclear Regulatory Commission's regulations Code of Federal Regulations.

Priority Justification

The rule scores 22 points (0,7,10,5) because of the following reasons: A) Rule with no contribution to the safety or security goals; B) Moderate contributor to the openness and operational excellence strategies; C) Rule which corrects published rule text; D) Rule with significant public participation or interest.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|--|
| N/A | N/A | This is a placeholder for a rulemakings that corrects errors in the Nuclear Regulatory Commission's regulations Code of Federal Regulations that may be published throughout the year. |
| | | |
| | | |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|-------------------|-------------------|-----------|---------|---------|--------|------|------|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Miscellaneous Administrative Rulemaking [This is a placeholder for annual recurring rule to update administrative or organizational information] | N/A | Corporate Support | ADM | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | | ADM | 0.25 | 0 | 0.5 |
| | | | | | | | | Total | 0.25 | 0 | 0.5 | 0 |

Abstract

This is a placeholder for any corporate support rulemaking that makes administrative updates to the Nuclear Regulatory Commission's regulations in the Code of Federal Regulations.

Priority Justification

The rule scores 22 points (0,7,10,5) because of the following reasons: A) Rule with no contribution to the safety or security goals; B) Moderate contributor to the openness and operational excellence strategies; C) Congressionally mandated rule or has Commission direction; and D) Rule with significant public participation or interest.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|--|
| N/A | N/A | This is a placeholder for any corporate support rulemakings that makes administrative updates to the Nuclear Regulatory Commission's regulations in the Code of Federal Regulations that may be published throughout the year. |
| | | |
| | | |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|-------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | U.S. Nuclear Regulatory Commission Acquisition Regulation (NRCAR) – 48 CFR Chap. 20 | N/A | Corporate Support | ADM | NRC-2014-0033 | N/A | AJ36 | | FTE | \$K | FTE | \$K |
| | | | | | | | | ADM | 0.5 | 0 | 0 | 0 |
| | | | | | | | | Total | 0.5 | 0 | 0 | 0 |

Abstract

This rule would update the NRCAR to conform to external regulations; meet the requirements of Federal acquisition laws, statutes, regulations, and Executive Orders; and incorporate Nuclear Regulatory Commission organizational changes. The revisions affect both internal and external stakeholders (contractors) and are needed to support current Nuclear Regulatory Commission contracting policies and ensure openness, transparency, and effectiveness in Agency acquisitions.

Priority Justification

The rule scores 22 points (0, 10, 10, 2) because of the following reasons: A) Does not contribute directly to the safety goal; B) Significant contributor to openness objective (strategy 1), effectiveness objective (strategy 1), and operational objective (financial management and procurement (strategy 2); C) Significant contributor – needed for conformance with external regulations and to address significant regulatory gap; and D) Low contributor toward regulatory burden reduction.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 06/01/2014 | N/A | 07/01/2016 | 08/01/2016 | 12/01/2016 | 02/01/2017 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|------------|--|
| 06/01/2014 | CPR Report | Rule added to the Common Prioritization of Rulemaking Report. Administrative rule to align Nuclear Regulatory Commission acquisitions regulations with 48 CFR Chapter 20, "Nuclear Regulatory Commission." |
| 07/01/2016 | TBD | Proposed rule due to the EDO. (projected date) |
| 08/01/2016 | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| 10/01/2016 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments. (projected date) |
| 12/01/2016 | TBD | Final rule due to the EDO. (projected date) |
| 02/01/2017 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

2. Completed in Current FY

Operating Reactors

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|--------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | 2009-2013 Editions and Addenda of the American Society of Mechanical Engineers Code | 50 | Operating Reactors | NRR | NRC-2011-0088 | N/A | AI97 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| Total | | | | | | | | | 0 | 0 | 0 | 0 |

Abstract

The purpose of this rulemaking is to amend the NRC's regulations to incorporate by reference the 2009-13 Editions & Addenda of the ASME Code. This is a non-discretionary rule directed by SECY-10-0016. The NRC has a well-established practice of approving and/or mandating the use of certain parts of editions and addenda of ASME Codes in 10 C.F.R. 50.55a through the rulemaking process of incorporation by reference. This practice assures consistency across the industry and that the NRC will continue to support the use of the most updated and technically sound techniques developed by the ASME to provide adequate protection to the public. This rulemaking also enhances the efficiency and effectiveness of NRC's regulations by making use of current voluntary consensus standards and is consistent with applicable requirements of the National Technology Transfer and Advancement Act.

Priority Justification

The rule scores 33 points (10, 10, 10, 3) because of the following reasons: A) Moderate contributor to the safety goal (strategy 1); B) Significant contributor to the regulatory effectiveness goal (strategies 1 and 2); C) Commission direction in SECY-10-0016 and implements applicable requirements of the National Technology Transfer and Advancement Act; and D) Moderate stakeholder interest.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 06/01/2013 | 12/01/2013 | 08/31/2015 | 09/18/2015 | 08/01/2016 | 10/31/2016 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|--|
| 04/13/2000 | SRM-SECY-00-0011 (ADAMS Accession No. ML003702722) | Since 1971, the Nuclear Regulatory Commission has incorporated by reference certain ASME codes in 10 CFR 50.55a and updated the regulation periodically to reflect more recent versions of ASME codes. On April 13, 2000, the Commission disapproved a proposal to eliminate the 120-month update requirement in 10 CFR 50.55a for inservice inspection and inservice testing. In a Federal Register notice dated August 3, 2001, the Nuclear Regulatory Commission stated that the Commission disapproved the elimination of this requirement because the ASME codes are subject to continuing refinement and improvement and it would be inappropriate to freeze these still evolving requirements (66 FR 40635). This rulemaking is a continuation of this well-established practice. |
| 01/28/2010 | SECY-10-0016 (ADAMS Accession No. | Authority for signing these rules is delegated to the Director of NRR. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|---|--|
| | ML092730529) | |
| 06/01/2013 | ASME Code (available at http://www.asme.org) | The 2013 edition of the ASME Boiler and Pressure Vessel Code is published. ASME codes are available to NRC staff at the NRC Technical Library. |
| 09/18/2015 | 80 FR 56820 | Publication of proposed rule in the Federal Register. |
| 03/02/2016 | Meeting Summary (ADAMS Accession No. ML16053A194) | Public Meeting held. |
| 08/01/2016 | TBD | Final rule due to the NRR Office Director. (projected date) |
| 10/31/2016 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|--------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | | | | | | | | | FTE | \$K | FTE | \$K |
| High | Incorporation by Reference of Revisions of ASME Regulatory Guides (Regulatory Guide (RG) 1.84, Rev. 37; RG 1.147, Rev. 18; and RG 1.192, Rev. 2; Approval of American Society of Mechanical Engineers Code Cases) | 50 | Operating Reactors | NRR | NRC-2012-0059 | N/A | AJ13 | | 0 | 0 | 0 | 0 |
| Total | | | | | | | | | 0 | 0 | 0 | 0 |

Abstract

The Nuclear Regulatory Commission lists the code cases that it finds to be acceptable or conditionally acceptable in Nuclear Regulatory Commission RGs, which are also incorporated by reference in 10 CFR 50.55a. The Nuclear Regulatory Commission has a well-established practice of approving and/or mandating the use of certain parts of editions and addenda of ASME Codes in 10 CFR 50.55a through the rulemaking process of incorporation by reference. This practice assures consistency across the industry and that the Nuclear Regulatory Commission will continue to support the use of the most updated and technically sound techniques developed by the ASME to provide adequate protection to the public. This rulemaking also enhances the efficiency and effectiveness of Nuclear Regulatory Commission regulations by making use of current voluntary consensus standards and is consistent with applicable requirements of the National Technology Transfer and Advancement Act. This is a non-discretionary rule directed by SECY-10-0016.

Priority Justification

The rule scores 33 points (10, 10, 10, 3) because of the following reasons: A) Moderate contributor to the safety goal (strategy 1); B) Significant contributor to the regulatory effectiveness goal (strategies 1, 2 and 3); C) Commission direction in SECY-10-0016 and implements applicable requirements of the National Technology Transfer and Advancement Act; and D) Moderate stakeholder interest.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 08/01/2013 | 10/01/2013 | 01/15/2016 | 03/02/2016 | 10/31/2016 | 11/11/2016 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|--|
| 04/13/2000 | SRM-SECY-00-0011 (ADAMS Accession No. ML003702722) | Since 1971, the Nuclear Regulatory Commission has incorporated by reference certain ASME codes in 10 CFR 50.55a and updated the regulation periodically to reflect more recent versions of ASME codes. On April 13, 2000, the Commission disapproved a proposal to eliminate the 120-month update requirement in 10 CFR 50.55a for inservice inspection and inservice testing. In a Federal Register notice dated August 3, 2001, the Nuclear Regulatory Commission stated that the Commission disapproved the elimination of this requirement because the ASME codes are subject to continuing refinement and improvement and it would be inappropriate to freeze these still evolving requirements (66 FR 40635). This rulemaking is a continuation of this well-established practice. |
| 07/06/2001 | SRM-SECY-01-0110 (ADAMS Accession No. ML011910369) | Commission approves rulemaking initiation. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|--|---|
| 01/28/2010 | SECY-10-0016 (ADAMS Accession No. ML092730529) | Authority for signing these rules is delegated to the Director of NRR. |
| 08/01/2013 | N/A | Initiate development of the regulatory basis: Each code case rulemaking addresses code cases from multiple code review cycles. August 1, 2013, represents the date that RES staff received code cases to review for the first cycle of code cases that the rule will address. |
| 10/01/2013 | N/A | Regulatory basis completed: Nuclear Regulatory Commission staff review of code cases completed. |
| 01/15/2016 | N/A | Proposed rule provided to the NRR Office Director. |
| 03/02/2016 | 81 FR 10780 | Publication of proposed rule in the Federal Register. |
| 05/16/2016 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments. |
| 10/31/2016 | TBD | Final rule provided to the NRR Office Director. (projected date) |
| 11/11/2016 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

Materials Users

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|-----------------|-------------------|---------------|-----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Medical Use of Byproduct Material-- Medical Event Definitions, Training and Experience, and Clarifying Amendments | 35 | Materials Users | NMSS | NRC-2008-0175 | PRM-35-20 | AI63 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | | 0 | 0 | 0 |
| Total | | | | | | | | | 0 | 0 | 0 | 0 |

Abstract

This rule would amend the Commission's medical use regulations in part 35. The proposed rule addresses three ongoing rulemaking projects and several other related topics. First, this rule proposes amendments to the reporting and notification requirements for a medical event for permanent implant brachytherapy. Second, the rule proposes changes: (1) to amend the training and experience requirements in multiple sections to remove the attestation statement for an individual who is certified by a specialty board whose certification process has been recognized by the NRC or an agreement state; (2) to the requirements for measuring molybdenum contamination and reporting of failed technetium and rubidium generators; and (3) to allow Associate Radiation Safety Officers to be named on a medical license. Third, the rule proposes changes to address a request filed in PRM-35-20 to exempt certain board-certified individuals from certain T&E requirements (i.e., "grandfather" these individuals) so that they may be identified on a license or permit for materials and uses that they performed on or before October 24, 2005, the expiration date of the former subpart J of part 35 which contained the prior T&E requirements.

Priority Justification

The rule scores 40 points (15, 10, 10, 5) because of the following reasons: A) Moderate contributor toward one or more goals and implements multiple strategies in one or more goals (safety strategies 1, 2, and 7); B) Significant contributor toward one or more strategies (regulatory effectiveness strategies 1 and 2); C) Significant contributor toward one or more considerations or the Commission has provided specific direction and priority/schedule on the rulemaking. SRM-SECY-08-0179, SRM-SECY-10-0062, and SRM-SECY-12-0053 provides Commission direction to prepare this rule. Future regulatory benefit; and D) Significant interest in this rule from industry and stakeholders. In addition, this rule addresses PRM-35-20.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 01/16/2009 | N/A | 08/08/2013 | 07/21/2014 | 06/30/2016 | 12/01/2016 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|--|
| 06/06/2008 | SECY-08-0080 (ADAMS Accession No. ML081370458) | Request Commission approval to publish a proposed rule: On June 6, 2008, the staff requested Commission approval to publish a proposed rule to amend 10 CFR Part 35. The proposed amendments would revise requirements related to reporting and notifications of medical events to clarify requirements for permanent implant brachytherapy. |
| 07/25/2008 | SRM-SECY-08-0080 (ADAMS Accession No. ML082100074) | Commission approves staff recommendations: On July 25, 2008, the Commission approved publication of a proposed rule to amend 10 CFR Part 35 related to reporting and notification of medical events and to clarify requirements for permanent implant brachytherapy. |
| 08/06/2008 | 73 FR 45635 | The proposed rule was published in the Federal Register for a 75-day comment period, closing on October 20, 2008. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|--|--|
| 10/06/2008 | 73 FR 58063 | The comment period was extended until November 7, 2008. |
| 11/20/2008 | SECY-08-0179 (ADAMS Accession No. ML083170176) | Request Commission approval to initiate rulemaking: On November 20, 2008, the staff requested Commission approval of staff recommendations for amending the preceptor attestation requirements in 10 CFR Part 35, "Medical Use of Byproduct Material." |
| 01/16/2009 | SRM-SECY-08-0179 | Commission approves rulemaking initiation: On January 16, 2009, the Commission approved the staff's recommendations for amending the preceptor attestation requirements in 10 CFR Part 35. The Commission directed the staff to develop the alternate pathway attestation requirements in concert with the Advisory Committee on Medical Uses of Isotopes (ACMUI) and the Agreement States. |
| 05/18/2010 | SECY-10-0062 (ADAMS Accession No. ML100890086) | Request Commission approval to publish a re-proposed rule: On May 18, 2010, the staff requested Commission approval to publish a re-proposed rule that would amend 10 CFR Part 35. The proposed amendments would revise Sections 35.40 and 35.3045 related to reporting and notifications of medical events. Section 35.24 would also be revised to require that licensees provide training to staff on the requirements of Section 35.3045. |
| 08/10/2010 | SRM-SECY-10-0062 (ADAMS Accession No. ML102220233) | Commission disapproves staff recommendations: On August 10, 2010, the Commission disapproved the staff's recommendations to publish the re-proposed amendments to 10 CFR Part 35. The Commission directed the staff to work closely with the ACMUI and the broader medical and stakeholder community to develop event definitions that will protect the interests of patients, allow physicians the flexibility to take actions that they deem medically necessary, while continuing to enable the agency to detect failures in process, procedure, and training as well as any misapplication of byproduct materials by authorized uses. |
| 04/05/2012 | SECY-12-0053 (ADAMS Accession No. ML12072A306) | Request Commission approval of staff recommendations: On April 5, 2012, the staff requested Commission approval of staff recommendations for modifying the regulatory requirements in Section 35.3045 for permanent implant brachytherapy medical event reporting. |
| 08/13/2012 | SRM-SECY-12-0053 (ADAMS Accession No. ML122260211) | Commission approves staff recommendations: On August 13, 2012, the Commission approved the staff's recommendations for modifying the regulatory requirements that appear in 10 CFR 35.3045 for permanent implant brachytherapy medical event reporting and for combining it with the expanded rulemaking (attestation requirements, and other issues). |
| 08/08/2013 | SECY-13-0084 (ADAMS Accession No. ML13178A124) | Request Commission approval to publish proposed rule: On August 8, 2013, staff requested Commission approval to publish a proposed rule for public comment. The proposed rule addresses three ongoing rulemaking projects and other related topics in 10 CFR Part 35: (1) amendments to the reporting and notification requirements for a medical event for permanent implant brachytherapy; (2) changes to training and experience requirements; (3) changes to the requirements for measuring molybdenum contamination and reporting of failed technetium and rubidium generators; (4) allow associate radiation safety officers to be named on a medical license. The proposed rule also addresses a petition for rulemaking (PRM 35-20) to exempt certain board-certified individuals from certain training and experience requirements. |
| 01/06/2014 | SRM-SECY-13-0084 (ADAMS Accession No. ML14007A044) | Commission approves staff recommendations: On January 6, 2014, the Commission approved publication of the proposed rule for public comment, subject to comments and changes noted in the SRM. The Commission directed the staff to: (1) request specific comments on a provision of the proposed medical event definition for normal tissue; (2) eliminate a proposed reporting requirement for manufacturers and distributors of failed generators and update the Nuclear Regulatory Commission's Memorandum of Understanding with the FDA; (3) extend the comment period from 90 to 120 days; and (4) request specific comment on the effective date for the final rule. The Commission also changed the compatibility category for medical event reporting from C to B. |
| 07/21/2014 | 79 FR 42410 | The proposed rule was published in the Federal Register for a 120-day comment period. |
| 09/22/2014 | 79 FR 56524 | A correction to the proposed rule was noticed in the Federal Register to include the one-time implementation costs from the information collection burden estimate and to extend the comment period by 30 days from the date of that notice to give the public time to comment on this correction. |
| 10/08/2014 | Meeting Summary (ADAMS Accession No. ML14311A906) | Staff held a public meeting on the proposed rule. |
| 11/18/2014 | N/A | Public comment period closed on November 18, 2014. |
| 10/06/2015 | Draft final rule | On October 6, 2015, staff provided the draft final rule to a subcommittee of the Advisory Committee on the Medical Uses of Isotopes (ACMUI) for its review and comment (a 90-day comment period). A teleconference meeting of the ACMUI will be held on January 6, 2016, to discuss the ACMUI's comments. |
| 11/18/2015 | Draft final rule | On November 18, 2015, the draft final rule was provided to the Agreement States for their review and comments. Comments are due to the staff no later than January 8, 2016. |
| 06/03/2016 | TBD | Final rule due to the EDO: Staff expects to provide the Commission with the final rule on or about June 17, 2016. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|-----|--|
| 09/01/2016 | TBD | Commission approves the final rule: Staff expects the Commission to issue an SRM in September, 2016, approving publication of the final rule. (projected date) |
| 12/01/2016 | TBD | Publication of final rule in the Federal Register: Staff expects to publish the final rule by December 1, 2016, pending Commission direction. (projected date) |

DRAFT

Rulemaking Activity Plan (FY 2017 - 2018)

Spent Fuel Storage and Transportation

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|---------------------------------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | List of Approved Spent Fuel Storage Casks - Holtec International HI-STORM FW Multipurpose Canister (MPC) Storage System, Amendment 2 | N/A | Spent Fuel Storage and Transportation | NMSS | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| Total | | | | | | | | | 0 | 0 | 0 | 0 |

Abstract

These rules would approve use of new and amended cask designs for dry storage of spent fuel. Casks that have been approved for use under a general license are added to list of approved designs in 10 CFR Part 72. The Nuclear Regulatory Commission publishes a varying number of these rules each year.

Priority Justification

These rules score 36 points (15, 6, 10, 5) because of the following reasons: A) Moderate contributor towards one or more goals and implements multiple strategies in one or more goals (safety strategies 2 and 3); B) Moderate contributor towards one strategy (regulatory effectiveness strategy 2); C) Significant contributor towards one or more considerations or Commission has provided specific direction and priority/schedule on the rulemaking. The staff sent SECY-01-0226, dated December 18, 2001, identifying the streamlined process that will be used for certificate of compliance (CoC) rulemakings, about five per year; and D) Significant contributor toward one or more considerations. There is significant interest by CoC holders and licensees in timely approval of CoC rulemakings, with the Office of Nuclear Material Safety and Safeguards/Spent Fuel Storage and Transportation requiring public availability of the CoC rulemaking schedule at <http://waste/spent-fuel-storage/sfs-schedule-rulemaking.html>. The typical schedule to complete a rule is 26 weeks after completion of the Safety Evaluation Report.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|---|---|
| 09/03/1998 | SRM-SECY-98-188 (ADAMS Accession No. ML003755369) | Commission approves rulemaking initiation: On September 3, 1998, the Commission approved initiation of the rulemaking. Specifically, the Commission approved the staff's proposals for simplifying the rulemaking process for CoC rulemakings for listing storage casks in 10 CFR §72.214 |
| 04/01/1999 | SRM-SECY-99-069 (ADAMS Accession No. ML003752073) | Commission directed staff to proceed expeditiously with its plans to simplify the process for amending a CoC without the need for rulemaking. |
| 01/24/2000 | SECY-00-0018 (ADAMS Accession No. ML003673962) | Staff informed the Commission of the steps the staff has taken to expedite the rulemaking process for both new and amended CoCs. |
| 12/18/2001 | SECY-01-0226 (ADAMS | Staff informed the Commission of the additional steps the staff has taken to expedite the rulemaking process for both new and amended CoC |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|-------------------------------|--|
| | Accession No. ML012890170) | rulemakings.. |
| 08/30/2016 | TBD | Submit proposed rule and direct final rule to the OEDO. (projected date) |
| 11/30/2016 | TBD | Publication of proposed rule and direct final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|---------------------------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | | | | | | | | | FTE | \$K | FTE | \$K |
| High | List of Approved Spent Fuel Storage Casks - Holtec International HI-STORM 100 Cask System, Amendment 10 | N/A | Spent Fuel Storage and Transportation | NMSS | NRC-2015-0270 | N/A | AJ71 | | | | | |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| Total | | | | | | | | | 0 | 0 | 0 | 0 |

| Abstract |
|---|
| This direct final rule would amend the Commission's spent fuel storage regulations by revising the Holtec International HI-STORM 100 Cask System listing within the "List of approved spent fuel storage casks" to include Amendment No. 10 to Certificate of Compliance (CoC) No. 1014. Amendment No. 10 adds new fuel classes to the contents approved for the loading of 16x16-pin fuel assemblies into a HI-STORM 100 Cask System; allows a minor increase in manganese in an alloy material for the system's overpack and transfer cask; clarifies the minimum water displacement required of a dummy fuel rod (i.e., a rod not filled with uranium pellets); and clarifies the design pressures needed for normal operation of forced helium drying systems. |
| Priority Justification |
| The rules score 36 points (15, 6, 10, 5) because of the following reasons: A) Moderate contributors towards one or more NRC safety goals and implement multiple strategies in one or more goals (safety strategies 2 and 3); B) Moderate contributor to one organizational excellence strategy (regulatory effectiveness strategy 2); C) Significant contributors to one or more other considerations (e.g., significant public interest); or because the Commission has provided specific direction and a priority/schedule for these rulemakings. In SECY-98-188, the Commission approved staff proposals to simplify certificate of compliance (CoC) rulemakings, about five per year. There is significant interest by CoC holders and licensees in timely approval of CoC rulemakings, with the Office of Nuclear Material Safety and Safeguards/Spent Fuel Storage and Transportation requiring public availability of the CoC rulemaking schedule at http://waste/spent-fuel-storage/sfs-schedule-rulemaking.html . The typical schedule to complete a rule is 26 weeks after completion of the Safety Evaluation Report. |

| Target Completion Dates | | | | | |
|-------------------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
| 11/27/2015 | N/A | 02/24/2016 | 03/14/2016 | 02/24/2016 | 03/14/2016 |

| Milestones | | |
|----------------|-----------------|--|
| Milestone Date | Document | Milestone |
| 09/03/1998 | SRM-SECY-98-188 | Commission approves rulemaking initiation: On September 3, 1998, the Commission approved initiation of the rulemaking. Specifically, the Commission approved the staff's proposals for simplifying the rulemaking process for CoC rulemakings for listing storage casks in 10 CFR §72.214. |
| 04/01/1999 | SRM-SECY-99-069 | Commission directed staff to proceed expeditiously with its plans to simplify the process for amending a CoC without the need for rulemaking. |
| 01/24/2000 | SECY-00-0018 | Staff informed the Commission of the steps the staff has taken to expedite the rulemaking process for both new and amended CoCs. |
| 12/18/2001 | SECY-01-0226 | Staff informed the Commission of the additional steps the staff has taken to expedite the rulemaking process for both new and amended CoC rulemakings. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|-------------|---|
| 02/24/2016 | N/A | Submit proposed rule and direct final rule to the OEDO. |
| 03/14/2016 | 81 FR 13265 | Publication of proposed rule and direct final rule in the Federal Register. |

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Rulemaking Activity Plan (FY 2017 - 2018)

Decommissioning and Low-Level Waste

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--------------------------------------|--------------|-------------------------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Low-Level Radioactive Waste Disposal | 61 | Decommissioning and Low-Level Waste | NMSS | NRC-2011-0012 | N/A | AI92 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| Total | | | | | | | | | 0 | 0 | 0 | 0 |

Abstract

This rule would require part 61 licensees to conduct site-specific analyses, including an intruder assessment, and make additional changes to the current regulations to reduce ambiguity and facilitate implementation.

Priority Justification

The rule scores 37 points (14, 8, 10, 5) because of the following reasons: A) Moderate contributor toward one or more goals and implements multiple strategies in one or more goals (safety strategies 1 and 2); B) Moderate contributor toward multiple strategies (regulatory effectiveness strategies 1 and 2); C) Significant contributor toward one or more considerations or the Commission has provided specific direction and priority/schedule on the rulemaking. In SRM-SECY-08-0147, the Commission directs staff to prepare this rule and it addresses a regulatory gap; and D) There is significant interest in this rule from industry and stakeholders.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 03/18/2009 | 09/30/2010 | 07/18/2013 | 03/26/2015 | 05/30/2016 | 11/30/2016 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|---|--|
| 10/07/2008 | SECY-08-0147 (ADAMS Accession No. ML0818207622) | Request Commission approval to initiate rulemaking: On October 7, 2008, the staff requested Commission approval to initiate the rulemaking. Staff recommends conducting a limited rulemaking to revise Part 61 to specify the need for a disposal facility licensee or applicant to conduct a site-specific analysis that addresses the unique characteristics of the waste and the additional considerations required for its disposal prior to disposal of large quantities of depleted uranium (DU) and other unique waste streams such as reprocessing waste. The technical requirements associated with disposal of large quantities of DU would be developed through the rulemaking process. Specific parameters and assumptions staff recommends for conducting the site-specific analysis would be incorporated into a guidance document that would be issued for public comment prior to being finalized. |
| 03/18/2009 | SRM-SECY-08-0147 (ADAMS Accession No. ML0907709880) | Commission approves rulemaking initiation: On March 18, 2009, the Commission approved initiation of the rulemaking. Specifically, the Commission has approved the staff's recommended Option 2 to 1) proceed with rulemaking in 10 CFR Part 61 to specify a requirement for a site-specific analysis for the disposal of large quantities of DU and the technical requirements for such an analysis; and 2) to develop a guidance document for public comment that outlines the parameters and assumptions to be used in conducting such site-specific analyses. |
| 04/01/2009 | N/A | Initiate development of the regulatory basis. |
| 04/07/2010 | SECY-10-0043 (ADAMS Accession No. ML090410531)) | Request Commission approval to expand the scope of rulemaking: On April 7, 2010, the staff requested Commission approval to adopt a risk-informed, performance-based low-level radioactive waste (LLRW) blending policy and address blended waste issue in the on-going 10 CFR Part 61 "Unique Waste Stream" rulemaking. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|--|--|
| 09/30/2010 | N/A | Office of Federal and State Materials and Environmental Management Programs (FSME) completed and accepted the regulatory basis document and initiated the rulemaking. |
| 10/13/2010 | SRM-SECY-10-0043 (ADAMS Accession No. ML102861764) | Commission approves expanding the scope of rulemaking: On October 13, 2010, the Commission approved initiation of the rulemaking. Specifically, the Commission approved the staff's recommended Option 2 to revise the Commission's current position on blending to be risk-informed and performance-based. As described in SECY-10-0043, Option 2 will be implemented through a combination of rulemaking and the issuance of guidance. |
| 05/03/2011 | 76 FR 24831 | Preliminary proposed rule language and regulatory basis published. |
| 06/18/2011 | N/A | Close of public comment period. |
| 11/03/2011 | COMWDM-11-0002/COMGEA-11-0002 (ADAMS Accession No. ML113070543) | Revision of the regulatory basis and preliminary proposed rule language: On November 3, 2011, the Commission proposed to "change the current rulemaking regarding site-specific analysis in order to bring a clearer risk-informed approach to Part 61. Doing so would eliminate the need for the far more complex rulemaking currently envisioned for the FY2014 time frame." |
| 01/19/2012 | SRM-COMWDM-11-0002/COMGEA-11-0002 (ADAMS Accession No. ML120190360) | On January 19, 2012, the Commission approved "expanding the current limited-scope revision to Part 61 regarding site-specific analysis to bring a clearer risk-informed approach to Part 61. The Commission agrees that there is value in considering, through extensive interactions with stakeholders, whether the risk-informed approaches below should be incorporated into the current rulemaking. Such revisions may obviate the need for a second protracted rulemaking." |
| 02/22/2012 | 77 FR 10401 | Notice of public meeting and request for comments published. |
| 05/08/2012 | 77 FR 26991 | Notice of public meeting and request for comments published. |
| 07/11/2012 | 77 FR 40817 | Notice of public meeting and request for comments published. |
| 07/31/2012 | N/A | Close of public comment period. |
| 08/13/2012 | 77 FR 48107 | Notice of workshop on performance assessments of near-surface LLRW disposal facilities. |
| 12/07/2012 | 77 FR 72997 | Publication of preliminary rule language and regulatory basis in the Federal Register. Second request for comment |
| 01/07/2013 | N/A | Close of public comment period. |
| 01/08/2013 | 78 FR 1155 | Correction notice on regulatory basis and preliminary rule language published. |
| 07/10/2013 | Letter response (ADAMS Accession No. ML13203A078) | ACRS brief on Part 61 rule (subcommittee brief on April 19, 2013). Letter report provided recommendations. |
| 07/18/2013 | SECY-13-0075 (ADAMS Accession No. ML13128A160) | Proposed rule due to the Commission: SECY paper requests Commission's approval to publish a proposed rule in the Federal Register that would amend 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste." |
| 01/24/2014 | 79 FR 4102 | Notice of public workshop published. |
| 02/19/2014 | ACRS letter (ADAMS Accession No. ML14041A152) | ACRS brief on Part 61 rule (subcommittee brief on January 16, 2014). Letter report provided recommendations. |
| 02/24/2014 | SRM-SECY-13-0075 (ADAMS Accession No. ML14043A371) | Commission directed staff to finalize proposed rule for publication. |
| 03/26/2015 | 80 FR 16082 | Publication of proposed rule in the Federal Register. |

Rulemaking Activity Plan (FY 2017 - 2018)

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|------------|-------------|---|
| 06/25/2015 | N/A | Commission brief with external stakeholders and Nuclear Regulatory Commission staff regarding Part 61 rule. No requirements were identified for staff action. |
| 07/24/2015 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments. |
| 08/27/2015 | 80 FR 51964 | Notice to re-open the comment period published in the Federal Register. |
| 09/21/2015 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments: 91 comment letters and over 1000 form letters received. |
| 05/30/2016 | TBD | Final rule due to the Commission. (projected date) |
| 11/30/2016 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

Corporate Support

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|-------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | | | | | | | | | FTE | \$K | FTE | \$K |
| High | Revision of Fee Schedules: Fee Recovery for FY 2016 | 170, 171 | Corporate Support | OCFO | NRC-2015-0223 | N/A | AJ66 | | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

The U.S. Nuclear Regulatory Commission (NRC) is proposing to amend the licensing, inspection, special project, and annual fees charged to its applicants and licensees and, for the first time, the NRC is proposing to recover its costs when it responds to third-party demands for information in litigation where the United States is not a party ("Touhy requests"). These proposed amendments are necessary to implement the Omnibus Budget Reconciliation Act of 1990 as amended (OBRA-90), which requires the NRC to recover approximately 90 percent of its annual budget through fees.

Priority Justification

The rule scores 40 points (15, 10, 10, 5) because of the following reasons: A) Moderate contributor to all safety goal strategies and security goal strategies through the monitoring and disbursement of funds to program offices; B) Direct contributor toward the openness goals - transparency (3 and 4) and participation (1); C) Direct contributor toward the effectiveness goals - regulatory processes (3 and 4); and D) Significant contributor to agency compliance with congressional mandate/priority/schedule and a significant contributor towards regulatory burden reduction.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 09/01/2015 | N/A | 02/24/2016 | 03/09/2016 | 06/08/2016 | 06/24/2016 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|-------------|---|
| 09/01/2015 | CPR Report | On September 1, 2015, this rule was added to the CPR database, and was subsequently approved by the Commission in the annual budget submission. |
| 02/10/2016 | N/A | Proposed rule due to the EDO. |
| 02/18/2016 | N/A | Proposed rule due to the CFO. |
| 02/18/2016 | N/A | Proposed rule due to the Commission. |
| 03/23/2016 | 81 FR 15457 | Publication of proposed rule in the Federal Register. |
| 05/31/2016 | N/A | Final rule due to the EDO. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|-----|---|
| 06/08/2016 | N/A | Final rule due to the CFO. (projected date) |
| 06/08/2016 | N/A | Final rule due to the Commission. (projected date) |
| 06/30/2016 | N/A | Publication of final rule in the Federal Register. (projected date) |

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Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|-------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM.No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Adjustment of Civil Penalties for Inflation for FY 2016 | 2, 13 | Corporate Support | OGC | NRC-2016-0057 | N/A | AJ72 | | FTE | \$K | FTE | \$K |
| | | | | | | | | OGC | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

This rule would amend the Commission's regulations to adjust the maximum civil monetary penalty the Nuclear Regulatory Commission can assess for violation of the Atomic Energy Act of 1954, as amended, as well as the maximum civil monetary penalty the Nuclear Regulatory Commission can assess for false claims or statements under the Program Fraud Civil Remedies Act. These adjustments are mandated by Congress through the Federal Civil Penalties Inflation Adjustment Act of 1990, as amended by the Federal Civil Penalties Inflation Adjustment Act Improvements Act of 2015.

Priority Justification

This rule scores 23 points (14, 2, 7, 0) because of the following reasons: A) Moderate contributor to the safety objective (strategy 4) and security objective 1 (strategy 2); B) Indirect contributor to the regulatory effectiveness strategy (strategy 2d); C) Congressional direction and schedule; and D) No contribution toward any considerations.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc. | Proposed Rule Publish | Final Rule to Commission/EDO/Etc. | Final Rule Publish |
|-----------------|------------------|--------------------------------------|-----------------------|-----------------------------------|--------------------|
| 09/01/2014 | N/A | N/A | N/A | 07/01/2016 | 07/31/2016 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|------------|---|
| 09/01/2014 | CPR Report | This rule was initiated when added to the CPR. This is statutorily required and is a non-discretionary rulemaking activity. |
| 07/01/2016 | TBD | Final rule due to the Commission. (projected date) |
| 07/31/2016 | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|-------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Variable Annual Fee Structure for Small Modular Reactors | 171 | Corporate Support | OCFO | NRC-2008-0664 | N/A | AI54 | | FTE | \$K | FTE | \$K |
| | | | | | | | | OCFO | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

This rule would amend the Nuclear Regulatory Commission's regulations governing annual fees to establish a variable annual fee structure for power reactors based on licensed power limits.

Priority Justification

The rule scores 20 points (0, 5, 10, 5) because of the following reasons: A) Rule does not comply with any objective; B) Moderate contributor toward the openness goal and openness strategy 3; C) Significant contributor toward congressional mandate/priority/schedule and because the Commission has approved implementation of a variable annual fee structure for small and medium sized reactors; and D) Significant contributor toward regulatory burden reduction including significant public participation and addresses a petition for rulemaking.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| 05/15/2015 | N/A | 10/16/2015 | 11/04/2015 | 04/14/2016 | 05/02/2016 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|--|
| 03/25/2009 | 74 FR 12735 | Advance notice of proposed rulemaking published in the Federal Register. |
| 03/27/2015 | SECY-15-0044 (ADAMS Accession No. ML15051A092) | Request Commission approval to initiate rulemaking. |
| 05/15/2015 | SRM-SECY-15-0044 (ADAMS Accession No. ML15135A427) | Commission approves rulemaking initiation. |
| 10/08/2015 | N/A | Proposed rule due to the EDO. |
| 10/16/2015 | N/A | Proposed rule due to the CFO. |
| 10/16/2015 | N/A | Proposed rule due to the Commission. |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|------------|-------------|---|
| 11/04/2015 | 80 FR 68268 | Publication of proposed rule in the Federal Register. |
| 12/04/2015 | N/A | Public comment period on proposed rule closes and staff begins reviewing the public comments. |
| 04/05/2016 | N/A | Final rule due to the EDO. |
| 04/13/2016 | N/A | Final rule due to the CFO. |
| 04/14/2016 | N/A | Final rule due to the Commission. |
| 05/02/2016 | TBD | Publication of final rule in the Federal Register: (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

3. Unfunded

Operating Reactors

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|--------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Defense Against Common Mode Failures in Digital Instrumentation and Control Systems | 50 | Operating Reactors | NRR | NRC-2015-0040 | N/A | AJ57 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

This rule would require applicants for Digital Instrumentation and Control systems to assess the defense-in-depth and diversity of proposed digital instrumentation and control systems to demonstrate that vulnerabilities to common mode failures have been adequately addressed. This is staff-initiated activity which was discussed in Item 18 of SRM-SECY-93-087.

Priority Justification

The rule scores 34 points (14, 6, 10, 4) because of the following reasons: A) Significant contributor to the safety goal (strategies 1 and 3); B) Moderate contributor to the regulatory effectiveness goal (strategies 1 and 2); C) Staff initiated activity with direction from Office of the Executive Director for Operations (OEDO) that addresses a regulatory gap and provides a future regulatory benefit; and D) There is significant interest in this rule from the public.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Proposed Rule Publish | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|-----------------------|----------------------------------|--------------------|
| TBD | TBD | TBD | TBD | TBD | TBD |

Milestones

| Milestone Date | Document | Milestone |
|----------------|-------------------------------|---|
| 07/21/1993 | SRM-SECY-93-087 (ML003708056) | Commission approves a revised position for defense against common-mode failures in digital instrumentation and control systems. Specifically, the Commission approved a revised position requiring applicants to assess the defense-in-depth and diversity of the proposed instrumentation and control system to demonstrate that vulnerabilities to common-mode failures have adequately been addressed. |
| 05/25/2016 | TBD | Commission paper describing an integrated action plan to modernize the digital instrumentation and controls regulatory infrastructure will discuss common cause failure policy and planning. |
| 05/30/2017 | TBD | Commission paper with recommendations related to rulemaking on common mode failures. A rulemaking plan will be attached as appropriate. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|--------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Approach to Risk-Inform, Performance-Base Requirements for Nuclear Power Plants | 50, 53 | Operating Reactors | NRR | NRC-2006-0008 | N/A | AH81 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

This rule would provide a risk-informed, performance-based regulatory framework for nuclear power plants. The rulemaking is primarily intended for advanced reactors, but could be used by small modular reactors or any other non-large light water reactors. An advance notice of proposed rulemaking was published in 2006, but the rulemaking effort has not advanced. The Commission approved the staff's recommendation to defer rulemaking for risk informed and performance based reactor requirements for advanced reactors until after the development of the licensing strategy for the Next Generation Nuclear Plant (NGNP), or receipt of an application for a Pebble Bed Modular Reactor design certification or combined license. The Commission directed the staff to provide a recommendation on initiating rulemaking 6 months after the development of the licensing strategy for the NGNP is finalized. Subsequently, the NGNP project was terminated. Because there is no near-term licensing test to use as a basis for determining how this rulemaking should proceed, the staff identified this rulemaking for discontinuation, pending Commission approval.

Priority Justification

The rule scores 25 points (15, 7, 3, 0) because of the following reasons: A) Significant contributor to the safety goal (Strategies 1 and 4); B) Moderate contributor toward the effectiveness objective (Strategy 1); C) addresses a significant regulatory gap; moderate Commission and Congressional interest in licensing small modular and advanced reactor designs; D) No public interest at this time; applicants are currently planning to use the Part 50 and Part 52 licensing framework.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--------------|--|
| 05/04/2006 | 71 FR 26267 | Advance notice of proposed rulemaking published. |
| 12/29/2006 | N/A | Close of public comment period. |
| 07/01/2012 | N/A | On hold pending completion of NGNP licensing test reviews. |
| 02/29/2016 | SECY-16-0021 | On February 29, 2016, the staff requested Commission approval to discontinue this rulemaking activity. |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|--------------------|-------------------|---------------|-----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Decoupling of Assumed Loss of Offsite Power (LOOP) From Loss-of-Coolant Accidents (LOCA) | 50 | Operating Reactors | NRR | NRC-2008-0606 | PRM-50-77 | AH43 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| Total | | | | | | | | | 0 | 0 | 0 | 0 |

Abstract

The rule would amend 10 CFR Part 50, Appendix A, Criterion 35, to eliminate, based on appropriate risk considerations, the assumption of a loss-of-offsite power coincident with a postulated large-break (low-frequency) loss-of-coolant accident. The rule would provide a voluntary alternative to existing requirements for satisfying specified acceptance criteria, and would consider, in part, Petition for Rulemaking (PRM)-50-77. Commission direction in Staff Requirements Memorandum (SRM)-SECY-09-0140 approved placing this rulemaking on hold pending further development on other related rulemakings.

Priority Justification

The rule scores 25 points (10, 7, 3, 5) because of the following reasons: A) Moderate contributor toward the Safety goal (Strategies 2 & 7); B) Significant contributor toward Regulatory Effectiveness (Strategies 1 & 2); C) Commission direction regarding schedule in SRM-SECY-09-0140; and D) Addresses PRM-50-77.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|---|---|
| 07/23/2001 | SECY-01-0133 | Request Commission approval to initiate rulemaking: On July 23, 2001, the NRC staff recommended rulemaking to evaluate two options to ensure ECCS reliability in place of the requirement to assume a simultaneous LOOP and an additional single failure. The staff provided a summary of the additional technical work that would need to be done to support the actual rule changes. |
| 03/29/2002 | SECY-02-0057 (ADAMS Accession No. ML0206660607) | On March 29, 2002, the staff provided the Commission with its "Fourth Status Report on Study of Risk-Informed Changes to the Technical Requirements of 10 CFR Part 50 (Option 3) and Recommendations on Risk-Informed Changes to 10 CFR 50.46 (ECCS Acceptance Criteria)." The staff noted that the performance of the technical work had identified additional issues that will require resolution. The staff stated that it "plans to pursue any appropriate rulemaking ... after the related technical studies are completed." |
| 03/31/2003 | SRM-SECY-02-0057 (ADAMS Accession No. ML030910476) | Commission approved rulemaking initiation: On March 31, 2003, the Commission directed the staff to "proceed with rulemaking, as an option, to risk-inform the ECCS functional reliability requirements in General Design Criterion 35 and thus relax the current requirements for consideration of a large-break loss of coolant accident (LBLOCA) coincident with a loss of offsite power (LOOP). ... In developing the technical bases supporting the changes, the staff should ensure that relevant issues and uncertainties that can impact plant risk are adequately considered (e.g., delayed LOOP and "double sequencing" of safety functions)." |
| 04/27/2004 | BWR Owners Group, "Separation of Loss of Offsite Power from Large Break LOCA" | On April 27, 2004, the Boiling Water Reactor (BWR) Owners Group (BWROG) submitted the topical report, "Separation of Loss of Offsite Power from Large Break LOCA" for staff review. The BWROG indicated that the topical report would support plant-specific exemption requests to implement specific plant changes that are currently not possible with the existing rule requirements. The staff recommended in SECY-04-0037, that it be allowed to finish its review of the topical report and pilot exemption request before initiating rulemaking. In its SRM of July 1, 2004, the Commission approved |

Rulemaking Activity Plan (FY 2017 - 2018)

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| | | the staff to begin rulemaking after review of the BWROG pilot exemption request. After an ongoing dialogue, on June 12, 2008, the BWROG withdrew its topical report, stating that "continued development of this LTR [Licensing Topical Report] is no longer cost effective and, if ultimately approved in the form presently desired by NRC staff, adoption by licensees would most likely be prohibitively expensive." Upon this withdrawal, the NRC staff reevaluated the rulemaking effort. |
| 09/28/2009 | SECY-09-0140 (ADAMS Accession No. ML092151078) | Because the draft final 10 CFR 50.46a risk-informed emergency core cooling system rule would not require the assumption of a LOOP when analyzing large-break LOCAs larger than the transition break size, the NRC staff recommended that the GDC 35 LOOP/LOCA rulemaking effort be discontinued. |
| 07/02/2010 | SRM-SECY-09-0140 (ADAMS Accession No. ML101830056) | The Commission's SRM directed the staff to defer the decision on continuing the rulemaking until after the 10 CFR 50.46a rule is implemented and the staff obtains feedback from industry on the potential incremental benefit of a separate LOOP/LOCA rule. |
| 12/10/2010 | SECY-10-0161 (ADAMS Accession No. ML102300252) | In SECY-10-0161 the NRC staff provided the draft final 10 CFR 50.46a rule to Commission for approval. |
| 04/26/2012 | SRM-SECY-10-0161 (ADAMS Accession No. ML12117A121) | Commission approved the staff's request to withdraw SECY-10-0161 from consideration. |
| 2/22/2016 | CA Note (ADAMS Accession No. ML16039A148) | CA note provided a status of ongoing emergency core cooling system rulemakings. The CA note stated that pending availability of resources, the staff will consider meeting with industry representatives to discuss whether and/or how to proceed on any future efforts to decouple the assumption of LOOP from LOCA analyses. |
| 04/13/2016 | SRM-SECY-16-0009 (ADAMS Accession No. ML16104A158) | Commission approved rebaselining recommendations including discontinuing the 10 CFR 50.46a rulemaking. |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|--------------------|-------------------|---------------|------------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Low | Requirement to Submit Complete and Accurate Information | 50 | Operating Reactors | NRR | NRC-2013-0077 | PRM-50-107 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRR | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

The rule would address a PRM requesting the Nuclear Regulatory Commission to revise its regulations relating to nuclear reactors at §§ 50.1, 50.9, 52.0, and 52.6 to expand its "regulatory framework to make it a legal obligation for those non-licensees who seek Nuclear Regulatory Commission regulatory approvals be held to the same legal standards for the submittal of complete and accurate information as would a licensee or an applicant for a license."

Priority Justification

The rule scores 15 points (5, 3, 2, 5) because of the following reasons: A) Less substantial or indirect contributor toward safety goal. Would incorporate lessons learned to enhance regulatory program for operating and new reactors; B) Less substantial or indirect contributor toward regulatory effectiveness strategy (Strategy 1: Proactively identify, assess, understand, and resolve safety and security issues); C) Less substantial or indirect contributor toward one or more considerations and Congress or the Commission has provided no specific direction and priority/schedule on the rulemaking. Regulatory gap and future regulatory benefit; and D) Significant contributor toward one or more considerations. The activity was initiated as a result of PRM 50-107.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|---|
| 09/30/2016 | TBD | Staff will deliver a SECY paper with recommended path forward (projected date). |

Rulemaking Activity Plan (FY 2017 - 2018)

New Reactors

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|---------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | U.S. Advanced Pressurized Water Reactor (US-APWR) Design Certification | 52 | New Reactors | NRO | NRC-2010-0133 | N/A | AI83 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

The U.S. APWR Design Certification rule would amend the Commission's regulations to 10 CFR Part 52 by issuing a new appendix for the initial certification of the U.S. APWR standard plant design. Applicants or licensees intending to construct and operate a nuclear power plant using the U.S. APWR design may do so by referencing this design certification rule.

Priority Justification

This rule scored 33 points (15, 10, 5, 3) because of the following reasons: A) Moderate contributor toward one or more goals and implements multiple strategies in one or more goals (Safety Strategies 2 and 3; Security Strategy 1); B) Moderate contributor toward multiple strategies (Regulatory Effectiveness Strategies 1, 2, and 3; Openness Strategy 3); C) Moderate contributor toward one or more considerations. Supports an NRC licensing initiative with a future regulatory benefit and has Commission and Congressional interest; and D) Moderate contributor toward one or more considerations. Moderate public interest and participation; submittal of a design certification application and a combined license application referencing the design.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| TBD | TBD | TBD | TBD | TBD |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|--|
| TBD | N/A | No specific date has been set to initiate this rulemaking. |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|---------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Incorporation of Lessons Learned From New Reactor Licensing Process (Parts 50 and 52 Licensing Process Alignment) | 52 | New Reactors | NRO | NRC-2009-0196 | N/A | AI66 | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRO | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

This rule would amend the Commission's regulations to 10 CFR Part 52 to provide clarifications and various minor revisions and incorporate lessons learned during reviews of early site permits and design certification and combined license applications.

Priority Justification

This rule scores 30 points (14, 7, 8, 1) because of the following reasons: A) Moderate contributor toward one or more goals and implements multiple strategies in one or more goals (Safety Strategies 1, 2, 3, 7 and Security Strategy 1); B) Significant contributor toward one or more strategy (Regulatory Effectiveness Strategies 1, 2, and 3; Openness Strategies 3); C) Significant contributor toward one or more considerations. Addresses a regulatory gap and conformance between the 10 CFR Parts 50 and 52 requirements, supports an NRC licensing initiative with a future regulatory benefit, and there is Commission and Congressional interest in SMRs; and D) Less substantial or indirect contributor toward one or more considerations.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| TBD | TBD | TBD | TBD | TBD |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|--|
| TBD | TBD | Staff plans to begin preparing the regulatory basis for this activity in 2019. |

Rulemaking Activity Plan (FY 2017 - 2018)

Materials Users

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|-----------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Low | Transfers of Certain Source Materials by Specific Licensees | 40 | Materials Users | NMSS | NRG-2002-0013 | N/A | AG64 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| Total | | | | | | | | | 0 | 0 | 0 | 0 |

Abstract

This rule would amend the Commission's regulations to require Nuclear Regulatory Commission approval for transfers from licensees of unimportant quantities of source material (less than 0.05 percent by weight) to persons exempt from licensing requirements. The objective of this proposed action is to ensure that the regulations regarding transfers of materials containing low concentrations of source material are adequate to protect public health and safety. A proposed rule was published for comment on August 28, 2002. Further action on this rulemaking was suspended in 2003. This rule has been identified for discontinuation, pending Commission approval.

Priority Justification

The rule scores 6 points (1, 2, 3, 0) because of the following reasons: A) Less substantial or indirect contributor toward the Safety goal (Strategy 2); B) Less substantial or indirect contributor toward Regulatory Effectiveness (Strategy 2); C) Moderate contributor toward one or more considerations on the Commission has provided specific direction with no priority/schedule on the rulemaking. While there was Commission direction for the proposed rule, it is no longer clear that the rule is necessary; and D) No contribution toward any consideration.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--------------|--|
| 08/28/2002 | 67 FR 55175 | Proposed rule published. |
| 11/12/2002 | N/A | Close of public comment period. |
| 06/24/2003 | SECY-03-0106 | Updated notification of intent to defer final rulemaking until related activities resolved. |
| 02/29/2016 | SECY-16-0021 | On February 29, 2016, the staff requested Commission approval to discontinue this rulemaking activity. |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|-----------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Sabotage of Nuclear Facilities, Fuel, or Designated Material | 73 | Materials Users | NMSS | NRC-2009-0227 | N/A | A168 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

This rule would determine whether byproduct material facilities such as hospitals, academic facilities, and other types of facilities warrant criminal sanctions under the Atomic Energy Act of 1954 as amended, for the wrongful introduction of weapons and sabotage. This rule has been identified for discontinuation, pending Commission approval.

Priority Justification

The rule scores 26 points (14, 5, 2, 5) because of the following reasons: A) Moderate contributor toward the Security goal (Strategies 1 and 2); B) Moderate contributor toward Regulatory Effectiveness (Strategy 1); C) Less substantial or indirect contributor toward one or more considerations and the Commission had provided no specific direction and priority/schedule on this rulemaking. Indirect contributor to closing a regulatory gap; and D) Significant contributor toward one or more considerations. There is a substantial interest among licensees and States to clarify this reporting requirement in the regulations.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|------------------|---|
| 09/22/2009 | M090922A | Commission guidance provided for staff to conduct assessment to determine whether including hospitals and academic facilities is warranted. |
| 06/18/2012 | SRM-SECY-12-0066 | Commission approved the staff's recommendation to defer this rulemaking until after the resolution of the 2010 Task Force Rec. 2 and consideration of actions related to chemical security and while Congress considers other criminal sanctions legislation. |
| 02/29/2016 | SECY-16-0021 | On February 29, 2016, the staff requested Commission approval to discontinue this rulemaking activity. |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|-----------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Low | Expansion of the National Source Tracking System | 20, 32 | Materials Users | NMSS | NRC-2008-0200 | N/A | AI29 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | | 0 | 0 | 0 |
| Total | | | | | | | | | 0 | 0 | 0 | 0 |

Abstract

The rule would amend the Commission's regulations to expand the current National Source Tracking System (NSTS) to include certain additional sealed sources at International Atomic Energy Agency Category 3 threshold values. The proposed amendments would require licensees to report certain transactions involving these sealed sources to the NSTS. These transactions would include the manufacture, transfer, receipt, disassembly, or disposal of the nationally tracked source. The proposed amendment would also require each licensee to provide its initial inventory of nationally tracked sources to the NSTS and annually verify and reconcile the information in the system with the licensee's actual inventory. In SRM-SECY-09-0086, dated June 30, 2009, the Commission was unable to reach a decision on the staff's recommendation to publish the final rule and, therefore, the recommendation was not approved. This rule has been identified for discontinuation, pending Commission approval.

Priority Justification

The rule scores 15 points (7, 4, 3, 1) because of the following reasons: A) moderate contributor to the security goal (Strategy 2: Maintain effective and consistent oversight of licensee performance to drive continued licensee compliance with NRC security requirements and license conditions); B) moderate contributor to the openness strategy (Strategy 3: Promote domestic and global nuclear safety and security by creating and taking advantage of opportunities to increase collaboration and share best practices with other Federal agencies; State, local, and Tribal governments; and the international regulatory community); C) Moderate contributor toward one or more strategy or the Commission has provided specific direction with no priority/schedule on the rulemaking. The NRC staff is conducting a program review of 10 CFR part 37, which includes an assessment of whether the NSTS should be expanded and will be reporting to the Commission and the Congress on this review in 2016; and D) Less substantial or indirect contributor toward addressing industry and State interest in the NSTS.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--------------|--|
| 02/29/2016 | SECY-16-0021 | On February 29, 2016, the staff requested Commission approval to discontinue this rulemaking activity. |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|-----------------|-------------------|-----------|----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Industrial Radiographic Operations and Training | 34 | Materials Users | NMSS | N/A | PRM-34-6 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

| Abstract |
|--|
| The rule would address a petition that requested the Nuclear Regulatory Commission amend its regulations to require that an individual receive at least 40 hours of radiation safety training before using sources of radiation for industrial radiography, to revise the requirements for at least two qualified individuals to be present at a temporary job site, and to clarify how many individuals are required to meet surveillance requirements. The petition also requested that NUREG-1556, Volume 2, be revised to reflect the proposed amendments. |
| Priority Justification |
| The rule scores 35 points (14, 9, 7, 5) because of the following reasons: A) Moderate contributor toward safety goal and implements multiple strategies (1, 2, and 4); B) Moderate contributor toward multiple strategies (Regulatory Effectiveness: strategy 1; Openness: Strategies 2 & 3); C) Significant contributor toward one or more considerations (conformance with external regulations, significant regulatory gap, and future regulatory benefit); and D) Significant contributor toward one or more considerations. The activity was initiated as a result of PRM 34-6 (two-person rule and training) and numerous TAR about use of electronic dosimeters for personnel monitoring of radiation exposure. |

| Target Completion Dates | | | | |
|-------------------------|------------------|-------------------------------------|----------------------------------|--------------------|
| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
| N/A | N/A | N/A | N/A | N/A |

| Milestones | | |
|----------------|----------|--|
| Milestone Date | Document | Milestone |
| N/A | N/A | This activity is unfunded and the staff does not plan to submit a rulemaking plan to the Commission, to initiate rulemaking, in the near future. |

Rulemaking Activity Plan (FY 2017 - 2018)

Fuel Facilities

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|-------------------------|--------------|---------------------------------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Spent Fuel Reprocessing | 50, 70 | Spent Fuel Storage and Transportation | NMSS | N/A | N/A | AJ53 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| Total | | | | | | | | | 0 | 0 | 0 | 0 |

Abstract

This rule would establish a framework for regulating reprocessing facilities. The development of the framework is limited in scope to the resolution of Gap 5, "Safety and Risk Assessment Methodologies and Considerations for a Reprocessing Facility," (SECY-09-0082, "Update on Reprocessing Regulatory Framework--Summary of Gap Analysis," ADAMS Accession No. ML091520280).

Priority Justification

The rule scores 30 points (15, 10, 3, 2) because of the following reasons: A) Significant contributor toward one or more goals (safety strategies 1, 2, 3, and 7; security strategies 1, 3, and 4); B) Significant contributor toward one or more strategy (regulatory effectiveness strategies 1, 2, and 3); C) Moderate contributor toward one or more considerations or the Commission has provided specific direction with no priority/schedule on the rulemaking. This rulemaking is directed by an SRM approving limited effort; and D) Moderate contributor toward one or more considerations. This rulemaking has moderate public interest and several letters of interest from industry to establish commercial reprocessing in the U.S. but no letter of intent to submit an application.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| 11/04/2013 | TBD | TBD | TBD | TBD |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--|---|
| 11/18/2011 | SECY-11-0163 (ADAMS Accession No. ML113202350) | On November 18, 2011, staff provided the Commission a draft regulatory basis document for 19 high and intermediate priority gaps. |
| 08/30/2013 | SECY-13-0093 (ADAMS Accession No. ML13178A233) | On August 30, 2013, the staff responded to Commission questions in SRM-SECY-11-0163 and requested Commission approval to initiate the rulemaking. |
| 11/04/2013 | SRM-SECY-13-0093 (ADAMS Accession No. ML13308A403) | Commission approves rulemaking initiation: On November 4, 2013, the Commission approved in part and disapproved in part the staff's proposed path forward outlined in SECY-13-0093. Specifically, the Commission approved the staff's proposal to establish a reprocessing-specific rule in a new part of the Commission's regulations, referred to notionally as "10 CFR Part 7X." However, the Commission directed that continued development of the framework be limited in scope, for the time being, to the resolution of Gap 5, "Safety and Risk Assessment Methodologies and Considerations for a Reprocessing Facility." The Commission also directed the staff to provide a notation vote paper presenting the results of this limited scope effort, upon its completion, as well as recommendations regarding next steps. Staff has been expending about 2 FTE per year with no direct contract support in this regard. |
| N/A | N/A | Conduct periodic ACRS briefings on the staff's Gap 5 resolution efforts including the (1) determination of the feasibility of requiring PRA for reprocessing by conducting a PRA for a large conceptual spent fuel reprocessing facility, and (2) development of the safety and risk assessment |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | |
|-----|-----|---|
| | | performance requirements. |
| N/A | N/A | Submit notation vote paper on reprocessing to Commission: Provide a notation vote paper to the Commission presenting the results of the draft regulatory basis for Gap 5, as well as recommendations regarding the next steps. If rulemaking is the recommended next step, then the Commission paper will either be in the form of a rulemaking plan or the rulemaking plan will be an enclosure to the SECY paper. |
| N/A | TBD | Regulatory basis completed and proposed rule and direct final rule submitted to the Commission. (projected date) |
| N/A | TBD | Publication of proposed rule and direct final rule in the Federal Register. (projected date) |
| N/A | TBD | Proposed rule due to the EDO. (projected date) |
| N/A | TBD | Publication of proposed rule in the Federal Register. (projected date) |
| N/A | TBD | Public comment period on proposed rule closes and staff begins reviewing the public comments. (projected date) |
| N/A | TBD | Final rule due to the EDO. (projected date) |
| N/A | TBD | Publication of final rule in the Federal Register. (projected date) |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|-----------------|-------------------|-----------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| High | Fitness for Duty - Security Force Fatigue at Nuclear Facilities | 26 | Fuel Facilities | NMSS | N/A | N/A | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| Total | | | | | | | | | 0 | 0 | 0 | 0 |

Abstract

This rule would address fatigue of security force personnel at certain materials licensee facilities (Category I fuel cycle). This rule has been identified for discontinuation, pending Commission approval.

Priority Justification

This rule scored 32 points (13, 7, 8, 4) because of the following reasons: A) Moderate contributor toward one goal and implements one goal strategy (Security Strategy 1); B) Moderate contributor toward multiple strategies (Regulatory Effectiveness Strategies 1 and 2); C) Significant contributor toward one or more considerations or Commission has provided specific direction and priority/schedule on the rulemaking. SRM-COMSECY-04-0037 provided Commission direction to pursue rulemaking for those facilities for which the staff believes fatigue-related requirements are necessary for the appropriate personnel; and D) Significant contributor toward one or more considerations. There is significant interest in this rule from industry and stakeholders involved with Category I fuel cycle facilities.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------------------------|--|
| 06/18/2014 | 79 FR 34641 | Draft regulatory basis published for comment. |
| 10/17/2014 | N/A | Close of public comment period. |
| 02/29/2016 | SECY-16-0021 (ML16063A134) | Based upon the limited number of licensees, the Category I licensee's willingness to self-impose a fatigue management program that included work hour limits and to incorporate that program into their security plan, the staff has determined it is a viable option. The staff sent a Commission paper to request termination of all the rulemaking activities for the 10 CFR Part 26 rulemaking for Category I licensees. This Commission paper was submitted prior to the regulatory basis due date of 3/18/2016. If the Commission terminates this rulemaking, staff will remove this entry from the Common Prioritization of Rulemaking and the Rulemaking Activity Plan in FY17/18. |
| 02/29/2016 | SECY-16-0021 | On February 29, 2016, the staff requested Commission approval to discontinue this rulemaking activity. |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|-----------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Domestic Licensing of Source Material—Amendments/Integrated Safety Analysis | 40, 150 | Fuel Facilities | NMSS | NRC-2009-0079 | N/A | AI50 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| Total | | | | | | | | | 0 | 0 | 0 | 0 |

Abstract

This rule would amend the Commission's regulations by adding additional requirements for licensees who possess significant quantities of uranium hexafluoride (UF₆). The proposed amendments would require such licensees to conduct integrated safety analyses (ISAs) similar to the ISAs performed by 10 CFR Part 70 licensees, set possession limits for UF₆ for determining licensing authority (Nuclear Regulatory Commission or Agreement States), and require NRC to perform a backfit analysis under specified circumstances. The proposed amendment would require applicants and licensees who possess or plan to possess significant amounts of UF₆ to conduct an ISA and submit an ISA summary to the Nuclear Regulatory Commission. The ISA, which evaluates and categorizes the consequences of accidents at Nuclear Regulatory Commission licensed facilities, would address both the radiological and chemical hazards from licensed material and hazardous chemicals produced in the processing of licensed material. The Nuclear Regulatory Commission is also proposing new guidance on the implementation of the additional regulatory requirements for licensees that would be authorized under this rulemaking. In an SRM dated May 3, 2013, the Commission disapproved the publication of the final rule. Instead, the Commission directed the Nuclear Regulatory Commission staff to conduct additional analyses, revise the final rule, and resubmit it to the Commission for reconsideration. Pursuant to SRM-COMSECY-15-0002, this rulemaking has been identified for discontinuation.

Priority Justification

The rule scores 27 points (14, 5, 7, 1) because of the following reasons: A) Moderate contributor toward one or more goals and implements multiple strategies in one or more goals (safety strategies 1, 2, 3, and 7); B) Moderate contributor toward the regulatory effectiveness strategy (strategy 2); C) Significant contributor toward one or more considerations. SRM to SECY-07-0146 provides Commission direction to prepare this rule and rule would address a gap in the regulations; and D) Less substantial or indirect contributor toward one or more considerations. This rulemaking has low interest from industry.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--------------|--|
| 02/29/2016 | SECY-16-0021 | On February 29, 2016, the staff requested Commission approval to discontinue this rulemaking activity. |

Rulemaking Activity Plan (FY 2017 - 2018)

Spent Fuel Storage and Transportation

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|---------------------------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Geologic Repository Operations Area Security and Material Control and Accounting Requirements | 63, 73, 74 | Spent Fuel Storage and Transportation | NMSS | NRC-2007-0670 | N/A | AI06 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

The rule would amend the Commission's regulations that would establish post September 11, 2001, security and material control and accounting requirements for a GROA to reflect the current threat environment. Due to budget constraints in the High-Level Waste program this rule has been identified for discontinuation, pending Commission approval.

Priority Justification

This rule scored 26 points (14, 7, 3, 2) because of the following reasons: A) Moderate contributor toward the security goal (Strategy 1, 3, and 4); B) Moderate contributor toward multiple regulatory effectiveness strategies (Strategy 1 and 2); C) Moderate contributor toward one or more considerations or the Commission had provided specific direction with no priority/schedule on the rulemaking. Addresses a regulatory gap; and D) Less substantial or indirect contributor toward one or more considerations and Congress or the Commission has provided no specific direction and priority/schedule on the rulemaking. Little industry and stakeholder interest in this rule.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--------------|--|
| 12/20/2007 | 72 FR 72521 | Proposed rule published. |
| 02/26/2008 | 73 FR 10187 | Extension of public comment period published. |
| 05/05/2008 | N/A | Close of comment period. |
| 02/29/2016 | SECY-16-0021 | On February 29, 2016, the staff requested Commission approval to discontinue this rulemaking activity. |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|---------------|-------------------|-----------|----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Spent Fuel Cask Certificate of Compliance Format and Content | 72 | N/A | NMSS | N/A | PRM-72-7 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

This rule would address a PRM that requests the Nuclear Regulatory Commission add a new rule that governs the format and content of spent fuel storage cask Certificates of Compliance (CoCs), extend the backfit rule to CoCs, and make other improvements that result in "more efficient and effective NRC oversight of dry cask storage activities as well as improved implementation of dry cask storage requirements by industry."

Priority Justification

The rule scores 24 points (14, 4, 1, 5) because of the following reasons: A) Moderate contributor toward one or more goals and implements multiple strategies in one or more goals (Safety goal: Strategies 1, 2, 3, and 4); B) Moderate contributor to the regulatory effectiveness strategy (Strategy 2: Regulate in a manner that manages known risks and threats effectively and efficiently, communicates requirements clearly, and ensures that regulations are applied consistently, are practical, and accommodate technology changes in a timely manner); C) Less substantial or indirect contributor toward one or more considerations and Congress or the Commission has provided no specific direction and priority/schedule on the rulemaking; and D) Moderate contributor toward one or more consideration. May reduce regulatory burden and is related to PRM-72-7.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|-----------|
|----------------|----------|-----------|

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|---------------------------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Geologic Repository Operations Area (GROA) Fitness-For-Duty Requirements | 26 | Spent Fuel Storage and Transportation | NMSS | NRC-2009-0089 | N/A | AI38 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

The rule would amend the Commission's regulations to reinstate the alcohol and drug provisions of the fitness-for-duty requirements to a GROA. The rulemaking would also impose fatigue provisions on security personnel at a GROA. Due to budget constraints in the High-Level Waste program, this rule has been identified for discontinuation, pending Commission approval.

Priority Justification

This rule scored 20 points (10, 6, 2, 2) because of the following reasons: A) Moderate contributor toward the security goal (Strategy 1); B) Moderate contributor toward the regulatory effectiveness strategy (Strategy 2); C) Moderate contributor toward one or more considerations or the Commission had provided specific direction with no priority/schedule on the rulemaking. Rule addresses a regulatory gap; and D) Less substantial or indirect contributor toward one or more considerations and Congress or the Commission has provided no specific direction and priority/schedule on the rulemaking. Little industry and stakeholder interest in this rule.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--------------|--|
| 12/20/2007 | 72 FR 72521 | Proposed rule published. |
| 03/04/2008 | N/A | Close of public comment period. |
| 02/26/2008 | 73 FR 10187 | Extension of public comment period published. |
| 05/05/2008 | N/A | Close of public comment period. |
| 02/29/2016 | SECY-16-0021 | On February 29, 2016, the staff requested Commission approval to discontinue this rulemaking activity. |

Rulemaking Activity Plan (FY 2017 - 2018)

Decommissioning and Low-Level Waste

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|-------------------------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Controlling the Disposition of Solid Materials | 20 | Decommissioning and Low-Level Waste | NMSS | NRC-1999-0002 | N/A | AH18 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| Total | | | | | | | | | 0 | 0 | 0 | 0 |

Abstract

This rule would add radiological criteria for controlling the disposition of solid materials that have no, or very small amounts of, residual radioactivity resulting from licensed operations, and which originate in restricted or impacted areas of NRC-licensed facilities. The Nuclear Regulatory Commission staff provided a draft proposed rule package on Controlling the Disposition of Solid Materials to the Commission on March 31, 2005, which the Commission disapproved (ADAMS Accession No. ML051520285). The rulemaking package included a summary of stakeholder comments (NUREG/CR-6682), Supplement 1 (ADAMS Accession No. ML003754410). The Commission's decision was based on the current high priority and complex tasks before it at the time; since then, staff has found that the current approach (to review specific cases on an individual basis) is fully protective of public health and safety. In addition, an immediate need for this rule has changed due to the shift in timing for reactor decommissioning. This rule has been identified for discontinuation, pending Commission approval.

Priority Justification

The rule scores 24 points (14, 6, 2, 2) because of the following reasons: A) Moderate contributor toward one or more goals and implements multiple strategies in one or more goal (Safety strategy 1 and 2); B) Moderate contributor toward regulatory effectiveness strategy (Strategy 2); C) Less substantial or indirect contributor toward one or more considerations and the Commission has provided no specific direction and priority/schedule on the rulemaking. Indirect contributor to closing regulatory gaps with States and the EPA. The Commission has provided no recent specific direction or schedule for the rule since the direction to defer it; and D) Moderate contributor toward one or more considerations. Moderate public interest and media coverage for this rule.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--------------|--|
| 02/29/2016 | SECY-16-0021 | On February 29, 2016, the staff requested Commission approval to discontinue this rulemaking activity. |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|-------------------------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Prompt Remediation of Residual Radioactivity During Operations | 20 | Decommissioning and Low-Level Waste | NMSS | NRC-2011-0162 | N/A | AJ17 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| Total | | | | | | | | | 0 | 0 | 0 | 0 |

Abstract

This rule would revise the Commission's Decommissioning Planning Rule (DPR) to require licensees to address the possible need to remediate residual radioactivity during the operational phase of licensed facilities in order to reduce the overall cost of decontamination and decommissioning after shutdown. On December 20, 2013, the Commission directed the staff to collect 2 years of additional data from the implementation of the DPR before deciding whether to proceed with the rulemaking. Staff expects to submit a SECY in September 2016, to propose a path forward based upon the 2 years of operating experience.

Priority Justification

The rule scores 24 points (7, 5, 7, 5) because of the following reasons: A) Moderate contributor toward the safety goal (Strategy 1); B) Moderate contributor toward multiple regulatory effectiveness strategies (Strategies 1 and 2); C) Significant contributor toward one or more considerations or the Commission has provided specific direction and priority/schedule of the rulemaking. SRM-SECY-07-0177 provides Commission direction to prepare this regulatory basis; and D) Significant contributor toward one or more considerations.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|---|
| 09/30/2016 | | Staff plans to submit a Commission paper in September 2016 regarding whether to proceed with rulemaking. If rulemaking is the recommended option, the Commission paper will either be in the form of a rulemaking plan or the rulemaking plan will be an enclosure. |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---------------------------------------|--------------|-------------------------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Low | Entombment Options for Power Reactors | 20,50 | Decommissioning and Low-Level Waste | NMSS | NRC-2001-0012 | N/A | AG89 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

This rule would clarify the use of entombment for power reactors. The Nuclear Regulatory Commission had determined that entombment of power reactors was a technically viable decommissioning alternative and could be accomplished safely. An advance notice of proposed rulemaking (ANPRM) was published seeking stakeholder input on three proposed regulatory options and whether entombment was a viable decommissioning alternative. In SECY 02-0191 (October 25, 2002), Nuclear Regulatory Commission staff proposed deferring the rulemaking until the Office of Nuclear Regulatory Research completed research to develop a sound technical basis for an entombment option. The Office of Nuclear Regulatory Research conducted research in 2004 and 2005, and the work was terminated in FY 2005, at the direction of the Commission. A research information letter was prepared summarizing the research results and regulatory implications of using concrete barriers to prevent or control the release of radioactive materials from waste disposal facilities or contaminated sites. This rule has been identified for discontinuation, pending Commission approval.

Priority Justification

The rule scores 2 points (1, 1, 0, 0) because of the following reasons: A) Less substantial or indirect contributor toward one goal (Safety Strategy 1); B) Less substantial or indirect contributor toward regulatory effectiveness (Strategy 1); C) No contribution toward any consideration. Research on this issue was terminated in FY 2005, at the direction of the Commission; and D) No contribution toward any consideration. This is not of significant interest to industry, nongovernmental organizations (NGOs), or other members of the public. This rule is recommended for discontinuation in a notation vote paper (SECY-16-0021).

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| N/A | N/A | N/A | N/A | N/A |

Milestones

| Milestone Date | Document | Milestone |
|----------------|--------------|--|
| 02/29/2016 | SECY-16-0021 | On February 29, 2016, the staff requested Commission approval to discontinue this rulemaking activity. |

Rulemaking Activity Plan (FY 2017 - 2018)

Corporate Support

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|-------------------|-------------------|---------------|---------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| Medium | Receipts-Based Small Business Size Standards | 2, 171 | Corporate Support | OCFO | NRC-2014-0264 | N/A | AJ51 | | FTE | \$K | FTE | \$K |
| | | | | | | | | | | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

This proposed rule would amend the size standards that NRC uses to qualify an NRC licensee as a "small entity" under the Regulatory Flexibility Act of 1980, as amended.

Priority Justification

The rule scores 17 points (0, 4, 8, 5) because of the following reasons: A) Does not contribute toward any goal; B) moderate contributor to the openness strategy (Strategy 1: Make information about the NRC's responsibilities and activities clear and accessible to stakeholders.); C) Significant contributor toward one or more considerations. Conform regulations with the the Small Business Regulatory Enforcement Fairness Act, the Regulatory Flexibility Act, and the Small business Administration's receipts-based size standards; and D) Significant contributor toward one or more considerations because it may reduce regulatory burden.

Target Completion Dates

| Rule Initiation | Regulatory Basis | Proposed Rule to Commission/EDO/Etc | Final Rule to Commission/EDO/Etc | Final Rule Publish |
|-----------------|------------------|-------------------------------------|----------------------------------|--------------------|
| TBD | TBD | TBD | TBD | TBD |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|--|
| N/A | N/A | Staff plans to survey NRC licensees to gather information necessary to determine whether to maintain a separate small business size standard or to adopt the Small Business Administration's standards that are based upon standard industry code classifications. |

Rulemaking Activity Plan (FY 2017 - 2018)

4. Petitions for Rulemaking

Office of Nuclear Reactor Regulation

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|---------------|-------------------|---------------|------------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | Uninterruptible Monitoring of Coolant and Fuel in Reactors and Spent Fuel Pools | 50 | NRR | NRR | NRC-2015-0230 | PRM-50-113 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRR | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

On September 10, 2015, Dr. Alexander DeVolpi submitted a PRM requesting that the Commission amend its regulations in 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," to require "installation of ex-vessel instrumentation for uninterrupted monitoring of coolant and fuel in reactors and spent-fuel pools." The petitioner cites a 2014 National Research Council report titled, "Lessons Learned from the Fukushima Nuclear Accident for Improving Safety of U.S. Nuclear Plants," which gave high priority to Recommendation 5.1A. This recommendation stated that greater "[a]ttention to availability, reliability, redundancy, and diversity of plant systems and equipment is specifically needed for... [i]nstrumentation for monitoring critical thermodynamic parameters in reactors, containments, and spent fuel pools." In addition, the petitioner cites Section 5.1.1.4 of the report, "Instrumentation for Monitoring Critical Thermodynamic Parameters," which states that "robust and diverse monitoring instrumentation that can withstand severe accident conditions is essential for diagnosing problems, selecting and implementing accident mitigation strategies, and monitoring their effectiveness." The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| 09/10/2015 | 12/01/2015 | 02/29/2016 | 04/30/2016 | 09/30/2016 |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|---------------|-------------------|---------------|------------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | Determining Which Structures, Systems, and Components and Functions are Important to Safety | 50 | NRR | NRR | NRC-2015-0213 | PRM-50-112 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

On July 20, 2015, and supplemented on August 31, 2015, Kurt T. Schaefer submitted a PRM that requests that the Commission amend 10 CFR Part 50 by defining and providing a set of criteria "for determining which structures, systems, components and functions are 'important to safety.'"

The petition was published for public comment on January 6, 2016 (81 FR 410). The public comment period closed on March 21, 2016. The staff is continuing to analyze the specific issues raised in the petition and reviewing the comments received to date.

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| 07/20/2015 | 01/06/2016 | TBD | 01/31/2017 | 07/01/2017 |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|---------------|-------------------|---------------|------------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | In-Core Temperature Monitoring at Nuclear Power Plants | 50 | NRR | NRR | NRC-2015-0124 | PRM-50-111 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRR | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

On March 13, 2015, Mark Edward Leyse submitted a petition for rulemaking requesting that the Commission amend its regulations to require all NPP licensees to use in-core monitoring devices at different elevations and radial positions throughout a reactor. The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment. The staff is continuing to analyze the specific issues raised in the petition.

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| 03/13/2015 | 07/16/2015 | 07/29/2016 | 11/30/2016 | 05/31/2017 |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|---------------|-------------------|---------------|------------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | Improved Identification Techniques against Alkali-Silica Concrete Degradation at Nuclear Power Plants | 50 | NRR | NRR | NRC-2014-0257 | PRM-50-109 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRR | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

On September 25, 2014, Sandra Gavutis, on behalf of C-10, submitted a PRM requesting that the Commission amend its regulations to provide improved identification techniques against alkali-silica reaction (ASR) concrete degradation at NPPs. The petitioner asserts that current NRC regulations, which rely on visual inspection to identify ASR degradation, do not adequately identify ASR without petrographic analysis. The petitioner is requesting that the NRC revise applicable regulations to require adherence with current American Concrete Institute standards and ASME codes. The staff expects to submit its recommended resolution of the petition to the Commission for approval.

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| 09/25/2014 | 01/12/2015 | 02/11/2016 | 08/30/2016 | 02/28/2017 |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|---------------|-------------------|---------------|-----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | Protection of Digital Computer and Communication Systems and Networks | 73 | NRR | NRR | NRC-2014-0165 | PRM-73-18 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRR | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

On June 12, 2014, Anthony Pietrangelo, on behalf of NEI, submitted a PRM requesting that the Commission revise certain cybersecurity language in its regulations to ensure that the rules are consistent with the NRC's original intent, are less burdensome for NRC licensees, and adequately protect public health and safety and common defense and security. The public comment period closed on December 8, 2014. The NRC received 19 public comments on the petition, 15 in support, 2 opposing the proposed changes, and 2 suggesting alternatives to the changes proposed in the petition. The public comments in support of the proposed changes cited detailed examples of specific equipment that the commenters believe should be out of the scope of the cybersecurity rule. The public comments that opposed the proposed changes and those that suggested alternatives were very detailed and provided suggestions for alternative approaches to regulating cybersecurity at NPPs. The staff is continuing to analyze the specific issues raised in the petition and the public comments received.

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| 06/12/2014 | 09/22/2014 | 06/30/2016 | 10/31/2016 | 04/28/2017 |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|---------------|-------------------|---------------|-----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | Malware and Programmable Logic in Computers in Nuclear Power Plant Systems | 73 | NRR | NRR | NRC-2013-0214 | PRM-73-17 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRR | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

On March 14, 2013, as supplemented by additional information through December 19, 2013, Alan Morris submitted a PRM requesting that the Commission require "new-design programmable logic computers" be installed in the control systems of NPPs to block malware attacks on the industrial control systems of those facilities. In addition, the petitioner requests that NPP staff be trained in "the programming and handling of the non-rewriteable memories" for NPPs. The NRC received the original request on March 14, 2013. The NRC staff determined that the original request did not meet the requirements in 10 CFR 2.802, "Petition for Rulemaking—Requirements for Filing," for docketing of a PRM, and notified the petitioner on August 9, 2013. The petitioner supplemented his original petition on August 17, 21, 23, and 27, 2013. In addition, the petitioner provided additional supplemental information through December 19, 2013. On June 12, 2014, the NRC staff sent a letter to the petitioner requesting additional information. The petitioner responded with several e-mails on June 18 and 19, 2014. The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| 03/14/2013 | 02/07/2014 | 05/05/2015 | 11/30/2016 | June 2016 |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|--|
| N/A | N/A | On May 19, 2016, the FRN closing this docket was submitted to the Office of the Secretary for publication in the Federal Register. The FRN is expected to be published between May 30 th and June 3 rd . |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|---------------|-------------------|---------------|------------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | Measurement and Control of Combustible Gas Generation and Dispersal | 50 | NRR | NRR | NRC-2011-0189 | PRM-50-103 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRR | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

On October 14, 2011, the Natural Resources Defense Council (NRDC) submitted a PRM requesting that the Commission amend its regulations regarding the measurement and control of combustible gas generation and dispersal within a power reactor system. Because the issues raised by this PRM is being considered by the Commission under its review of the Fukushima NTTF report, the NRC did not institute a separate public comment period. Action on PRM-50-103 has been postponed pending further action on the Fukushima NTTF report.

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| 10/14/2011 | 01/05/2012 | TBD | TBD | TBD |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--------------------------|--------------|---------------|-------------------|---------------|-----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | Enhancing Reactor Safety | 50 | NRR | NRR | NRC-2011-0189 | PRM-50-99 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | | | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

On July 26, 2011, the NRDC submitted six PRMs (five of which have already been closed) requesting that the Commission amend its regulations to require: (1) emergency preparedness (EP) enhancements for prolonged station blackouts, (2) EP enhancements for multiunit events, and (3) licensee confirmation of seismic hazards and flooding hazards every 10 years that addresses any new and significant information. All of the PRMs cite the Fukushima NTTF report as the rationale and bases for the PRMs.

Because the issues raised by this PRM is being considered by the Commission under its review of the Fukushima NTTF report, the NRC did not institute a separate public comment period.

Action on PRM-50-99 has been postponed pending further action on the NTTF report.

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| 07/26/2011 | 09/20/2011 | TBD | TBD | TBD |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|---------------|-------------------|---------------|-------------------------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | Calculated Maximum Fuel Element Cladding Temperature | 50 | NRR | NRR | NRC-2009-0554 | PRM-50-93 and PRM-50-95 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

| Abstract |
|---|
| <p>On November 17, 2009, and June 7, 2010, Mark Edward Leyse, on behalf of the New England Coalition, submitted PRMs that request that the Commission revise 10 CFR 50.46(b)(1) to require that the calculated maximum fuel element cladding temperature not exceed a limit based on data from multirod (assembly) severe fuel damage experiments. The petitioner also requests revision of Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," to 10 CFR Part 50.</p> <p>The NRC received 20 comments, the majority of which were in support of the petition. The NRC published a second FRN on October 27, 2010 (75 FR 66007), to consolidate PRM-50-93 and PRM-50-95 and re-open the public comment period. The NRC received an additional 12 public comments.</p> <p>The staff is continuing to analyze the specific issues raised in the petitions. RES is developing a draft technical analysis to support the staff's recommendation. The WG requested and received an extension to August 2016.</p> |
| Priority Justification |
| <p>A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.</p> |

| Target Completion Dates | | | | |
|-------------------------|--|-----------------------------|--|--------------------|
| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
| 11/17/2009 | 01/25/2010 | 09/30/2016 | 11/30/2016 | 02/24/2017 |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|---------------|-------------------|---------------|----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | Nuclear Energy Institute – Fitness-for-Duty Programs | 26 | NRR | NRR | NRC-2010-0304 | PRM-26-5 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRR | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

On September 3, 2010, Anthony R. Pietrangolo, on behalf of NEI, submitted a PRM requesting that the NRC amend its regulations regarding fitness-for-duty programs to refine existing requirements based on experience gained since the regulations were last amended in 2008. The NRC published a notice of receipt of, and request for public comment on the PRM-26-5 on October 22, 2010. The public comment period ended on January 5, 2011, and the NRC received 39 comment letters from corporations, professional organizations, and private citizens. Of these 39 comment letters, 11 specifically voiced support for the petition, while 13 voiced opposition. Those comment letters that voiced neither support nor opposition to the petition itself discussed a diverse range of perspectives on the fatigue management provisions contained in 10 CFR Part 26, Subpart I. On May 16, 2011, the NRC published a notice in the Federal Register (76 FR 28192) closing the docket for this PRM because staff determined that it would be considered in the proposed rulemaking titled "Fitness-for-Duty Programs" (previously titled "Part 26, Subpart I" and "Quality Control/Quality Verification") (Docket ID: NRC-2009-0090). On December 9, 2015, a notice discontinuing the "Fitness-for-Duty Programs" rulemaking was published in the Federal Register and staff determined that these PRMs would be resolved by the NRC in a separate action (80 FR 76394).

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| 09/03/2010 | 10/22/2010 | 10/31/2016 | 03/31/2017 | 07/30/2017 |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|---------------|-------------------|---------------|----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | | | | | | | | | FTE | \$K | FTE | \$K |
| | Erik Erb – Minimum Day Off Requirement for Security Officers | 26 | NRR | NRR | NRC-2010-0310 | PRM-26-6 | N/A | | | | | |
| | | | | | | | | NRR | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

On August 17, 2010, Erik Erb submitted a petition for rulemaking requesting that the NRC amend its fitness-for-duty regulations to decrease the minimum days off requirement from an average of 3 days per week to 2.5 or 2 days per week for security officers working 12-hour shifts. The NRC published a notice of receipt of, and request for public comment on PRM-26-6 on November 23, 2010. The public comment period ended on February 7, 2011, and the NRC received 5 comment letters from corporations, professional organizations, and private citizens. The comments generally supported the petition. On May 16, 2011, the NRC published a notice in the Federal Register (76 FR 28191) closing the docket for this PRM because staff determined that it would be considered in the proposed rulemaking titled "Fitness-for-Duty Programs" (previously titled "Part 26, Subpart I" and "Quality Control/Quality Verification") (Docket ID: NRC-2009-0090). On December 9, 2015, a notice discontinuing the "Fitness-for-Duty Programs" rulemaking was published in the Federal Register and staff determined that these PRMs would be resolved by the NRC in a separate action (80 FR 76394).

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| 08/17/2010 | 11/23/2010 | TBD | TBD | TBD |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|---------------|-------------------|---------------|----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | Professional Reactor Operator Society - Fitness-for-Duty Programs | 26 | NRR | NRR | NRC-2009-0482 | PRM-26-3 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | | NRR | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

On October 16, 2009, Robert N. Meyer, on behalf of the Professional Reactor Operator Society, submitted a PRM requesting that the NRC change the term "unit outage" to "site outage" in 10 CFR Part 26 and that the definition of "site outage" read "up to 1 week prior to disconnecting the reactor unit from the grid and up to 75-percent turbine power following reconnection to the grid." The NRC published a notice of receipt of, and request for public comment on PRM-26-3 on November 27, 2009. The public comment period ended on February 10, 2010, and the NRC received 4 comment letters from NEI, nuclear power plant operators and managers, and a private citizen. The comments generally supported the petition. On May 16, 2011, the NRC published a notice in the Federal Register (76 FR 28192) closing the docket for this PRM because staff determined that it would be considered in the proposed rulemaking titled "Fitness-for-Duty Programs" (previously titled "Part 26, Subpart I" and "Quality Control/Quality Verification") (Docket ID: NRC-2009-0090). On December 9, 2015, a notice discontinuing the "Fitness-for-Duty Programs" rulemaking was published in the Federal Register and staff determined that these PRMs would be resolved by the NRC in a separate action (80 FR 76394).

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| 10/16/2009 | 11/27/2009 | TBD | TBD | TBD |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|--------------|---------------|-------------------|---------------|-----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | | | | | | | | | FTE | \$K | FTE | \$K |
| | Large Break Loss of Coolant Accident Redefinition | 50 | NRR | NRR | NRC-2004-0006 | PRM-50-75 | N/A | | | | | |
| | | | | | | | | NRR | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

The petition requests amendment of the NRC's Emergency Core Cooling System (ECCS) regulations to allow the use of an alternative maximum pipe break size for the largest pipe in the reactor coolant system in ECCS evaluation models for Light-Water Nuclear Power Reactors. The regulations currently specify the use of a double-ended rupture of the largest pipe in the reactor coolant system in ECCS models. NEI states that the proposed change is necessary to improve consistency within the existing regulations and will provide increased plant safety through the use of more realistic technical specifications in surveillance testing. The petitioner estimates regulatory improvements could be expedited by up to two years.

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| TBD | TBD | TBD | TBD | TBD |

Milestones

| Milestone Date | Document | Milestone |
|----------------|----------|--|
| N/A | N/A | In SRM-SECY-16-0009, "Recommendations Resulting from the Integrated Prioritization and Re-Baselining of Agency Activities" (ADAMS Accession No. ML16104A158), the Commission approved of discontinuing the rule. Because this rule would have addressed PRM-50-75, staff will need to address PRM 50-75 through alternative means. |

Rulemaking Activity Plan (FY 2017 - 2018)

Office of New Reactors

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|---------------|-------------------|---------------|------------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors | 50 | NRO | NRO | NRC-2015-0028 | PRM-50-110 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NRO | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

On January 15, 2015, Michael D. Tschiltz, on behalf of NEI, submitted a PRM requesting that the Commission amend its regulations to clarify the scope of applicability of 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors," to include holders of combined operating licenses (COL). The applicability and scope of the NRC's regulations in 10 CFR 50.69 currently applies to a holder of an operating license under 10 CFR Part 50; a holder of a renewed operating license under 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants"; an applicant for a construction permit or operating license under 10 CFR Part 50; or an applicant for a design approval, a combined license, or manufacturing license under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." The petitioner is requesting that the rule be amended to include holders of COLs in the scope of applicability. The NRC staff discussed this topic at public meetings held during the 2 years before NEI filed this PRM. The staff held a public meeting on September 16, 2015, to gain further understanding of the scope and bases for the petition. During the public meeting, NEI clarified that holders of COLs be included in the scope of applicability of 10 CFR 50.69, which could lead to a need for additional guidance. The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the PRM did not request public comment. The staff is preparing to submit its recommended resolution of the petition to the Commission for approval.

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| 01/15/2015 | 03/27/2015 | 12/21/2015 | 09/30/2016 | 04/28/2017 |

Rulemaking Activity Plan (FY 2017 - 2018)

Office of Nuclear Material Safety and Safeguards

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--|--------------|---------------|-------------------|---------------|---------------------------------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | Linear No-Threshold Model and Standards for Protection against Radiation | 20 | NMSS | NMSS | NRC-2015-0057 | PRM-20-28, PRM-20-29, PRM-20-30 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | NMSS | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

On February 9, 2015, February 13, 2015, and February 24, 2015, Carol S. Marcus, Mark L. Miller, and Mohan Doss, respectively, submitted nearly identical petitions requesting that the Commission amend its regulations in Part 20 of Title 10 of the Code of Federal Regulations (10 CFR), "Standards for Protection Against Radiation," to take radiation hormesis into account and end the NRC's reliance on the linear no-threshold hypothesis used to determine dose standards in its regulations. The concept of radiation hormesis claims that low doses of radiation have "no effects or protective effects" on population groups. Consequently, the petitioners request that: (1) worker dose remain at present levels, with allowances up to 100 millisievert (10 roentgen equivalent man (rem)); (2) the use of the "as low as is reasonably achievable" principle be removed entirely from the NRC's regulations; (3) public doses be raised to match worker doses; and (4) the NRC end differential doses to pregnant women, embryos, fetuses, and children under 18 years of age. The public comment period was scheduled to close on September 8, 2015; however, the NRC received requests for an extension of the comment period. The staff extended the comment period by 90 days (80 FR 50804; August 21, 2015). The comment period closed on November 19, 2015. The NRC received 635 individual public comments and 2,627 form letter comments on these PRMs. Of the 635 individual public comments received, 543 disagreed with the petition or were out of scope, and 92 agreed with the petition. The staff is continuing to analyze the specific issues raised in the petition and the public comments received.

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| 02/09/2015 | 06/23/2015 | TBD | TBD | 06/30/2017 |

Rulemaking Activity Plan (FY 2017 - 2018)

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|--------------------------------|--------------|---------------|-------------------|---------------|----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | Dry Cask Storage of Spent Fuel | 72 | NMSS | NMSS | NRC-2008-0649 | PRM-72-6 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

On November 24, 2008, C-10 Research and Education Foundation, Inc. (C-10), submitted a PRM that requests that the Commission amend its regulations governing onsite dry cask storage of spent fuel. The petitioner believes that the current regulations do not provide sufficient requirements for safe storage of spent nuclear fuel in dry cask storage at independent spent fuel storage installations (ISFSIs). The petitioner requests the following 12 changes:

1. The NRC should prohibit the production of nonconforming pre-built full scale casks specifically built for NRC certification testing.
2. The NRC certification of casks should be based on upgraded code requirements that include design criteria and technical specifications for a 100 year minimum age-related degradation timeframe.
3. The NRC should approve, as part of the original ISFSI certification process and construction license, a method for dry cask transfer capacity that would allow for immediate and safe maintenance on a faulty or failing cask.
4. The NRC should require that dry casks be qualified for transport at the time of onsite storage approval certification.
5. The NRC should require mandatory compliance with the American Society of Mechanical Engineers (ASME) codes and standards "without exception."
6. The NRC should require ASME Code stamping for fabrication.
7. All materials for fabrication should be supplied by ASME-approved material suppliers.
8. Current ASME codes and standards for conservative heat treatment and leak tightness should be adopted and enforced.
9. A safe and secure hot cell transfer station, coupled with an auxiliary pool, should be built as part of an upgraded ISFSI design certification and licensing process.
10. The NRC should require real-time heat and radiation monitoring at ISFSIs.
11. The NRC should require hardened onsite storage at all nuclear power plants (NPP).
12. The NRC should establish funding to conduct ongoing studies to provide the data required to accurately define and monitor for age-related material degradation.

The NRC received approximately 9,000 comments, the vast majority of which were in postcard format and supported the petition.

The staff is preparing to submit its recommended resolution of the petition to the Commission for approval.

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| 11/24/2008 | 03/03/2009 | 05/18/2015 | 04/29/2016 | 10/31/2016 |

Rulemaking Activity Plan (FY 2017 - 2018)

Office of the General Counsel

| General Rule Information | | | | | | | | Budget | | | | |
|--------------------------|---|------------------|------------------|----------------------|---------------|----------|---------|--------|------|-----|------|-----|
| Priority | Rule Title | CFR/ Citation | Business Line | Rulemaking Office | Docket ID | PRM No. | RIN No. | Office | FY17 | | FY18 | |
| | Agency Procedures for Responding to Adverse Court Decisions and Addressing Funding Shortfalls | 2 | OGC | OGC | NRC-2015-0264 | PRM-2-15 | N/A | | FTE | \$K | FTE | \$K |
| | | | | | | | | | 0 | 0 | 0 | 0 |
| | | | | | | | | Total | 0 | 0 | 0 | 0 |

Abstract

On October 22, 2015, Jeffrey M. Skov submitted a PRM requesting that the Commission amend its rules of practice and procedure to establish procedures for responding to adverse court decisions and to annually report to the public each instance in which the NRC does not receive "sufficient funds reasonably necessary to implement in good faith its statutory mandates."

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

Priority Justification

A prioritization justification will be completed if the Commission decides to consider this petition in the rulemaking process.

Target Completion Dates

| Date Received | Docketing Notice Published in Federal Register | Petition Determination Date | Recommendation Submitted to Commission | PRM Docket Closure |
|---------------|--|-----------------------------|--|--------------------|
| 10/22/2015 | 02/17/2016 | TBD | 06/28/2017 | 12/28/2017 |

Rulemaking Activity Plan (FY 2017 - 2018)

5. Completed

| Title | Docket ID | RIN | PRM No. | Final Action |
|--|---------------|------|------------|--|
| Final Action Published in the <i>Federal Register</i> (Rulemaking Activities) | | | | |
| List of Approved Spent Fuel Storage Casks: Holtec International HI-STORM Flood/Wind Multipurpose Storage System, Certificate of Compliance No. 1032, Amendment No. 0, Revision 1 | NRC-2015-0134 | AJ62 | N/A | On September 28, 2015, the NRC published a direct final rule (80 FR 58195) and companion proposed rule (80 FR 58222) amending its spent fuel storage regulations by revising the Holtec International HI-STORM Flood/Wind Multipurpose Storage System listing within the "List of approved spent fuel storage casks" to add Amendment No. 0, Revision 1, to Certificate of Compliance No. 1032. On January 11, 2016, the NRC published a notice in the <i>Federal Register</i> confirming the effective date of April 25, 2016, for this direct final rule (81 FR 1116). |
| List of Approved Spent Fuel Storage Casks: MAGNASTOR Cask System, Certificate of Compliance No. 1031, Amendment Nos. 0-3, Revision 1 | NRC-2015-0186 | AJ65 | N/A | On November 18, 2015, the NRC published a direct final rule (80 FR 71929) and companion proposed rule (80 FR 71982) amending its spent fuel storage regulations by revising the NAC International, Inc., MAGNASTOR Cask System listing within the "List of approved spent fuel storage casks" to add Amendment Nos. 0-3, Revision 1, to Certificate of Compliance No. 1031. On January 27, 2016, the NRC published a notice in the <i>Federal Register</i> confirming the effective date of February 1, 2016, for this direct final rule (81 FR 4574). |
| List of Approved Spent Fuel Storage Casks: Holtec International HI-STORM 100 Cask System, Certificate of Compliance No. 1014, Amendment No. 9, Revision 1 | NRC-2015-0156 | AJ63 | N/A | On January 6, 2016, the NRC published a direct final rule (81 FR 371) and companion proposed rule (81 FR 412) amending its spent fuel storage regulations by revising the Holtec International HI-STORM 100 Cask System listing within the "List of approved spent fuel storage casks" to add Amendment No. 9, Revision 1, to Certificate of Compliance No. 1014. On March 22, 2016, the NRC published a notice in the <i>Federal Register</i> confirming the effective date of March 21, 2016, for this direct final rule (81 FR 15153). |
| Final Action Published in the <i>Federal Register</i> (Petitions for Rulemaking) | | | | |
| Environmental Qualification of Electrical Equipment Applicable to Existing and New Reactors | NRC-2012-0177 | N/A | PRM-50-106 | On March 7, 2016, the NRC published a notice in the <i>Federal Register</i> denying this petition for rulemaking (81 FR 11681). |
| Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents | NRC-2014-0171 | N/A | PRM-50-108 | On May 13, 2016, the NRC published a notice in the <i>Federal Register</i> denying this petition for rulemaking (81 FR 29761). |
| Spent Fuel Storage and Disposal | NRC-2014-0014 | N/A | PRM-51-30 | On May 19, 2017, the NRC published a notice in the <i>Federal Register</i> denying this petition for rulemaking (81 FR 31532). |
| Environmental Impacts of Spent Fuel Storage During Reactor Operation | NRC-2014-0055 | N/A | PRM-51-31 | On May 19, 2017, the NRC published a notice in the <i>Federal Register</i> denying this petition for rulemaking (81 FR 31532). |
| Activities No Longer Being Pursued | | | | |
| 2015 Edition of the American Society of Mechanical Engineers Operations and Maintenance Code | N/A | N/A | N/A | This activity was combined with "2015 Edition of the American Society of Mechanical Engineers Boiler & Pressure Vessel Code." |
| Clarifying Requirements in Part 21, Reporting of Defects and Noncompliance | NRC-2012-0012 | AJ09 | N/A | In SRM-SECY-16-0009, "Recommendations Resulting from the Integrated Prioritization and Re-Baselining of Agency Activities" (ADAMS Accession No. ML16104A158), the Commission approved of discontinuing this activity. The staff will work towards removing this activity from the Unified Agenda. |
| Dose Assessments for Radioactive Effluents | NRC-2014-0044 | AJ38 | N/A | In SRM-SECY-16-0009, "Recommendations Resulting from the Integrated Prioritization and Re-Baselining of Agency Activities" |

Rulemaking Activity Plan (FY 2017 - 2018)

| | | | | |
|--|---------------|------|-----------|--|
| | | | | (ADAMS Accession No. ML16104A158), the Commission approved of discontinuing this activity. The staff will work towards removing this activity from the Unified Agenda. |
| Radiation Protection | NRC-2009-0279 | AJ29 | N/A | In SRM-SECY-16-0009, "Recommendations Resulting from the Integrated Prioritization and Re-Baselining of Agency Activities" (ADAMS Accession No. ML16104A158), the Commission approved of discontinuing this activity. The staff will work towards removing this activity from the Unified Agenda. |
| Risk-Informed Changes to Loss-of-Coolant Accident Technical Requirements | NRC-2004-0006 | AH29 | PRM-50-75 | In SRM-SECY-16-0009, "Recommendations Resulting from the Integrated Prioritization and Re-Baselining of Agency Activities" (ADAMS Accession No. ML16104A158), the Commission approved of discontinuing this activity. The staff will work towards removing this activity from the Unified Agenda. |
| Risk Management Regulatory Framework | N/A | N/A | N/A | In SRM-SECY-15-0168, "Recommendations on Issues Related to Implementation of a Risk Management Regulatory Framework" (ADAMS Accession No. ML16069A370), the Commission approved of the staff's recommendation to maintain the existing regulatory framework for the nuclear power reactor safety program area. |
| Institute of Electrical and Electronics Engineers (IEEE) Standard 603-2009 | NRC-2011-0089 | AI98 | N/A | In SRM-SECY-15-0106, "Proposed Rule: Incorporation by Reference of Institute of Electrical and Electronics Engineers Standard 603-2009, "IEEE STANDARD Criteria for Safety Systems for Nuclear Power Generating Stations" (ADAMS Accession No. ML16056A614), the Commission disapproved of the staff's recommendation to publish the proposed rule. The incorporation by reference of IEEE 603 is now included in the agency's integrated digital I&C action plan. This rulemaking activity is being discontinued. The staff will work towards removing this activity from the Unified Agenda. |

OFFICIAL USE ONLY – SENSITIVE INTERNAL INFORMATION

SUBJECT: 2017–2018 RULEMAKING ACTIVITY PLAN

The purpose of this Commissioners' Assistant (CA) note is to provide the fiscal year (FY) 2017–2018 Rulemaking Activity Plan (RAP) for the Commission's information.

In the staff requirements memorandum for SECY-15-0129, "Commission Involvement in Early Stages of Rulemaking," dated February 3, 2016 (Accession No. ML16034A441 in the NRC's Agencywide Documents Access and Management System (ADAMS)), the Commission approved the staff's recommendation to submit the RAP as an enclosure to a CA note and move the due date for the annual submission of the RAP to May/June, to coincide with the submittal of the annual budget to the Chairman.

The 2017–2018 RAP lists all rulemaking and petition for rulemaking activities being tracked by the NRC. Section 1, "Funded," lists 38 rulemaking activities that the staff is requesting to fund in the FY 2017–2018 planning period. Each rulemaking entry in Section 1 includes: (1) a summary of the objective of the rulemaking, (2) highlights of recent progress and planned actions toward completing the rulemaking, (3) the rulemaking's priority and justification, and (4) resource estimates. An executive summary of Section 1 entitled, "Rulemaking Activities to be Funded in FY 2017-2018," was submitted to the Office of the Chief Financial Officer in May for inclusion as an enclosure in the annual budget to the Chairman. Section 2, "Completed in Current FY," lists 7 rulemaking activities that will be completed in FY2016. Section 3, "Unfunded," lists 19 rulemaking activities that are currently on hold, suspended, or being considered by the Commission for possible discontinuation. Section 4, "Petitions for Rulemaking," lists 19 activities the staff is currently evaluating to determine whether the issues raised should be considered in the rulemaking process. Section 5, "Completed," is a summary table describing the final action taken on 10 rulemaking activities since the December 18, 2015, RAP (SECY-15-0166, ADAMS Accession No. ML15308A222) was submitted to the Commission.

The staff plans to make available the entire list of rulemaking and petition for rulemaking activities being tracked by the NRC on the NRC's public Web site (<http://www.nrc.gov/reading-rm/doc-collections/rulemaking-ruleforum/rule-priorities.html>), in August 2016. Only the abstract, the justification for each rulemaking's priority, and the schedule for each activity will be provided on the public Web site.

The staff has enclosed a copy of the FY 2017–2018 RAP to assist the Commission during its review of the proposed budget.

Enclosure:

1. Fiscal Year 2017-2018 Rulemaking Activity Plan

cc: C. Carpenter, ADM
D. Meyer, ADM
S. Salter, ADM
J. Widdup, ADM
C. Bladey, ADM
L. Terry, ADM

OFFICIAL USE ONLY – SENSITIVE INTERNAL INFORMATION

From: U.S. Nuclear Regulatory Commission (NRC)
Sent: 22 May 2015 16:51:03 +0000
To: Main, Jeffrey;Valencia, Jennifer;Borges, Jennifer
Subject: Changed: Open Petition for Rulemaking Dockets (All Years)

Page Watch Notification

>>>> 435 ADDED >>>> 436 ADDED >>>> 437 ADDED >>>> 438 ADDED >>>>
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Page Last Reviewed/Updated Tuesday, November 25, 2014

>>>> 675 ADDED

Page Last Reviewed/Updated Friday, May 22, 2015

You are a designated administrator for the U.S.
Nuclear Regulatory Commission (NRC) Open
Petition for Rulemaking Dockets (All Years) topic.
GovDelivery recently detected changes to the
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• <http://www.nrc.gov/reading-rm/doc-collections/rulemaking->

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Change Report

<http://www.nrc.gov/reading-rm/doc-collections/rulemaking-ruleforum/petitions-by-year/open-petitions-all-years.html>

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GovDelivery, Inc., 408 St. Peter Street, Suite 600, St. Paul, Minnesota 55102



From: Doyle, Daniel
Sent: 25 Jun 2015 15:01:24 -0400
To: Borges, Jennifer
Subject: Congressional letters for PRM-50-108 rule

Jennifer,
Should I try to follow the new template for the congressional letters for PRM-50-108? The template is for rules and doesn't have instructions for PRMs. For example, what should I put in the last three bullets? I drafted up the letters following previous examples of congressional letters for PRBs. Please take a look and let me know if you think this is okay:

[View ADAMS P8 Properties ML14307A845](#)

[Open ADAMS P8 Document \(PRM-50-108 Annual Spent Fuel Pool Evaluations Congressional Letters\)](#)

Dan

From: Doyle, Daniel
Sent: Monday, June 22, 2015 3:22 PM
To: Borges, Jennifer
Subject: RE: Congressional letters for IEEE rule

Great, thanks

From: Borges, Jennifer
Sent: Monday, June 22, 2015 3:09 PM
To: Doyle, Daniel
Subject: RE: Congressional letters for IEEE rule

Hi Dan,

I have reviewed the congressional letters and they look good.

Thank you,

Jennifer

From: Doyle, Daniel
Sent: Friday, June 19, 2015 3:43 PM
To: Borges, Jennifer
Subject: Congressional letters for IEEE rule

Jennifer,

I revised the congressional letters for the IEEE proposed rule to follow the new template. Tara asked Leslie and she said to just revise the letters without sending them through concurrence. The template was pretty straight forward, so I think it should be fine, but can you please just take a look at it and fix anything that you think needs to be fixed? Thanks.

[View ADAMS P8 Properties ML113191345](#)

[Open ADAMS P8 Document \(Rulemaking: Proposed Rule: Congressional Letters - Incorporation by Reference of Institute of Electrical and Electronics Engineers Standard 603-2009\)](#)

Dan

The Honorable Barbara Boxer
Chairman, Committee on Environment
and Public Works
United States Senate
Washington, DC 20510

Dear Madam Chairman:

Enclosed is a copy of a notice of receipt for petition for rulemaking, PRM-50-108, filed by Mr. Mark Edward Leyse on June 19, 2014. The petition requests that the NRC make new regulations concerning the use of spent fuel pool accident evaluation models. The notice will be published in the *Federal Register* shortly.

Please feel free to contact me at (301) 415-1776 if you have questions or need more information.

Sincerely,

Eugene Dacus, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Senator David Vitter

The Honorable Sheldon Whitehouse
Chairman, Subcommittee on Clean Air
and Nuclear Safety
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

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cc: Senator Jeff Sessions

The Honorable Fred Upton
Chairman, Committee on Energy
and Commerce
United States House of Representatives
Washington, DC 20515

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Sincerely,

Eugene Dacus, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Henry A. Waxman

The Honorable Ed Whitfield
Chairman, Subcommittee on Energy
and Power
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

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Sincerely,

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Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Bobby L. Rush

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Chairman, Subcommittee on Environment
and the Economy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

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Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Paul Tonko

IDENTICAL LETTERS SENT TO:

The Honorable Barbara Boxer with cc: to Senator David Vitter

The Honorable Sheldon Whitehouse with cc: to Senator Jeff Sessions

The Honorable Fred Upton with cc: to Representative Henry A. Waxman

The Honorable Ed Whitfield with cc: to Representative Bobby L. Rush

ADAMS Accession No: ML14223B142

*via e-mail

| OFFICE | ADM/DAS/RADB/RT | ADM/DAS/RADB/TL | ADM/DAS/RADB/BC | OCA/D |
|--------|-----------------|---------------------------|-----------------|--------|
| NAME | JBorges | LTerry (JShepherd for) | CBladey | EDacus |
| DATE | 9/29/14 | 9/29/14 | 9/29/14 | |

OFFICIAL AGENCY RECORD

The Honorable Barbara Boxer
Chairman, Committee on Environment
and Public Works
United States Senate
Washington, DC 20510

Dear Madam Chairman:

Enclosed is a copy of a notice of receipt and request for public on a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edward Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

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Committee on Environment and Public Works
United States Senate
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Office of Congressional Affairs

Enclosure: *Federal Register* Notice

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and Commerce
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Washington, DC 20515

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Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Henry A. Waxman

The Honorable Ed Whitfield
Chairman, Subcommittee on Energy
and Power
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

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Office of Congressional Affairs

Enclosure: *Federal Register* Notice

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Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

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Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Paul Tonko

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and the Economy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

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Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Paul Tonko

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The Honorable Barbara Boxer with cc: to Senator David Vitter
The Honorable Sheldon Whitehouse with cc: to Senator Jeff Sessions
The Honorable Fred Upton with cc: to Representative Henry A. Waxman
The Honorable Ed Whitfield with cc: to Representative Bobby L. Rush

ADAMS Accession No: MLXXXXXXXXXX

*via e-mail

| OFFICE | ADM/DAS/RADB/ RT | ADM/DAS/RADB /TL | ADM/DAS/RADB /BC | | OGC | OCA/D |
|--------|---------------------|---------------------|---------------------|--|-----|--------|
| NAME | JBorges | LTerry | CBladey | | | EDacus |
| DATE | | | | | | |

OFFICIAL AGENCY RECORD

The Honorable James M. Inhofe
Chairman, Committee on Environment
and Public Works
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

The U.S. Nuclear Regulatory Commission (NRC) is publishing the following document in the *Federal Register*:

- Title: Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents [NRC-2014-0171].
- Description of the document: This *Federal Register* notice ~~document~~ denies a petition for rulemaking (PRM), ~~(docketed as PRM-50-108,)~~ submitted by Mr. Mark Edward Leyse that requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes.
- Dates: The docket for the petition for rulemaking, PRM-50-108, will be is closed on the date of publication.

For more information, see the enclosed document.

Please contact me at 301-415-1776 if you have questions or need more information.

Sincerely,

Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Senator Barbara Boxer

Comment [JLB]: Please use e-letterhead for these letters. ADM will transmit the package to SECY electronically.

Comment [TL]: Make changes to all letters.

The Honorable Shelly Moore Capito
Chairman, Subcommittee on Clean Air
and Nuclear Safety
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

Dear Madam Chairwoman:

The U.S. Nuclear Regulatory Commission (NRC) is publishing the following document in the *Federal Register*:

- Title: Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents.
- Description: This *Federal Register* notice denies a petition for rulemaking (docketed as PRM-50-108) that requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes.
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For more information, see the enclosed document.

Please contact me at 301-415-1776 if you have questions or need more information.

Sincerely,

Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Senator Thomas R. Carper

The Honorable Fred Upton
Chairman, Committee on Energy
and Commerce
United States House of Representatives
Washington, DC 20515

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Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Representative Frank Pallone, Jr.

The Honorable Ed Whitfield
Chairman, Subcommittee on Energy
and Power
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

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Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Representative Bobby L. Rush

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Committee on Energy and Commerce
United States House of Representatives
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For more information, see the enclosed document.

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Enclosure:
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For more information, see the enclosed document.

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Sincerely,

Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Representative Paul Tonko

IDENTICAL LETTERS SENT TO:

The Honorable James M. Inhofe with cc: to Senator Barbara Boxer

The Honorable Shelly Moore Capito with cc: to Senator Thomas R. Carper

The Honorable Fred Upton with cc: to Representative Frank Pallone, Jr.

The Honorable Ed Whitfield with cc: to Representative Bobby L. Rush

ADAMS Accession Nos: LTR: ML14307A845; FRN: ML14307A630

| OFFICE | NRR/DPR/PRMB/PM | NRR/DPR/PRMB/RS | NRR/DPR/PRMB/BC | NRR/DPR/DD |
|--------|----------------------------|----------------------|-----------------|------------|
| NAME | DDoyle | GLappert | TInverso | AMohseni |
| DATE | 7/14/2015 | 7/16/2015 | 7/27/2015 | 7/27/2015 |
| OFFICE | NRR/DPR/D | ADM/DAS/RADB/BC | OCA | |
| NAME | LKokajko (AMohseni for) | CBladey (LTerry for) | EDacus | |
| DATE | 7/31/15 | 8/24/2015 | | |

OFFICIAL RECORD COPY

From: Borges, Jennifer
Sent: 3 Jun 2015 19:49:05 +0000
To: Doyle, Daniel
Subject: Declined: PRM-50-108 - next steps

From: Borges, Jennifer
Sent: 12 Nov 2014 14:26:31 +0000
To: Doyle, Daniel
Cc: Barczy, Theresa
Subject: Declined: PRM-50-108 working group meeting

Hi Dan,

I won't be able to make this meeting. My daughter broke her arm over the holiday and I'm heading to the orthopedist in few minutes. If you have any questions for ADM or need immediate assistance, please contact Theresa Barczy.

Thank you,

Jennifer Borges
Regulations Specialist
Rules Team
ADM/DAS/RADB

Location: 3WFN 6-A38
' 301-287-0999



jennifer.borges@nrc.gov

From: Borges, Jennifer
Sent: 3 May 2016 16:53:46 +0000
To: Craver, Patti; Lewis, Antoinette; Remsburg, Kristy; McCloskey, Bridin
Cc: Bladey, Cindy; DeJesus, Anthony; Doyle, Daniel; Doyle, Daniel; Terry, Leslie
Subject: Electronic Transmittal: Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents" (PRM-50-108; NRC-2014-0171)
Attachments: ogc nlo on prm-50-108.pdf, FRN PRM-50-108 ADM Redline.lst.docx, PRM-50-108 REDLINE Congressional Letters.lst.docx, prm-50-108_Letter to petitioner.lst.docx, frn - redline strikeout.docx, letter to petitioner - redline strikeout.docx
Importance: High

Hello,

ADM is submitting for your signature and concurrent publication in the *Federal Register* the denial of the petition for rulemaking entitled "Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents" (PRM-50-108; NRC-2014-0171). Please provide to the Office of the Federal Register (OFR) the signed document, the certified copies of the document, and a copy of the document on a diskette. In your transmittal sheet going to the OFR, please request that they use the diskette to typeset the document.

ADM is also electronically transmitting the congressional letters.

The ADAMS accession number for the package is [ML16061A114](#) and the ADAMS accession numbers for the individual documents are:

- *Federal Register* notice (FRN) regarding the denial of the petition for rulemaking entitled "Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents" (PRM-50-108; NRC-2014-0171), ADAMS Accession No. [ML16022A185](#).
- Letters from SECY to the petitioners, notifying them that the petition has been denied (ADAMS Accession No. [ML16022A187](#)).
- Congressional letters (ADAMS Accession No. [ML14307A845](#)).

The related SECY paper/SRM is SRM-SECY-15-0146 (ADAMS Accession No. [ML16096A197](#)). The SRM redline markups are attached. ADM has confirmed that the changes have been made. If SECY has any concerns please contact ADM. Also attached is a marked up copy showing the Office of Administration requested changes to the FRN.

The Office of the General Counsel reviewed and concurred on this notice on April 22, 2016 (see attached e-mail containing NLO).

Please provide a copy of the signed document to the Office of Congressional Affairs to be dispatched with the congressional letters.

Also, please return a copy of the signed notice to me, Mail Stop O-12H08.

You may direct questions to me at 301-415-3647 (e-mail: Jennifer.Borges@nrc.gov) or Leslie Terry at 301-415-1167 (e-mail: Leslie.Terry@nrc.gov).

Thank you,


Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

Location: OWFN 12-G07

 301-415-3647

 jennifer.borges@nrc.gov

Doyle, Daniel

From: Mizuno, Geary
Sent: Friday, April 22, 2016 4:40 PM
To: Doyle, Daniel
Cc: Spencer, Mary; Gendelman, Adam
Subject: RE: PRM-50-108 (post-SRM) - please provide NLO (OGC Ticket 2016-1544)

Categories: PRM-50-108

Dan:

By this e-mail, I am providing a NLO to the FRN and the letter to the petitioner informing him of the NRC's action (OGC Ticket 2016-1544).

Please note, that OGC's NLO does not apply if there are any changes to the package (other than typographic and grammar corrections) which are made after OGC provides its NLO. Such changes should be brought to the attention of OGC to ensure that the changes themselves do not raise new legal issues not present in the version forming the basis for OGC's NLO, or that the changes upset OGC's previous bases for providing the NLO. This e-mail serves as the official record of OGC's NLO.

Geary S. Mizuno

From: Doyle, Daniel
Sent: Friday, April 15, 2016 11:17 PM
To: OGCMailCenter Resource <OGCMailCenter.Resource@nrc.gov>
Cc: Mizuno, Geary <Geary.Mizuno@nrc.gov>
Subject: PRM-50-108 (post-SRM) - please provide NLO

I am requesting NLO on the attached *Federal Register* notice and letter to the petitioner for PRM-50-108. ADAMS links are also provided below. These documents include the edits directed by the Commission in SRM-SECY-15-0146 (ML16096A192). Also, as requested by Geary in his email 4/5/16 at 2:34pm, the word "new" was deleted from the letter to the petitioner so it matches the conclusion in the FRN. For your convenience, I have attached a redline/strikeout version of both documents showing all changes from the versions in SECY-15-0146.

[View ADAMS P8 Properties ML16022A185](#)

[Open ADAMS P8 Document \(FRN: Petition for Rulemaking: Denial: Spent Fuel Pool Evaluations \(PRM-50-108\)\)](#)

[View ADAMS P8 Properties ML16022A187](#)

[Open ADAMS P8 Document \(LTR to Mark Leyse, Petitioner from Annette Vietti-Cook RE: Denial of Petition for Rulemaking: Spent Fuel Pool Evaluations \(PRM-50-108\)\)](#)

Dan
415-3748

ADM redline

[7590-01-P]

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM or the petition), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking with respect to SFPs or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on [INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*].

Comment [TL]: Change made because we use both.

Comment [TL]: Consistent with how we have defined it in the previous section.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this ~~(action petition)~~ by any of the following methods:

Comment [TL]: To be consistent with previous sentence:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for

Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):**

You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "ADAMS Public Documents" and then select "Begin Web-Based ADAMS Search." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

TABLE OF CONTENTS:

- I. [The Petition]
- II. Reasons for Denial:
- III. Conclusion:
- IV. Availability of Documents:

I. The Petition

Section 2.802 of [File Title] 10 of the *Code of Federal Regulations* (10 CFR), "[Petition for rulemaking—requirements for filing]" provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition [for rulemaking] dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air

Comment [TL]: OFR formatting requirement.

Comment [TL]: OFR formatting requirement.

Comment [TL]: OFR formatting requirement.

Comment [Adj]: Should we be using the new title? I forgot to do this in the PRM I sent to SECY last week. YES.

Comment [TL]: For consistency.

reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR simulations predict. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner stated that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential

consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations that would be required by the fourth requested regulation would be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk

of an SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate an SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to an SFP fire. In order for an SFP fire to occur, all SFP systems, backup systems, and operator actions that are intended to prevent the spent fuel in the pool from being uncovered would have to fail. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of an SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner stated that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that an SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and, ultimately, an SFP

accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response

Spent nuclear fuel offloaded from a reactor is initially stored in an SFP. The SFPs at all nuclear plants in the United States are robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage.

Studies conducted over the last four decades have consistently shown the risk of an accident causing a zirconium fire in an SFP to be low. The risk of an SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools," (ADAMS Accession No. ML082330232), in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS

Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (51 FR 30028; August 21, 1986) and that no new regulatory requirements were warranted.

The risk of an SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, an SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even with this conservative assumption, the study found the risk of an SFP fire to be low and well within the Commission's Safety Goals.

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability and, accordingly, the risk of an SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC took extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and

maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

Also, in 2014, the NRC documented a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). In COMSECY-13-0030, the NRC staff concluded that SFPs are robust structures with large safety margins and recommended to the Commission that assessments of possible regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage were not warranted. The Commission subsequently approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this noticed document, the NRC has determined that the risk of an SFP severe accident is low. While the risk of a severe accident in an SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent

Comment [TL]: Will publish in proposed rules section of the Federal Register, therefore, we do not call it a "notice."

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

parameters, and maintain cooling capability; mitigation measures in place if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (77 FR 74788; December 18, 2012) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and license amendment reviews. In addition, baseline NRC inspections provide ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate an SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and their results

proposed to be provided to the NRC are not needed for the effectiveness of the NRC's approach to ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs and protective actions for plant personnel and the public to limit exposure to radioactive materials.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. At least two NRC resident inspectors are assigned to each site to provide monitoring and inspection of routine and special activities. They are aware of, and routinely observe, SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees as a result of an NRC order or a change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects and noncompliances associated with basic components, which include SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and noncompliances. The NRC is also informed of events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, a nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant or licensee as having a significant implication for public health and safety or common defense and security must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The annual evaluations requested in the petition would not provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would

postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent uncovering of the fuel, the information that would be obtained from the proposed requirement in the petition would not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2. The petitioner stated that there are serious flaws with MELCOR, which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response:

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish

requirements for how such an evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's statements that MELCOR is flawed.

There are inherent uncertainties in the progression of severe accidents. There are many interrelated phenomena that need to be properly understood; otherwise, conservatism in one area may lead to overall non-conservative results. Conservatism can be meaningfully introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

The important question for a severe accident analysis is whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussing the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multi-unit or concurrent accident, or fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and, even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has been validated against experimental data, and it represents the current state of the art in severe accident analysis. In NUREG-2161, the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment, core relocation to the vessel lower head, and ex-vessel core concrete interaction." Furthermore, MELCOR has been benchmarked against many experiments, including separate

and integral effects tests for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

Additional information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161. The NRC also addressed questions regarding MELCOR in Appendix D to NUREG-2157, Volume 2, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," (ADAMS Accession No. ML14196A107).

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-------------------|---|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leye. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |

| | | |
|-----------------|--|-------------|
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

_____ Dated at Rockville, Maryland, this day of , 2016.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.



ADM redline
UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Comment [TL]: Make this change to all letters.

The Honorable James M. Inhofe
Chairman, Committee on Environment
and Public Works
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

The U.S. Nuclear Regulatory Commission (NRC) is publishing the following document in the *Federal Register*.

- Title: Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents [NRC-2014-0171].
- Description of the document: This document denies a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse. The petition requests that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool accident scenarios for use by the NRC in severe accident response.
- ~~Dates: The docket for the petition, the petition for rulemaking, PRM-50-108, will be closed on the date of publication.~~

For more information, see the enclosed document.

Please contact me at 301-415-1776 if you have questions or need more information.

Sincerely,

Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Senator Barbara Boxer



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

The Honorable Shelley Moore Capito
Chairman, Subcommittee on Clean Air
and Nuclear Safety
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

Dear Madam Chairwoman:

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Sincerely,

Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Senator Thomas R. Carper



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

The Honorable Fred Upton
Chairman, Committee on Energy
and Commerce
United States House of Representatives
Washington, DC 20515

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Sincerely,

Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Representative Frank Pallone, Jr.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

The Honorable Ed Whitfield
Chairman, Subcommittee on Energy
and Power
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

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Sincerely,

Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Representative Bobby L. Rush



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

The Honorable John Shimkus
Chairman, Subcommittee on Environment
and the Economy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

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Enclosure:
Federal Register notice

cc: Representative Paul Tonko

The Honorable John Shimkus
Chairman, Subcommittee on Environment
and the Economy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

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Enclosure:
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cc: Representative Paul Tonko

IDENTICAL LETTERS SENT TO:

The Honorable James M. Inhofe with cc: to Senator Barbara Boxer

The Honorable Shelley Moore Capito with cc: to Senator Thomas R. Carper

The Honorable Fred Upton with cc: to Representative Frank Pallone, Jr.

The Honorable Ed Whitfield with cc: to Representative Bobby L. Rush

ADAMS Accession Nos: LTR: ML14307A845; FRN: ML14307A630

| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR:DD |
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| NAME | DDoyle | GLappert | TInverso | AMohseni |
| DATE | 7/14/2015 | 7/16/2015 | 7/27/2015 | 7/27/2015 |
| OFFICE | NRR/DPR:D | ADM/DAS/RADB:BC* | OCA | |
| NAME | LKokajko (AMohseni for) | CBladey (JBorges for) | EDacus | |
| DATE | 7/31/2015 | 8/24/2015 | | |

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ADM redline
UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition did not present information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC, as requested by the petition, is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the FR.

The docket for this petition, PRM-50-108, is closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking with respect to SFPs or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):** You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

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- II. Reasons for Denial.
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- IV. Availability of Documents.

I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air

reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR indicates simulations predict. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner ~~claimed~~stated that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential

consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations in that would be required by the fourth requested regulation should would be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents

because the risk of aan SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate aan SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to aan SFP fire. In order for aan SFP fire to occur, all SFP systems, backup systems, and operator actions ~~would have to fail~~that are intended to prevent the spent fuel in the pool from being uncovered would have to fail. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of aan SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner ~~claimed~~stated that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that aan SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several

examples of events that could lead to a long-term station blackout and, ultimately, a an SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in a an SFP. The SFPs at all nuclear plants in the United States are extremely robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding ~~as a result of the significant volume of water above the spent fuel.~~ Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage. ~~As spent fuel cools, older fuel is sometimes removed from a plant's SFP for on-site dry cask storage, depending on the space available in the SFP. Fuel removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure. They are monitored and routinely inspected for integrity, and they are protected by security measures.~~

Studies conducted over the last four decades have consistently shown that the probability risk of an accident causing a zirconium fire in a an SFP to be lower than that for ~~severe reactor accidents.~~ low. The risk of a an SFP accident was examined in the 1980s as

Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools", in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (51 FR 30028; August 21, 1986; 51 FR 30028) and that no new regulatory requirements were warranted.

The risk of aan SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, aan SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even when all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in a SFP zirconium fire with this conservative assumption, the study found the risk of aan SFP fire to be low and well within the Commission's Safety Goals.

~~In light of the changes in storage configuration of the SFP (increased to high density racks), inadvertent partial draindown events, as well as monumental events such as the September 11, 2001, terrorist attacks and the 2011 accident at the Fukushima Dai-ichi nuclear power plant, the NRC continues to examine the issue of SFP safety. Recently, the NRC~~

conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). ~~The COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).~~

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk of an SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC ~~has taken~~took extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the

Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

Also, in 2014, the NRC documented a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). In COMSECY-13-0030, the NRC staff concluded that SFPs are robust structures with large safety margins and recommended to the Commission that assessments of possible regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage were not warranted. The Commission subsequently approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of aan SFP severe accident is low. While the risk of a severe accident in aan SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures in place if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

information proposed to be provided to the NRC is not needed for the effectiveness of NRC's approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (77 FR 74788; December 18, 2012; ~~77 FR 74788~~) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and ~~for license amendment requests and provides reviews.~~ In addition, baseline NRC inspections provide ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate ~~aan~~ a SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and ~~its~~their results proposed to be provided to the NRC ~~is~~are not needed for the effectiveness of the NRC's approach ~~for~~to ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's final-safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs and protective actions for plant personnel and the public to limit exposure to radioactive materials.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly

inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. ~~The~~ At least two NRC resident inspectors are ~~permanently stationed on~~ assigned to each site to provide monitoring and inspection of routine and special activities. They are aware of, and routinely observe, SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees ~~as a result of an NRC order or a change in regulations.~~

In accordance with 10 CFR part 21, the NRC is informed of defects ~~in and failures to conform to the NRC requirements~~ and noncompliances associated with respect to basic components, which ~~includes~~ include SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and ~~failures to conform~~ noncompliances. The NRC is also informed of the events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, ~~the~~ a nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant ~~and/or~~ or licensee as having a significant implication for public health and safety or common defense and security, must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. ~~Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident require redundant equipment and strategies to address loss of cooling to SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.~~

~~It is unclear how the~~The annual evaluations requested in the petition would not provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent uncovering of the fuel~~uncovery~~, the information that would be obtained from the proposed requirement in the petition ~~does~~would not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2. The petitioner ~~claimed~~stated that there are serious flaws with MELCOR, which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how ~~the~~such an evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's ~~claims~~statements that MELCOR is flawed. ~~The following discussion is provided in order to address the petitioner's claims about the adequacy of MELCOR, even though this discussion does not form the basis for denial of this petition for rulemaking.~~

~~The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request~~

for a new requirement for licensees to perform annual evaluations of SFPs. The petitioner's request to address perceived deficiencies in current severe accident models go hand-in-hand with the petitioner's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC is providing the following information about how MELCOR is used and the NRC's views on some of the phenomena discussed in the petition.

The petitioner claimed that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petitioner also claimed that MELCOR under-predicts the zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petitioner claimed, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petitioner pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. The MELCOR computer code has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation as discussed later in this section.

The MELCOR computer code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as, otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., "zirconium fire") occurs. A self-sustaining zirconium fire will develop if the heat generation rate from reaction with oxidant exceeds the heat loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a self-sustaining zirconium fire will occur.

Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher temperatures, the presence of any measurable amount of oxygen in the gas (steam or air) attacking the cladding is sufficient to prevent the formation of surface ZrN.

Further, if ZrN does form it can be converted readily to zirconium oxide (ZrO_2) when exposed to oxygen. The heat generation from the reaction of cladding to form ZrN followed by oxidation of the ZrN to form ZrO_2 is essentially the same as the direct reaction of Zr to form ZrO_2 . This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in the petition. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre- to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.

With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS-B9R), these phenomena are well understood and recognized in the formulations of models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a SFP. The code assessment against zirconium fire experiments conducted at Sandia National Laboratory (SNL) and code-to-code comparison documented in NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident" (ADAMS Accession No. ML13072A056), address fire propagation phenomena.

The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys" (ADAMS Accession No. ML041900069). The MELCOR computer code was used in the zirconium fire experiments (see NUREG/CR-7143) and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code-to-code comparisons) as well as the SFP study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.

The recent Sandia Fuel Project by the Organisation for Economic Co-operation and Development Nuclear Energy Agency provided experimental data relevant for hydraulic and ignition phenomena of prototypic pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petitioner asserted that the SNL SFP accident experiments are unrealistic because they were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100 micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the

~~complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.~~

The important question for ~~ana~~ a severe accident analysis is ~~if~~whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to ~~discussion of~~discussing the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, ~~multiunit~~multi-unit or concurrent accident, or fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and, even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates. ~~The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volumes 1 and 2 (ADAMS Accession Nos. ML14196A105 and ML14196A107)) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 feet above the top of the fuel in the pool, therefore encompassing the effects of some of the phenomena mentioned by the petition.~~

~~In conclusion, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. The NRC has considered the most important phenomena and continues to improve the models to further reduce the uncertainties. However, the NRC wishes to emphasize that these improvement efforts do not reflect an NRC determination that the models are unacceptable for their intended use by the NRC.~~

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has been validated against experimental data, and it represents the current state of the art in severe accident analysis. In NUREG-2161, the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment, core relocation to the vessel lower head, and ex-vessel core concrete interaction." Furthermore, MELCOR has been benchmarked against many experiments, including separate and integral effects tests for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

Additional information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161. The NRC also addressed questions regarding MELCOR in Appendix D to NUREG-2157, Volume 2, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," (ADAMS Accession No. ML14196A107).

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude

that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-----------------|---|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| June 2004 | NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys." | ML041900069 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |

| | | |
|-------------------|---|-------------|
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| March 2013 | NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling-Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident." | ML13072A056 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 20152016.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,

Secretary of the Commission.

| | | |
|-------------------|---|-------------|
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements—COMSECY-13-0030—Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

_____ Dated at Rockville, Maryland, this _____ day of _____, 2015.

_____ For the Nuclear Regulatory Commission.

_____ Annette L. Vietti-Cook,
Secretary of the Commission.

ADAMS Accession Nos: PKG: ML14307A691; FRN: ML14307A630 _____ *via-email

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|--------|-------------------------------|---------------------|-----------------------|----------------------------|----------------------------------|
| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D |
| NAME | DDoyle | GLapperl | TInverso | AMohseni | LKokajko (AMohseni for) |
| DATE | 7/14/2015 | 7/16/2015 | 7/17/2015 | 7/27/2015 | 7/31/2015 |
| OFFICE | NRR/DSS:D* | NRR/JLD:D* | RES:D* | NRO:D* | ADM/DAS/RADB:BC Tech-Editing* |
| NAME | TMcGinty | JDavis (JBowen for) | BSheron (SCoffin for) | GTracy (JMonninger for) | CBlahey (JBorges for) |
| DATE | 8/24/2015 | 8/25/2015 | 8/27/2015 | 8/28/2015 | 8/24/2015 |
| OFFICE | OGC/GCLR/RMR* | NRR:D | EDO | | |
| NAME | MSpencer (GMizuno for)-NLO | WDean | VMcCree | | |
| DATE | 9/23/2015 | 10/6/15 | 11/19/15 | | |

OFFICIAL RECORD COPY



SRM redline
UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition ~~failed to~~did not present any significant new information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC, as requested by the petition, is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the FR.

The docket for this petition closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition failed to present any significant new information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petition is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the *Federal Register*.

The docket for this petition closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

ADAMS Accession Nos: PKG: ML14307A691; LTR to Petitioner: ML14307A157; FRN: ML14307A630

*Concurrence via email

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|--------|-------------------------------|---------------------|--------------------------|----------------------------|----------------------------|
| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D |
| NAME | DDoyle | GLappert | Tinverse | AMohseni | LKekajko (AMohseni for) |
| DATE | 7/14/2015 | 7/16/2015 | 7/17/2015 | 7/27/2015 | 7/31/2015 |
| OFFICE | NRR/DSS:D* | NRR/JLD:D* | RES:D* | NRO:D* | ADM/DAS/RADB:BC* |
| NAME | TMcGinty | JDavis (JBowen for) | BSheron (SCoffin for) | GTracy (JMenninger for) | GBladey (JBorges for) |
| DATE | 8/24/2015 | 8/25/2015 | 8/27/2015 | 8/28/2015 | 8/24/2015 |
| OFFICE | OGC/GCLR/RMR* | NRR:D | EDO | | |
| NAME | MSpencer (GMizuno for) NLO | WDean | VMcGree | | |
| DATE | 9/23/2015 | 10/6/15 | 11/19/15 | | |

OFFICIAL RECORD COPY

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

From: U.S. Nuclear Regulatory Commission (NRC)
Sent: 13 May 2016 09:50:57 -0500
To: Glazer, Adam;Borges, Jennifer;Valencia, Jennifer
Subject: [External_Sender] Changed: Petition for Rulemaking Dockets for 2014

Page Watch Notification

You are a designated administrator for the U.S. Nuclear Regulatory Commission (NRC) Petition for Rulemaking Dockets for 2014 topic. GovDelivery recently detected changes to the topic's Page Watch URL(s).

If you would like to notify 457 subscribers of this change, please follow this link.
If you do not wish to notify these subscribers, please disregard this message.

The topic Page Watch URL(s) that changed are:

- <http://www.nrc.gov/reading-rm/doc-collections/rulemaking-ruleforum/petitions-by-year/2014/>

See below for a detailed report of the changes that were detected.

To view Page Watch settings and other topic information, please follow this link.

Need Help? Check out our knowledge base article on
Setting Up Page Watch.

If you have further questions, contact
Customer Support.

Change Report

<http://www.nrc.gov/reading-rm/doc-collections/rulemaking-ruleforum/petitions-by-year/2014/>

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| Docket ID | PRM | Title | Status |
|---------------|------------|--|---|
| NRC-2014-0257 | PRM-50-109 | Improved Identification Techniques Against Alkali-Silica Reaction Concrete Degradation at Nuclear Power Plants | Open |
| NRC-2014-0172 | PRM-37-1 | Licensee Requirements for Physical Protection of Plants and Materials | Consideration in Rulemaking Process NRC-2015-0094 |
| NRC-2014-0171 | PRM-50-108 | Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents | Denied |
| NRC-2014-0165 | PRM-73-18 | Protection of Digital Computer and Communication Systems and Networks | Open |
| NRC-2014- | PRM- | Environmental Impacts of Spent Fuel Storage During Reactor | Open |

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|-----------------------|-----------------------|---|------|
| 0055 | 51- 31 | Operation | |
| NRC- 2014- 0014 | PRM - 51- 30 | Petition to Revise and Integrate All Safety and Environmental Regulations Related to Spent Fuel Storage and Disposal | Open |

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GovDelivery, Inc., 408 St. Peter Street, Suite 600, St. Paul, Minnesota 55102



From: Doyle, Daniel
Sent: 13 May 2016 11:51:48 -0400
To: Mizuno, Geary;Borges, Jennifer;Hernandez, Raul;Esmaili, Hossein;Casto, Greg;Witt, Kevin
Cc: Gavrilas, Mirela;Burnell, Scott;Mahoney, Michael
Subject: Final FRN for PRM-50-108
Attachments: PRM-50-108_81FR29761.pdf

Here is the published FRN denying PRM-50-108. The notice is also available at the following link:

<https://federalregister.gov/a/2016-11212>

The PRM is now closed. Thanks for your support on this project.

Dan

415-3748

From: Doyle, Daniel

Sent: Wednesday, May 11, 2016 10:18 AM

To: Mizuno, Geary ; Borges, Jennifer ; Hernandez, Raul ; Esmaili, Hossein ; Casto, Greg ; Witt, Kevin

Cc: Gavrilas, Mirela ; Burnell, Scott ; Mahoney, Michael

Subject: RE: SRM-SECY-15-0146 - PRM denial on SFP accident evaluations (PRM-50-108)

The notice denying PRM-50-108 will be published in the *Federal Register* this Friday, May 13.

The letter to the petitioner was sent out last Friday, and, per our office instruction, I informed the petitioner (via email) that the NRC's findings will be published shortly.

Dan

From: Doyle, Daniel

Sent: Thursday, May 05, 2016 10:47 AM

To: Mizuno, Geary <Geary.Mizuno@nrc.gov>; Borges, Jennifer <Jennifer.Borges@nrc.gov>; Hernandez, Raul <Raul.Hernandez@nrc.gov>; Esmaili, Hossein <Hossein.Esmaili@nrc.gov>; Casto, Greg <Greg.Cast@nrc.gov>; Witt, Kevin <Kevin.Witt@nrc.gov>

Cc: Gavrilas, Mirela <Mirela.Gavrilas@nrc.gov>

Subject: RE: SRM-SECY-15-0146 - PRM denial on SFP accident evaluations (PRM-50-108)

The FRN to close PRM-50-108 was sent to SECY for signature on Tuesday, so it should be published within the next two weeks or so. After SECY signs it, they will forward it to the Office of the Federal Register for publication. I'll send out the actual published version when I get it. Here is a link to the ADAMS package including the FRN:

[View ADAMS P8 Properties ML16061A114](#)

[Open ADAMS P8 Package \(PRM-50-108 Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents \(NRC-2014-0171\).\)](#)

Dan

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket No. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; notice of docketing.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) has received a petition for rulemaking (PRM) from Mr. Mark Edward Leyse (the petitioner), dated June 19, 2014. The petition was docketed by the NRC on July 14, 2014, and has been assigned Docket No. PRM-50-108. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The NRC is not requesting public comment on PRM-50-108 at this time.

ADDRESSES: Please refer to Docket ID **NRC-2014-0171** when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this petition by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2014-0171**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-287-3422; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **NRC's Agencywide Documents Access and Management System (ADAMS):**

You may obtain publicly available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdrr.resource@nrc.gov. The ADAMS accession number for each document referenced in this document (if that document is available in ADAMS) is provided the first time that a document is referenced. The petition, PRM-50-108, is available in ADAMS under Accession Number ML14195A388.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Project Manager, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748, e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

I. The Petitioner.

Mr. Mark Edward Leyse (the petitioner) submitted this petition for rulemaking (PRM) as an individual. In Section II of the petition, "Statement of Petitioner's Interest," the petitioner explains that he disagrees with the conclusions of recent MELCOR simulations of boiling water reactor (BWR) Mark I spent fuel pool (SFP) accident scenarios.

On December 23, 2013, Mr. Leyse submitted a PRM (ADAMS Accession No. ML14008A427)

with similar requests. On March 21, 2014, the NRC requested additional information to further clarify the petitioner's request (ADAMS Accession No. ML14023A743). On June 19, 2014 (ADAMS Accession No. ML14195A388), the petitioner responded to the request and resubmitted the petition with additional information. After evaluating the resubmitted petition, the NRC has determined that the petition meets the threshold sufficiency requirements for a petition for rulemaking under § 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," and the petition has been docketed as PRM-50-108. The NRC is not requesting public comment on PRM-50-108 at this time.

II. The Petition.

The petition requests that the NRC develop new regulations requiring that (1) spent fuel pool (SFP) accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petition references recent NRC post-Fukushima MELCOR simulations of BWR Mark I SFP accident/fire scenarios. The petition states that the conclusions from the NRC's

MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petition states that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium fires than MELCOR indicates. The petition states that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petition claims that the new regulations would help improve public and plant-worker safety. The petitioner asserts that the first three proposed regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petition states that the fourth proposed regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petition states that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs.

Dated at Rockville, Maryland, this XX day of XXXX, 2014.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket No. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; notice of docketing.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) has received a petition for rulemaking (PRM) from Mr. Mark Edward Leyse (the petitioner), dated June 19, 2014. The petition was docketed by the NRC on July 14, 2014, and has been assigned Docket No. PRM-50-108. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The NRC is not requesting public comment on PRM-50-108 at this time.

ADDRESSES: Please refer to Docket ID **NRC-2014-0171** when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this petition by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2014-0171**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-287-3422; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **NRC's Agencywide Documents Access and Management System (ADAMS):**

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- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Project Manager, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748, e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

I. The Petitioner.

Mr. Mark Edward Leyse (the petitioner) submitted this petition for rulemaking (PRM) as an individual. In Section II of the petition, "Statement of Petitioner's Interest," the petitioner explains that he disagrees with the conclusions of recent MELCOR simulations of boiling water reactor (BWR) Mark I spent fuel pool (SFP) accident scenarios.

On December 23, 2013, Mr. Leyse submitted a PRM (ADAMS Accession No. ML14008A427)

with similar requests. On March 21, 2014, the NRC requested additional information to further clarify the petitioner's request (ADAMS Accession No. ML14023A743). On June 19, 2014 (ADAMS Accession No. ML14195A388), the petitioner responded to the request and resubmitted the petition with additional information. After evaluating the resubmitted petition, the NRC has determined that the petition meets the threshold sufficiency requirements for a petition for rulemaking under § 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," and the petition has been docketed as PRM-50-108. The NRC is not requesting public comment on PRM-50-108 at this time.

II. The Petition.

The petition requests that the NRC develop new regulations requiring that (1) the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction be calculated by spent fuel pool (SFP) accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments; (2) the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction be calculated by SFP accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments, conducted with pre-oxidized fuel cladding; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petition references recent NRC post-Fukushima MELCOR simulations of BWR Mark I SFP accident/fire scenarios. The petition states that the conclusions from the NRC's

MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petition states that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium fires than MELCOR indicates. The petition states that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petition claims that the new regulations would help improve public and plant-worker safety. The petitioner asserts that the first three proposed regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petition states that the fourth proposed regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petition states that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs.

Dated at Rockville, Maryland, this XX day of XXXX, 2014.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

[7590-01-P]

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket No. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; notice of docketing.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) has received a petition for rulemaking (PRM) from Mr. Mark Edward Leyse (the petitioner), dated June 19, 2014. The petition was docketed by the NRC on July 14, 2014, and has been assigned Docket No. PRM-50-108. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The NRC is not instituting a public comment period for this on PRM-50-108 at this time.

ADDRESSES: Please refer to Docket ID **NRC-2014-0171** when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this petition by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2014-0171**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-287-3422; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

Comment [gsm]: Can we please use plain language?

Also, note that we describe this differently in the letter to Mr. Leyse – we say:

The NRC is not requesting public comment on your petition for rulemaking at this time

This is actually the best way of putting it and I strongly suggest that we use this sentence in the RFN as well – here and in the discussion below, with a change from “your petition” to “PRM-50-108.”

- **NRC's Agencywide Documents Access and Management System (ADAMS):**

You may obtain publicly available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-based ADAMS Search.](#)" For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced in this document (if that document is available in ADAMS) is provided the first time that a document is referenced. The petition, PRM-50-108, is available in ADAMS under Accession Number ML14195A388.

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SUPPLEMENTARY INFORMATION:

I. The Petitioner.

Mr. Mark Edward Leyse (the petitioner) submitted this petition for rulemaking (PRM) as an individual. In Section II of the petition, "Statement of Petitioner's Interest," the petitioner explains that he disagrees with the conclusions of recent MELCOR simulations of boiling water reactor (BWR) Mark I spent fuel pool (SFP) accident scenarios.

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with similar requests. On March 21, 2014, the NRC requested ~~supplement~~ additional information to further clarify the petitioner's request (ADAMS Accession No. ML14023A743).

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~~The NRC is not instituting a public comment period for this PRM at this time.~~

Comment [gsm]: It is more accurate to say "additional." The petitioner decides whether the information is going to be in the form of a "supplement" or in the form of a new/resubmitted/amended petition.

Comment [gsm]: Can we please use plain language?

Also, note that we describe this differently in the letter to Mr. Leysc. – we say:

The NRC is not requesting public comment on your petition for rulemaking at this time

This is actually the best way of putting it, and I strongly suggest that we use this sentence in the RFN as well – here, and in the discussion below, with a change from "your petition" to "PRM-50-108."

Comment [gsm]: See earlier comment on this sentence.

II. The Petition.

The petition requests that the NRC develop new regulations requiring that (1) the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction be calculated by spent fuel pool (SFP) accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments; (2) the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction be calculated by SFP accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments, conducted with pre-oxidized fuel cladding; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

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The petition claims that the new regulations would help improve public and plant-worker safety. The petitioner asserts that the first three proposed regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petition states that the fourth proposed regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petition states that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs.

Dated at Rockville, Maryland, this XX day of XXXX, 2014.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM or the petition), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking with respect to SFPs or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this petition by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

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FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

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I. The Petition

II. Reasons for Denial

III. Conclusion

IV. Availability of Documents

I. The Petition

Section 2.802 of title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking—requirements for filing," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of:

postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR simulations predict. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner stated that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested

regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations that would be required by the fourth requested regulation would be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of an SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for

regulatory decisionmaking, and the evaluations would not prevent or mitigate an SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to an SFP fire. In order for an SFP fire to occur, all SFP systems, backup systems, and operator actions that are intended to prevent the spent fuel in the pool from being uncovered would have to fail. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of an SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high

The petitioner stated that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that an SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and, ultimately, an SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response

Spent nuclear fuel offloaded from a reactor is initially stored in an SFP. The SFPs at all nuclear plants in the United States are robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage.

Studies conducted over the last four decades have consistently shown the risk of an accident causing a zirconium fire in an SFP to be low. The risk of an SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public

health objectives (51 FR 30028; August 21, 1986) and that no new regulatory requirements were warranted.

The risk of an SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, an SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even with this conservative assumption, the study found the risk of an SFP fire to be low and well within the Commission's Safety Goals.

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability and, accordingly, the risk of an SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC took extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the

Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

Also, in 2014, the NRC documented a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). In COMSECY-13-0030, the NRC staff concluded that SFPs are robust structures with large safety margins and recommended to the Commission that assessments of possible regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage were not warranted. The Commission subsequently approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this document, the NRC has determined that the risk of an SFP severe accident is low. While the risk of a severe accident in an SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures in place if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (77 FR 74788; December 18, 2012) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and license amendment reviews. In addition, baseline NRC inspections provide ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate an SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and their results proposed to be provided to the NRC are not needed for the effectiveness of the NRC's approach to ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's safety analysis report. Licensees are required to operate the plant,

including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs and protective actions for plant personnel and the public to limit exposure to radioactive materials.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. At least two NRC resident inspectors are assigned to each site to provide monitoring and inspection of routine and special activities.

They are aware of, and routinely observe, SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees as a result of an NRC order or a change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects and noncompliances associated with basic components, which include SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and noncompliances. The NRC is also informed of events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, a nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant or licensee as having a significant implication for public health and safety or common defense and security must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The annual evaluations requested in the petition would not provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-

coolant and subsequent uncovering of the fuel, the information that would be obtained from the proposed requirement in the petition would not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2. The petitioner stated that there are serious flaws with MELCOR, which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how such an evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's statements that MELCOR is flawed.

There are inherent uncertainties in the progression of severe accidents. There are many interrelated phenomena that need to be properly understood; otherwise, conservatism in one area may lead to overall non-conservative results. Conservatism can be meaningfully

introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

The important question for a severe accident analysis is whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussing the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multi-unit or concurrent accident, or fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and, even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has been validated against experimental data, and it represents the current state of the art in severe accident analysis. In NUREG-2161, the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment, core relocation to the vessel lower head, and ex-vessel core concrete interaction." Furthermore, MELCOR has been benchmarked against many experiments, including separate and integral effects tests for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

Additional information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161. The NRC also addressed questions regarding MELCOR in Appendix D to

NUREG-2157, Volume 2, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel" (ADAMS Accession No. ML14196A107).

III. Conclusion

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-----------------|--|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |

| | | |
|-------------------|---|-------------|
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 2016.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

From: Borges, Jennifer
Sent: 13 Aug 2014 16:26:23 +0000
To: Doyle, Daniel
Subject: FW: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Hi Dan,

In response to Geary's comment, I will remove the comment opportunity section from the action statement, summary, and addresses section. In respect to the way the sections are organized, I followed the latest PRM template; however, if you have any recommendations for improving the content of the notice, please let me know.

FYI- Shelby Lewman (OGC) has been assigned to work on this action.

Thank you,


Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

Location: 3WFN 6-A38

 301-287-0999

 jennifer.borges@nrc.gov

From: Mizuno, Geary

Sent: Monday, August 11, 2014 4:47 PM

To: Borges, Jennifer; RidsNrrMailCenter Resource; RidsNroMailCenter Resource; RidsOgcMailCenter Resource

Cc: Shepherd, Jill; Doyle, Daniel; Jones, Bradley; Baum, Robin; Inverso, Tara; Colaccino, Joseph; Bladey, Cindy

Subject: RE: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108
Jennifer and Dan:

Why are we requesting comments on this PRM? I see nothing in this that suggests we should provide an opportunity for the public to submit comments. If there are specific issues for which public comment would be useful, or information that we think would help our deliberations, then we should ask specific questions seeking to elicit this information. Otherwise, we should NOT be providing a general comment opportunity.

In any event, the organization and content of the FRN needs work. The discussions under Sections II and III are not well organized. I have a hard time trying to figure out why the information on docketing is under II. The Petitioner, and why this section contains no real information describing the petitioner and why he has satisfied our requirement to describe his interest in this rulemaking subject. In addition, there is no information in the FRN that justifies why the NRC determined that Mr. Leyse had met our requirements in 2.802(c)(2) as reported on p.5.

The wording of the FRN is also problematic, because at times it is impossible to distinguish whether the FRN is describing assertions made by the petitioner, or actually represents NRC's position/description. For example, on p. 4, under **II. The Petitioner**, the first sentence: "Mr. Leyse is aware of recent NRC post-Fukushima MELCOR simulations of boiling water reactor (BWR) Mark I SFP accident scenarios and disagree with the resulting conclusions of it." Is this our statement and why do we need to make this statement in order to describe the petitioner for purposes of this PRM?

Why are we using the word "estipulating" in the same paragraph? That is not correct in this context; just because the petitioner uses does not mean we have to accede to its use.

especially since we are not putting it in the quotation. The correct word is "requiring". I also find that putting the description of each of the four regulations in **II. The Petitioner**, detracts from the emphasis of this section. It should be placed in **III. The Petition**, in the first paragraph. This completes my review of the package.

Geary

From: Borges, Jennifer

Sent: Monday, August 11, 2014 4:03 PM

To: RidsNrrMailCenter Resource; RidsNroMailCenter Resource; RidsOgcMailCenter Resource

Cc: Shepherd, Jill; Mizuno, Geary; Doyle, Daniel; Jones, Bradley; Baum, Robin; Inverso, Tara; Colaccino, Joseph; Bladey, Cindy

Subject: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Hello,

Below is a link to the notice of docketing package for a petition for rulemaking prepared for PRM-50-108 filed with the Commission by Mr. Mark Edward Leyse. Also, for your information, I have provided the link to the incoming petition. Please review and provide me with your concurrence by **August 25, 2014**.

If you have any questions concerning this matter, please let me know or contact Jill Shepherd at 301-287-0950 (Jill.Shepherd@nrc.gov).

PACKAGE:

(Federal Register Notice, Congressional Letters, & Letter to Petitioner)

[View ADAMS P8 Properties ML14223B127](#)

[Open ADAMS P8 Package \(PRM-50-108 Notice of Docketing RE: Fuel-Cladding Issues in Postulated SFP Accidents\)](#)

INCOMING:

[View ADAMS P8 Properties ML14008A427](#)

[Open ADAMS P8 Document \(Spent Fuel Pool \(Fuel Cladding\) Rulemaking Petition submitted by Atomic Safety Organization\)](#)

INCOMING:

(Additional Information)

[View ADAMS P8 Properties ML14195A388](#)

[Open ADAMS P8 Document \(PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents.\)](#)

Thank you,

Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

301-287-0999

From: Borges, Jennifer
Sent: 11 Sep 2014 12:33:09 +0000
To: Doyle, Daniel
Subject: FW: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

FYI

From: Borges, Jennifer
Sent: Monday, September 08, 2014 2:40 PM
To: RidsOgcMailCenter Resource
Cc: Barczy, Theresa; Jones, Bradley; Bladey, Cindy; Mizuno, Geary; Lewman, Shelbie; Safford, Carrie
Subject: RE: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Hello,

Below is a link to the notice of docketing package for a petition for rulemaking prepared for PRM-50-108 filed with the Commission by Mr. Mark Edward Leyse. These documents incorporate comments received from NRR and NRO. For your information, I have provided the link to the incoming petition. Please review and provide me with your concurrence by

September 19, 2014.

If you have any questions concerning this matter, please let me know or contact Theresa Barczy at 301-287-3418 (Theresa.Barczy@nrc.gov).

PACKAGE:

(*Federal Register* Notice, Congressional Letters, & Letter to Petitioner)

[View ADAMS P8 Properties ML14223B127](#)

[Open ADAMS P8 Package \(PRM-50-108 Notice of Docketing RE: Fuel-Cladding Issues in Postulated SFP Accidents\)](#)

INCOMING:

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INCOMING:

(Additional Information)

[View ADAMS P8 Properties ML14195A388](#)

[Open ADAMS P8 Document \(PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents.\)](#)

Thank you,

Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

301-287-0999

From: Mizuno, Geary
Sent: Monday, August 11, 2014 4:47 PM
To: Borges, Jennifer; RidsNrrMailCenter Resource; RidsNroMailCenter Resource; RidsOgcMailCenter Resource
Cc: Shepherd, Jill; Doyle, Daniel; Jones, Bradley; Baum, Robin; Inverso, Tara; Colaccino, Joseph; Bladey, Cindy
Subject: RE: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108
Jennifer and Dan:

Why are we requesting comments on this PRM? I see nothing in this that suggests we should provide an opportunity for the public to submit comments. If there are specific issues for which public comment would be useful, or information that we think would help our deliberations, then

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Why are we using the word "stipulating" in the same paragraph? That is not correct in this context; just because the petitioner uses does not mean we have to accede to its use especially since we are not putting it in the quotation. The correct word is "requiring". I also find that putting the description of each of the four regulations in **II. The Petitioner**, detracts from the emphasis of this section. It should be placed in **III. The Petition**, in the first paragraph. This completes my review of the package.

Geary

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Sent: Monday, August 11, 2014 4:03 PM

To: RidsNrrMailCenter Resource; RidsNroMailCenter Resource; RidsOgcMailCenter Resource

Cc: Shepherd, Jill; Mizuno, Geary; Doyle, Daniel; Jones, Bradley; Baum, Robin; Inverso, Tara; Colaccino, Joseph; Bladey, Cindy

Subject: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Hello,

Below is a link to the notice of docketing package for a petition for rulemaking prepared for PRM-50-108 filed with the Commission by Mr. Mark Edward Leyse. Also, for your information, I have provided the link to the incoming petition. Please review and provide me with your concurrence by **August 25, 2014**.

If you have any questions concerning this matter, please let me know or contact Jill Shepherd at 301-287-0950 (Jill.Shepherd@nrc.gov).

PACKAGE:

(Federal Register Notice, Congressional Letters, & Letter to Petitioner)

[View ADAMS P8 Properties ML14223B127](#)

[Open ADAMS P8 Package \(PRM-50-108 Notice of Docketing RE: Fuel-Cladding Issues in Postulated SFP Accidents\)](#)

INCOMING:

[View ADAMS P8 Properties ML14008A427](#)

[Open ADAMS P8 Document \(Spent Fuel Pool \(Fuel Cladding\) Rulemaking Petition submitted by Atomic Safety Organization\)](#)

INCOMING:

(Additional Information)

[View ADAMS P8 Properties ML14195A388](#)

[Open ADAMS P8 Document \(PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents.\)](#)

Thank you,

Jennifer Borges
Regulations Specialist
Rules Team
ADM/DAS/RADB
301-287-0999

From: DeJesus, Anthony
Sent: 10 Feb 2016 10:53:06 -0500
To: Schneider, Stewart; Doyle, Daniel
Cc: Bladey, Cindy; Terry, Leslie; Borges, Jennifer
Subject: FW: ACTION: Review Status Report on Petitions for Rulemaking - March 2016
Attachments: PRM Status Report March 2016 FINAL DRAFT_2-10-2016.docx

Dan/Stewart:

After talking with Stewart this morning, we realized we needed to add the FFD PRMs back into the PRM Status Report since the FFD rule was discontinued. As a result, those PRMs are now officially "open" once again.

I added a combined entry for these PRMs (PRMs-26-3, 5, and 6) (see pages 34, 35, and 36).

I've tried to describe the PRMs as best I could. Do you have a better title than I provided that would capture all the PRMs (and that we would use on any future FRN). Please revise that entry however you see fit. I borrowed a lot of the info from other FRNs we have published.

Let me know if you have any questions.

anthony

From: DeJesus, Anthony

Sent: Friday, February 05, 2016 3:48 PM

To: RidsNrrMailCenter Resource ; RidsNmssOd Resource ; RidsNroMailCenter Resource ; RidsOgcMailCenter Resource ; QTE Resource

Cc: Doyle, Daniel ; Whaley, Sheena ; Smith, Tanya ; Spencer, Mary ; Bladey, Cindy ; Terry, Leslie (Leslie.Terry@nrc.gov) ; Borges, Jennifer

Subject: ACTION: Review Status Report on Petitions for Rulemaking - March 2016

By February 18, 2016, please review and provide your concurrence on the following attached documents:

- The March 2016 Status Report on Petitions for Rulemaking, and
- The transmittal memo to the EDO.

We are requesting Office Director level concurrence on these documents.

Background

Each February and August, the Status Report on Petitions for Rulemaking is prepared for the Executive Director for Operations' (EDO) information. The information contained in this report is for the use of the EDO and is not made available to the general public. The current report covers the period of August 31, 2015 - February 1, 2016. The last report, dated October 2, 2015, is available in the U.S. Nuclear Regulatory Commission's Agencywide Documents Access and Management System under Accession No. ML15217A434.

Your Review and Response

Please verify that this report contains an entry for all of the active petitions for which your office is responsible and that each entry is accurate and contains the most current information (i.e., all communication with the petitioner). If a contact person is not listed, or has changed, please identify a member of your staff who will serve as the contact person for your office.

Please provide me with your concurrence by **February 18, 2016**. If you have any questions concerning this matter, please contact me at 301-415-1106 (Anthony.deJesus@nrc.gov) or Jennifer Borges at 301-415-3647 (Jennifer.Borges@nrc.gov).



Anthony de Jesús, Sr. Regulations Specialist

Agency 2.802 Petition Coordinator
Rules, Announcements, and Directives Branch
U.S Nuclear Regulatory Commission
OWFN 12- G09
Washington, DC 20555-0001
301-415-1106
Anthony.deJesus@nrc.gov

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STATUS REPORT ON PETITIONS FOR RULEMAKING

March 2016

Enclosure

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INTRODUCTION

The Status Report on Petitions for Rulemaking (PRM) is provided to the Executive Director for Operations (EDO) bi-annually. The purpose of this report is to inform the EDO of petitions currently before the agency and to provide an update on progress toward their completion. This report includes petitions docketed since the last report dated October 2, 2015 (Accession No. ML15217A434 in the U.S. Nuclear Regulatory Commission's (NRC's) Agencywide Documents Access and Management System). In addition, this report informs the EDO of petitions completed since the last report. The Office of Administration, in consultation with the Office of Nuclear Reactor Regulation (NRR), the Office of Nuclear Material Safety and Safeguards (NMSS), the Office of New Reactors (NRO), and the Office of the General Counsel (OGC), compiles the information for each open petition.

The report presents open petitions by office, beginning with the newest dockets and ending with the oldest dockets. The report captures the progression of each petition as it moves through the agency's process. The report includes hyperlinks to the docket for each petition on <http://www.regulations.gov>, thereby making additional pertinent documentation, including any public comments received, readily available to the reader. All reports since 2010 are available on [The NRC Rulemaker](#).¹ If you have a comment or suggestion for additional improvements to this report, please contact Anthony de Jesús at 301-415-1106.

¹<http://fusion.nrc.gov/adm/team/DAS/RADB/resource/Lists/Status%20Report%20on%20Petitions%20for%20Rulemaking/AllItems.aspx>.

LIST OF COMMON ABBREVIATIONS

| | |
|--------|--|
| 10 CFR | Title 10 of the <i>Code of Federal Regulations</i> |
| ADAMS | Agencywide Documents Access and Management System |
| ASLB | Atomic Safety Licensing Board |
| ASME | American Society of Mechanical Engineers |
| ASR | alkali-silica reaction |
| COL | combined operating license |
| ECCS | Emergency Core Cooling System |
| EDO | Executive Director for Operations |
| EP | emergency preparedness |
| FR | <i>Federal Register</i> |
| FRN | <i>Federal Register</i> notice |
| ISFSI | independent spent fuel storage installations |
| LOCA | loss-of-coolant accident |
| mSv | millisievert |
| NEI | Nuclear Energy Institute |
| NMSS | Office of Nuclear Material Safety and Safeguards |
| NPP | nuclear power plant |
| NRC | U.S. Nuclear Regulatory Commission |
| NRO | Office of New Reactors |
| NRDC | Natural Resources Defense Council |
| NRR | Office of Nuclear Reactor Regulation |
| NTTF | Near-Term Task Force |
| PRM | petition for rulemaking |
| PRB | Petition Review Board |
| rem | roentgen equivalent in man |
| RIN | Regulation Identification Number |
| SECY | Office of the Secretary |
| SFP | spent fuel pool |
| SRM | staff requirements memorandum |
| WG | working group |

DEFINITIONS

Open PRM: Any docketed² petition for rulemaking that the NRC staff is actively working on.

Closed PRM: The PRM docket is closed, either through publication of a notice of denial or a notice stating that the petition will be fully or partially considered in the rulemaking process.

Estimated Date for Submission to Commission:³ Four months after the date of the meeting of the Petition Review Board (PRB).

Pending PRM: A notice has not been published indicating the closure of the petition docket.

Status of Petition since the Last PRM Report: A brief statement of the actions that have occurred or will occur in the near future. (For example: "Notice of docketing and request for public comment is under development.")

Date of PRB: The date that the PRB and petition working group (WG) determine the regulatory decision on a PRM (i.e., denial, consideration in a current or future rulemaking, or partial consideration in a current or future rulemaking).

Target PRB Date: The PRB and petition WG determine the regulatory decision on a petition within 12 months from the date the notice of docketing is published in the *Federal Register* (FR).

Undetermined: A date has not been established at this time.

Withdrawn: The petitioner no longer wants to pursue the requested action and has notified the NRC. The change in status includes the date that the *Federal Register* notice (FRN) was published to notify the public that the petition was withdrawn.

Public Comments on the Petition: A brief summary of the comments received from the public or any interested party regarding a PRM, including the number received, type (individual, form letter, etc.), commenters (individual, industry, State organization, etc.), and whether the comments were generally in support of or generally in disagreement of the petition.

Background or Items of Interest (if applicable): Pertinent information related to the PRM that the staff wants to document throughout the process (e.g., congressional interest, changes in the regulatory environment).

² A PRM is docketed by the NRC if it meets the docketing criteria in § 2.802 of Title 10 of the *Code of Federal Regulations*, "Petition for rulemaking—requirements for filing."

³ NRC official who has the ultimate authority to determine whether a PRM will be denied or considered in whole or in part in the rulemaking process.

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OPEN PETITIONS BY OFFICE

Enclosure

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~~OFFICIAL USE ONLY SENSITIVE INTERNAL INFORMATION~~

**OPEN PETITIONS FOR THE OFFICE OF NUCLEAR MATERIAL SAFETY AND
SAFEGUARDS**

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~~OFFICIAL USE ONLY - SENSITIVE INTERNAL INFORMATION~~

Comment [TL]: This report will be submitted in March. NMSS should firm up PRB plans.

PRM NOS.: PRM-20-28, PRM-20-29, and PRM-20-30

PETITION SUBJECT: Linear No-Threshold Model and Standards for Protection against Radiation

PETITIONERS: Carol S. Marcus, Mark L. Miller, and Mohan Doss

DOCKET ID: NRC-2015-0057

NRC CONTACT: Vanessa Cox, NMSS, 301-415-8342

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--|--|-----------------|--------------|-------------------|---|
| February 9, 2015 February 13, 2015 February 24, 2015 | June 23, 2015 80 FR 35870 | March 2016 | Undetermined | Undetermined | July 2016 |
| | | | | | |

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PRM-20-28, PRM-20-29, and PRM-20-30 (continued)

PETITION SUMMARY:

On February 9, 2015, February 13, 2015, and February 24, 2015, Carol S. Marcus, Mark L. Miller, and Mohan Doss, respectively, submitted nearly identical petitions requesting that the Commission amend its regulations in Part 20 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Standards for Protection against Radiation," to take radiation hormesis into account and end the NRC's reliance on the linear no-threshold hypothesis used to determine dose standards in its regulations. The concept of radiation hormesis claims that low doses of radiation have "no effects or protective effects" on population groups. Consequently, the petitioners request that: (1) worker dose remain at present levels, with allowances up to 100 millisievert (10 rem); (2) the use of the "as low as reasonably achievable" principle be removed entirely from the NRC's regulations; (3) public doses be raised to match worker doses; and (4) the NRC end differential doses to pregnant women, embryos and fetuses, and children under 18 years of age.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition and the public comments received.

PUBLIC COMMENTS ON THE PETITION:

The public comment period was scheduled to close on September 8, 2015; however, the NRC received requests for an extension of the comment period. The staff extended the comment period by 90 days (80 FR 50804; August 21, 2015). The comment period closed on November 19, 2015. The NRC received 561 individual public comments and 2,511 form letter comments on these PRMs. [The majority of comments were opposed to the changes requested by the petitioners.]

BACKGROUND/ITEMS OF INTEREST (if applicable):

The staff is evaluating three nearly identical petitions as one activity.

Comment [AdJ]: NMSS, check for accuracy. Do we have a break down of number opposed, number in support, etc? If so, please provide that breakdown here.

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Comment (TL): Update

PRM NO.: PRM-51-30

PETITION SUBJECT: Spent Fuel Storage and Disposal

PETITIONER: Diane Curran, on behalf of 34 environmental organizations

DOCKET ID: NRC-2014-0014

NRC CONTACT: Keith McDaniel, NMSS, 301-415-5252

| Date Received | Notice of Docketing Published in the Federal Register | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--------------------------------------|---|-----------------|----------------|-------------------|---|
| December 20, 2013 January 7, 2014 | April 21, 2014 79 FR 22055 | March 2015 | April 14, 2015 | Denied | September 2015 |

PETITION SUMMARY:

On December 20, 2013, as corrected on January 7, 2014, Diane Curran, on behalf of 34 environmental organizations, submitted a PRM that requests that the Commission revise and integrate all safety and environmental regulations related to spent fuel storage and disposal. The petitioner requests that the NRC conduct a comprehensive review of these regulations and environmental studies, revise them to be consistent with the current state of knowledge, and integrate them into one cohesive regulatory framework in order to comply with the National Environmental Policy Act.

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PRM-51-30 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is finalizing the denial package to be submitted for Commission approval.

Comment [TL]: Should only be status since last report.

Comment [AdJ]: NRR Update

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC formed a WG to address both PRM-51-30 and PRM-51-31 (Environmental Impacts of Spent Fuel Storage during Reactor Operation) because both petitions make similar rulemaking requests.

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PRM NO.: PRM-72-6

PETITION SUBJECT: Dry Cask Storage of Spent Fuel

PETITIONER: C-10 Research and Education Foundation, Inc.

DOCKET ID: NRC-2008-0649

NRC CONTACT: Torre Taylor, NMSS, 301-415-7900

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Date of Final Action/ <i>Federal Register</i> Notice Citation |
|----------------------|--|---|---|--|---|
| November 24, 2008 | March 3, 2009 74 FR 9178 | First PRB: January 2010 Second PRB: May 2015 | First PRB: January 2010 Second PRB: May 18, 2015 | First Review: Denied, Partial Consideration in the Rulemaking Process, and Undetermined (see Background below) Remaining two issues: Denied | First publication: October 16, 2012 77 FR 63254 Publication on remaining two issues after Commission Direction |

PRM-72-6 (continued)

PETITION SUMMARY:

On November 24, 2008, C-10 Research and Education Foundation, Inc. (C-10), submitted a PRM that requests that the Commission amend its regulations governing onsite dry cask storage of spent fuel. The petitioner believes that the current regulations do not provide sufficient requirements for safe storage of spent nuclear fuel in dry cask storage at independent spent fuel storage installations (ISFSIs). The petitioner requests the following 12 changes:

1. The NRC should prohibit the production of nonconforming pre-built full scale casks specifically built for NRC certification testing.
2. The NRC certification of casks should be based on upgraded code requirements that include design criteria and technical specifications for a 100-year minimum age-related degradation timeframe.
3. The NRC should approve, as part of the original ISFSI certification process and construction license, a method for dry cask transfer capacity that will allow for immediate and safe maintenance on a faulty or failing cask.
4. The NRC should require that dry casks be qualified for transport at the time of onsite storage approval certification.
5. The NRC should require mandatory compliance with the American Society of Mechanical Engineers (ASME) codes and standards "without exception."
6. The NRC should require ASME code stamping for fabrication.
7. All materials for fabrication should be supplied by ASME-approved material suppliers.
8. Current ASME codes and standards for conservative heat treatment and leak tightness should be adopted and enforced.
9. A safe and secure hot cell transfer station coupled with an auxiliary pool should be built as part of an upgraded ISFSI design certification and licensing process.
10. The NRC should require real-time heat and radiation monitoring at ISFSIs.
11. The NRC should require hardened onsite storage at all nuclear power plants (NPPs).
12. The NRC should establish funding to conduct ongoing studies to provide the data required to accurately define and monitor for age-related material degradation.

PRM-72-6 (continued)

Comment [Adj]: Update

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is preparing a denial package to be submitted to the Commission for approval in October 2015.

PUBLIC COMMENTS ON THE PETITION:

The NRC received approximately 9,000 comments, the vast majority of which were in postcard format and supported the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC published an FRN on October 16, 2012 (77 FR 63254), acknowledging that the petition would be partially considered in the rulemaking process. The FRN stated that the Commission denied nine of the petitioner's requests (Requests 1, 2, 3, 5 through 8, 10, and 12), as listed in the "Petition Summary," and would consider one request in the rulemaking process (Request 11). The FRN stated that the NRC was deferring action on two requests (Requests 4 and 9) for future rulemaking determinations.

The docket for PRM-72-6 remains open until the Commission acts on Requests 4 and 9.

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OPEN PETITIONS FOR THE OFFICE OF NUCLEAR REACTOR REGULATION

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PRM NO.: PRM-50-113

PETITION SUBJECT: Uninterruptible Monitoring of Coolant and Fuel in Reactors and Spent Fuel Pools

PETITIONER: Alexander DeVolpi

DOCKET ID: NRC-2015-0230

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

Comment [AdJ]: Report goes to EDO in March. Important this is accurate

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--------------------|--|-------------------------|-------------------------|-------------------------|---|
| September 10, 2015 | December 1, 2015 80 FR 75009 | PRB Will Not Be Held | PRB Will Not Be Held | PRB Will Not Be Held | March 2016 |

PETITION SUMMARY:

On September 10, 2015, Dr. Alexander DeVolpi submitted a PRM that requests that the Commission amend its regulations in 10 CFR Part 50 to require "installation of ex-vessel instrumentation for uninterrupted monitoring of coolant and fuel in reactors and spent-fuel pools." The petitioner cites a 2014 National Research Council report titled, "Lessons Learned from the Fukushima Nuclear Accident for Improving Safety of U.S. Nuclear Plants," that gave high priority to Recommendation 5.1A, which stated that greater

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PRM-50-113 (continued)

"[a]ttention to availability, reliability, redundancy, and diversity of plant systems and equipment is specifically needed for . . . Instrumentation for monitoring critical thermodynamic parameters in reactors, containments, and spent fuel pools." In addition, the petitioner cites to Section 5.1.1.4 of the report, "Instrumentation for Monitoring Critical Thermodynamic Parameters," which states that "robust and diverse monitoring instrumentation that can withstand severe accident conditions is essential for diagnosing problems, selecting and implementing accident mitigation strategies, and monitoring their effectiveness."

STATUS OF PETITION SINCE THE LAST PRM REPORT:

This is the first entry for this PRM in this report. The staff is continuing to analyze the specific issues raised in the petition..

PUBLIC COMMENTS ON THE PETITION:

The NRC did not request public comment on this petition as the staff believed it had sufficient information to fully evaluate the issues raised in the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

Comment [Adj]: NRR should briefly discuss the other activities related to this PRM. Including explain why a PRB is not being held.

PRM NO.: PRM-50-112

PETITION SUBJECT: Defining "Important to Safety"

PETITIONER: Kurt T. Schaefer

DOCKET ID: NRC-2015-0213

NRC CONTACT: Robert Beall, NRR, 301-415-3874

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|----------------------------------|--|-----------------|--------------|----------------------|---|
| July 20, 2015 August 31, 2015 | January 6, 2016 | Undetermined | Undetermined | Undetermined | January 2017 |

PETITION SUMMARY:

On July 20, 2015, and supplemented on August 31, 2015, Kurt T. Schaefer submitted a PRM that requests that the Commission amend 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," by defining and providing a set of criteria "for determining which structures, systems, components and functions are 'important to safety.'"

PRM-50-112 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The petition was published for public comment on January 6, 2016 (81 FR 410).

PUBLIC COMMENTS ON THE PETITION:

The public comment period closes on March 21, 2016.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-50-111

PETITION SUBJECT: Power Reactor In-Core Monitoring

PETITIONER: Mark Edward Leyse

DOCKET ID: NRC-2015-0124

NRC CONTACT: Natreon Jordan, NRR, 301-415-7410

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|----------------|--|-----------------|--------------|----------------------|---|
| March 13, 2015 | July 16, 2015 80 FR 42067 | July 2016 | Undetermined | Undetermined | November 2016 |

PETITION SUMMARY:

On July 16, 2015, Mark Edward Leyse submitted a PRM that requests that the Commission amend its regulations to require all NPP licensees to use in-core monitoring devices at different elevations and radial positions throughout the reactor.

PRM-50-111 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

PRM-50-111, which applies to boiling water reactors, is an extension of the issues raised in PRM-50-105, which also was submitted by Mr. Leyse. The NRC interpreted PRM-50-105 as limited to pressurized water reactors, and denied the PRM (78 FR 56174; September 12, 2013).

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PRM NO.: PRM-50-109

PETITION SUBJECT: Improved Identification Techniques against Alkali-Silica Concrete Degradation at Nuclear Power Plants

PETITIONER: Sandra Gavutis, on behalf of C-10

DOCKET ID: NRC-2014-0257

NRC CONTACT: Jessica Kratchman, NRR, 301-415-5112

Comment [Adj]: Will need to update
as soon as PRB takes place on 2/11

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--------------------|--|-----------------|----------------------|----------------------|---|
| September 25, 2014 | January 12, 2015 80 FR 1476 | January 2016 | February 11, 2016 | Undetermined | May 2016 |

PETITION SUMMARY:

On September 25, 2014, Sandra Gavutis, on behalf of C-10, submitted a PRM that requests that the Commission amend its regulations to provide improved identification techniques against alkali-silica reaction (ASR) concrete degradation at NPPs. The petitioner asserts that current NRC regulations, which rely on visual inspection to identify ASR degradation, do not adequately identify ASR without petrographic analysis. The petitioner is requesting that the NRC revise applicable regulations to require adherence with current American Concrete Institute standards and ASME codes.

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PRM-50-109 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

[The WG met with the PRB on February 11, 2016, and the PRB approved the staff's recommendation to... The staff is preparing a package to be submitted to the Commission for approval in May 2016.]

Comment [AdJ]: NRR should update this to reflect current status.

Comment [AdJ]: NRR should update with actual numbers in support, against, etc.

PUBLIC COMMENTS ON THE PETITION:

The public comment period closed on March 30, 2015. The NRC received 10 public comments on the petition, XX in support of the petition, XX opposing the proposed changes, and XX suggesting alternatives to the changes proposed in the petition.]

BACKGROUND/ITEMS OF INTEREST (if applicable):

The staff confirmed with the petitioner that the petitioner did not intend a portion of the PRM to be treated as an allegation against the licensee.

PRM NO.: PRM-50-108

PETITION SUBJECT: Fuel-Cladding Issues in Postulated Spent Fuel Pool (SFP) Accidents

PETITIONER: Mark Edward Leyse

DOCKET ID: NRC-2014-0171

NRC CONTACT: Daniel Doyle, NRR, 301-415-3748

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------|--|-----------------|--------------|----------------------|---|
| June 19, 2014 | October 7, 2014 79 FR 60383 | October 2015 | May 27, 2015 | Denied | November 2015 |

PETITION SUMMARY:

On June 19, 2014, Mark Edward Leyse submitted a PRM that requests that the Commission make new regulations stipulating the following:

1. The rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction should be calculated by SFP accident evaluation models using data from multirod bundle (assembly) severe accident experiments.

PRM-50-108 (continued)

Comment | Guidance | Update

2. The rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction should be calculated by SFP accident evaluation models using data from multirod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding.
3. SFP accident evaluation models should be required to conservatively model nitrogen-induced breakaway oxidation behavior.
4. Licensees should be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

[The WG is finalizing the denial package to be submitted for Commission approval.]

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

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PRM NO.: PRM-73-18

PETITION SUBJECT: Protection of Digital Computer and Communication Systems and Networks

PETITIONER: Anthony Pietrangelo, on behalf of the Nuclear Energy Institute (NEI)

DOCKET ID: NRC-2014-0165

NRC CONTACT: Jason Carneal, NRR, 301-415-1451

Comment [Guidance]: Report goes to EDO in March, make sure accurate.

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------|--|-----------------|--------------|----------------------|---|
| June 12, 2014 | September 22, 2014 79 FR 56525 | (March 2016) | Undetermined | Undetermined | July 2016 |

PETITION SUMMARY:

On June 12, 2014, Anthony Pietrangelo, on behalf of the NEI, submitted a PRM that requests that the Commission revise certain cybersecurity language in its regulations to ensure that the rules are consistent with the NRC's original intent, are less burdensome for NRC licensees, and adequately protect the public health and safety and common defense and security.

PRM-73-18 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition and the public comments received..

PUBLIC COMMENTS ON THE PETITION:

The public comment period closed on December 12, 2014. The NRC received 19 public comments on the petition, 15 in support of the petition, 2 opposing the proposed changes, and 2 suggesting alternatives to the changes proposed in the petition. The public comments in support of the proposed changes cited detailed examples of specific equipment that the commenters believe should be out of the scope of the cyber security rule. The public comments that opposed the proposed changes and those that suggested alternatives were very detailed and provided suggestions for alternative approaches to regulating cyber security at NPPs.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

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Comment | Guidance | Update

PRM NO.: PRM-51-31

PETITION SUBJECT: Environmental Impacts of Spent Fuel Storage during Reactor Operation

PETITIONER: Diane Curran, on behalf of 34 environmental organizations

DOCKET ID: NRC-2014-0055

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|------------------------------------|--|-----------------|----------------|----------------------|---|
| February 18, 2014 June 26, 2014 | May 1, 2014 79 FR 24595 July 24, 2014 79 FR 42989 | May 2015 | April 14, 2015 | Denied | September 2015 |

PETITION SUMMARY:

On February 18, 2014 (received by the Office of the Secretary (SECY) on March 12, 2014), Diane Curran, on behalf of 34 environmental organizations, submitted a PRM that requests that the Commission revise its regulations and consider, in all pending

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PRM-51-31 (continued)

and future licensing and re-licensing decisions, what the petitioners consider to be new and significant information bearing on the environmental impacts of high-density spent fuel storage in reactor pools and the costs and benefits for avoiding or mitigating those impacts.

On June 26, 2014, Ms. Curran submitted a document, characterized as an "amended petition" for rulemaking, requesting that the NRC "add to the record of the February 18, 2014, petition the observations made by Chairman Macfarlane in her dissenting comments" on the NRC staff document designated COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel," dated November 12, 2013 (ADAMS Accession No. ML13273A601). The NRC does not consider the June 26, 2014, document to be an amendment to the February 18, 2014, petition as the petitioner does not request that the NRC take any rulemaking actions that were not otherwise requested in the February 18, 2014, petition. Therefore, the NRC will consider the June 26, 2014, document to be a supplement to PRM-51-31, and accordingly, included it in the docket for PRM-51-31 (NRC-2014-0055).

STATUS OF PETITION SINCE THE LAST PRM REPORT:

[The WG is finalizing the denial package to be submitted for Commission approval.]

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC formed a WG to address both PRM-51-30 (Spent Fuel Storage and Disposal) and PRM-51-31.

Comment [Guidance]: Update

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Comment [Guidance]: Update

PRM NO.: PRM-73-17

PETITION SUBJECT: Malware and Programmable Logic in Computers in Nuclear Power Plant Systems

PETITIONER: Alan Morris of Morris and Ward, Consulting Engineers

DOCKET ID: NRC-2013-0214

NRC CONTACT: Natreon Jordan, NRR, 301-415-7410

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---|--|-----------------|-------------|----------------------|---|
| March 14, 2013; August 17, 21, 23, and 27, 2013 | February 7, 2014 79 FR 7406 | February 2015 | May 5, 2015 | Denied | February 2016 |

PETITION SUMMARY:

On March 14, 2013, as supplemented by additional information through December 19, 2013, Alan Morris submitted a PRM that requests that the Commission require "new-design programmable logic computers" be installed in the control systems of NPPs to

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PRM-73-17 (continued)

block malware attacks on the industrial control systems of those facilities. In addition, the petitioner requests that NPP staff be trained in "the programming and handling of the non-rewriteable memories" for NPPs.

Comment [Guidance]: Make sure this reflects any Commission/EDO criticisms of the FRN.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

A Commission assistant briefing was held on January 11, 2016. The WG is making changes to the FRN identified in this meeting.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC received the original request on March 14, 2013. The NRC staff determined that the original request did not meet the requirements in 10 CFR 2.802 for docketing of a PRM, and it notified the petitioner on August 9, 2013. The petitioner supplemented his original petition on August 17, 21, 23, and 27, 2013. In addition, the petitioner provided additional supplemental information through December 19, 2013. On June 12, 2014, the NRC staff sent a letter to the petitioner requesting additional information. The petitioner responded with several e-mails on June 18 and 19, 2014.

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PRM NO.: PRM-50-106

PETITION SUBJECT: Environmental Qualification of Electrical Equipment Applicable to Existing and New Reactors

PETITIONER: Paul M. Blanch and C. Jordan Weaver, Natural Resources Defense Council (NRDC)

DOCKET ID: NRC-2012-0177

NRC CONTACT: Margaret S. Ellenson, NRR, 301-415-0894

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------|--|-----------------|--------------------|----------------------|---|
| June 18, 2012 | September 27, 2012 77 FR 59345 | September 2013 | September 18, 2013 | Denied | August 2015 |

PETITION SUMMARY:

On June 18, 2012, Paul M. Blanch and C. Jordan Weaver, of NRDC, jointly submitted a PRM that requests that the Commission "initiate rulemaking to revise its regulations to clearly and unequivocally require the environmental qualification of all safety-related cables, wires, splices, connections, and other ancillary electrical equipment that may be subjected to submergence and/or moisture intrusion during normal operating conditions, severe weather, seasonal flooding, and seismic events, and post-accident conditions, both inside and outside of containment."

PRM-50-106 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff submitted the denial package to the Commission for approval (SECY-15-0098, "Denial of Petition for Rulemaking related to Environmental Qualifications of Electrical Equipment (PRM-50-106)," dated August 5, 2015 (ADAMS Accession No. ML14071A279)).

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-50-103

PETITION SUBJECT: Measurement and Control of Combustible Gas Generation and Dispersal

PETITIONER: NRDC and Mark Leyse

DOCKET ID: NRC-2011-0189

NRC CONTACT: Richard Dudley, NRR, 301-415-1116

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|------------------|--|-----------------|--------------|----------------------|--|
| October 14, 2011 | January 5, 2012 77 FR 441 | Undetermined | Undetermined | Undetermined | Undetermined |

PETITION SUMMARY:

On October 14, 2011, the NRDC submitted a PRM that requests that the Commission amend its regulations regarding the measurement and control of combustible gas generation and dispersal within a power reactor system.

PRM-50-103 (continued)

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STATUS OF PETITION SINCE THE LAST PRM REPORT:

Action on this petition has been postponed pending further action on Recommendation 6 of the Fukushima Near-Term Task Force (NTTF) report.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not institute a public comment period, because the hydrogen control issue raised by this petition is being considered by the Commission under Recommendation 6 of the Fukushima NTTF report.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

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PRM NO.: PRM-50-99

PETITION SUBJECT: Enhancing Reactor Safety

PETITIONER: NRDC

DOCKET ID: NRC-2011-0189

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|----------------------|---|--|---|---|--|
| July 26, 2011 | September 20, 2011 76 FR 58165 | PRM-50-97 and PRM-50-98: NA PRM-50-99: Undetermined | PRM-50-97 and PRM-50- 98: NA PRM-50-99: Undetermined | PRM-50-97 and PRM-50- 98: Consider in Rulemaking PRM-50-99: Undetermined | PRM-50-97 and PRM-50-98: September 2015 PRM-50-99: Undetermined |

PRM-50-97, PRM-50-98, and PRM-50-99 (continued)

PETITION SUMMARY:

On July 26, 2011, the NRDC submitted six PRMs (three of which have already been closed) that request that the Commission amend its regulations to require: (1) Emergency Preparedness (EP) enhancements for prolonged station blackouts, (2) EP enhancements for multiunit events, and (3) licensees to confirm seismic hazards and flooding hazards every 10 years and address any new and significant information. All of the PRMs cite the Fukushima NTTF report as the rationale and bases for the PRMs.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

PRM-50-97 and PRM-50-98 are being considered within the Mitigation Strategies for Beyond-Design-Basis Events (RIN 3150-AJ49) proposed rule and the staff is preparing letters to the petitioner for EDO signature.

Action on PRM-50-99 has been postponed pending further action on the NTTF report.

PUBLIC COMMENTS ON THE PETITION:

Because the issues raised by these PRMs are being considered by the Commission under its review of the Fukushima NTTF report, the NRC did not institute a separate public comment period.

BACKGROUND/ITEMS OF INTEREST (if applicable):

In the SRM to SECY-15-0065, "Proposed Rule: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)," dated August 27, 2015 (ADAMS Accession No. ML15239A767), the Commission approved the staff's recommendation that these three petitions be addressed through the Mitigation of Beyond-Design-Basis Events proposed rulemaking.

PRM NO.: PRM-50-93 and PRM-50-95

PETITION SUBJECT: Calculated Maximum Fuel Element Cladding Temperature

PETITIONER: Mark Edward Leyse, on behalf of the New England Coalition

DOCKET ID: NRC-2009-0554

NRC CONTACT: Daniel Doyle, NRR, 301-415-3748

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|-----------------------------------|--|-----------------|--------------|----------------------|--|
| November 17, 2009 June 7, 2010 | January 25, 2010 75 FR 3876 | September 2016 | Undetermined | Undetermined | March 2017 |

PETITION SUMMARY:

On November 17, 2009, and June 7, 2010, Mark Edward Leyse, on behalf of the New England Coalition, submitted PRMs that request that the Commission revise 10 CFR 50.46(b)(1) to require that the calculated maximum fuel element cladding temperature not exceed a limit based on data from multirod (assembly) severe fuel damage experiments. The petitioner also requests revision of Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," to 10 CFR Part 50.

PRM-50-93 and PRM-50-95 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

[The staff is continuing to analyze the specific issues raised in the petitions. Specific items from the petitions include 7, 8, 11, 13, and 14. The WG requested and received an extension to August 2016.]

PUBLIC COMMENTS ON THE PETITION:

The NRC received 20 comments, the majority of which were in support of the petition, and is preparing to make a presentation in the fall of 2015 to the PRB on dispositioning this PRM. The NRC published a second FRN on October 27, 2010 (75 FR 66007), to consolidate PRM-50-93 and PRM-50-95 and re-open the public comment period. The NRC received an additional 12 public comments.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The duration of the NRC's review will exceed the typical review period of PRMs because of the extremely large amount of information in PRMs 50-93/95. As a result, the NRC staff has implemented a special enhanced-transparency review process to increase the visibility of its review to the public. The NRC will publicly release its draft determinations regarding each group or category of issues on a periodic basis as the review progresses. In addition, the NRC will communicate preliminary review information to the petitioners and to other persons or organizations known to be interested in this activity. However, the NRC's conclusions on the issues raised in PRMs 50-93/95 will not be final until the Commission formally acts on the staff's recommendations and publishes a notice of this action in the FR. The staff will place a disclaimer on all preliminary findings to clearly indicate their non-final status.

The NRC explained this special process to the petitioner in a letter on August 25, 2011. The preliminary analyses are included in the docket on www.regulations.gov.

Comment [AdJ]: NRR, Has there been a PRB?

Comment [AdJ]: NRR, please update. Was a PRB held in fall 2015?

Comment [AdJ]: NRR, should we mention the back-and-forth email correspondence with Leyse?

PRM NO.: PRM-26-3, PRM-26-5, and PRM-26-6

PETITION SUBJECT: "Managing Fatigue" and Options for Implementing an Alternative Interim Regulatory Approach to the Minimum Days Off Provisions

PETITIONERS: Robert N. Meyer, on behalf of the Professional Reactor Operator Society; Anthony R. Pietrangelo, on behalf of the Nuclear Energy Institute; and Erik Erb

DOCKET ID: NRC-2009-0482, NRC-2010-0304, and NRC-2010-0310

NRC CONTACT: Stewart Schneider, NRR, 301-415-4123

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|-------------------|--|-----------------|--------------|----------------------|--|
| October 16, 2009 | November 27, 2009 74 FR 62257 | Undetermined | Undetermined | Undetermined | MONTH 2016 |
| September 3, 2010 | October 22, 2010 75 FR 65249 | | | | |
| August 17, 2010 | November 23, 2010 75 FR 71368 | | | | |

PRM-26-3, PRM-26-5, and PRM-26 (continued)

PETITION SUMMARY:

On October 29, 2009, Robert N. Meyer, on behalf of the Professional Reactor Operator Society, submitted a PRM requesting that the NRC change the term "unit outage" to "site outage" in 10 CFR Part 26 and that the definition of "site outage" read "up to 1 week prior to disconnecting the reactor unit from the grid and up to 75-percent turbine power following reconnection to the grid." On September 3, 2010, Anthony R. Pietrangelo, on behalf of the Nuclear Energy Institute, submitted a PRM requesting that the NRC amend its regulations regarding fitness-for-duty programs to refine existing requirements based on experience gained since the regulations were last amended in 2008. On August 17, 2010, Erik Erb submitted a PRM requesting that the that the NRC amend its fitness-for-duty regulations to decrease the minimum days off requirement from an average of 3 days per week to 2.5 or 2 days per week for security officers working 12-hour shifts.

In the SRM to SECY-11-0003/0028, "Status of Enforcement Discretion Request and Rulemaking Activities Related to 10 CFR part 26, subpart I, 'Managing Fatigue' and Options for Implementing an Alternative Interim Regulatory Approach to the Minimum Days Off Provisions of 10 CFR part 26, subpart I, 'Managing Fatigue,'" the Commission directed the NRC staff to address these PRMs in a rulemaking effort separate from the alternative to the minimum days off (MDO) rulemaking. The scope of the alternative MDO rulemaking was limited solely to providing an alternative to the then-current requirements for minimum days off in 10 CFR part 26, subpart I. On May 16, 2011, the NRC published three documents in the *Federal Register* (one for each PRM) informing the public that the issues raised in each PRM would be considered in a planned QC/QV rulemaking (76 FR 28192).

STATUS OF PETITION SINCE THE LAST PRM REPORT:

In the "Status Report on Petitions for Rulemaking as of August 2011," dated September 12, 2011 (ML112580409), the docket for this PRM was closed because staff determined that it would be considered in the proposed rulemaking titled "Fitness-for-Duty Programs" (previously titled "Part 26, Subpart I" and "Quality Control/Quality Verification") (Docket ID: NRC-2009-0090). On December 9, 2015, a notice discontinuing the "Fitness-for-Duty Programs" rulemaking was published in the *Federal Register* and staff determined that these rulemaking would be resolved by the NRC in a separate action.

PRM-26-3, PRM-26-5, and PRM-26 (continued)

PUBLIC COMMENTS ON THE PETITION:

The NRC published a notice of receipt of, and request for public comment on PRM-26-3 on November 27, 2009. The public comment period ended on February 10, 2010, and the NRC received 4 comment letters from NEI, nuclear power plant operators and managers, and a private citizen. The comments generally supported the petition.

The NRC published a notice of receipt of, and request for public comment on the PRM-26-5 on October 22, 2010. The public comment period ended on January 5, 2011, and the NRC received 39 comment letters from corporations, professional organizations, and private citizens. Of these 39 comment letters, 11 specifically voiced support for the petition, while 13 voiced opposition. Those comment letters that voiced neither support for nor opposition to the petition itself discussed a diverse range of perspectives on the fatigue management provisions contained in 10 CFR part 26, subpart I.

The NRC published a notice of receipt of, and request for public comment on PRM-26-6 on November 23, 2010. The public comment period ended on February 7, 2011, and the NRC received 5 comment letters from corporations, professional organizations, and private citizens. The comments generally supported the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

INSERT A SHORT DISCUSSION OF PATH FORWARD. IF WE WILL NOT BE HOLDING A PRB PLEASE EXPLAIN WHY.

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OPEN PETITIONS FOR THE OFFICE OF NEW REACTORS

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PRM NO.: PRM-50-110

PETITION SUBJECT: Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors

PETITIONER: Michael D. Tschiltz, on behalf of the NEI

DOCKET ID: NRC-2015-0028

NRC CONTACT: Rollie Berry, NRO, 301-415-8162

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------------|--|-----------------------|-------------------|---------------------------|---|
| January 15, 2015 | March 27, 2015 80 FR 16308 | May 2016 | December 21, 2015 | Consider in Rulemaking | September 2016 |

PETITION SUMMARY:

On January 15, 2015, Michael D. Tschiltz, on behalf of NEI, submitted a PRM that requests that the Commission amend its regulations to clarify the scope of applicability of 10 CFR 50.69, "Risk-informed categorization and treatment of structures, systems, and components for nuclear power reactors," to include holders of COLs. The applicability and scope of the NRC's regulations in

PRM-50-110 (continued)

§ 50.69 currently applies to a holder of an operating license under 10 CFR Part 50; a holder of a renewed operating license under 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," an applicant for a construction permit or operating license under 10 CFR Part 50; or an applicant for a design approval, a combined license, or manufacturing license under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." The petitioner is requesting that the rule be amended to include holders of COLs in the scope of applicability.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG met with the PRB on December 21, 2015, and the PRB approved the staff's recommendation to consider the petition. The WG will submit a SECY paper to the Commission recommending that rulemaking be initiated, as well as additional options that the Commission may consider during its review of the PRM.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition; therefore, the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC staff discussed this topic at public meetings held during the two years before NEI filed this PRM. The staff held a public meeting on September 16, 2015, to gauge the need for the proposed amendment. During the public meeting, NEI clarified the applicability, which could lead to a need for additional guidance.

Comment [Adj]: NRO, is this accurate? Or should we delete this sentence.

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OPEN PETITIONS FOR THE OFFICE OF THE GENERAL COUNSEL

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PRM NO.: PRM-2-15

PETITION SUBJECT: Agency Procedures for Responding to Adverse Court Decisions and Addressing Funding Shortfalls

PETITIONER: Jeffrey M. Skov

DOCKET ID: NRC-2015-0264

NRC CONTACT: Ian Irvin, OGC, 301-415-1933

Comment [TL]: Insert cite when FRN published.

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|------------------|--|-----------------|--------------|----------------------|---|
| October 22, 2015 | February 2016 | February 2017 | Undetermined | Undetermined | June 2017 |

PETITION SUMMARY:

On October 22, 2015, Jeffrey M. Skov submitted a PRM that requests that the Commission amend its rules of practice and procedure to establish procedures for responding to adverse court decisions and to annually report to the public each instance where the NRC does not receive "sufficient funds reasonably necessary to implement in good faith its statutory mandates."

PRM-2-15 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

This is the first entry for this PRM in this report. The staff is analyzing the issues raised in the petition.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

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PETITIONS COMPLETED SINCE LAST REPORT

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| PRM No. | PRM Date | Petitioner | Subject | Docket ID | Resolution |
|-----------|------------|------------|---|----------------------|--|
| PRM-50-97 | 07/26/2011 | NRDC | Emergency Preparedness Enhancements for Prolonged Station Blackouts | <u>NRC-2011-0189</u> | Petition will be resolved in Mitigation of Beyond-Design-Basis Events rulemaking [NRC-2014-0240 ; RIN 3150-AJ49] |
| PRM-50-98 | 07/26/2011 | NRDC | Emergency Preparedness Enhancements for Multiunit Events | <u>NRC-2011-0189</u> | Petition will be resolved in Mitigation of Beyond-Design-Basis Events rulemaking [NRC-2014-0240 ; RIN 3150-AJ49] |

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From: Malave, Yanely
Sent: 18 Feb 2016 13:21:27 -0500
To: DeJesus, Anthony
Cc: Yilma, Haimanot; RidsNroMailCenter Resource; Borges, Jennifer
Subject: FW: ACTION: YT-2016-0020 - Review Status Report on Petitions for Rulemaking - March 2016
Attachments: PRM Status Report March 2016 FINAL DRAFT_2-5-16.docx, RE: PRM Status Report
Importance: High

Good afternoon Anthony

Michael Mayfield concurs for NRO on the PRM Status Report with one comment on pg. 36.

Let me know if you have any question.

NRO Correspondence Team; this completes DEIA's action for YT-2016-0020.


Thanks


Yanely Malave-Velez

Technical Assistant

US NRC - Office of New Reactors

Division of Engineering, Infrastructure, and Advanced Reactors

 yanely.malave@nrc.gov

 301-415-1519

From: RidsNroMailCenter Resource
Sent: Friday, February 05, 2016 4:00 PM
To: Hamilton, LaJuan <LaJuan.Hamilton@nrc.gov>; White, Alicia <Alicia.White@nrc.gov>
Cc: Smith, Tanya <Tanya.Smith@nrc.gov>; Malave, Yanely <Yanely.Malave@nrc.gov>; Yilma, Haimanot <Haimanot.Yilma@nrc.gov>; RidsNroMailCenter Resource <RidsNroMailCenter.Resource@nrc.gov>; Coates, Anissa <Anissa.Coates@nrc.gov>
Subject: FW: ACTION: YT-2016-0020 - Review Status Report on Petitions for Rulemaking - March 2016
Importance: High

ACTION: DEIA

YT-2016-0020 - Review Status Report on Petitions for Rulemaking - March 2016

Due Date: 2/18/16 (please provide Office concurrence to Anthony DeJesus, ADM)

Thanks,

NRO Correspondence Team

Yvette Correa

From: DeJesus, Anthony

Sent: Friday, February 05, 2016 3:48 PM

To: RidsNrrMailCenter Resource <RidsNrrMailCenter.Resource@nrc.gov>; RidsNmssOd Resource <RidsNmssOd.Resource@nrc.gov>; RidsNroMailCenter Resource <RidsNroMailCenter.Resource@nrc.gov>; RidsOgcMailCenter Resource <RidsOgcMailCenter.Resource@nrc.gov>; QTE Resource <QTE.Resource@nrc.gov>

Cc: Doyle, Daniel <Daniel.Doyle@nrc.gov>; Whaley, Sheena <Sheena.Whaley@nrc.gov>; Smith, Tanya <Tanya.Smith@nrc.gov>; Spencer, Mary <Mary.Spencer@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>; Terry, Leslie <Leslie.Terry@nrc.gov>; Borges, Jennifer <Jennifer.Borges@nrc.gov>

Subject: ACTION: Review Status Report on Petitions for Rulemaking - March 2016

By February 18, 2016, please review and provide your concurrence on the following attached documents:

- The March 2016 Status Report on Petitions for Rulemaking, and
- The transmittal memo to the EDO.

We are requesting Office Director level concurrence on these documents.

Background

Each February and August, the Status Report on Petitions for Rulemaking is prepared for the Executive Director for Operations' (EDO) information. The information contained in this report is for the use of the EDO and is not made available to the general public. The current report covers the period of August 31, 2015 - February 1, 2016. The last report, dated October 2, 2015, is available in the U.S. Nuclear Regulatory Commission's Agencywide Documents Access and Management System under Accession No. ML15217A434.

Your Review and Response

Please verify that this report contains an entry for all of the active petitions for which your office is responsible and that each entry is accurate and contains the most current information (i.e., all communication with the petitioner). If a contact

person is not listed, or has changed, please identify a member of your staff who will serve as the contact person for your office.

Please provide me with your concurrence by **February 18, 2016**. If you have any questions concerning this matter, please contact me at 301-415-1106 (Anthony.deJesus@nrc.gov) or Jennifer Borges at 301-415-3647 (Jennifer.Borges@nrc.gov).



Anthony de Jesús, Sr. Regulations Specialist

Agency 2.802 Petition Coordinator

Rules, Announcements, and Directives Branch

U.S Nuclear Regulatory Commission

OWFN 12- G09

Washington, DC 20555-0001

301-415-1106

Anthony.deJesus@nrc.gov

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STATUS REPORT ON PETITIONS FOR RULEMAKING

March 2016

Enclosure

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INTRODUCTION

The Status Report on Petitions for Rulemaking (PRM) is provided to the Executive Director for Operations (EDO) bi-annually. The purpose of this report is to inform the EDO of petitions currently before the agency and to provide an update on progress toward their completion. This report includes petitions docketed since the last report dated October 2, 2015 (Accession No. ML15217A434 in the U.S. Nuclear Regulatory Commission's (NRC's) Agencywide Documents Access and Management System). In addition, this report informs the EDO of petitions completed since the last report. The Office of Administration, in consultation with the Office of Nuclear Reactor Regulation (NRR), the Office of Nuclear Material Safety and Safeguards (NMSS), the Office of New Reactors (NRO), and the Office of the General Counsel (OGC), compiles the information for each open petition.

The report presents open petitions by office, beginning with the newest dockets and ending with the oldest dockets. The report captures the progression of each petition as it moves through the agency's process. The report includes hyperlinks to the docket for each petition on <http://www.regulations.gov>, thereby making additional pertinent documentation, including any public comments received, readily available to the reader. All reports since 2010 are available on [The NRC Rulemaker](#).¹ If you have a comment or suggestion for additional improvements to this report, please contact Anthony de Jesús at 301-415-1106.

¹<http://fusion.nrc.gov/adm/team/DAS/RADB/resource/Lists/Status%20Report%20on%20Petitions%20for%20Rulemaking/AllItems.aspx>.

LIST OF COMMON ABBREVIATIONS

| | |
|--------|--|
| 10 CFR | Title 10 of the <i>Code of Federal Regulations</i> |
| ADAMS | Agencywide Documents Access and Management System |
| ASLB | Atomic Safety Licensing Board |
| ASME | American Society of Mechanical Engineers |
| ASR | alkali-silica reaction |
| COL | combined operating license |
| ECCS | Emergency Core Cooling System |
| EDO | Executive Director for Operations |
| EP | emergency preparedness |
| FR | <i>Federal Register</i> |
| FRN | <i>Federal Register</i> notice |
| ISFSI | independent spent fuel storage installations |
| LOCA | loss-of-coolant accident |
| mSv | millisievert |
| NEI | Nuclear Energy Institute |
| NMSS | Office of Nuclear Material Safety and Safeguards |
| NPP | nuclear power plant |
| NRC | U.S. Nuclear Regulatory Commission |
| NRO | Office of New Reactors |
| NRDC | Natural Resources Defense Council |
| NRR | Office of Nuclear Reactor Regulation |
| NTTF | Near-Term Task Force |
| PRM | petition for rulemaking |
| PRB | Petition Review Board |
| rem | roentgen equivalent in man |
| RIN | Regulation Identification Number |
| SECY | Office of the Secretary |
| SFP | spent fuel pool |
| SRM | staff requirements memorandum |
| WG | working group |

DEFINITIONS

Open PRM: Any docketed² petition for rulemaking that the NRC staff is actively working on.

Closed PRM: The PRM docket is closed, either through publication of a notice of denial or a notice stating that the petition will be fully or partially considered in the rulemaking process.

Estimated Date for Submission to Commission:³ Four months after the date of the meeting of the Petition Review Board (PRB).

Pending PRM: A notice has not been published indicating the closure of the petition docket.

Status of Petition since the Last PRM Report: A brief statement of the actions that have occurred or will occur in the near future. (For example: "Notice of docketing and request for public comment is under development.")

Date of PRB: The date that the PRB and petition working group (WG) determine the regulatory decision on a PRM (i.e., denial, consideration in a current or future rulemaking, or partial consideration in a current or future rulemaking).

Target PRB Date: The PRB and petition WG determine the regulatory decision on a petition within 12 months from the date the notice of docketing is published in the *Federal Register* (FR).

Undetermined: A date has not been established at this time.

Withdrawn: The petitioner no longer wants to pursue the requested action and has notified the NRC. The change in status includes the date that the *Federal Register* notice (FRN) was published to notify the public that the petition was withdrawn.

Public Comments on the Petition: A brief summary of the comments received from the public or any interested party regarding a PRM, including the number received, type (individual, form letter, etc.), commenters (individual, industry, State organization, etc.), and whether the comments were generally in support of or generally in disagreement of the petition.

Background or Items of Interest (if applicable): Pertinent information related to the PRM that the staff wants to document throughout the process (e.g., congressional interest, changes in the regulatory environment).

² A PRM is docketed by the NRC if it meets the docketing criteria in § 2.802 of Title 10 of the *Code of Federal Regulations*, "Petition for rulemaking—requirements for filing."

³ NRC official who has the ultimate authority to determine whether a PRM will be denied or considered in whole or in part in the rulemaking process.

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OPEN PETITIONS BY OFFICE

Enclosure

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**OPEN PETITIONS FOR THE OFFICE OF NUCLEAR MATERIAL SAFETY AND
SAFEGUARDS**

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PRM NOS.: PRM-20-28, PRM-20-29, and PRM-20-30

PETITION SUBJECT: Linear No-Threshold Model and Standards for Protection against Radiation

PETITIONERS: Carol S. Marcus, Mark L. Miller, and Mohan Doss

DOCKET ID: NRC-2015-0057

NRC CONTACT: Vanessa Cox, NMSS, 301-415-8342

Comment (TL): This report will be submitted in March. NMSS should firm up PRB plans.

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--|--|-----------------|--------------|-------------------|---|
| February 9, 2015 February 13, 2015 February 24, 2015 | June 23, 2015 80 FR 35870 | March 2016 | Undetermined | Undetermined | July 2016 |
| | | | | | |

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PRM-20-28, PRM-20-29, and PRM-20-30 (continued)

PETITION SUMMARY:

On February 9, 2015, February 13, 2015, and February 24, 2015, Carol S. Marcus, Mark L. Miller, and Mohan Doss, respectively, submitted nearly identical petitions requesting that the Commission amend its regulations in Part 20 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Standards for Protection against Radiation," to take radiation hormesis into account and end the NRC's reliance on the linear no-threshold hypothesis used to determine dose standards in its regulations. The concept of radiation hormesis claims that low doses of radiation have "no effects or protective effects" on population groups. Consequently, the petitioners request that: (1) worker dose remain at present levels, with allowances up to 100 millisievert (10 rem); (2) the use of the "as low as reasonably achievable" principle be removed entirely from the NRC's regulations; (3) public doses be raised to match worker doses; and (4) the NRC end differential doses to pregnant women, embryos and fetuses, and children under 18 years of age.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition and the public comments received.

PUBLIC COMMENTS ON THE PETITION:

The public comment period was scheduled to close on September 8, 2015; however, the NRC received requests for an extension of the comment period. The staff extended the comment period by 90 days (80 FR 50804; August 21, 2015). The comment period closed on November 19, 2015. The NRC received 561 individual public comments and 2,511 form letter comments on these PRMs. [The majority of comments were opposed to the changes requested by the petitioners.]

BACKGROUND/ITEMS OF INTEREST (if applicable):

The staff is evaluating three nearly identical petitions as one activity.

Comment [AdJ]: NMSS, check for accuracy. Do we have a break down of number opposed, number in support, etc? If so, please provide that breakdown here.

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Comment (TL): Update

PRM NO.: PRM-51-30

PETITION SUBJECT: Spent Fuel Storage and Disposal

PETITIONER: Diane Curran, on behalf of 34 environmental organizations

DOCKET ID: NRC-2014-0014

NRC CONTACT: Keith McDaniel, NMSS, 301-415-5252

| Date Received | Notice of Docketing Published in the Federal Register | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--------------------------------------|---|-----------------|----------------|-------------------|---|
| December 20, 2013 January 7, 2014 | April 21, 2014 79 FR 22055 | March 2015 | April 14, 2015 | Denied | September 2015 |

PETITION SUMMARY:

On December 20, 2013, as corrected on January 7, 2014, Diane Curran, on behalf of 34 environmental organizations, submitted a PRM that requests that the Commission revise and integrate all safety and environmental regulations related to spent fuel storage and disposal. The petitioner requests that the NRC conduct a comprehensive review of these regulations and environmental studies, revise them to be consistent with the current state of knowledge, and integrate them into one cohesive regulatory framework in order to comply with the National Environmental Policy Act.

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PRM-51-30 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is finalizing the denial package to be submitted for Commission approval.

Comment [TL]: Should only be status since last report.

Comment [Adj]: NRR Update

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC formed a WG to address both PRM-51-30 and PRM-51-31 (Environmental Impacts of Spent Fuel Storage during Reactor Operation) because both petitions make similar rulemaking requests.

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PRM NO.: PRM-72-6

PETITION SUBJECT: Dry Cask Storage of Spent Fuel

PETITIONER: C-10 Research and Education Foundation, Inc.

DOCKET ID: NRC-2008-0649

NRC CONTACT: Torre Taylor, NMSS, 301-415-7900

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Date of Final Action/<i>Federal Register</i> Notice Citation |
|------------------------------|---|--|--|---|--|
| November 24, 2008 | March 3, 2009 74 FR 9178 | First PRB: January 2010 Second PRB: May 2015 | First PRB: January 2010 Second PRB: May 18, 2015 | First Review: Denied, Partial Consideration in the Rulemaking Process, and Undetermined (see Background below) Remaining two issues: Denied | First publication: October 16, 2012 77 FR 63254 Publication on remaining two issues after Commission Direction |

PRM-72-6 (continued)

PETITION SUMMARY:

On November 24, 2008, C-10 Research and Education Foundation, Inc. (C-10), submitted a PRM that requests that the Commission amend its regulations governing onsite dry cask storage of spent fuel. The petitioner believes that the current regulations do not provide sufficient requirements for safe storage of spent nuclear fuel in dry cask storage at independent spent fuel storage installations (ISFSIs). The petitioner requests the following 12 changes:

1. The NRC should prohibit the production of nonconforming pre-built full scale casks specifically built for NRC certification testing.
2. The NRC certification of casks should be based on upgraded code requirements that include design criteria and technical specifications for a 100-year minimum age-related degradation timeframe.
3. The NRC should approve, as part of the original ISFSI certification process and construction license, a method for dry cask transfer capacity that will allow for immediate and safe maintenance on a faulty or failing cask.
4. The NRC should require that dry casks be qualified for transport at the time of onsite storage approval certification.
5. The NRC should require mandatory compliance with the American Society of Mechanical Engineers (ASME) codes and standards "without exception."
6. The NRC should require ASME code stamping for fabrication.
7. All materials for fabrication should be supplied by ASME-approved material suppliers.
8. Current ASME codes and standards for conservative heat treatment and leak tightness should be adopted and enforced.
9. A safe and secure hot cell transfer station coupled with an auxiliary pool should be built as part of an upgraded ISFSI design certification and licensing process.
10. The NRC should require real-time heat and radiation monitoring at ISFSIs.
11. The NRC should require hardened onsite storage at all nuclear power plants (NPPs).
12. The NRC should establish funding to conduct ongoing studies to provide the data required to accurately define and monitor for age-related material degradation.

PRM-72-6 (continued)

Comment [AdJ]: Update

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is preparing a denial package to be submitted to the Commission for approval in October 2015.

PUBLIC COMMENTS ON THE PETITION:

The NRC received approximately 9,000 comments, the vast majority of which were in postcard format and supported the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC published an FRN on October 16, 2012 (77 FR 63254), acknowledging that the petition would be partially considered in the rulemaking process. The FRN stated that the Commission denied nine of the petitioner's requests (Requests 1, 2, 3, 5 through 8, 10, and 12), as listed in the "Petition Summary," and would consider one request in the rulemaking process (Request 11). The FRN stated that the NRC was deferring action on two requests (Requests 4 and 9) for future rulemaking determinations.

The docket for PRM-72-6 remains open until the Commission acts on Requests 4 and 9.

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OPEN PETITIONS FOR THE OFFICE OF NUCLEAR REACTOR REGULATION

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PRM NO.: PRM-50-113

PETITION SUBJECT: Uninterruptible Monitoring of Coolant and Fuel in Reactors and Spent Fuel Pools

PETITIONER: Alexander DeVolpi

DOCKET ID: NRC-2015-0230

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

Comment [AdJ]: Report goes to EDO in March. Important this is accurate

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--------------------|--|-------------------------|-------------------------|-------------------------|---|
| September 10, 2015 | December 1, 2015 80 FR 75009 | PRB Will Not Be Held | PRB Will Not Be Held | PRB Will Not Be Held | March 2016 |

PETITION SUMMARY:

On September 10, 2015, Dr. Alexander DeVolpi submitted a PRM that requests that the Commission amend its regulations in 10 CFR Part 50 to require "installation of ex-vessel instrumentation for uninterrupted monitoring of coolant and fuel in reactors and spent-fuel pools." The petitioner cites a 2014 National Research Council report titled, "Lessons Learned from the Fukushima Nuclear Accident for Improving Safety of U.S. Nuclear Plants," that gave high priority to Recommendation 5.1A, which stated that greater

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PRM-50-113 (continued)

"[a]ttention to availability, reliability, redundancy, and diversity of plant systems and equipment is specifically needed for . . . Instrumentation for monitoring critical thermodynamic parameters in reactors, containments, and spent fuel pools." In addition, the petitioner cites to Section 5.1.1.4 of the report, "Instrumentation for Monitoring Critical Thermodynamic Parameters," which states that "robust and diverse monitoring instrumentation that can withstand severe accident conditions is essential for diagnosing problems, selecting and implementing accident mitigation strategies, and monitoring their effectiveness."

STATUS OF PETITION SINCE THE LAST PRM REPORT:

This is the first entry for this PRM in this report. The staff is continuing to analyze the specific issues raised in the petition..

PUBLIC COMMENTS ON THE PETITION:

The NRC did not request public comment on this petition as the staff believed it had sufficient information to fully evaluate the issues raised in the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

Comment [AdJ]: NRR should briefly discuss the other activities related to this PRM. Including explain why a PRB is not being held.

PRM NO.: PRM-50-112

PETITION SUBJECT: Defining "Important to Safety"

PETITIONER: Kurt T. Schaefer

DOCKET ID: NRC-2015-0213

NRC CONTACT: Robert Beall, NRR, 301-415-3874

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|----------------------------------|--|-----------------|--------------|----------------------|---|
| July 20, 2015 August 31, 2015 | January 6, 2016 | Undetermined | Undetermined | Undetermined | January 2017 |

PETITION SUMMARY:

On July 20, 2015, and supplemented on August 31, 2015, Kurt T. Schaefer submitted a PRM that requests that the Commission amend 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," by defining and providing a set of criteria "for determining which structures, systems, components and functions are 'important to safety.'"

PRM-50-112 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The petition was published for public comment on January 6, 2016 (81 FR 410).

PUBLIC COMMENTS ON THE PETITION:

The public comment period closes on March 21, 2016.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-50-111

PETITION SUBJECT: Power Reactor In-Core Monitoring

PETITIONER: Mark Edward Leyse

DOCKET ID: NRC-2015-0124

NRC CONTACT: Natreon Jordan, NRR, 301-415-7410

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|----------------|--|-----------------|--------------|----------------------|---|
| March 13, 2015 | July 16, 2015 80 FR 42067 | July 2016 | Undetermined | Undetermined | November 2016 |

PETITION SUMMARY:

On July 16, 2015, Mark Edward Leyse submitted a PRM that requests that the Commission amend its regulations to require all NPP licensees to use in-core monitoring devices at different elevations and radial positions throughout the reactor.

PRM-50-111 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

PRM-50-111, which applies to boiling water reactors, is an extension of the issues raised in PRM-50-105, which also was submitted by Mr. Leyse. The NRC interpreted PRM-50-105 as limited to pressurized water reactors, and denied the PRM (78 FR 56174; September 12, 2013).

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Comment [AdJ]: Will need to update as soon as PRB takes place on 2/11.

PRM NO.: PRM-50-109

PETITION SUBJECT: Improved Identification Techniques against Alkali-Silica Concrete Degradation at Nuclear Power Plants

PETITIONER: Sandra Gavutis, on behalf of C-10

DOCKET ID: NRC-2014-0257

NRC CONTACT: Jessica Kratchman, NRR, 301-415-5112

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|--------------------|--|-----------------|----------------------|----------------------|---|
| September 25, 2014 | January 12, 2015 80 FR 1476 | January 2016 | February 11, 2016 | Undetermined | May 2016 |

PETITION SUMMARY:

On September 25, 2014, Sandra Gavutis, on behalf of C-10, submitted a PRM that requests that the Commission amend its regulations to provide improved identification techniques against alkali-silica reaction (ASR) concrete degradation at NPPs. The petitioner asserts that current NRC regulations, which rely on visual inspection to identify ASR degradation, do not adequately identify ASR without petrographic analysis. The petitioner is requesting that the NRC revise applicable regulations to require adherence with current American Concrete Institute standards and ASME codes.

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PRM-50-109 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

[The WG met with the PRB on February 11, 2016, and the PRB approved the staff's recommendation to... The staff is preparing a package to be submitted to the Commission for approval in May 2016.]

Comment [AdJ]: NRR should update this to reflect current status.

Comment [AdJ]: NRR should update with actual numbers in support, against, etc.

PUBLIC COMMENTS ON THE PETITION:

The public comment period closed on March 30, 2015. The NRC received 10 public comments on the petition, XX in support of the petition, XX opposing the proposed changes, and XX suggesting alternatives to the changes proposed in the petition.]

BACKGROUND/ITEMS OF INTEREST (if applicable):

The staff confirmed with the petitioner that the petitioner did not intend a portion of the PRM to be treated as an allegation against the licensee.

PRM NO.: PRM-50-108

PETITION SUBJECT: Fuel-Cladding Issues in Postulated Spent Fuel Pool (SFP) Accidents

PETITIONER: Mark Edward Leyse

DOCKET ID: NRC-2014-0171

NRC CONTACT: Daniel Doyle, NRR, 301-415-3748

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------|--|-----------------|--------------|----------------------|---|
| June 19, 2014 | October 7, 2014 79 FR 60383 | October 2015 | May 27, 2015 | Denied | November 2015 |

PETITION SUMMARY:

On June 19, 2014, Mark Edward Leyse submitted a PRM that requests that the Commission make new regulations stipulating the following:

1. The rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction should be calculated by SFP accident evaluation models using data from multirod bundle (assembly) severe accident experiments.

PRM-50-108 (continued)

Comment | Guidance | Update

2. The rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction should be calculated by SFP accident evaluation models using data from multirod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding.
3. SFP accident evaluation models should be required to conservatively model nitrogen-induced breakaway oxidation behavior.
4. Licensees should be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

[The WG is finalizing the denial package to be submitted for Commission approval.]

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

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PRM NO.: PRM-73-18

PETITION SUBJECT: Protection of Digital Computer and Communication Systems and Networks

PETITIONER: Anthony Pietrangelo, on behalf of the Nuclear Energy Institute (NEI)

DOCKET ID: NRC-2014-0165

NRC CONTACT: Jason Carneal, NRR, 301-415-1451

Comment [Guidance]: Report goes to EDO in March, make sure accurate.

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------|--|-----------------|--------------|----------------------|---|
| June 12, 2014 | September 22, 2014 79 FR 56525 | March 2016 | Undetermined | Undetermined | July 2016 |

PETITION SUMMARY:

On June 12, 2014, Anthony Pietrangelo, on behalf of the NEI, submitted a PRM that requests that the Commission revise certain cybersecurity language in its regulations to ensure that the rules are consistent with the NRC's original intent, are less burdensome for NRC licensees, and adequately protect the public health and safety and common defense and security.

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PRM-73-18 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition and the public comments received..

PUBLIC COMMENTS ON THE PETITION:

The public comment period closed on December 12, 2014. The NRC received 19 public comments on the petition, 15 in support of the petition, 2 opposing the proposed changes, and 2 suggesting alternatives to the changes proposed in the petition. The public comments in support of the proposed changes cited detailed examples of specific equipment that the commenters believe should be out of the scope of the cyber security rule. The public comments that opposed the proposed changes and those that suggested alternatives were very detailed and provided suggestions for alternative approaches to regulating cyber security at NPPs.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

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Comment | Guidance | Update

PRM NO.: PRM-51-31

PETITION SUBJECT: Environmental Impacts of Spent Fuel Storage during Reactor Operation

PETITIONER: Diane Curran, on behalf of 34 environmental organizations

DOCKET ID: NRC-2014-0055

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|------------------------------------|--|-----------------|----------------|----------------------|---|
| February 18, 2014 June 26, 2014 | May 1, 2014 79 FR 24595 July 24, 2014 79 FR 42989 | May 2015 | April 14, 2015 | Denied | September 2015 |

PETITION SUMMARY:

On February 18, 2014 (received by the Office of the Secretary (SECY) on March 12, 2014), Diane Curran, on behalf of 34 environmental organizations, submitted a PRM that requests that the Commission revise its regulations and consider, in all pending

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PRM-51-31 (continued)

and future licensing and re-licensing decisions, what the petitioners consider to be new and significant information bearing on the environmental impacts of high-density spent fuel storage in reactor pools and the costs and benefits for avoiding or mitigating those impacts.

On June 26, 2014, Ms. Curran submitted a document, characterized as an "amended petition" for rulemaking, requesting that the NRC "add to the record of the February 18, 2014, petition the observations made by Chairman Macfarlane in her dissenting comments" on the NRC staff document designated COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel," dated November 12, 2013 (ADAMS Accession No. ML13273A601). The NRC does not consider the June 26, 2014, document to be an amendment to the February 18, 2014, petition as the petitioner does not request that the NRC take any rulemaking actions that were not otherwise requested in the February 18, 2014, petition. Therefore, the NRC will consider the June 26, 2014, document to be a supplement to PRM-51-31, and accordingly, included it in the docket for PRM-51-31 (NRC-2014-0055).

STATUS OF PETITION SINCE THE LAST PRM REPORT:

[The WG is finalizing the denial package to be submitted for Commission approval.]

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC formed a WG to address both PRM-51-30 (Spent Fuel Storage and Disposal) and PRM-51-31.

Comment [Guidance]: Update

PRM NO.: PRM-73-17

PETITION SUBJECT: Malware and Programmable Logic in Computers in Nuclear Power Plant Systems

PETITIONER: Alan Morris of Morris and Ward, Consulting Engineers

DOCKET ID: NRC-2013-0214

NRC CONTACT: Natreon Jordan, NRR, 301-415-7410

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---|--|-----------------|-------------|----------------------|---|
| March 14, 2013; August 17, 21, 23, and 27, 2013 | February 7, 2014 79 FR 7406 | February 2015 | May 5, 2015 | Denied | February 2016 |

PETITION SUMMARY:

On March 14, 2013, as supplemented by additional information through December 19, 2013, Alan Morris submitted a PRM that requests that the Commission require "new-design programmable logic computers" be installed in the control systems of NPPs to

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PRM-73-17 (continued)

block malware attacks on the industrial control systems of those facilities. In addition, the petitioner requests that NPP staff be trained in "the programming and handling of the non-rewriteable memories" for NPPs.

Comment [Guidance]: Make sure this reflects any Commission/EDO criticisms of the FRN.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

A Commission assistant briefing was held on January 11, 2016. The WG is making changes to the FRN identified in this meeting.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC received the original request on March 14, 2013. The NRC staff determined that the original request did not meet the requirements in 10 CFR 2.802 for docketing of a PRM, and it notified the petitioner on August 9, 2013. The petitioner supplemented his original petition on August 17, 21, 23, and 27, 2013. In addition, the petitioner provided additional supplemental information through December 19, 2013. On June 12, 2014, the NRC staff sent a letter to the petitioner requesting additional information. The petitioner responded with several e-mails on June 18 and 19, 2014.]

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PRM NO.: PRM-50-106

PETITION SUBJECT: Environmental Qualification of Electrical Equipment Applicable to Existing and New Reactors

PETITIONER: Paul M. Blanch and C. Jordan Weaver, Natural Resources Defense Council (NRDC)

DOCKET ID: NRC-2012-0177

NRC CONTACT: Margaret S. Ellenson, NRR, 301-415-0894

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|---------------|--|-----------------|--------------------|----------------------|---|
| June 18, 2012 | September 27, 2012 77 FR 59345 | September 2013 | September 18, 2013 | Denied | August 2015 |

PETITION SUMMARY:

On June 18, 2012, Paul M. Blanch and C. Jordan Weaver, of NRDC, jointly submitted a PRM that requests that the Commission "initiate rulemaking to revise its regulations to clearly and unequivocally require the environmental qualification of all safety-related cables, wires, splices, connections, and other ancillary electrical equipment that may be subjected to submergence and/or moisture intrusion during normal operating conditions; severe weather, seasonal flooding, and seismic events, and post-accident conditions, both inside and outside of containment."

PRM-50-106 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff submitted the denial package to the Commission for approval (SECY-15-0098, "Denial of Petition for Rulemaking related to Environmental Qualifications of Electrical Equipment (PRM-50-106)," dated August 5, 2015 (ADAMS Accession No. ML14071A279)).

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-50-103

PETITION SUBJECT: Measurement and Control of Combustible Gas Generation and Dispersal

PETITIONER: NRDC and Mark Leyse

DOCKET ID: NRC-2011-0189

NRC CONTACT: Richard Dudley, NRR, 301-415-1116

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|------------------|--|-----------------|--------------|----------------------|--|
| October 14, 2011 | January 5, 2012 77 FR 441 | Undetermined | Undetermined | Undetermined | Undetermined |

PETITION SUMMARY:

On October 14, 2011, the NRDC submitted a PRM that requests that the Commission amend its regulations regarding the measurement and control of combustible gas generation and dispersal within a power reactor system.

PRM-50-103 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

Action on this petition has been postponed pending further action on Recommendation 6 of the Fukushima Near-Term Task Force (NTTF) report.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not institute a public comment period, because the hydrogen control issue raised by this petition is being considered by the Commission under Recommendation 6 of the Fukushima NTTF report.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

PRM NO.: PRM-50-99

PETITION SUBJECT: Enhancing Reactor Safety

PETITIONER: NRDC

DOCKET ID: NRC-2011-0189

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|----------------------|---|--|---|---|--|
| July 26, 2011 | September 20, 2011 76 FR 58165 | PRM-50-97 and PRM-50-98: NA PRM-50-99: Undetermined | PRM-50-97 and PRM-50- 98: NA PRM-50-99: Undetermined | PRM-50-97 and PRM-50- 98: Consider in Rulemaking PRM-50-99: Undetermined | PRM-50-97 and PRM-50-98: September 2015 PRM-50-99: Undetermined |

PRM-50-97, PRM-50-98, and PRM-50-99 (continued)

PETITION SUMMARY:

On July 26, 2011, the NRDC submitted six PRMs (three of which have already been closed) that request that the Commission amend its regulations to require: (1) Emergency Preparedness (EP) enhancements for prolonged station blackouts, (2) EP enhancements for multiunit events, and (3) licensees to confirm seismic hazards and flooding hazards every 10 years and address any new and significant information. All of the PRMs cite the Fukushima NTTF report as the rationale and bases for the PRMs.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

PRM-50-97 and PRM-50-98 are being considered within the Mitigation Strategies for Beyond-Design-Basis Events (RIN 3150-AJ49) proposed rule and the staff is preparing letters to the petitioner for EDO signature.

Action on PRM-50-99 has been postponed pending further action on the NTTF report.

PUBLIC COMMENTS ON THE PETITION:

Because the issues raised by these PRMs are being considered by the Commission under its review of the Fukushima NTTF report, the NRC did not institute a separate public comment period.

BACKGROUND/ITEMS OF INTEREST (if applicable):

In the SRM to SECY-15-0065, "Proposed Rule: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)," dated August 27, 2015 (ADAMS Accession No. ML15239A767), the Commission approved the staff's recommendation that these three petitions be addressed through the Mitigation of Beyond-Design-Basis Events proposed rulemaking.

PRM NO.: PRM-50-93 and PRM-50-95

PETITION SUBJECT: Calculated Maximum Fuel Element Cladding Temperature

PETITIONER: Mark Edward Leyse, on behalf of the New England Coalition

DOCKET ID: NRC-2009-0554

NRC CONTACT: Daniel Doyle, NRR, 301-415-3748

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|-----------------------------------|--|-----------------|--------------|----------------------|--|
| November 17, 2009 June 7, 2010 | January 25, 2010 75 FR 3876 | September 2016 | Undetermined | Undetermined | March 2017 |

PETITION SUMMARY:

On November 17, 2009, and June 7, 2010, Mark Edward Leyse, on behalf of the New England Coalition, submitted PRMs that request that the Commission revise 10 CFR 50.46(b)(1) to require that the calculated maximum fuel element cladding temperature not exceed a limit based on data from multirod (assembly) severe fuel damage experiments. The petitioner also requests revision of Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," to 10 CFR Part 50.

PRM-50-93 and PRM-50-95 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

[The staff is continuing to analyze the specific issues raised in the petitions. Specific items from the petitions include 7, 8, 11, 13, and 14. The WG requested and received an extension to August 2016.]

PUBLIC COMMENTS ON THE PETITION:

The NRC received 20 comments, the majority of which were in support of the petition, and is preparing to make a presentation in the fall of 2015 to the PRB on dispositioning this PRM. The NRC published a second FRN on October 27, 2010 (75 FR 66007), to consolidate PRM-50-93 and PRM-50-95 and re-open the public comment period. The NRC received an additional 12 public comments.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The duration of the NRC's review will exceed the typical review period of PRMs because of the extremely large amount of information in PRMs 50-93/95. As a result, the NRC staff has implemented a special enhanced-transparency review process to increase the visibility of its review to the public. The NRC will publicly release its draft determinations regarding each group or category of issues on a periodic basis as the review progresses. In addition, the NRC will communicate preliminary review information to the petitioners and to other persons or organizations known to be interested in this activity. However, the NRC's conclusions on the issues raised in PRMs 50-93/95 will not be final until the Commission formally acts on the staff's recommendations and publishes a notice of this action in the FR. The staff will place a disclaimer on all preliminary findings to clearly indicate their non-final status.]

The NRC explained this special process to the petitioner in a letter on August 25, 2011. The preliminary analyses are included in the docket on www.regulations.gov.

Comment [AdJ]: NRR, Has there been a PRB?

Comment [AdJ]: NRR, please update. Was a PRB held in fall 2015?

Comment [AdJ]: NRR, should we mention the back-and-forth email correspondence with Leyse?

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OPEN PETITIONS FOR THE OFFICE OF NEW REACTORS

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PRM NO.: PRM-50-110

PETITION SUBJECT: Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors

PETITIONER: Michael D. Tschiltz, on behalf of the NEI

DOCKET ID: NRC-2015-0028

NRC CONTACT: Rollie Berry, NRO, 301-415-8162

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|------------------|--|-----------------|-------------------|------------------------|---|
| January 15, 2015 | March 27, 2015 80 FR 16308 | May 2016 | December 21, 2015 | Consider in Rulemaking | September 2016 |

PETITION SUMMARY:

On January 15, 2015, Michael D. Tschiltz, on behalf of NEI, submitted a PRM that requests that the Commission amend its regulations to clarify the scope of applicability of 10 CFR 50.69, "Risk-informed categorization and treatment of structures, systems, and components for nuclear power reactors," to include holders of COLs. The applicability and scope of the NRC's regulations in

PRM-50-110 (continued)

§ 50.69 currently applies to a holder of an operating license under 10 CFR Part 50; a holder of a renewed operating license under 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," an applicant for a construction permit or operating license under 10 CFR Part 50; or an applicant for a design approval, a combined license, or manufacturing license under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." The petitioner is requesting that the rule be amended to include holders of COLs in the scope of applicability.

Comment [SS]: Rephrased the previous sentence.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG met with the PRB on December 21, 2015, and the PRB approved the staff's recommendation to consider the petition. The WG will submit a SECY paper to the Commission recommending that rulemaking be initiated, as well as additional options that the Commission may consider during its review of the PRM.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition; therefore, the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC staff discussed this topic at public meetings held during the two years before NEI filed this PRM. The staff held a public meeting on September 16, 2015, to gain further understanding of the scope and bases for the petition. During the public meeting, NEI clarified the applicability, which could lead to a need for additional guidance.

OPEN PETITIONS FOR THE OFFICE OF THE GENERAL COUNSEL

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PRM NO.: PRM-2-15

PETITION SUBJECT: Agency Procedures for Responding to Adverse Court Decisions and Addressing Funding Shortfalls

PETITIONER: Jeffrey M. Skov

DOCKET ID: NRC-2015-0264

NRC CONTACT: Ian Irvin, OGC, 301-415-1933

Comment [TL]: Insert cite when ERN published.

| Date Received | Notice of Docketing Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Commission |
|------------------|--|-----------------|--------------|----------------------|---|
| October 22, 2015 | February 2016 | February 2017 | Undetermined | Undetermined | June 2017 |

PETITION SUMMARY:

On October 22, 2015, Jeffrey M. Skov submitted a PRM that requests that the Commission amend its rules of practice and procedure to establish procedures for responding to adverse court decisions and to annually report to the public each instance where the NRC does not receive "sufficient funds reasonably necessary to implement in good faith its statutory mandates."

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PRM-2-15 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

This is the first entry for this PRM in this report. The staff is analyzing the issues raised in the petition.

PUBLIC COMMENTS ON THE PETITION:

The staff determined it has sufficient information to fully evaluate the issues raised in the petition, so the FRN did not request public comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None.

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PETITIONS COMPLETED SINCE LAST REPORT

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| PRM No. | PRM Date | Petitioner | Subject | Docket ID | Resolution |
|-----------|------------|------------|---|----------------------|--|
| PRM-50-97 | 07/26/2011 | NRDC | Emergency Preparedness Enhancements for Prolonged Station Blackouts | <u>NRC-2011-0189</u> | Petition will be resolved in Mitigation of Beyond-Design-Basis Events rulemaking [NRC-2014-0240 ; RIN 3150-AJ49] |
| PRM-50-98 | 07/26/2011 | NRDC | Emergency Preparedness Enhancements for Multiunit Events | <u>NRC-2011-0189</u> | Petition will be resolved in Mitigation of Beyond-Design-Basis Events rulemaking [NRC-2014-0240 ; RIN 3150-AJ49] |

~~OFFICIAL USE ONLY - SENSITIVE INTERNAL INFORMATION~~

From: Mayfield, Michael
Sent: 18 Feb 2016 11:29:50 -0500
To: Malave, Yanely
Subject: RE: PRM Status Report

Yanely - I looked through this and specifically at Solomon's comment. I'm good with this. Please respond to whoever that I'm concurring for NRO.

Mike

From: Malave, Yanely
Sent: Thursday, February 18, 2016 10:11 AM
To: Mayfield, Michael
Subject: PRM Status Report

Good morning Mayfield

Please find attached the PRM Status Report and transmittal memo.

Solomon Sahle reviewed the documents and only provided one comment on pg. 36 of the report; which is related to PRM-50-110, "Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors."

I talked to the FO and they agree that you can concur for the office.

The concurrence is due today.

Let me know if you have any question


Thanks


Yanely Malave-Velez

Technical Assistant

US NRC - Office of New Reactors

Division of Engineering, Infrastructure, and Advanced Reactors

 yanely.malave@nrc.gov

 301-415-1519

From: Doyle, Daniel
Sent: 2 Mar 2016 16:39:35 -0500
To: Mizuno, Geary;Borges, Jennifer;Hernandez, Raul;Esmaili, Hossein;Casto, Greg;Witt, Kevin
Cc: Mohseni, Aby
Subject: FW: draft SRM-SECY-15-0146 - denial of SFP PRM
Attachments: 15-0146.srm.docx, 15-0146.srm.encl1.docx, 15-0146.srm.encl2.docx

Here is the first draft SRM on the denial of PRM-50-108. No surprises here. The two enclosures consolidate the edits from the vote sheets on the draft FRN and letter to the petitioner. The comment from Commissioner Baran about the NAS study is an "additional comment" and is not eligible for comment by the staff unless it moves over into the body of the SRM in a future version.

If you believe there is a need to comment for clarity on anything in the draft SRM, please discuss briefly with your management and let me know as soon as possible.

Thanks,

Dan

415-3748

From: Clark, Theresa

Sent: Wednesday, March 02, 2016 4:16 PM

To: Wertz, Trent ; Bowman, Gregory ; Lubinski, John ; Dean, Bill ; Evans, Michele ; Doyle, Daniel ; Bowen, Jeremy

Cc: Iyengar, Raj ; Sampson, Michele

Subject: FYI: draft SRM-SECY-15-0146 - denial of SFP PRM

FYI—I am assuming you guys don't want to comment on this draft SRM that supports issuing the PRM, but thought you (particularly JLD) should be aware of the one ACC that relates to the NAS report. (We don't comment on ACCs, in general, so this is just FYI.) If by chance you do see a need to comment, please let me know right away. Thanks!

From: Jimenez, Patricia

Sent: Wednesday, March 02, 2016 2:48 PM

Subject: Draft-SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)

Good Afternoon:

As provided in the Internal Commission Procedures, the staff is "...afforded an opportunity to review the SRM to ensure that the Commission decision is clear and understandable and that resource, scheduler, and legal constraints are properly considered."

Draft Staff Requirements Memorandum (SRM), *Draft SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)*, is being circulated for the normal 3-day period for Commission review.

Responses to this draft SRM should be addressed to Richard Laufer, Glenn Ellmers, Pam Shea, and Denise McGovern. Comments from OEDO Offices should be provided by the OEDO.

Thank you,

Patty Jimenez

Office of the Secretary

U.S. Nuclear Regulatory Commission

Phone: 301-415-1969

Email: Patricia.Jimenez@nrc.gov





UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 2, 2016

SECRETARY

MEMORANDUM TO: Chairman Burns
Commissioner Svinicki
Commissioner Ostendorff
Commissioner Baran

FROM: Annette L. Vietti-Cook, Secretary **/RA/**

SUBJECT: DRAFT STAFF REQUIREMENTS MEMORANDUM
SECY-15-0146 – DENIAL OF PETITION FOR RULEMAKING
REQUESTING AMENDMENTS REGARDING SPENT FUEL
POOL SEVERE ACCIDENT EVALUATIONS (PRM-50-108; NRC-
2014-0171)

Enclosed is the draft staff requirements memorandum on SECY-15-0146. Your response to the SRM is requested by COB Monday, March 7, 2016.

Requests for extensions of review time will be granted up to 2 business days. SECY may issue an SRM when a majority view exists and all extensions have expired.

The subject SECY paper, individual Commissioner votes and this SRM will be released to the public 5 working days after the dispatch of the letter to the petitioner.

Enclosure:
As stated

cc: EDO
OGC

**SECY NOTE: THIS SRM TO BE RELEASED TO THE PUBLIC FIVE WORKING DAYS
AFTER DISPATCH OF THE LETTER TO THE PETITIONER**

MEMORANDUM TO: Victor M. McCree
Executive Director for Operations

FROM: Annette L. Vietti-Cook, Secretary

SUBJECT: STAFF REQUIREMENTS – SECY-15-0146 – DENIAL OF
PETITION FOR RULEMAKING REQUESTING AMENDMENTS
REGARDING SPENT FUEL POOL SEVERE ACCIDENT
EVALUATIONS (PRM-50-108; NRC-2014-0171)

The Commission has approved the denial of the petition for rulemaking submitted by Mr. Mark Edward Leyse (the petitioner) and publication of the related *Federal Register* notice, subject to the edits provided in the enclosures.

Enclosure: 1. Changes to the *Federal Register* notice in SECY-15-0146
2. Changes to the letters to the petitioner

cc: Chairman Burns
Commissioner Svinicki
Commissioner Ostendorff
Commissioner Baran
OGC
CFO
OCA
OPA
ODs, RAs, ACRS, ASLBP (via E-Mail)
PDR

**SECY NOTE: THIS SRM TO BE RELEASED TO THE PUBLIC FIVE WORKING DAYS
AFTER DISPATCH OF THE LETTER TO THE PETITIONER**

**Additional Commissioner Comments to be Included in the SRM
if Agreed to by a Majority of the Commission**

1. Consistent with SRM-COMSECY-13-0030, the Commission looks forward to reviewing the NRC staff's careful consideration of the National Academy of Sciences (NAS) report on spent fuel pool safety and security, including the staff's identification of any new information contained in the report and determination of whether additional study or action by NRC is warranted in light of the report's findings and recommendations. **[JMB]**

**SECY NOTE: THIS SRM TO BE RELEASED TO THE PUBLIC FIVE WORKING DAYS
AFTER DISPATCH OF THE LETTER TO THE PETITIONER**

[7590-01-P]

Comment [LR]: SGB KLS JMB

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking with respect to SFPs or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):** You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

TABLE OF CONTENTS:

- I. The Petition.
- II. Reasons for Denial.
- III. Conclusion.
- IV. Availability of Documents.

I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of

zirconium (Zr) fires than MELCOR indicates simulations predict. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

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The petitioner claimed stated that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations..

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations that would be required by in the fourth requested regulation should would be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of an SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate an SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to an SFP fire. In order for an SFP fire to occur, all SFP systems, backup systems, and operator actions would have to fail to prevent the spent fuel in the pool from being uncovered would have to fail. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of an SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

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Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner ~~claimed stated~~ that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that ~~an~~ SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and ultimately ~~an~~ SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in ~~an~~ SFP. The SFPs at all nuclear plants in the United States are ~~extremely~~ robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding ~~as a result of the significant volume of water above the spent fuel~~. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage. As spent fuel cools, older fuel is sometimes removed from a plant's SFP for on-site dry cask storage, depending on the space available in the SFP. Fuel

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removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure. They are monitored and routinely inspected for integrity, and they are protected by security measures.

Studies conducted over the last four decades have consistently shown that the probability risk of an accident causing a zirconium fire in an SFP to be lower than that for severe reactor accidents. The risk of an SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools", in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (51 FR 30028; August 21, 1986; 51 FR 30028) and that no new regulatory requirements were warranted.

The risk of an SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, an SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even when all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in a SFP zirconium fire with this conservative assumption, the study found the risk of an SFP fire to be low and well within the Commission's Safety Goals.

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In light of the changes in storage configuration of the SFP (increased to high density racks), inadvertent partial draindown events, as well as (monumental) events such as the September 11, 2001, terrorist attacks and the 2011 accident at the Fukushima Dai-ichi nuclear power plant, the NRC continues to examine the issue of SFP safety. (Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk of an SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.)

Recently, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). The COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

(Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk of a SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.)

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Following the 2011 accident at Fukushima Dai-ichi, the NRC has taken extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

Recently, Also, in 2014, the NRC conducted documented a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). The COMSECY-13-0030, the NRC staff concluded that SFPs are very robust structures with large safety margins and recommended to the Commission that assessments of possible proposed regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of an SFP severe accident is low. While the risk of a severe accident in

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(w/edits indicated); WCO

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¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

an SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures in place if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (77 FR 74788; December 18, 2012; 77 FR 74788) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and for license amendment reviews requests. In addition, baseline NRC inspections provide and provides ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate an SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and its results proposed to be provided to the NRC is are not needed for the effectiveness of the NRC's approach for ensuring SFP safety.

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The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's ~~final~~ safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs ~~(as well as and)~~ protective actions for plant personnel and the public to limit exposure to radioactive materials.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. ~~The At least two~~ NRC resident inspectors are ~~permanently~~ stationed on-site to provide monitoring and inspection of routine and special activities. They are aware of ~~and routinely observe~~ SFP activities involving fuel manipulation.

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Comment [EG]: KLS

The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees ~~(e-as a result of an NRC order or a)~~ change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects ~~(n-and failures to conform to the NRC requirements with respect to and noncompliances associated with)~~ basic components, which ~~(includes)~~ SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and ~~(failures to conform noncompliances)~~. The NRC is also informed of ~~(the)~~ events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, ~~(the a)~~ nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant ~~(and or)~~ licensee as having a significant implication for public health and safety or common defense and security ~~(must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.)~~

~~(The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:~~

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

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Comment [LR]: SGB KLS JMB

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident require redundant equipment and strategies to address loss of cooling to SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.

~~It is unclear how~~ The annual evaluations requested in the petition would ~~not~~ provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent ~~(uncovering of the fuel uncover)~~, the information that would be obtained from the proposed requirement in the petition ~~does would~~ not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2.

The petitioner ~~(claimed-stated)~~ that there are serious flaws with MELCOR which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

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Comment [LR]: all

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Comment [EG]: KLS

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how ~~the such an~~ evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's ~~claims statements~~ that MELCOR is flawed. ~~The following discussion is provided in order to address the petitioner's claims about the adequacy of MELCOR, even though this discussion does not form the basis for denial of this petition for rulemaking.~~

~~The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request for a new requirement for licensees to perform annual evaluations of SFPs. The petitioner's request to address perceived deficiencies in current severe accident models go hand-in-hand with the petitioner's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC is providing the following information about how MELCOR is used and the NRC's views on some of the phenomena discussed in the petition.~~

There are inherent uncertainties in the progression of severe accidents ~~and there are~~ many interrelated phenomena. Therefore, it is neither desirable nor ~~very~~ practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood ~~as~~ otherwise conservatism in one area may lead to ~~some~~ overall non-conservative results. Conservatism can be meaningfully introduced

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Comment [LR]: SGB KLS WCO

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Comment [EG]: KLS

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Comment [EG]: KLS

into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

The important question for a severe accident analysis is whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to ~~discussing~~ discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multi-unit or concurrent accident, ~~or~~ fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis and has been validated against experimental data. ~~The MELCOR computer code and it~~ represents the current state of the art in severe accident analysis. In NUREG-2161,

"Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor," the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment, core relocation to the vessel lower head, and ex-vessel core concrete interaction." Further ~~more~~, MELCOR has been benchmarked against many experiments including separate and integral effects ~~tests testing~~ for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

~~FurtherAdditional~~ information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161, ~~Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor,~~ (ADAMS Accession No. ML14255A365).

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Comment [LR]: SGB KLS (with edits indicated) JMB (w/edits indicated) – relocated from below.

Comment [LR]: WCO JMB

Comment [EG]: KLS

Comment [EG]: KLS

Comment [EG]: KLS

Comment [LR]: WCO JMB

Comment [LR]: SGB; KLS WCO JMB (w/edits indicated)

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Comment [LR]: WCO JMB would spell out "spent fuel pool"

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The NRC also addressed questions regarding MELCOR in Appendix D to NUREG-2157, Volume 2, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," (ADAMS Accession No. ML14196A107).

The petitioner claimed that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petitioner also claimed that MELCOR under-predicts the zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petitioner claimed, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petitioner pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. The MELCOR computer code has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation as discussed later in this section.

The MELCOR computer code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as, otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced

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(with edit indicated)

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(into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.)

(Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., "zirconium fire") occurs. A self-sustaining zirconium fire will develop if the heat-generation rate from reaction with oxidant exceeds the heat-loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a self-sustaining zirconium fire will occur.)

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Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher temperatures, the presence of any measurable amount of oxygen in the gas (steam or air) attacking the cladding is sufficient to prevent the formation of surface ZrN. Further, if ZrN does form it can be converted readily to zirconium oxide (ZrO₂) when exposed to oxygen. The heat generation from the reaction of cladding to form ZrN followed by oxidation of the ZrN to form ZrO₂ is essentially the same as the direct reaction of Zr to form ZrO₂. This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in the petition. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre- to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental

(increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.)

(With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS-B9R), these phenomena are well understood and recognized in the formulations of models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a SFP. The code assessment against zirconium fire experiments conducted at Sandia National Laboratory (SNL) and code-to-code comparison documented in NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss of Coolant Accident" (ADAMS Accession No. ML13072A056), address fire propagation phenomena.)

(The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys" (ADAMS Accession No. ML041900069). The MELCOR computer code was used in the zirconium fire experiments (see NUREG/CR-7143) and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code-to-code comparisons) as well as the SFP study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.)

The recent Sandia Fuel Project by the Organisation for Economic Co-operation and Development Nuclear Energy Agency provided experimental data relevant for hydraulic and ignition phenomena of prototypic pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petitioner asserted that the SNL SFP accident experiments are unrealistic because they

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were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100 micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.)

(The important question for an analysis is if the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core-concrete interaction, multiunit or concurrent accident, fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates. The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volumes 1 and 2 (ADAMS Accession Nos. ML14196A105 and ML14196A107)) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 feet above the top of the fuel in the pool, therefore encompassing the effects of some of the phenomena mentioned by the petition.)

In conclusion, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP

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evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. The NRC has considered the most important phenomena and continues to improve the models to further reduce the uncertainties. However, the NRC wishes to emphasize that these improvement efforts do not reflect an NRC determination that the models are unacceptable for their intended use by the NRC.

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III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/ <i>Federal Register</i> Citation |
|-----------------|--|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |

| | | |
|-------------------|---|-------------|
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| June 2004 | NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys." | ML041900069 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| March 2013 | NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident." | ML13072A056 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 2015.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Comment [LR]: JMB

Comment [LR]: JMB

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition ~~failed to~~ did not present any significant new information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC, as requested by the petition, is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the FR.

The docket for this petition closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

From: Terry, Leslie
Sent: 3 Mar 2016 05:31:07 -0500
To: Barczy, Theresa;Borges, Jennifer;DeJesus, Anthony;Forder, Dawn;Gallagher, Carol;Leatherbury (Daniels), Christian;Love-Blair, Angella;Mendiola, Doris;Shepherd, Jill
Cc: Bladey, Cindy
Subject: FW: Draft-SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)
Attachments: 15-0146.srm.docx, 15-0146.srm.encl1.docx, 15-0146.srm.encl2.docx

I will be forwarding all SRMs that I receive. Please ensure you carefully read any SRMs associated with your rulemaking and petition for rulemaking actions.

Thanks,

Leslie

From: Araguas, Christian
Sent: Wednesday, March 02, 2016 3:14 PM
To: Terry, Leslie ; Bladey, Cindy
Subject: FW: Draft-SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)
FYI.

From: Jimenez, Patricia
Sent: Wednesday, March 02, 2016 2:48 PM
To: Averbach, Andrew <Andrew.Averbach@nrc.gov>; Baggett, Steven <Steven.Baggett@nrc.gov>; Baran, Jeff <Jeff.Baran@nrc.gov>; Bates, Andrew <Andrew.Bates@nrc.gov>; Baval, Rochelle <Rochelle.Baval@nrc.gov>; Benner, Eric <Eric.Benner@nrc.gov>; Blake, Kathleen <Kathleen.Blake@nrc.gov>; Bloomer, Tamara <Tamara.Bloomer@nrc.gov>; Bozin, Sunny <Sunny.Bozin@nrc.gov>; Burns, Stephen <Stephen.Burns@nrc.gov>; Campbell, Tison <Tison.Campbell@nrc.gov>; Castleman, Patrick <Patrick.Castleman@nrc.gov>; Chairman Temp <Chairman.Temp@nrc.gov>; Ciani, Sandra <Sandra.Ciani@nrc.gov>; Clark, Brooke <Brooke.Clark@nrc.gov>; Cohen, Miriam <Miriam.Cohen@nrc.gov>; Cubbage, Amy <Amy.Cubbage@nrc.gov>; Doane, Margaret <Margaret.Doane@nrc.gov>; Araguas, Christian <Christian.Araguas@nrc.gov>; Bowen, Jeremy <Jeremy.Bowen@nrc.gov>; Cai, June <June.Cai@nrc.gov>; Clark, Theresa <Theresa.Clark@nrc.gov>; Corley, Cherrie <Cherrie.Corley@nrc.gov>; Crane, Samantha <Samantha.Crane@nrc.gov>; Franovich, Rani <Rani.Franovich@nrc.gov>; Gallalee, Trish <Trish.Gallalee@nrc.gov>; Inverso, Tara <Tara.Inverso@nrc.gov>; Iyengar, Raj <Raj.Iyengar@nrc.gov>; Jessie, Janelle <Janelle.Jessie@nrc.gov>; Jolicoeur, John <John.Jolicoeur@nrc.gov>; Khanna, Meena <Meena.Khanna@nrc.gov>; Lemoncelli, Mauri <Mauri.Lemoncelli@nrc.gov>; McIntyre, David <David.McIntyre@nrc.gov>; Merilos, Joyce <Joyce.Merilos@nrc.gov>; Rakovan, Lance <Lance.Rakovan@nrc.gov>; Rasouli, Houman <Houman.Rasouli@nrc.gov>; Rihm, Roger <Roger.Rihm@nrc.gov>; Sampson, Michele <Michele.Sampson@nrc.gov>; Schofer, Maria <Maria.Schofer@nrc.gov>; Ellmers, Glenn <Glenn.Ellmers@nrc.gov>; Frazier, Alan <Alan.Frazier@nrc.gov>; Fuller, Justin <Justin.Fuller@nrc.gov>; Gilles, Nanette <Nanette.Gilles@nrc.gov>; Henderson, Karen <Karen.Henderson@nrc.gov>; Herr, Linda <Linda.Herr@nrc.gov>; Hudson, Sharon <Sharon.Hudson@nrc.gov>; Jimenez, Patricia <Patricia.Jimenez@nrc.gov>; Jones, Bradley <Bradley.Jones@nrc.gov>; Kasputys, Clare <Clare.Kasputys@nrc.gov>; KLS Temp <KLS.Temp@nrc.gov>; Kriss, Barbara <Barbara.Kriss@nrc.gov>; Krsek, Robert <Robert.Krsek@nrc.gov>; Laufer, Richard <Richard.Laufer@nrc.gov>; Lepre, Janet <Janet.Lepre@nrc.gov>; Mamish, Nader <Nader.Mamish@nrc.gov>; Marsh, Molly <Molly.Marsh@nrc.gov>; Martin, Jody <Jody.Martin@nrc.gov>; McGovern, Denise

<Denise.McGovern@nrc.gov>; Moore, Johari <Johari.Moore@nrc.gov>; Muessle, Mary <Mary.Muessle@nrc.gov>; Ostendorff, William <William.Ostendorff@nrc.gov>; Powell, Amy <Amy.Powell@nrc.gov>; Riddick, Nicole <Nicole.Riddick@nrc.gov>; RidsEdoDraftSrmVote Resource <RidsEdoDraftSrmVote.Resource@nrc.gov>; Schumann, Stacy <Stacy.Schumann@nrc.gov>; Shane, Raeann <Raeann.Shane@nrc.gov>; Shea, Pamela <Pamela.Shea@nrc.gov>; Smith, Maxwell <Maxwell.Smith@nrc.gov>; Smith, Otis <Otis.Smith@nrc.gov>; Stokes, Tracey <Tracey.Stokes@nrc.gov>; Svinicki, Kristine <Kristine.Svinicki@nrc.gov>; Taylor, Renee <Renee.Taylor@nrc.gov>; Temp, JMB <JMB.Temp@nrc.gov>; Temp, WCO <WCO.Temp@nrc.gov>; Valentin, Andrea <Andrea.Valentin@nrc.gov>; Vietti-Cook, Annette <Annette.Vietti-Cook@nrc.gov>; Williamson, Edward <Edward.Williamson@nrc.gov>; Wilson, Anthony <Anthony.Wilson@nrc.gov>; Wylie, Maureen <Maureen.Wylie@nrc.gov>; Zabler, Marian <Marian.Zabler@nrc.gov>; Zorn, Jason <Jason.Zorn@nrc.gov>
Cc: Akstulewicz, Brenda <Brenda.Akstulewicz@nrc.gov>; Jimenez, Patricia <Patricia.Jimenez@nrc.gov>; Temp, SECY <SECY.Temp@nrc.gov>

Subject: Draft-SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)

Good Afternoon:

As provided in the Internal Commission Procedures, the staff is "...afforded an opportunity to review the SRM to ensure that the Commission decision is clear and understandable and that resource, scheduler, and legal constraints are properly considered."

Draft Staff Requirements Memorandum (SRM), *Draft SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)*, is being circulated for the normal 3-day period for Commission review.

Responses to this draft SRM should be addressed to Richard Laufer, Glenn Ellmers, Pam Shea, and Denise McGovern. Comments from OEDO Offices should be provided by the OEDO.

Thank you,

Patty Jimenez

Office of the Secretary

U.S. Nuclear Regulatory Commission

Phone: 301-415-1969

Email: Patricia.Jimenez@nrc.gov





UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 2, 2016

SECRETARY

MEMORANDUM TO: Chairman Burns
Commissioner Svinicki
Commissioner Ostendorff
Commissioner Baran

FROM: Annette L. Vietti-Cook, Secretary /RA/

SUBJECT: DRAFT STAFF REQUIREMENTS MEMORANDUM
SECY-15-0146 – DENIAL OF PETITION FOR RULEMAKING
REQUESTING AMENDMENTS REGARDING SPENT FUEL
POOL SEVERE ACCIDENT EVALUATIONS (PRM-50-108; NRC-
2014-0171)

Enclosed is the draft staff requirements memorandum on SECY-15-0146. Your response to the SRM is requested by COB Monday, March 7, 2016.

Requests for extensions of review time will be granted up to 2 business days. SECY may issue an SRM when a majority view exists and all extensions have expired.

The subject SECY paper, individual Commissioner votes and this SRM will be released to the public 5 working days after the dispatch of the letter to the petitioner.

Enclosure:
As stated

cc: EDO
OGC

**SECY NOTE: THIS SRM TO BE RELEASED TO THE PUBLIC FIVE WORKING DAYS
AFTER DISPATCH OF THE LETTER TO THE PETITIONER**

MEMORANDUM TO: Victor M. McCree
Executive Director for Operations

FROM: Annette L. Vietti-Cook, Secretary

SUBJECT: STAFF REQUIREMENTS – SECY-15-0146 – DENIAL OF
PETITION FOR RULEMAKING REQUESTING AMENDMENTS
REGARDING SPENT FUEL POOL SEVERE ACCIDENT
EVALUATIONS (PRM-50-108; NRC-2014-0171)

The Commission has approved the denial of the petition for rulemaking submitted by Mr. Mark Edward Leyse (the petitioner) and publication of the related *Federal Register* notice, subject to the edits provided in the enclosures.

Enclosure: 1. Changes to the *Federal Register* notice in SECY-15-0146
2. Changes to the letters to the petitioner

cc: Chairman Burns
Commissioner Svinicki
Commissioner Ostendorff
Commissioner Baran
OGC
CFO
OCA
OPA
ODs, RAs, ACRS, ASLBP (via E-Mail)
PDR

**SECY NOTE: THIS SRM TO BE RELEASED TO THE PUBLIC FIVE WORKING DAYS
AFTER DISPATCH OF THE LETTER TO THE PETITIONER**

**Additional Commissioner Comments to be Included in the SRM
if Agreed to by a Majority of the Commission**

1. Consistent with SRM-COMSECY-13-0030, the Commission looks forward to reviewing the NRC staff's careful consideration of the National Academy of Sciences (NAS) report on spent fuel pool safety and security, including the staff's identification of any new information contained in the report and determination of whether additional study or action by NRC is warranted in light of the report's findings and recommendations. **[JMB]**

**SECY NOTE: THIS SRM TO BE RELEASED TO THE PUBLIC FIVE WORKING DAYS
AFTER DISPATCH OF THE LETTER TO THE PETITIONER**

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking with respect to SFPs or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):**
You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search.](#)" For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

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- II. Reasons for Denial.
- III. Conclusion.
- IV. Availability of Documents.

I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of

zirconium (Zr) fires than MELCOR ~~indicates simulations predict~~. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

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The petitioner ~~claimed stated~~ that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations that would be required by in the fourth requested regulation should would be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of an SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate an SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to an SFP fire. In order for an SFP fire to occur, all SFP systems, backup systems, and operator actions would have to fail to prevent the spent fuel in the pool from being uncovered would have to fail. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of an SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

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Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner ~~claimed stated~~ that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that ~~an~~ SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and ultimately ~~an~~ SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in ~~an~~ SFP. The SFPs at all nuclear plants in the United States are ~~extremely~~ robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding ~~as a result of the significant volume of water above the spent fuel~~. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage. As spent fuel cools, older fuel is sometimes removed from a plant's SFP for on-site dry cask storage, depending on the space available in the SFP. Fuel

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removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure. They are monitored and routinely inspected for integrity, and they are protected by security measures.

Studies conducted over the last four decades have consistently shown that the probability risk of an accident causing a zirconium fire in an SFP to be lower than that for severe reactor accidents. The risk of an SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools", in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (51 FR 30028; August 21, 1986; 51 FR 30028) and that no new regulatory requirements were warranted.

The risk of an SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, an SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even when all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in a SFP zirconium fire with this conservative assumption, the study found the risk of an SFP fire to be low and well within the Commission's Safety Goals.

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In light of the changes in storage configuration of the SFP (increased to high density racks), inadvertent partial draindown events, as well as (monumental) events such as the September 11, 2001, terrorist attacks and the 2011 accident at the Fukushima Dai-ichi nuclear power plant, the NRC continues to examine the issue of SFP safety. (Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk of an SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.)

Recently, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). The COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

(Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk of a SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.)

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Following the 2011 accident at Fukushima Dai-ichi, the NRC ~~has taken~~ extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

~~Recently~~ Also, in 2014, the NRC ~~conducted~~ ~~documented~~ a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). ~~Their~~ COMSECY-13-0030, ~~the NRC staff~~ concluded that SFPs are ~~very~~ robust structures with large safety margins and ~~recommended to the Commission that assessments of possible proposed~~ regulatory actions to ~~require the expedited transfer of spent fuel from SFPs to dry cask storage~~ ~~further enhance safety~~ were not warranted. The Commission subsequently ~~concluded that no regulatory action needed to be pursued~~ approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of ~~an~~ SFP severe accident is low. While the risk of a severe accident in

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¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

an SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures in place if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (77 FR 74788; December 18, 2012; 77 FR 74788) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

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Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and for license amendment reviews requests. In addition, baseline NRC inspections provide and provides ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate an SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and its results proposed to be provided to the NRC is are not needed for the effectiveness of the NRC's approach for ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's final safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs as well as and protective actions for plant personnel and the public to limit exposure to radioactive materials.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. The At least two NRC resident inspectors are permanently stationed on-site to provide monitoring and inspection of routine and special activities. They are aware of and routinely observe SFP activities involving fuel manipulation.

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The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees ~~(e-as a result of an NRC order or a)~~ change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects ~~(in-and failures to conform to the NRC requirements with respect to-and noncompliances associated with)~~ basic components, which ~~(includes)~~ SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and ~~failures to conform noncompliances~~. The NRC is also informed of ~~(the)~~ events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, ~~(the-a)~~ nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant ~~(and-or)~~ licensee as having a significant implication for public health and safety or common defense and security ~~(must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.)~~

~~(The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:~~

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

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Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident require redundant equipment and strategies to address loss of cooling to SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.

~~It is unclear how~~ The annual evaluations requested in the petition would ~~not~~ provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent ~~uncovering of the fuel uncover~~, the information that would be obtained from the proposed requirement in the petition ~~does would~~ not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2. The petitioner ~~claimed stated~~ that there are serious flaws with MELCOR which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

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NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how ~~the such an~~ evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's ~~claims statements~~ that MELCOR is flawed. ~~The following discussion is provided in order to address the petitioner's claims about the adequacy of MELCOR, even though this discussion does not form the basis for denial of this petition for rulemaking.~~

~~The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request for a new requirement for licensees to perform annual evaluations of SFPs. The petitioner's request to address perceived deficiencies in current severe accident models go hand-in-hand with the petitioner's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC is providing the following information about how MELCOR is used and the NRC's views on some of the phenomena discussed in the petition.~~

~~There are inherent uncertainties in the progression of severe accidents ~~and there are~~ many interrelated phenomena. Therefore, it is neither desirable nor ~~very~~ practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood ~~as~~ otherwise conservatism in one area may lead to ~~some~~ overall non-conservative results. Conservatism can be meaningfully introduced~~

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into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

The important question for a severe accident analysis is whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussing discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multi-unit or concurrent accident, or fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis and has been validated against experimental data. The MELCOR computer code and it represents the current state of the art in severe accident analysis. In NUREG-2161,

"Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor," the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment, core relocation to the vessel lower head, and ex-vessel core concrete interaction." Further more, MELCOR has been benchmarked against many experiments including separate and integral effects tests testing for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

Further Additional information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161, Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor, (ADAMS Accession No. ML14255A365).

Comment [LR]: SGB KLS (with edits indicated) JMB relocated from below (w/edits indicated)..

Comment [LR]: JMB

Comment [EG]: KLS

Comment [LR]: SGB KLS (with edits indicated) JMB (w/edits indicated) - relocated from below.

Comment [LR]: WCO JMB

Comment [EG]: KLS

Comment [EG]: KLS

Comment [EG]: KLS

Comment [LR]: WCO JMB

Comment [LR]: SGB; KLS WCO JMB (w/edits indicated)

Comment [EG]: KLS

Comment [LR]: WCO JMB would spell out "spent fuel pool"

Comment [EG]: KLS

The NRC also addressed questions regarding MELCOR in Appendix D to NUREG-2157, Volume 2, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," (ADAMS Accession No. ML14196A107).

The petitioner claimed that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petitioner also claimed that MELCOR under-predicts the zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petitioner claimed, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petitioner pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. The MELCOR computer code has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation as discussed later in this section.

The MELCOR computer code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as, otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced

Comment [EG]: KLS

Comment [LR]: SGB WCO JMB KLS
(with edit indicated)

Comment [LR]: all

Comment [LR]: all

Comment [LR]: all

(into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.)

Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., "zirconium fire") occurs. A self-sustaining zirconium fire will develop if the heat-generation rate from reaction with oxidant exceeds the heat-loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a self-sustaining zirconium fire will occur.

Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher temperatures, the presence of any measurable amount of oxygen in the gas (steam or air) attacking the cladding is sufficient to prevent the formation of surface ZrN . Further, if ZrN does form it can be converted readily to zirconium oxide (ZrO_2) when exposed to oxygen. The heat generation from the reaction of cladding to form ZrN followed by oxidation of the ZrN to form ZrO_2 is essentially the same as the direct reaction of Zr to form ZrO_2 . This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in the petition. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre- to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental

Comment [LR]: SGB KLS JMB would relocate above

Comment [LR]: all

{increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.}

{With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS B9R), these phenomena are well understood and recognized in the formulations of models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a SFP. The code assessment against zirconium fire experiments conducted at Sandia National Laboratory (SNL) and code-to-code comparison documented in NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss of Coolant Accident" (ADAMS Accession No. ML13072A056), address fire propagation phenomena.}

{The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys" (ADAMS Accession No. ML041900069). The MELCOR computer code was used in the zirconium fire experiments (see NUREG/CR-7143) and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code-to-code comparisons) as well as the SFP study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.}

The recent Sandia Fuel Project by the Organisation for Economic Co-operation and Development Nuclear Energy Agency provided experimental data relevant for hydraulic and ignition phenomena of prototypic pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petitioner asserted that the SNL SFP accident experiments are unrealistic because they

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Comment [LR]: all

were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100 micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.)

(The important question for an analysis is if the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core-concrete interaction, multiunit or concurrent accident, fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates. The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volumes 1 and 2 (ADAMS Accession Nos. ML14196A105 and ML14196A107)) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 feet above the top of the fuel in the pool, therefore encompassing the effects of some of the phenomena mentioned by the petition.)

In conclusion, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP

Comment [LR]: all

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Comment [LR]: all

evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. The NRC has considered the most important phenomena and continues to improve the models to further reduce the uncertainties. However, the NRC wishes to emphasize that these improvement efforts do not reflect an NRC determination that the models are unacceptable for their intended use by the NRC.

Comment [LR]: all

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/ <i>Federal Register</i> Citation |
|-----------------|--|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |

| | | |
|-------------------|---|-------------|
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| June 2004 | NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys." | ML041900069 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| March 2013 | NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident." | ML13072A056 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 2015.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Comment [LR]: JMB

Comment [LR]: JMB

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition ~~failed to~~ ~~did not~~ ~~present any significant new~~ information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC, as requested by the petition, is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the FR.

The docket for this petition closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

From: Doyle, Daniel
Sent: 11 Mar 2016 12:53:29 -0500
To: Mizuno, Geary;Borges, Jennifer;Hernandez, Raul;Esmaili, Hossein;Casto, Greg;Witt, Kevin
Cc: Mohseni, Aby
Subject: FW: Draft-SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)
Attachments: 15-0146.srm.encl1_SGB edits.docx

FYI. The Commission offices are responding to the edits from the other offices. The Chairman and Commissioner Baran approve ACC 1. It will move into the body if it receives another vote. *Consistent with SRM-COMSECY-13-0030, the Commission looks forward to reviewing the NRC staff's careful consideration of the National Academy of Sciences (NAS) report on spent fuel pool safety and security, including the staff's identification of any new information contained in the report and determination of whether additional study or action by NRC is warranted in light of the report's findings and recommendations.*

Dan

From: Clark, Theresa
Sent: Friday, March 11, 2016 12:20 PM
To: Doyle, Daniel ; Tobin, Jennifer
Subject: Fwd: Draft-SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)

From: "Moore, Johari" <Johari.Moore@nrc.gov>
Subject: RE: Draft-SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)
Date: 11 March 2016 11:44
To: "Jimenez, Patricia" <Patricia.Jimenez@nrc.gov>, "Averbach, Andrew" <Andrew.Averbach@nrc.gov>, "Baggett, Steven" <Steven.Baggett@nrc.gov>, "Baran, Jeff" <Jeff.Baran@nrc.gov>, "Bates, Andrew" <Andrew.Bates@nrc.gov>, "Bavol, Rochelle" <Rochelle.Bavol@nrc.gov>, "Benner, Eric" <Eric.Benner@nrc.gov>, "Blake, Kathleen" <Kathleen.Blake@nrc.gov>, "Bloomer, Tamara" <Tamara.Bloomer@nrc.gov>, "Bozin, Sunny" <Sunny.Bozin@nrc.gov>, "Burns, Stephen" <Stephen.Burns@nrc.gov>, "Campbell, Tison" <Tison.Campbell@nrc.gov>, "Castleman, Patrick" <Patrick.Castleman@nrc.gov>, "Chairman Temp" <Chairman.Temp@nrc.gov>, "Cianci, Sandra" <Sandra.Cianci@nrc.gov>, "Clark, Brooke" <Brooke.Clark@nrc.gov>, "Cohen, Miriam" <Miriam.Cohen@nrc.gov>, "Cubbage, Amy" <Amy.Cubbage@nrc.gov>, "Doane, Margaret" <Margaret.Doane@nrc.gov>, "Araguas, Christian" <Christian.Araguas@nrc.gov>, "Bowen, Jeremy" <Jeremy.Bowen@nrc.gov>, "Cai, June" <June.Cai@nrc.gov>, "Clark, Theresa" <Theresa.Clark@nrc.gov>, "Corley, Cherrie" <Cherrie.Corley@nrc.gov>, "Crane, Samantha" <Samantha.Crane@nrc.gov>, "Franovich, Rani" <Rani.Franovich@nrc.gov>, "Gallalee, Trish" <Trish.Gallalee@nrc.gov>, "Inverso, Tara" <Tara.Inverso@nrc.gov>, "Iyengar, Raj" <Raj.Iyengar@nrc.gov>, "Jessie, Janelle" <Janelle.Jessie@nrc.gov>, "Jolicoeur, John" <John.Jolicoeur@nrc.gov>, "Khanna, Meena" <Meena.Khanna@nrc.gov>, "Lemoncelli, Mauri" <Mauri.Lemoncelli@nrc.gov>, "McIntyre, David" <David.McIntyre@nrc.gov>, "Merilos, Joyce" <Joyce.Merilos@nrc.gov>, "Rakovan,

Lance" <Lance.Rakovan@nrc.gov>, "Rasouli, Houman" <Houman.Rasouli@nrc.gov>, "Rihm, Roger" <Roger.Rihm@nrc.gov>, "Sampson, Michele" <Michele.Sampson@nrc.gov>, "Schofer, Maria" <Maria.Schofer@nrc.gov>, "Ellmers, Glenn" <Glenn.Ellmers@nrc.gov>, "Frazier, Alan" <Alan.Frazier@nrc.gov>, "Fuller, Justin" <Justin.Fuller@nrc.gov>, "Gilles, Nanette" <Nanette.Gilles@nrc.gov>, "Henderson, Karen" <Karen.Henderson@nrc.gov>, "Herr, Linda" <Linda.Herr@nrc.gov>, "Hudson, Sharon" <Sharon.Hudson@nrc.gov>, "Jones, Bradley" <Bradley.Jones@nrc.gov>, "Kasputys, Clare" <Clare.Kasputys@nrc.gov>, "KLS Temp" <KLS.Temp@nrc.gov>, "Kriss, Barbara" <Barbara.Kriss@nrc.gov>, "Krsek, Robert" <Robert.Krsek@nrc.gov>, "Laufer, Richard" <Richard.Laufer@nrc.gov>, "Lepre, Janet" <Janet.Lepre@nrc.gov>, "Mamish, Nader" <Nader.Mamish@nrc.gov>, "Marsh, Molly" <Molly.Marsh@nrc.gov>, "Martin, Jody" <Jody.Martin@nrc.gov>, "McGovern, Denise" <Denise.McGovern@nrc.gov>, "Muessle, Mary" <Mary.Muessle@nrc.gov>, "Ostendorff, William" <William.Ostendorff@nrc.gov>, "Powell, Amy" <Amy.Powell@nrc.gov>, "Riddick, Nicole" <Nicole.Riddick@nrc.gov>, "RidsEdoDraftSrmVote Resource" <RidsEdoDraftSrmVote.Resource@nrc.gov>, "Schumann, Stacy" <Stacy.Schumann@nrc.gov>, "Shane, Raeann" <Raeann.Shane@nrc.gov>, "Shea, Pamela" <Pamela.Shea@nrc.gov>, "Smith, Maxwell" <Maxwell.Smith@nrc.gov>, "Smith, Otis" <Otis.Smith@nrc.gov>, "Stokes, Tracey" <Tracey.Stokes@nrc.gov>, "Svinicki, Kristine" <Kristine.Svinicki@nrc.gov>, "Taylor, Renee" <Renee.Taylor@nrc.gov>, "Temp, JMB" <JMB.Temp@nrc.gov>, "Temp, WCO" <WCO.Temp@nrc.gov>, "Valentin, Andrea" <Andrea.Valentin@nrc.gov>, "Vietti-Cook, Annette" <Annette.Vietti-Cook@nrc.gov>, "Williamson, Edward" <Edward.Williamson@nrc.gov>, "Wilson, Anthony" <Anthony.Wilson@nrc.gov>, "Wylie, Maureen" <Maureen.Wylie@nrc.gov>, "Zobler, Marian" <Marian.Zobler@nrc.gov>, "Zorn, Jason" <Jason.Zorn@nrc.gov>
Cc: "Akstulewicz, Brenda" <Brenda.Akstulewicz@nrc.gov>, "Temp, SECY" <SECY.Temp@nrc.gov>

The Chairman approves the draft SRM, ACC 1, and the edits to enclosure 2. The Chairman approves enclosure 1 consistent with his vote and as modified in the attached.

Johari

From: Jimenez, Patricia

Sent: Wednesday, March 02, 2016 2:48 PM

To: Averbach, Andrew <Andrew.Averbach@nrc.gov>; Baggett, Steven <Steven.Baggett@nrc.gov>; Baran, Jeff <Jeff.Baran@nrc.gov>; Bates, Andrew <Andrew.Bates@nrc.gov>; Baval, Rochelle <Rochelle.Baval@nrc.gov>; Benner, Eric <Eric.Benner@nrc.gov>; Blake, Kathleen <Kathleen.Blake@nrc.gov>; Bloomer, Tamara <Tamara.Bloomer@nrc.gov>; Bozin, Sunny <Sunny.Bozin@nrc.gov>; Burns, Stephen <Stephen.Burns@nrc.gov>; Campbell, Tison <Tison.Campbell@nrc.gov>; Castleman, Patrick <Patrick.Castleman@nrc.gov>; Chairman Temp <Chairman.Temp@nrc.gov>; Ciani, Sandra <Sandra.Ciani@nrc.gov>; Clark, Brooke <Brooke.Clark@nrc.gov>; Cohen, Miriam <Miriam.Cohen@nrc.gov>; Cubbage, Amy <Amy.Cubbage@nrc.gov>; Doane, Margaret <Margaret.Doane@nrc.gov>; Araguas, Christian <Christian.Araguas@nrc.gov>; Bowen, Jeremy <Jeremy.Bowen@nrc.gov>; Cai, June <June.Cai@nrc.gov>; Clark, Theresa <Theresa.Clark@nrc.gov>; Corley, Cherrie <Cherrie.Corley@nrc.gov>; Crane, Samantha <Samantha.Crane@nrc.gov>; Franovich, Rani <Rani.Franovich@nrc.gov>; Gallalee, Trish <Trish.Gallalee@nrc.gov>; Inverso, Tara <Tara.Inverso@nrc.gov>; Iyengar, Raj <Raj.Iyengar@nrc.gov>; Jessie, Janelle <Janelle.Jessie@nrc.gov>; Jolicoeur, John <John.Jolicoeur@nrc.gov>; Khanna, Meena <Meena.Khanna@nrc.gov>; Lemoncelli, Mauri <Mauri.Lemoncelli@nrc.gov>; McIntyre, David <David.McIntyre@nrc.gov>; Merilos, Joyce

<Joyce.Merilos@nrc.gov>; Rakovan, Lance <Lance.Rakovan@nrc.gov>; Rasouli, Houman <Houman.Rasouli@nrc.gov>; Rihm, Roger <Roger.Rihm@nrc.gov>; Sampson, Michele <Michele.Sampson@nrc.gov>; Schofer, Maria <Maria.Schofer@nrc.gov>; Ellmers, Glenn <Glenn.Ellmers@nrc.gov>; Frazier, Alan <Alan.Frazier@nrc.gov>; Fuller, Justin <Justin.Fuller@nrc.gov>; Gilles, Nanette <Nanette.Gilles@nrc.gov>; Henderson, Karen <Karen.Henderson@nrc.gov>; Herr, Linda <Linda.Herr@nrc.gov>; Hudson, Sharon <Sharon.Hudson@nrc.gov>; Jimenez, Patricia <Patricia.Jimenez@nrc.gov>; Jones, Bradley <Bradley.Jones@nrc.gov>; Kasputys, Clare <Clare.Kasputys@nrc.gov>; KLS Temp <KLS.Temp@nrc.gov>; Kriss, Barbara <Barbara.Kriss@nrc.gov>; Krsek, Robert <Robert.Krsek@nrc.gov>; Laufer, Richard <Richard.Laufer@nrc.gov>; Lepre, Janet <Janet.Lepre@nrc.gov>; Mamish, Nader <Nader.Mamish@nrc.gov>; Marsh, Molly <Molly.Marsh@nrc.gov>; Martin, Jody <Jody.Martin@nrc.gov>; McGovern, Denise <Denise.McGovern@nrc.gov>; Moore, Johari <Johari.Moore@nrc.gov>; Muessle, Mary <Mary.Muessle@nrc.gov>; Ostendorff, William <William.Ostendorff@nrc.gov>; Powell, Amy <Amy.Powell@nrc.gov>; Riddick, Nicole <Nicole.Riddick@nrc.gov>; RidsEdoDraftSrmVote Resource <RidsEdoDraftSrmVote.Resource@nrc.gov>; Schumann, Stacy <Stacy.Schumann@nrc.gov>; Shane, Raeann <Raeann.Shane@nrc.gov>; Shea, Pamela <Pamela.Shea@nrc.gov>; Smith, Maxwell <Maxwell.Smith@nrc.gov>; Smith, Otis <Otis.Smith@nrc.gov>; Stokes, Tracey <Tracey.Stokes@nrc.gov>; Svinicki, Kristine <Kristine.Svinicki@nrc.gov>; Taylor, Renee <Renée.Taylor@nrc.gov>; Temp, JMB <JMB.Temp@nrc.gov>; Temp, WCO <WCO.Temp@nrc.gov>; Valentin, Andrea <Andrea.Valentin@nrc.gov>; Vietti-Cook, Annette <Annette.Vietti-Cook@nrc.gov>; Williamson, Edward <Edward.Williamson@nrc.gov>; Wilson, Anthony <Anthony.Wilson@nrc.gov>; Wylie, Maureen <Maureen.Wylie@nrc.gov>; Zabler, Marian <Marian.Zabler@nrc.gov>; Zorn, Jason <Jason.Zorn@nrc.gov>

Cc: Akstulewicz, Brenda <Brenda.Akstulewicz@nrc.gov>; Jimenez, Patricia <Patricia.Jimenez@nrc.gov>; Temp, SECY <SECY.Temp@nrc.gov>

Subject: Draft-SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)

Good Afternoon:

As provided in the Internal Commission Procedures, the staff is "...afforded an opportunity to review the SRM to ensure that the Commission decision is clear and understandable and that resource, schedular, and legal constraints are properly considered."

Draft Staff Requirements Memorandum (SRM), *Draft SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)*, is being circulated for the normal 3-day period for Commission review.

Responses to this draft SRM should be addressed to Richard Laufer, Glenn Ellmers, Pam Shea, and Denise McGovern. Comments from OEDO Offices should be provided by the OEDO.

Thank you,

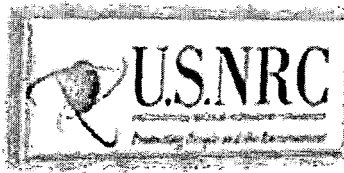
Patty Jimenez

Office of the Secretary

U.S. Nuclear Regulatory Commission

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NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking (with respect to SFPs) or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):** You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

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- I. The Petition.
- II. Reasons for Denial.
- III. Conclusion.

IV. Availability of Documents.

I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from

SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR ~~indicates simulations predict~~. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner ~~claimed stated~~ that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP

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accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations that ~~would be required by~~ the fourth requested regulation ~~should~~ ~~would~~ be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of ~~an~~ SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate ~~an~~ SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to ~~an~~ SFP fire. In order for ~~an~~ SFP fire to occur, all SFP systems, backup systems, and operator actions ~~would have to fail~~ ~~that are intended to prevent the spent fuel in the pool from being uncovered~~ ~~would have to fail~~. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of ~~an~~ SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

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Comment [LR]: JMB

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Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner ~~claimed stated~~ that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that ~~an~~ SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and ultimately ~~an~~ SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in ~~an~~ SFP. The SFPs at all nuclear plants in the United States are ~~extremely~~ robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding ~~as a result of the significant volume of water above the spent fuel~~. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage. As spent fuel cools, older fuel is sometimes removed from a

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plant's SFP for on-site dry cask storage, depending on the space available in the SFP. Fuel removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure. They are monitored and routinely inspected for integrity, and they are protected by security measures.

Studies conducted over the last four decades have consistently shown that the probability risk of an accident causing a zirconium fire in an SFP to be lower than that for severe reactor accidents. The risk of an SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools", in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (51 FR 30028; August 21, 1986; 51 FR 30028) and that no new regulatory requirements were warranted.

The risk of an SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, an SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even when all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in a SFP zirconium fire with this

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(conservative assumption), the study found the risk of an SFP fire to be low and well within the Commission's Safety Goals.

In light of the changes in storage configuration of the SFP (increased to high-density racks), inadvertent partial draindown events, as well as (monumental) events such as the September 11, 2001, terrorist attacks and the 2011 accident at the Fukushima Dai-ichi nuclear power plant, the NRC continues to examine the issue of SFP safety. (Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability (a) and, accordingly, the risk of an SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.)

Recently, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). The COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional

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Comment [SGB]: SGB approves

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strategies, the probability of and, accordingly, the risk of a SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.)

Following the 2011 accident at Fukushima Dai-ichi, the NRC has taken extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

Also, in 2014, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). The COMSECY-13-0030, the NRC staff concluded that SFPs are very robust structures with large safety margins and recommended to the Commission that assessments of possible proposed regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage further enhance safety were not warranted. The Commission subsequently concluded

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¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

~~that no regulatory action needed to be pursued~~ approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of ~~(an)~~ SFP severe accident is low. While the risk of a severe accident in ~~(an)~~ SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures ~~(in place)~~ if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process ~~(77 FR 74788; December 18, 2012; 77 FR 74788)~~ and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

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Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and ~~(for)~~ license amendment ~~(reviews requests)~~ In addition, baseline NRC inspections provide and provides ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in

the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate an SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and its results proposed to be provided to the NRC is not needed for the effectiveness of the NRC's approach for ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's final safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.

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The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. ~~The~~ At least two NRC resident inspectors are ~~permanently stationed on~~ assigned to each site to provide monitoring and inspection of routine and special activities. They are aware of ~~and routinely observe~~ SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees ~~to as a result of an NRC order or a~~ change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects ~~in and failures to conform to the NRC requirements with respect to and noncompliances associated with~~ basic components, which ~~includes~~ SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and ~~failures to conform noncompliances~~. The NRC is also informed of ~~the~~ events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, ~~the a~~ nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant ~~and or~~ licensee as having a significant implication for public health and safety or common defense and security ~~must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.~~

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

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 Comment [SGB]: SGB approves
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- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident require redundant equipment and strategies to address loss of cooling to SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.

~~It is unclear how~~ The annual evaluations requested in the petition would not provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent ~~uncovering of the fuel uncover~~, the information that would be obtained from the proposed requirement in the petition ~~does would~~ not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

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Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2.

The petitioner ~~claimed-stated~~ that there are serious flaws with MELCOR which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how ~~the such an~~ evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's ~~claims statements~~ that MELCOR is flawed. ~~The following discussion is provided in order to address the petitioner's claims about the adequacy of MELCOR, even though this discussion does not form the basis for denial of this petition for rulemaking.~~

The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request for a new requirement for licensees to perform annual evaluations of SFPs. The petitioner's request to address perceived deficiencies in current severe accident models go hand-in-hand with the petitioner's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC is providing the

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following information about how MELCOR is used and the NRC's views on some of the phenomena discussed in the petition.

There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as otherwise conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

The important question for a severe accident analysis is whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussing discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multi-unit or concurrent accident, or fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis and has been validated against experimental data. The MELCOR computer code and it represents the current state of the art in severe accident analysis. In NUREG-2161, Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor, the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment,

Comment [LR]: SGB KLS WCO

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Comment [LR]: SGB JMB

Comment [LR]: JMB

Comment [EG]: KLS

Comment [LR]: JMB

Comment [LR]: JMB

Comment [EG]: KLS

Comment [LR]: SGB KLS (with edits indicated) JMB relocated from below (w/edits indicated)..

Comment [SGB]: SGB approves JMB version of this paragraph

Comment [LR]: JMB

Comment [SGB]: SGB disapproves

Comment [EG]: KLS

Comment [SGB]: SGB approves

Comment [LR]: SGB KLS (with edits indicated) JMB (w/edits indicated) - relocated from below.

Comment [LR]: WCO JMB

Comment [SGB]: SGB approves

Comment [EG]: KLS

Comment [SGB]: SGB disapproves

Comment [SGB]: SGB approves deleting the title of NUREG-2161 here.

core relocation to the vessel lower head, and ex-vessel core concrete interaction." Further^(more), MELCOR has been benchmarked against many experiments^(including separate and integral effects tests testing) for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

^(FurtherAdditional) information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161, ^{(Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor, (ADAMS Accession No. ML14255A365).}

The NRC also addressed questions regarding MELCOR in Appendix D to NUREG-2157, Volume 2, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," (ADAMS Accession ^{(No. ML14196A107).})

^(The petitioner claimed that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petitioner also claimed that MELCOR under-predicts the zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petitioner claimed, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petitioner pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.)

^(The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. The MELCOR computer code has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation as discussed later in this section.)

Comment [EG]: KLS

Comment [SGB]: SGB approves

Comment [EG]: KLS

Comment [SGB]: SGB approves

Comment [LR]: WCO JMB

Comment [SGB]: SGB approves

Comment [LR]: SGB; KLS WCO JMB (w/edits indicated)

Comment [EG]: KLS

Comment [SGB]: SGB approves

Comment [LR]: WCO JMB would spell out "spent fuel pool"

Comment [SGB]: SGB disapproves

Comment [EG]: KLS

Comment [SGB]: SGB approves as edited (also delete ADAMS citation)

Comment [EG]: KLS

Comment [SGB]: SGB disapproves

Comment [LR]: SGB WCO JMB KLS (with edit indicated)

Comment [LR]: all

Comment [LR]: all

The MELCOR computer code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as, otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., "zirconium fire") occurs. A self-sustaining zirconium fire will develop if the heat-generation rate from reaction with oxidant exceeds the heat-loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a self-sustaining zirconium fire will occur.

Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher temperatures, the presence of any measurable amount of oxygen in the gas (steam or air) attacking the cladding is sufficient to prevent the formation of surface ZrN. Further, if ZrN does form it can be converted readily to zirconium oxide (ZrO₂) when exposed to oxygen. The heat generation from the reaction of cladding to form ZrN followed by oxidation of

Comment [LR]: all

Comment [LR]: SGB KLS JMB would relocate above

Comment [LR]: all

{the ZrN to form ZrO_2 is essentially the same as the direct reaction of Zr to form ZrO_2 . This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in the petition. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre- to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.}

{With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS-B9R), these phenomena are well understood and recognized in the formulations of models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a SFP. The code assessment against zirconium fire experiments conducted at Sandia National Laboratory (SNL) and code-to-code comparison documented in NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident" (ADAMS Accession No. ML13072A056), address fire propagation phenomena.}

The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys" (ADAMS Accession No. ML041900069). The MELCOR computer code was used in the zirconium fire experiments (see NUREG/CR-7143)

Comment [LR]: all

Comment [LR]: all

(and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code-to-code comparisons) as well as the SFP study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.)

(The recent Sandia Fuel Project by the Organisation for Economic Co-operation and Development Nuclear Energy Agency provided experimental data relevant for hydraulic and ignition phenomena of prototypic pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petitioner asserted that the SNL SFP accident experiments are unrealistic because they were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100 micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.)

The important question for an analysis is if the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core-concrete interaction, multiunit or concurrent accident, fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for

Comment [LR]: all

Comment [LR]: all

the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates. The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volumes 1 and 2 (ADAMS Accession Nos. ML14196A105 and ML14196A107)) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 feet above the top of the fuel in the pool, therefore encompassing the effects of some of the phenomena mentioned by the petition.

In conclusion, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. The NRC has considered the most important phenomena and continues to improve the models to further reduce the uncertainties. However, the NRC wishes to emphasize that these improvement efforts do not reflect an NRC determination that the models are unacceptable for their intended use by the NRC.

Comment [LR]: SGB KLS relocated above

Comment [LR]: all

Comment [LR]: all

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents

Comment [SGB]: The Chairman approves deleting documents no longer referenced in this FRN from the table below.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/ <i>Federal Register Citation</i> |
|-------------------|---|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| June 2004 | NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys." | ML041900069 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| March 2013 | NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss of Coolant Accident." | ML13072A056 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |

| | | |
|-----------------|---|-------------|
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 2015.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission

From: Borges, Jennifer
Sent: 15 Aug 2014 10:29:57 +0000
To: Shepherd, Jill
Subject: FW: example of not soliciting comments?

Hi Jill,

Do you know any other petition that did not request public comments during the notice of receipt stage?

The one that came to mind is this one:

<http://www.regulations.gov/#!documentDetail;D=NRC-2011-0189-0009>

Thank you,

Jennifer

From: Doyle, Daniel
Sent: Thursday, August 14, 2014 9:20 PM
To: Borges, Jennifer
Subject: example of not soliciting comments?

Jennifer,

Do you have an example of an FRN that docket a PRM without soliciting comments?

Dan

From: Doyle, Daniel
Sent: Wednesday, August 13, 2014 1:25 PM
To: Borges, Jennifer
Subject: RE: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Jennifer,

Ok, I'll let you know if I have any recommendations.

Thanks,

Dan

From: Borges, Jennifer
Sent: Wednesday, August 13, 2014 12:26 PM
To: Doyle, Daniel
Subject: FW: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Hi Dan,

In response to Geary's comment, I will remove the comment opportunity section from the action statement, summary, and addresses section. In respect to the way the sections are organized, I followed the latest PRM template; however, if you have any recommendations for improving the content of the notice, please let me know.

FYI- Shelbie Lewman (OGC) has been assigned to work on this action.

Thank you,

Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

Location: 3WFN 6-A38

☎ 301-287-0999

✉ jennifer.borges@nrc.gov

From: Mizuno, Geary
Sent: Monday, August 11, 2014 4:47 PM
To: Borges, Jennifer; RidsNrrMailCenter Resource; RidsNroMailCenter Resource; RidsOgcMailCenter Resource

Cc: Shepherd, Jill; Doyle, Daniel; Jones, Bradley; Baum, Robin; Inverso, Tara; Colaccino, Joseph; Bladey, Cindy

Subject: RE: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108 Jennifer and Dan:

Why are we requesting comments on this PRM? I see nothing in this that suggests we should provide an opportunity for the public to submit comments. If there are specific issues for which public comment would be useful, or information that we think would help our deliberations, then we should ask specific questions seeking to elicit this information. Otherwise, we should NOT be providing a general comment opportunity.

In any event, the organization and content of the FRN needs work. The discussions under Sections II and III are not well organized. I have a hard time trying to figure out why the information on docketing is under II. The Petitioner, and why this section contains no real information describing the petitioner and why he has satisfied our requirement to describe his interest in this rulemaking subject. In addition, there is no information in the FRN that justifies why the NRC determined that Mr. Leyse had met our requirements in 2.802(c)(2) as reported on p.5.

The wording of the FRN is also problematic, because at times it is impossible to distinguish whether the FRN is describing assertions made by the petitioner, or actually represents NRC's position/description. For example, on p. 4, under **II. The Petitioner**, the first sentence: *Mr. Leyse is aware of recent NRC post-Fukushima MELCOR simulations of boiling water reactor (BWR) Mark I SFP accident scenarios and disagree with the resulting conclusions of it.* Is this our statement and why do we need to make this statement in order to describe the petitioner for purposes of this PRM?

Why are we using the word "stipulating" in the same paragraph? That is not correct in this context; just because the petitioner uses does not mean we have to accede to its use especially since we are not putting it in the quotation. The correct word is "requiring". I also find that putting the description of each of the four regulations in **II. The Petitioner**, detracts from the emphasis of this section. It should be placed in **III. The Petition**, in the first paragraph. This completes my review of the package.

Geary

From: Borges, Jennifer

Sent: Monday, August 11, 2014 4:03 PM

To: RidsNrrMailCenter Resource; RidsNroMailCenter Resource; RidsOgcMailCenter Resource

Cc: Shepherd, Jill; Mizuno, Geary; Doyle, Daniel; Jones, Bradley; Baum, Robin; Inverso, Tara; Colaccino, Joseph; Bladey, Cindy

Subject: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Hello,

Below is a link to the notice of docketing package for a petition for rulemaking prepared for PRM-50-108 filed with the Commission by Mr. Mark Edward Leyse. Also, for your information, I have provided the link to the incoming petition. Please review and provide me with your concurrence by **August 25, 2014**.

If you have any questions concerning this matter, please let me know or contact Jill Shepherd at 301-287-0950 (Jill.Shepherd@nrc.gov).

PACKAGE:

(Federal Register Notice, Congressional Letters, & Letter to Petitioner)

[View ADAMS P8 Properties ML14223B127](#)

[Open ADAMS P8 Package \(PRM-50-108 Notice of Docketing RE: Fuel-Cladding Issues in Postulated SFP Accidents\)](#)

INCOMING:

[View ADAMS P8 Properties ML14008A427](#)

Open ADAMS P8 Document (Spent Fuel Pool (Fuel Cladding) Rulemaking Petition submitted by Atomic Safety Organization)

INCOMING:

(Additional Information)

View ADAMS P8 Properties ML14195A388

Open ADAMS P8 Document (PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents.)

Thank you,

Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

301-287-0999

From: Borges, Jennifer
Sent: 25 May 2016 12:56:42 +0000
To: FOIAPAADM Resource
Cc: Kundrat, Christine;DeJesus, Anthony
Subject: FW: FOIA/PA-2016-00474 Action Item/Instructions Search for Records in Perfected Request

Hello,

During the petition resolution phase for PRM-50-108, various individuals from SECY were involved as part of the review, voting, SRM development, and publication process. These individuals may have responsive records as well.

Thank you,


Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

Location: OWFN 12-G07

 301-415-3647

 jennifer.borges@nrc.gov

From: Borges, Jennifer
Sent: Tuesday, May 24, 2016 3:49 PM
To: FOIAPAADM Resource
Cc: Kundrat, Christine ; DeJesus, Anthony
Subject: RE: FOIA/PA-2016-00474 Action Item/Instructions Search for Records in Perfected Request

Hello,

I have been assigned as the lead for the subject line FOIA request (FOIA/PA-2016-00474).

During the docketing phase the petition was reviewed by several individuals.

After docketing the petition, NRR assigned a lead project manager and several working group members. These members may have responsive records and are listed below.

Project Manager:

Daniel Doyle

Working group members:

Jennifer Borges

Greg Casto

Hossein Esmaili

Raul Hernandez

Geary Mizuno

Kevin Witt

Thank you,


Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

Location: OWFN 12-G07

 301-415-3647

 jennifer.borges@nrc.gov

From: Terry, Leslie
Sent: Tuesday, May 24, 2016 11:39 AM

To: Borges, Jennifer <Jennifer.Borges@nrc.gov>; DeJesus, Anthony <Anthony.DeJesus@nrc.gov>

Cc: Bladey, Cindy <Cindy.Bladey@nrc.gov>

Subject: FW: FOIA/PA-2016-00474 Action Item/Instructions Search for Records in Perfected Request
Please take the lead for responding to this FOIA.

From: FOIAPAADM Resource

Sent: Tuesday, May 24, 2016 11:31 AM

To: Bowman, Adriane <Adriane.Bowman@nrc.gov>; Salter, Susan <Susan.Salter@nrc.gov>; Widdup, Joseph <Joseph.Widdup@nrc.gov>; Terry, Leslie <Leslie.Terry@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>; Chang, Helen <Helen.Chang@nrc.gov>

Cc: FOIAPAADM Resource <FOIAPAADM.Resource@nrc.gov>

Subject: FW: FOIA/PA-2016-00474 Action Item/Instructions Search for Records in Perfected Request
Good Day,

This subject FOIA has been assigned to DAS. FOIA Guidance is available in SharePoint to assist staff.

Summary of Request:

"All records not already publicly available in ADAMS related to the petition for rulemaking submitted by Mark Edward Leyse and designated as PRM-50-108 and NRC-2014-0171 by the staff"

This requester has been placed in the estimated fees, or has provided an advance payment, or there are no billable fees. The request is now considered "perfected."

Please provide **Responsive Records** to FOIAPAADM.Resource@nrc.gov on or before **12 Noon on Friday June 3, 2016.**

If there are no responsive records during this time period, please respond with "no records".

Thank you

From: Borges, Jennifer
Sent: 25 May 2016 13:56:11 +0000
To: Terry, Leslie
Subject: FW: FOIA/PA-2016-00474 Action Item/Instructions Search for Records in Perfected Request

Leslie,

I am taking the lead on this request with Anthony's assistance. This is my first time I process a FOIA request. I already notified Dan and the working group member for PRM-50-108.

Anthony and I will be meeting with Dan later today to discuss.

Thank you,


Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

Location: OWFN 12-G07

 301-415-3647

 jennifer.borges@nrc.gov

From: FOIAPAADM Resource

Sent: Wednesday, May 25, 2016 9:47 AM

To: Borges, Jennifer

Subject: RE: FOIA/PA-2016-00474 Action Item/Instructions Search for Records in Perfected Request

Thank you. I will provide this information to the FOIA specialist with a recommendation of a referral.

I will let you know if there are questions.

From: Borges, Jennifer

Sent: Wednesday, May 25, 2016 8:57 AM

To: FOIAPAADM Resource <FOIAPAADM.Resource@nrc.gov>

Cc: Kundrat, Christine <Christine.Kundrat@nrc.gov>; DeJesus, Anthony <Anthony.DeJesus@nrc.gov>

Subject: FW: FOIA/PA-2016-00474 Action Item/Instructions Search for Records in Perfected Request

Hello,

During the petition resolution phase for PRM-50-108, various individuals from SECY were involved as part of the review, voting, SRM development, and publication process. These individuals may have responsive records as well.

Thank you,


Jennifer Borges


Regulations Specialist

Rules Team

ADM/DAS/RADB

Location: OWFN 12-G07

 301-415-3647

 jennifer.borges@nrc.gov

From: Borges, Jennifer

Sent: Tuesday, May 24, 2016 3:49 PM

To: FOIAPAADM Resource <FOIAPAADM.Resource@nrc.gov>

Cc: Kundrat, Christine <Christine.Kundrat@nrc.gov>; DeJesus, Anthony <Anthony.DeJesus@nrc.gov>

Subject: RE: FOIA/PA-2016-00474 Action Item/Instructions Search for Records in Perfected Request

Hello,

I have been assigned as the lead for the subject line FOIA request (FOIA/PA-2016-00474).

During the docketing phase the petition was reviewed by several individuals.

After docketing the petition, NRR assigned a lead project manager and several working group members. These members may have responsive records and are listed below.

Project Manager:

Daniel Doyle

Working group members:

Jennifer Borges

Greg Casto

Hossein Esmaili

Raul Hernandez

Geary Mizuno

Kevin Witt

Thank you,


Jennifer Borges


Regulations Specialist

Rules Team

ADM/DAS/RADB

Location: OWFN 12-G07

 301-415-3647

 jennifer.borges@nrc.gov

From: Terry, Leslie

Sent: Tuesday, May 24, 2016 11:39 AM

To: Borges, Jennifer <Jennifer.Borges@nrc.gov>; DeJesus, Anthony <Anthony.DeJesus@nrc.gov>

Cc: Bladey, Cindy <Cindy.Bladey@nrc.gov>

Subject: FW: FOIA/PA-2016-00474 Action Item/Instructions Search for Records in Perfected Request

Please take the lead for responding to this FOIA.

From: FOIAPAADM Resource

Sent: Tuesday, May 24, 2016 11:31 AM

To: Bowman, Adriane <Adriane.Bowman@nrc.gov>; Salter, Susan <Susan.Salter@nrc.gov>; Widdup,

Joseph <Joseph.Widdup@nrc.gov>; Terry, Leslie <Leslie.Terry@nrc.gov>; Bladey, Cindy

<Cindy.Bladey@nrc.gov>; Chang, Helen <Helen.Chang@nrc.gov>

Cc: FOIAPAADM Resource <FOIAPAADM.Resource@nrc.gov>

Subject: FW: FOIA/PA-2016-00474 Action Item/Instructions Search for Records in Perfected Request

Good Day,

This subject FOIA has been assigned to DAS. FOIA Guidance is available in SharePoint to assist staff.

Summary of Request:

"All records not already publicly available in ADAMS related to the petition for rulemaking submitted by Mark Edward Leyse and designated as PRM-50-108 and NRC-2014-0171 by the staff"

This requester has been placed in the estimated fees, or has provided an advance payment, or there are no billable fees. The request is now considered "perfected."

Please provide **Responsive Records** to FOIAPAADM.Resource@nrc.gov **on or before 12 Noon on Friday June 3, 2016.**

If there are no responsive records during this time period, please respond with "no records".

Thank you

From: Doyle, Daniel
Sent: 3 Oct 2014 17:20:48 -0400
To: Borges, Jennifer;StAmour, Norman;Hernandez, Raul;Esmaili, Hossein;Greenleaf, Michael;Witt, Kevin
Cc: Inverso, Tara
Subject: FW: FRN to be published
Attachments: 09-30-14_PRM 50-108.docx, 09-30-14_Ltr to petitioner PRM-50-108.docx

FYI

From: Craver, Patti
Sent: Friday, October 03, 2014 5:18 PM
To: Couret, Ivonne; Harrington, Holly; McIntyre, David; Bladey, Cindy; Mendiola, Doris; Terry, Leslie; Conley, Maureen; Shepherd, Jill; Doyle, Daniel
Cc: Lewis, Antoinette; Remsburg, Kristy; Shea, Pamela; Newell, Brian; Speiser, Herald; Giitter, Rebecca; Julian, Emile; Sola, Clara; Baval, Rochelle; Laufer, Richard
Subject: FRN to be published

Good afternoon,
Subject FRN:
Petition for rulemaking; notice of document on Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents (PRM-50-108)
The attached FRN (ML14223B131) was delivered to the Office of the Federal Register Thursday, October 2, 2014.
The letter to the petitioner (ML14223B168) was mailed on Tuesday, September 30, 2014.
It is the staff's responsibility to declare their document (FRN) in ADAMS once it has been published in the Federal Register. Staff can verify publication of their document at the following web site: <http://www.gpo.gov/fdsys/> click on Federal Register located at the right hand box.
Paper copies have been placed in the mail.
Thanks,
Patti Craver
Correspondence and Records Staff
Office of the Secretary
U.S. Nuclear Regulatory Commission
(301) 415-1513

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket No. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; notice of docketing.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) has received a petition for rulemaking (PRM) from Mr. Mark Edward Leye (the petitioner), dated June 19, 2014. The petition was docketed by the NRC on July 14, 2014, and has been assigned Docket No. PRM-50-108. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The NRC is not requesting public comment on PRM-50-108 at this time.

ADDRESSES: Please refer to Docket ID **NRC-2014-0171** when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this petition by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2014-0171**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-287-3422; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **NRC's Agencywide Documents Access and Management System (ADAMS):**

You may obtain publicly available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced in this document (if that document is available in ADAMS) is provided the first time that a document is referenced. The petition, PRM-50-108, is available in ADAMS under Accession Number ML14195A388.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Project Manager, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748, e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

I. The Petitioner.

Mr. Mark Edward Leyse (the petitioner) submitted this petition for rulemaking (PRM) as an individual. In Section II of the petition, "Statement of Petitioner's Interest," the petitioner explains that he disagrees with the conclusions of recent MELCOR simulations of boiling water reactor (BWR) Mark I spent fuel pool (SFP) accident scenarios. On December 23, 2013, Mr. Leyse submitted a PRM (ADAMS Accession No. ML14008A427) with similar requests. On

March 21, 2014, the NRC requested additional information to further clarify the petitioner's request (ADAMS Accession No. ML14023A743). On June 19, 2014 (ADAMS Accession No. ML14195A388), the petitioner responded to the request and resubmitted the petition with additional information. After evaluating the resubmitted petition, the NRC has determined that the petition meets the threshold sufficiency requirements for a petition for rulemaking under § 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," and the petition has been docketed as PRM-50-108. The NRC is not requesting public comment on PRM-50-108 at this time.

II. The Petition.

The petition requests that the NRC develop new regulations requiring that (1) spent fuel pool (SFP) accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petition references recent NRC post-Fukushima MELCOR simulations of BWR Mark I SFP accident/fire scenarios. The petition states that the conclusions from the NRC's

MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petition states that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium fires than MELCOR indicates. The petition states that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petition claims that the new regulations would help improve public and plant-worker safety. The petitioner asserts that the first three proposed regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petition states that the fourth proposed regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petition states that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs.

Dated at Rockville, Maryland, this 30th day of September, 2014.

For the Nuclear Regulatory Commission.

/RA/

Annette L. Vietti-Cook,
Secretary of the Commission.

September 30, 2014

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

This letter is in reference to your petition for rulemaking that you submitted to the U.S. Nuclear Regulatory Commission (NRC) on June 19, 2014 (NRC's Agencywide Documents Access and Management System Accession No. ML14195A388). In your petition, you request that the NRC develop new regulations stipulating that (1) spent fuel pool (SFP) accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

Your petition has been docketed under § 2.802 of Title 10 of the *Code of Federal Regulations*, "Petition for rulemaking," to acknowledge your request and has been assigned Docket No. PRM-50-108. Please reference this docket number on any correspondence you may have concerning the petition. The enclosed notice acknowledging receipt of the petition will be published in the *Federal Register*. The NRC is not requesting public comment on your petition for rulemaking at this time. The NRC appreciates your offer to send copies of the references cited in your petition and would like to take you up on this offer. This would greatly assist the staff in its review. Please provide the references to the staff contacts listed below. As the staff reviews your petition, it may be necessary to request additional information.

You can monitor the docket for your petition on the Federal rulemaking Web site, <http://www.regulations.gov>, by searching on Docket ID NRC-2014-0171. In addition, the Federal rulemaking Web site allows you to receive alerts when changes or additions occur in a docket folder. To subscribe: (1) navigate to the docket folder NRC-2014-0171; (2) click the "E-mail Alert" link; and (3) enter your e-mail address and select how frequently you would like to receive e-mails (daily, weekly, or monthly). The NRC also tracks all petition actions on its Web site at <http://www.nrc.gov/reading-rm/doc-collections/rulemaking-ruleforum/petitions-by-year.html>.

M. Leyse

- 2 -

You may direct any questions you have concerning the petition process or the status of your petition to Cindy Bladey at 301-287-0949 (e-mail: Cindy.Bladey@nrc.gov) or to Daniel Doyle at 301-415-3748 (e-mail: Daniel.Doyle@nrc.gov).

Sincerely,

/RA/

Annette L. Vietti-Cook

Enclosure:

Federal Register notice

From: Borges, Jennifer
Sent: 22 Sep 2015 17:38:23 +0000
To: DeJesus, Anthony
Subject: FW: Geary's comment on table of documents for PRM FRNs

Recommended changes to PRM templates.

From: Doyle, Daniel
Sent: Tuesday, September 22, 2015 1:31 PM
To: Borges, Jennifer
Cc: Inverso, Tara
Subject: Geary's comment on table of documents for PRM FRNs

Jennifer,

Geary provided the template-related comment below on PRM-50-108. Can you forward this to the person in ADM who is responsible for updating the FRN templates so they can talk to Geary about this and refine the subdivider/heading titles as he suggested? The table in PRM-50-108 includes 16 documents, and it lists them in chronological order.

Thanks,

Dan

I request that the staff develop standard guidance for how to construct a table of documents for use only in PRMs.

In my view, the table should have internal subdividers/headings in somewhat the following order (subdivider/heading titles are subject to joint refinement by the staff and OGC):

1. PRM and NRC notices related to the PRM
2. Documents referenced in PRM
3. Other Documents referenced by the NRC in this PRM notice.

From: Borges, Jennifer
Sent: 22 Sep 2015 17:40:16 +0000
To: Doyle, Daniel
Subject: FW: Geary's comment on table of documents for PRM FRNs

Hi Dan,

I have notified the PRM coordinator (A. de Jesús) about these changes. ADM will be updating the PRM templates as soon as resources become available.

Thank you,

Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

Location: OWFN 12-G07



301-415-3647



jennifer.borges@nrc.gov

From: Doyle, Daniel

Sent: Tuesday, September 22, 2015 1:31 PM

To: Borges, Jennifer

Cc: Inverso, Tara

Subject: Geary's comment on table of documents for PRM FRNs

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1. PRM and NRC notices related to the PRM
2. Documents referenced in PRM
3. Other Documents referenced by the NRC in this PRM notice.

From: Borges, Jennifer
Sent: 18 Sep 2014 14:46:13 +0000
To: Doyle, Daniel
Subject: FW: NLO on Docketing package for PRM 50-108 (OGC Ticket 2014-3672)

Just got NLO. I'll process the package tomorrow and will route it through Cindy on Monday.

Thanks,
Jennifer

From: Mizuno, Geary
Sent: Thursday, September 18, 2014 10:44 AM
To: Shepherd, Jill; Borges, Jennifer
Cc: Bladey, Cindy; Jones, Bradley; Biggins, James; Fowler, Sidney; Safford, Carrie; StAmour, Norman
Subject: NLO on Docketing package for PRM 50-108 (OGC Ticket 2014-3672)

Jill and Jennifer:

By this e-mail, OGC-RMR is providing a NLO for the docketing notice package for PRM-50-108((OGC Ticket 2014-3672). However, we have the following suggestion for improving the FRN, which you may consider: in the FRN, on page 2, under **II. The Petition**, we suggest that the items (1) and (2) of first sentence be re-written as follows, in order to preclude the misapprehension that there currently are no accident evaluation models (changes in bolded green):

The petition requests that the NRC develop new regulations requiring that (1) spent fuel pool (SFP) accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) **SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; * * ***

This NLO was coordinated with OGC-HLW Division, and the suggestion above was a result of my collaboration with Sid Fowler, who is an HLG assigned to OGC-HLW. If you have any questions, please e-mail or call me (301-415-1639).

Geary

From: Doyle, Daniel
Sent: 20 May 2016 19:51:45 -0400
To: Esmaili, Hossein;Borges, Jennifer;Hernandez, Raul;Casto, Greg;Witt, Kevin
Cc: Gavrilas, Mirela;Khanna, Meena;Case, Michael;Webber, Kimberly;Mahoney, Michael
Subject: FW: NRC-2014-0171
Attachments: 2.345 Petition for Reconsideration (Regarding PRM-50-108).pdf, response to email from petitioner rev 2.docx

I received the email below and the attached PDF from the petitioner this afternoon. I reviewed this and did not see anything for referral to the IG or 2.206 or allegation processes. I revised the draft response (attached Word file) to refer to both of his emails, and I'm planning on sending this as soon as I get the OK from RES and OGC. I will follow up Monday morning.
Dan

From: Mark Leyse [mailto:markleyse@gmail.com]

Sent: Friday, May 20, 2016 3:24 PM

To: RulemakingComments Resource

Cc: Doyle, Daniel ; Mohseni, Aby ; Burnell, Scott ; Bladey, Cindy ; Dave Lochbaum ; Gordon Thompson ; Matthew G. McKinzie ; Geoffrey Fettus ; Thomas B. Cochran ; Alemayehu, Bemnet ; Ed Lyman ; Robert Alvarez ; Robert H. Leyse ; Paul Gallay ; Paul Gunter ; Michel Lee ; Mary Lampert ; CHAIRMAN Resource ; Valliere, Nanette ; Moore, Johari ; Patrick.Castlennan@nrc.gov; Frazier, Alan ; Cubbage, Amy ; Bloomer, Tamara ; Krsek, Robert ; michal_freedhoff@markey.senate.gov; Diane Curran ; Jim Riccio ; Richard Webster ; Thomas Popik ; Raymond Shadis ; Clay Turnbull

Subject: [External_Sender] NRC-2014-0171

Dear Rulemaking and Adjudications Staff:

Attached to this e-mail is a 10 C.F.R. § 2.345 petition for reconsideration, dated May 20, 2016, requesting that the NRC reconsider its denial of PRM-50-108.

The NRC published its decision to deny PRM-50-108 in the Federal Register on May 13, 2016. This 10 C.F.R. § 2.345 petition is being submitted within ten (10) days after the date of the NRC's Federal Register notice.

In accordance with requirements of 10 C.F.R. § 2.345, this petition demonstrates that there are clear and material errors in the NRC's decision to deny PRM-50-108.

In accordance with requirements of 10 C.F.R. § 2.345, this petition states the relief that is sought.

Sincerely,

Mark Leyse

P.O. Box 1314

New York, NY 10025

markleyse@gmail.com

May 20, 2016

Annette L. Vietti-Cook
Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Rulemakings and Adjudications Staff

PETITION FOR RECONSIDERATION

This petition for reconsideration is submitted pursuant to 10 C.F.R. § 2.345 by Mark Edward Leyse ("Petitioner").

Petitioner requests that the U.S. Nuclear Regulatory Commission ("NRC") reconsider its denial of PRM-50-108. The NRC published its decision to deny PRM-50-108 in the Federal Register on May 13, 2016. This 10 C.F.R. § 2.345 petition is being submitted within ten (10) days after the date of the NRC's Federal Register notice.

I. CLEAR AND MATERIAL ERRORS IN THE NRC'S DECISION TO DENY PRM-50-108

In accordance with requirements of 10 C.F.R. § 2.345, in this section, Petitioner demonstrates that there are clear and material errors in the NRC's decision to deny PRM-50-108.

I.A. The NRC's Federal Register notice, denying PRM-50-108, does not address information PRM-50-108 provided indicating that regulations pertaining to Spent Fuel Pool ("SFP") Accident Evaluation Models are needed because the frequency of the type of events that could lead to SFP accidents is relatively high.

The NRC's denial of PRM-50-108 does not address information PRM-50-108 provided (on pages 39-42) indicating that regulations pertaining to SFP Accident Evaluation Models are needed. Regulations are needed because the frequency of the type of events that could lead to SFP accidents is relatively high. The information provided in PRM-50-108 included statements that the NRC published in the Federal Register on December 18, 2012 announcing that PRM-50-96¹ had been accepted.

¹ Thomas Popik, The Foundation for Resilient Societies, PRM-50-96, March 14, 2011, (ADAMS Accession No. ML110750145).

PRM-50-96 was submitted by Thomas Popik of The Foundation for Resilient Societies on March 14, 2011. PRM-50-96 requested that new regulations be enacted to help prevent SFP fires in the event of long-term power blackouts.

In its December 18, 2012 Federal Register notice announcing that PRM-50-96 had been accepted, the NRC stated that an extreme solar storm hitting Earth (geomagnetic disturbance)—with an intensity similar to that of the 1859 Carrington event²—could occur as frequently as once in 153 years to once in 500 years ($6.5 \times 10^{-3}/\text{yr}$ to $2.0 \times 10^{-3}/\text{yr}$) and initiate “a series of events potentially leading to core damage at multiple nuclear sites.”³

(It is noteworthy that on July 23, 2012, there were two consecutive coronal mass ejections separated by about 10 to 15 minutes that caused an extreme solar storm—deemed to have an intensity similar to that of the Carrington event—in interplanetary space, which passed through Earth’s orbit; the solar storm missed hitting Earth by nine days.⁴)

In its May 13, 2016 Federal Register notice, denying PRM-50-108, the NRC makes statements that are contrary to what it stated in its December 18, 2012 Federal Register notice on PRM-50-96. In the May 13, 2016 Federal Register notice, the NRC states: “It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of an SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident.”⁵

The NRC needs to conduct probabilistic risk assessments (“PRA”) that estimate the frequency of SFP fires that could occur at multiple nuclear sites in the event of long-term catastrophic grid failures—blackouts that would last months to years. The NRC needs to address the problem of blackouts that would last months to years. It is pertinent

² The Carrington event in 1859 is the largest solar storm ever recorded.

³ NRC, “Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools: Proposed Rules,” Docket No. PRM-50-96, NRC-2011-0069, Federal Register, Vol. 77, No. 243, December 18, 2012, p. 74790.

⁴ Ying D. Liu, “Observations of an Extreme Storm in Interplanetary Space Caused by Successive Coronal Mass Ejections,” *Nature Communications*, March 18, 2014; and Robert Sanders, “Fierce solar magnetic storm barely missed Earth in 2012,” *University of California, Berkeley News Center*, March 18, 2014.

⁵ NRC, “Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents,” *Petition for Rulemaking; Denial*, Docket No. PRM-50-108, NRC-2014-0171, Federal Register, Vol. 81, No. 93, May 13, 2016, p. 29762.

that in comments on COMSECY-13-0030, NRC Chairwoman, Allison M. Macfarlane, states that “[a] comprehensive safety and security case for spent fuel pools should consider *the full range of potential hazards* (natural or human-induced) that could initiate an accident...”⁶ [emphasis added]. Unfortunately, recent NRC Post-Fukushima MELCOR simulations of BWR Mark I SFP accident/fire scenarios have only considered accidents that would be initiated by beyond-design-basis earthquakes: events that are assigned with very slight probabilities of occurring.⁷

I.B. The NRC’s Federal Register notice, denying PRM-50-108, does not address information PRM-50-108 provided on an important April 2000 letter Dana A. Powers, Chairman of the Advisory Committee on Reactor Safeguards (“ACRS”), sent to Richard A. Meserve, Chairman of the NRC.

The NRC’s denial of PRM-50-108 *does not address or even mention* an April 2000 letter Dana A. Powers, Chairman of the ACRS, sent to Richard A. Meserve, Chairman of the NRC. The letter criticizes the final draft of NUREG-1738, “Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants.”⁸ (Discussion and quotes from the April 2000 ACRS letter are provided in PRM-50-108 on pages 5, 25, and 38.)

The ACRS letter states that the final draft for NUREG-1738 “relied on relatively geriatric work” for its *analysis of the interaction of air with zirconium fuel cladding*, pointing out that “[m]uch more is known now about air interactions with cladding,” including knowledge gained “from studies being performed as part of a cooperative international program (PHEBUS FP⁹) in which NRC is a partner.”¹⁰

⁶ NRC, “Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel,” COMSECY-13-0030, May 27, 2014, p. 4.

⁷ Andrew Barto *et al.*, NRC, “Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor,” NUREG-2161, September 2014, (ADAMS Accession No. ML14255A365).

⁸ T.E. Collins *et al.*, NRC, “Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants,” NUREG-1738, February 2001, (ADAMS Accession No. ML010430066).

⁹ PHEBUS FP is an experimental program that researched severe-accident reactor core damage.

¹⁰ Dana A. Powers, Chairman of ACRS, Letter to Richard A. Meserve, Chairman of NRC, Regarding ACRS Recommendations for Improvements to the NRC Staff’s “Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants,” April 13, 2000, (ADAMS Accession No. ML003704532), pp. 3-4.

The ACRS letter explains “that nitrogen from air depleted of oxygen will interact exothermically with zircaloy cladding. The reaction of zirconium with nitrogen is exothermic by about 86,000 calories per mole of zirconium reacted. Because the heat required to raise zirconium from room temperature to melting is only about 18,000 calories per mole, the reaction enthalpy with nitrogen is ample.”¹¹ The letter goes on to further discuss the reaction of zirconium and air.

Regarding air interactions with zirconium as well as *neglecting* to model the affects of nitrogen, *the ACRS concludes*: “Because of these findings, *we do not accept* the staff’s claim that it has performed ‘bounding’ calculations of the heatup of Zircaloy clad fuel even when it neglects heat losses”¹² [emphasis added].

The NRC’s Federal Register notice, denying PRM-50-108, mentions NUREG-1738 and other NRC studies as if they are *gold standards* of SFP-fire analysis. *Contrary* to the ACRS April 2000 letter, the NRC even claims that “previous studies (*i.e.*, NUREG– 1738)...used *bounding or conservative estimates*”¹³ [emphasis added].

As of 2016, the NRC’s MELCOR computer safety model—used to simulate SFP accidents—*still does not* model how nitrogen would affect zirconium fuel cladding. Nonetheless, the NRC’s Federal Register notice, denying PRM-50-108, states: “The MELCOR computer code is the NRC’s best estimate tool for severe accident analysis. It has been validated against experimental data, and it represents the current state of the art in severe accident analysis.”¹⁴

The NRC’s claim regarding MELCOR is a clear error. After 16 years time, the issues raised in the ACRS April 2000 letter remain unresolved. This is a reason that PRM-50-108 should be reconsidered. The NRC’s philosophy of defense-in-depth requires the application of conservative models.¹⁵ Therefore, MELCOR’s model of air interactions with zirconium needs to be improved, as PRM-50-108 requests.

¹¹ *Id.*, p. 4.

¹² *Id.*

¹³ NRC, “Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents,” Petition for Rulemaking; Denial, Docket No. PRM-50-108, NRC-2014-0171, p. 29764.

¹⁴ *Id.*

¹⁵ Charles Miller *et al.*, NRC, “Recommendations for Enhancing Reactor Safety in the 21st Century: The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident,” SECY-11-0093, July 12, 2011, (ADAMS Accession No. ML111861807), p. 3.

I.C. The NRC's Federal Register notice, denying PRM-50-108, does not address information PRM-50-108 provided on limitations of MELCOR's SFP model.

The NRC's denial of PRM-50-108 does not address information that PRM-50-108 provided (on pages 24 to 31) documenting limitations of MELCOR.

Regarding limitations of MELCOR, in 2006, a Sandia National Laboratories report observed that MELCOR *does not* model the nitriding of zirconium fuel cladding, stating that fuel cladding would "combine with nitrogen if no oxygen or steam are available" and that the nitriding process is exothermic (heat-generating). MELCOR also *does not simulate* how nitrogen gas (in air) affects the oxidation of zirconium in air.¹⁶ This is a serious flaw because the presence of nitrogen accelerates the oxidation (burning) and degradation of zirconium fuel-cladding *in air*,¹⁷ which would affect the progression and severity of a SFP accident, including the amount of radioactive releases.¹⁸

The NRC's Federal Register notice, denying PRM-50-108, also does not address the fact that PRM-50-108 (on pages 30-31) provided an example of a particular SFP fire scenario that MELCOR simulated (in NUREG-2161) in which there would be a depletion of oxygen in an intact reactor building.¹⁹ The MELCOR simulation would have had *different results* if it had realistically modeled the effects of nitrogen.

PRM-50-108 provided a criticism of MELCOR from the Paul Scherrer Institute ("PSI") (on pages 27 and 28).

¹⁶ K. C. Wagner, R. O. Gauntt, Sandia National Laboratories, Analysis and Modeling Division, "Mitigation of Spent Fuel Pool Loss-of-Coolant Inventory Accidents and Extension of Reference Plant Analyses to Other Spent Fuel Pools," SANDIA Letter Report, Revision 2, November 2006, (ADAMS Accession No. ML120970086), p. 12.; and L. Fernandez-Moguel, J. Birchley, European MELCOR User's Group, "PSI air oxidation model in MELCOR: Part 2: Analysis of experiments and model assessment," Stockholm, May 2013, which states: "Neither MELCOR nor SCDAP [a severe accident computer safety model] are able to predict a nitride reaction."

¹⁷ J. Stuckert, M. Große, Z. Hózer, M. Steinbrück, Karlsruhe Institute of Technology, "Results of the QUENCH-16 Bundle Experiment on Air Ingress," KIT-SR 7634, May 2013, p. 1; and O. Coindreau, C. Duriez, S. Ederli, "Air Oxidation of Zircaloy-4 in the 600-1000°C Temperature Range: Modeling for ASTEC Code Application," Journal of Nuclear Materials 405, 2010, p. 208.

¹⁸ J. Stuckert *et al.*, "Results of the QUENCH-16 Bundle Experiment on Air Ingress," p. 1.

¹⁹ Andrew Barto *et al.*, NRC, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor," NUREG-2161, p. 145.

First, it needs to be clarified that the NRC used MELCOR version 1.8.6 (2005) for a post-Fukushima SFP safety study, NUREG-2161.²⁰ (There is also a MELCOR version 2.1 that has a SFP model that is functionally the same as version 1.8.6's.²¹)

As PRM-50-108 states and quotes, PSI assessed MELCOR 1.8.6's ability to predict fuel-cladding behavior in accidents involving air ingress into the reactor vessel—which is pertinent to MELCOR's ability to predict zirconium-air reaction rates in SFP accidents—and “concluded that development of MELCOR was needed *to capture the accelerated cladding oxidation that can take place under air ingress conditions* (characterized by transition from formation of a protective oxide film to non-protective ‘breakaway’ oxidation at a significantly higher rate)”²² [emphasis added].

I.D. The NRC's Federal Register notice, denying PRM-50-108, published on May 13, 2016, does not include information on the reaction of air and zirconium that was discussed in a draft of the Federal Register notice, dated November 19, 2016.

A draft of the NRC's Federal Register notice announcing the denial of PRM-50-108 is dated November 19, 2016 (according to the NRC's ADAMS Public Documents).²³ Unlike the Federal Register notice, denying PRM-50-108, published on May 13, 2016, the draft of the Federal Register notice discusses the reaction of air and zirconium. There are several paragraphs of information on the air-zirconium reaction in the draft that are not included in the published Federal Register notice. The draft of the Federal Register notice actually contains information on the air-zirconium reaction that supports accepting PRM-50-108 for consideration in the NRC's rulemaking process.

²⁰ Andrew Barto *et al.*, NRC, “Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor,” NUREG-2161, September 2014, (ADAMS Accession No. ML14255A365), pp. 95-96.

²¹ *Id.*, p. 96.

²² S. Guntay, J. Birchley, “MELCOR Further Development in the Area of Air Ingress and Participation in OECDNEA SFP Project to Be Performed in the Time Frame 2009-2012,” April 2009, p. 2.

²³ NRC, “Draft of the Federal Register Notice Announcing the Denial of PRM-50-108,” Enclosure 1 of SECY-15-0146, NRC-2014-0171, November 19, 2016, (ADAMS Accession No. ML14307A630).

Here are four quotes from the draft of the Federal Register notice that support the arguments of PRM-50-108:

1) "The NRC recognizes that the phenomena discussed in the petition [PRM-50-108] are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident."²⁴

2) "The petitioner pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate."²⁵

3) "As an additional heat source, nitriding is only important in oxygen-starved situations (*e.g.*, in cases where the reactor building is intact during the zirconium fire)."²⁶ (Keep in mind that, as mentioned above, PRM-50-108 provided an example of a SFP fire scenario in which there would be a depletion of oxygen in an intact reactor building.)

4) "Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air."²⁷

The fourth quote from the draft of the Federal Register notice is very important. The fact that oxygen-starved conditions develop because of the rapid consumption of oxygen (in air) is one of the primary reasons why Petitioner submitted PRM-50-108 to the NRC. The fact that MELCOR does not model this phenomenon is another reason why the NRC should reconsider its decision to deny PRM-50-108.

Here is some of the information on oxygen starvation that PRM-50-108 discusses and quotes. On page 21, PRM-50-108 states: "When zirconium reacts in air it is possible for the reaction to become oxygen-starved; however, if zirconium is locally oxygen-starved in air, nitrogen will react with it."

PRM-50-108 has information (on page 23) regarding the fact that *cladding degradation can be even much faster in oxygen starved situations* (in air), a 2008 *Journal of Nuclear Materials* paper states:

Kinetic data of this study have been obtained mainly in high air flow conditions. *In real accidental situations, where oxygen starved situations are likely to occur, cladding degradation can be even much faster than*

²⁴ *Id.*, p. 14.

²⁵ *Id.*, p. 15.

²⁶ *Id.*, p. 16.

²⁷ *Id.*

predictable from these high air flow data, because of early initiation of the nitriding process, as shown by the few tests performed at the highest temperatures with insufficient air flow rate. All in all, more experimental investigations are required to address the various conditions that can be encountered in accidental situation²⁸ [emphasis added].

It is puzzling that the NRC did not include information on the air-zirconium reaction in its published Federal Register notice regarding its decision to deny PRM-50-108. That is, in the section of the notice in which the NRC explains that MELCOR “represents the current state of the art in severe accident analysis.”²⁹

One might even suspect that some information was not included in the published Federal Register notice precisely because it elucidated deficiencies of MELCOR. Here is an example of two deleted sentences indicating that the NRC is aware of MELCOR’s deficiencies: “There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is *neither desirable nor very practical* to develop a “conservative” computer safety model for severe accidents”³⁰ [emphasis added].

The fact that information on the air-zirconium reaction—relevant to what PRM-50-108 requested—was not published Federal Register notice is yet another reason why the NRC should reconsider its decision to deny PRM-50-108. Why was this information placed in the draft yet *not* included in the published Federal Register notice?

II. COMPELLING NEW INFORMATION

II.A. A December 2015 cyber-attack caused a blackout in Ukraine.

On May 18, 2016 the Committee on Homeland Security and Governmental Affairs, a chief oversight committee of the U.S. Senate, held a meeting: “Assessing the Security of Critical Infrastructure: Threat, Vulnerabilities, and Solutions.” In his opening statement, the Chairman of the Committee, Ron Johnson, stated: “In December 2015, a cyber-attack on the control system of a Ukrainian electric grid left over 230,000 consumers without

²⁸ C. Duriez, T. Dupont, B. Schmet, F. Enoch, “Zircaloy-4 and M5 High Temperature Oxidation and Nitriding in Air,” *Journal of Nuclear Materials* 380 (2008), p. 44.

²⁹ NRC, “Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents,” Petition for Rulemaking; Denial, Docket No. PRM-50-108, NRC-2014-0171, p. 29764.

³⁰ NRC, “Draft of the Federal Register Notice Announcing the Denial of PRM-50-108,” Enclosure 1 of SECY-15-0146, NRC-2014-0171, November 19, 2016, p. 15.

power, in some cases for over six hours. The attack did not result in any physical damage to the grid, though it demonstrates how hackers could corrupt software-related assets.”³¹

As mentioned above, a draft of the NRC’s Federal Register notice announcing the denial of PRM-50-108 is dated November 19, 2016.³² That means that PRM-50-108 was denied before the December 2015 cyber-attack caused a blackout in Ukraine. The Ukrainian blackout pertains to issues raised in PRM-50-108. That is another reason why the NRC’s decision to deny PRM-50-108 should be reconsidered.

Incidentally, on May 18, 2016, Chairman Johnson also pointed out that experts argue that “a major solar weather event causing widespread power outages is inevitable.”³³

II.B. Deficiencies of MELCOR, regarding the air cooling of spent fuel assemblies in SFPs.

This important information (published in 2014) was not provided in PRM-50-108.

According to a 2014 *Annals of Nuclear Energy* paper, severe accident codes, including MELCOR, use thermal hydraulic models that are not necessarily appropriate for SFPs. Regarding SFP modeling limitations, the paper states:

The phenomena of natural convection and boiling in the fuel building. In fact, the conclusions on the coolability of [fuel assemblies] can be very different, in function of the calculations. Some studies show, for a loss of water transient (conducting to fast dewatering and air ingress in the [fuel assemblies]), that air flow is sufficient to remove the power, for other studies this conclusion depends on the air flow that could actually flow in the [fuel assemblies]. (Remark: Most of these calculations seem to *use thermal hydraulic parameters/models which seem not appropriate for SFP geometries*. Therefore, the gas flow is *strongly overestimated and non-conservative*. OECD SFP experiment showed ignition in a simulated 3 year old spent fuel element in air)³⁴ [emphasis added].

³¹ Ron Johnson, “Opening Statement: Assessing the Security of Critical Infrastructure: Threats, Vulnerabilities, and Solutions,” Committee on Homeland Security and Governmental Affairs, May 18, 2016.

³² NRC, “Draft of the Federal Register Notice Announcing the Denial of PRM-50-108,” Enclosure 1 of SECY-15-0146, NRC-2014-0171, November 19, 2016.

³³ Ron Johnson, “Opening Statement: Assessing the Security of Critical Infrastructure: Threats, Vulnerabilities, and Solutions,” Committee on Homeland Security and Governmental Affairs.

³⁴ J. Fleurot *et al.*, “Synthesis of spent fuel pool accident assessments using severe accident codes,” *Annals of Nuclear Energy*, 74, 2014, p. 70.

The fact that MELCOR's model of the air cooling of spent fuel assemblies is non-conservative is yet another reason the NRC should reconsider PRM-50-108.

III. THE RELIEF SOUGHT

In accordance with requirements of 10 C.F.R. § 2.345, in this section, Petitioner states the relief that is sought.

Petitioner requests that the NRC reconsider its denial of PRM-50-108. PRM-50-108's arguments for the requested regulations are fact-based and fully referenced. As discussed in Section I of this 10 C.F.R. § 2.345 petition, there are clear and material errors in the NRC's decision to deny PRM-50-108. The NRC itself has made conflicting statements about the frequency of SFP fires. The NRC needs to conduct PRAs that estimate the frequency of SFP fires in the event of blackouts that would last months to years. It is likely that such PRAs would reveal that the frequencies of SFP fires are relatively high and that the regulations (or a variation of such) requested in PRM-50-108 are needed to help improve public and plant-worker safety.

In accordance with NRC's philosophy of defense-in-depth, which requires the application of conservative models,³⁵ it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

Respectfully submitted,

/s/

Mark Edward Leyse
P.O. Box 1314
New York, NY 10025
markleyse@gmail.com

³⁵ Charles Miller *et al.*, NRC, "Recommendations for Enhancing Reactor Safety in the 21st Century: The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," SECY-11-0093, p. 3.

Subject: Correspondence Regarding Denial of PRM-50-108

Dear Mr. Leyse:

In your e-mails dated May 16 and May 20, 2016, you requested that the U.S. Nuclear Regulatory Commission (NRC) reconsider its decision to deny PRM-50-108 (81 FR 29761; May 13, 2016). The NRC does not have a formal process for seeking reconsideration of a Commission action on a rulemaking petition. Therefore, the Commission's denial in that notice constitutes the NRC's final action on your petition for rulemaking. Although you are free to communicate with the NRC regarding the Commission's denial of your petition for rulemaking, the NRC will not reconsider its decision or provide you a response on such communications.

The NRC reviewed the information in your e-mails to determine if additional regulatory action is warranted. The NRC determined that you have not provided any new technical information or rationale in your e-mails warranting additional regulatory action. Accordingly, no further regulatory action is being taken by the NRC as a result of your e-mails.

Please note that the National Academy of Sciences (NAS) released a report on May 20, 2016, with recommendations about spent fuel safety and security. The NRC staff's (staff's) preliminary review of the report did not identify any safety or security issues that would require immediate action by the NRC. Looking at all the available information, the NRC remains confident that U.S. spent fuel is safely and securely stored. The report looks ahead to some areas that NAS believes warrant further study or action. The NRC will evaluate the report and its recommendations to see if it needs to take any further action in the long run. The staff plans to provide the Commission with its assessment of the NAS report later this year.

Sincerely,

Dan Doyle

Project Manager
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748

From: DeJesus, Anthony
Sent: 28 Apr 2016 06:03:49 -0400
To: Borges, Jennifer
Subject: FW: Petition for rulemaking for SECY signature (NRC-2014-0171)
Attachments: ogc nlo on prn-50-108.pdf, frn - redline strikeout.docx, letter to petitioner - redline strikeout.docx

Tell me if you would like me to do something with this.

From: Terry, Leslie

Sent: Wednesday, April 27, 2016 2:04 PM

To: DeJesus, Anthony

Subject: FW: Petition for rulemaking for SECY signature (NRC-2014-0171)

From: Doyle, Daniel

Sent: Wednesday, April 27, 2016 11:21 AM

To: Notice_Publish Resource <Notice_Publish.Resource@nrc.gov>

Cc: Bladey, Cindy <Cindy.Bladey@nrc.gov>; Borges, Jennifer <Jennifer.Borges@nrc.gov>; Terry, Leslie <Leslie.Terry@nrc.gov>

Subject: Petition for rulemaking for SECY signature (NRC-2014-0171)

MEMORANDUM TO: Cindy Bladey, Chief

Rules, Announcements, and Directives Branch
Division of Administrative Services
Office of Administration

FROM: Daniel Doyle, Acting Chief

Rulemaking Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

SUBJECT: PETITION FOR RULEMAKING: FUEL-CLADDING ISSUES IN POSTULATED SPENT FUEL POOL ACCIDENTS (NRC-2014-0171)

The *Federal Register* notice (FRN) referenced in the subject line is ready for transmittal to SECY for signature. ADM/DAS/RDB and SECY have been given owner's rights to the *Federal Register* notice package (ADAMS Accession No. ML16061A114).^{*} The ADAMS accession number for this FRN, and all other associated documents referenced in this memorandum are provided at the end of this document.

In addition to the FRN, this package includes the following documents:

- ✎ The letter to the petitioner (ML16022A187)
- ✎ The Congressional letters for transmittal to the Office of Congressional Affairs. ADM/DAS/RDB and OCA have been given owner rights to these documents.
- ✎ The staff requirements memorandum (SRM and the two enclosures). A redline/strikeout file showing Commission requested changes to the FRN and letter to the petitioner is attached to this email.

All publicly available NRC documents referenced in the notice have been finalized in ADAMS and profiled for public release. The ADAMS accession numbers for all such documents are provided in the text of the FRN.

The FRN must be submitted to SECY by May 4, 2016.

The Office of the General Counsel has reviewed this notice and provided an NLO on April 22, 2016. A copy of the NLO e-mail is attached to this email.

Enclosures:

1. FRN* (ML16022A185)
2. Congressional letters* (ML14307A845)

3. SRM (Pkg: ML16096A192, SRM: ML16096A197, Encl. 1: ML16096A201, Encl. 2: ML16096A203)

4. Redline showing changes made by program office post SRM (see attached files)

CONTACT: Daniel Doyle, NRR/DPR/PRMB

301-415-3748

*ADM/DAS/RDB has been given owner's rights to the package and these documents in ADAMS. Owner rights is needed for the package so that ADM's redline/strikeout can be added into the package. SECY will contact the PM after the package has been submitted to the OFR and the PM will be responsible for removing ADM's redline/strikeout from the package.

Doyle, Daniel

From: Mizuno, Geary
Sent: Friday, April 22, 2016 4:40 PM
To: Doyle, Daniel
Cc: Spencer, Mary; Gendelman, Adam
Subject: RE: PRM-50-108 (post-SRM) - please provide NLO (OGC Ticket 2016-1544)

Categories: PRM-50-108

Dan:

By this e-mail, I am providing a NLO to the FRN and the letter to the petitioner informing him of the NRC's action (OGC Ticket 2016-1544).

Please note, that OGC's NLO does not apply if there are any changes to the package (other than typographic and grammar corrections) which are made after OGC provides its NLO. Such changes should be brought to the attention of OGC to ensure that the changes themselves do not raise new legal issues not present in the version forming the basis for OGC's NLO, or that the changes upset OGC's previous bases for providing the NLO. This e-mail serves as the official record of OGC's NLO.

Geary S. Mizuno

From: Doyle, Daniel
Sent: Friday, April 15, 2016 11:17 PM
To: OGCMailCenter Resource <OGCMailCenter.Resource@nrc.gov>
Cc: Mizuno, Geary <Geary.Mizuno@nrc.gov>
Subject: PRM-50-108 (post-SRM) - please provide NLO

I am requesting NLO on the attached *Federal Register* notice and letter to the petitioner for PRM-50-108. ADAMS links are also provided below. These documents include the edits directed by the Commission in SRM-SECY-15-0146 (ML16096A192). Also, as requested by Geary in his email 4/5/16 at 2:34pm, the word "new" was deleted from the letter to the petitioner so it matches the conclusion in the FRN. For your convenience, I have attached a redline/strikeout version of both documents showing all changes from the versions in SECY-15-0146.

[View ADAMS P8 Properties ML16022A185](#)

[Open ADAMS P8 Document \(FRN: Petition for Rulemaking: Denial: Spent Fuel Pool Evaluations \(PRM-50-108\)\)](#)

[View ADAMS P8 Properties ML16022A187](#)

[Open ADAMS P8 Document \(LTR to Mark Leyse, Petitioner from Annette Vietti-Cook RE: Denial of Petition for Rulemaking: Spent Fuel Pool Evaluations \(PRM-50-108\)\)](#)

Dan
415-3748

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking with respect to SFPs or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):**
You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search.](#)" For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

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II. Reasons for Denial.

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I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of:

postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR indicates-simulations predict. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner ~~claimed~~stated that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested

regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations ~~in that would be required by the fourth requested regulation should~~ would be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of an SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not

needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate aan SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to aan SFP fire. In order for aan SFP fire to occur, all SFP systems, backup systems, and operator actions ~~would have to fail~~that are intended to prevent the spent fuel in the pool from being uncovered would have to fail. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of aan SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner ~~claimed~~stated that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that aan SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and, ultimately, ~~a~~, an SFP

accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in aan SFP. The SFPs at all nuclear plants in the United States are extremely robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding ~~as a result of the significant volume of water above the spent fuel.~~ Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage. ~~As spent fuel cools, older fuel is sometimes removed from a plant's SFP for on-site dry cask storage, depending on the space available in the SFP. Fuel removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure. They are monitored and routinely inspected for integrity, and they are protected by security measures.~~

Studies conducted over the last four decades have consistently shown ~~that the~~ probability risk of an accident causing a zirconium fire in aan SFP to be lower ~~than that for severe reactor accidents.~~ low. The risk of aan SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools", 1 in light of increased

use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (51 FR 30028; August 21, 1986; 51 FR 30028) and that no new regulatory requirements were warranted.

The risk of aan SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, aan SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. ~~Even when all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in a SFP zirconium fire~~ with this conservative assumption, the study found the risk of aan SFP fire to be low and well within the Commission's Safety Goals.

~~In light of the changes in storage configuration of the SFP (increased to high density racks), inadvertent partial draindown events, as well as monumental events such as the September 11, 2001, terrorist attacks and the 2011 accident at the Fukushima Dai-ichi nuclear power plant, the NRC continues to examine the issue of SFP safety. Recently, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation~~

for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel” (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC’s oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, “Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor” (ADAMS Accession No. ML14255A365). ~~The COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).~~

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk of an SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC ~~has taken~~took extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, “Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events” (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance

establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

Also, in 2014, the NRC documented a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). In COMSECY-13-0030, the NRC staff concluded that SFPs are robust structures with large safety margins and recommended to the Commission that assessments of possible regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage were not warranted. The Commission subsequently approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of an SFP severe accident is low. While the risk of a severe accident in an SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures in place if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (77 FR 74788; December 18, 2012; ~~77 FR 74788~~) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and ~~for license amendment requests and provides reviews.~~ In addition, baseline NRC inspections provide ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate ~~aan~~ SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and ~~its~~their results proposed to be provided to the NRC ~~is~~are not needed for the effectiveness of the NRC's approach ~~for~~to ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's final-safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs and protective actions for plant personnel and the public to limit exposure to radioactive materials.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly

inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. ~~The~~ At least two NRC resident inspectors are ~~permanently stationed on~~ assigned to each site to provide monitoring and inspection of routine and special activities. They are aware of, and routinely observe, SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees ~~as a result of an NRC order or a change in regulations.~~

In accordance with 10 CFR part 21, the NRC is informed of defects ~~in and failures to conform to the NRC requirements~~ and noncompliances associated with respect to basic components, which ~~includes~~ include SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and failures ~~to conform, noncompliances.~~ The NRC is also informed of the events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, ~~the~~ a nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant ~~and/or~~ or licensee as having a significant implication for public health and safety or common defense and security, must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. ~~Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident require redundant equipment and strategies to address loss of cooling to SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.~~

~~It is unclear how the~~The annual evaluations requested in the petition would not provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent uncovering of the fuel~~uncovery~~, the information that would be obtained from the proposed requirement in the petition ~~does~~would not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2. The petitioner ~~claimed~~stated that there are serious flaws with MELCOR, which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how ~~the~~such an evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's ~~claims~~statements that MELCOR is flawed. ~~The following discussion is provided in order to address the petitioner's claims about the adequacy of MELCOR, even though this discussion does not form the basis for denial of this petition for rulemaking.~~

~~The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request~~

for a new requirement for licensees to perform annual evaluations of SFPs. The petitioner's request to address perceived deficiencies in current severe accident models go hand-in-hand with the petitioner's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC is providing the following information about how MELCOR is used and the NRC's views on some of the phenomena discussed in the petition.

The petitioner claimed that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petitioner also claimed that MELCOR under-predicts the zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petitioner claimed, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petitioner pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. The MELCOR computer code has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation as discussed later in this section.

The MELCOR computer code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as; otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., "zirconium fire") occurs. A self-sustaining zirconium fire will develop if the heat generation rate from reaction with oxidant exceeds the heat loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a self-sustaining zirconium fire will occur.

Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher temperatures, the presence of any measurable amount of oxygen in the gas (steam or air) attacking the cladding is sufficient to prevent the formation of surface ZrN.

Further, if ZrN does form it can be converted readily to zirconium oxide (ZrO_2) when exposed to oxygen. The heat generation from the reaction of cladding to form ZrN followed by oxidation of the ZrN to form ZrO_2 is essentially the same as the direct reaction of Zr to form ZrO_2 . This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in the petition. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre- to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.

With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS-B9R), these phenomena are well understood and recognized in the formulations of models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a SFP. The code assessment against zirconium fire experiments conducted at Sandia National Laboratory (SNL) and code-to-code comparison documented in NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident" (ADAMS Accession No. ML13072A056), address fire propagation phenomena.

The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys" (ADAMS Accession No. ML041900069). The MELCOR computer code was used in the zirconium fire experiments (see NUREG/CR-7143) and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code-to-code comparisons) as well as the SFP study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.

The recent Sandia Fuel Project by the Organisation for Economic Co-operation and Development Nuclear Energy Agency provided experimental data relevant for hydraulic and ignition phenomena of prototypic pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petitioner asserted that the SNL SFP accident experiments are unrealistic because they were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100 micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the

~~complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.~~

The important question for ~~ana~~ a severe accident analysis is ~~if~~whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to ~~discussion of~~discussing the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, ~~multiunit~~multi-unit or concurrent accident, or fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and, even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates. ~~The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volumes 1 and 2 (ADAMS Accession Nos. ML14196A105 and ML14196A107)) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 feet above the top of the fuel in the pool, therefore encompassing the effects of some of the phenomena mentioned by the petition.~~

~~In conclusion, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. The NRC has considered the most important phenomena and continues to improve the models to further reduce the uncertainties. However, the NRC wishes to emphasize that these improvement efforts do not reflect an NRC determination that the models are unacceptable for their intended use by the NRC.~~

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has been validated against experimental data, and it represents the current state of the art in severe accident analysis. In NUREG-2161, the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment, core relocation to the vessel lower head, and ex-vessel core concrete interaction." Furthermore, MELCOR has been benchmarked against many experiments, including separate and integral effects tests for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

Additional information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161. The NRC also addressed questions regarding MELCOR in Appendix D to NUREG-2157, Volume 2, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," (ADAMS Accession No. ML14196A107).

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude

that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-----------------|---|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| June 2004 | NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys." | ML041900069 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |

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| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| March 2013 | NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss of Coolant Accident." | ML13072A056 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , ~~2015~~2016.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,

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Secretary of the Commission.

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| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements—COMSECY-13-0030—Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
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| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

_____ Dated at Rockville, Maryland, this _____ day of _____, 2015.

_____ For the Nuclear Regulatory Commission.

_____ Annette L. Vietti-Cook,
Secretary of the Commission.

ADAMS Accession Nos: PKG: ML14307A691; FRN: ML14307A630 _____ *via email

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| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D |
| NAME | DDoyle | GLapperl | TInverse | AMohseni | LKokajko (AMohseni for) |
| DATE | 7/14/2015 | 7/16/2015 | 7/17/2015 | 7/27/2015 | 7/31/2015 |
| OFFICE | NRR/DSS:D* | NRR/JLD:D* | RES:D* | NRO:D* | ADM/DAS/RADB:BC Tech Editing* |
| NAME | TMcGinty | JDavis (JBowen for) | BSheron (SCoffin for) | GTracy (JMonninger for) | CBladey (JBorges for) |
| DATE | 8/24/2015 | 8/25/2015 | 8/27/2015 | 8/28/2015 | 8/24/2015 |
| OFFICE | OGC/GCLR/RMR* | NRR:D | EDO | | |
| NAME | MSpencer (GMizuno for) NLO | WDean | VMcCree | | |
| DATE | 9/23/2015 | 10/6/15 | 11/19/15 | | |

OFFICIAL RECORD COPY



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition ~~failed to~~did not present any significant new information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC, as requested by the petition, is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the FR.

The docket for this petition closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM 50-108, and the NRC published a notice of docketing in the *Federal Register* on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition failed to present any significant new information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petition is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the *Federal Register*.

The docket for this petition closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

ADAMS Accession Nos: PKG: ML14307A691; LTR to Petitioner: ML14307A157; FRN: ML14307A630

*Concurrence via email

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| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D |
| NAME | DDoyle | Glappert | Tinverse | AMohseni | LKokajko (AMohseni for) |
| DATE | 7/14/2015 | 7/16/2015 | 7/17/2015 | 7/27/2015 | 7/31/2015 |
| OFFICE | NRR/DSS:D* | NRR/JLD:D* | RES:D* | NRO:D* | ADM/DAS/RADB:BC* |
| NAME | TMcGinty | JDavis (JBowen for) | BSheron (SCoffin for) | GTracy (JMonninger for) | GBladey (JBorges for) |
| DATE | 8/24/2015 | 8/25/2015 | 8/27/2015 | 8/28/2015 | 8/24/2015 |
| OFFICE | OGC/GCLR/RMR* | NRR:D | EDO | | |
| NAME | MSpencer (GMizuno for) NLO | WDean | VMcGree | | |
| DATE | 9/23/2015 | 10/6/15 | 11/19/15 | | |

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¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

From: Borges, Jennifer
Sent: 2 May 2016 14:57:02 +0000
To: Bladey, Cindy
Cc: Terry, Leslie;DeJesus, Anthony
Subject: FW: Petition for rulemaking for SECY signature (NRC-2014-0171)
Attachments: FRN PRM-50-108 ADM Redline.lst.docx, PRM-50-108 REDLINE Congressional Letters.lst.docx, prm-50-108_Letter to petitioner.lst.docx
Importance: High

Cindy,
Attached are the redlines for the PRM-50-108 SECY package. I have incorporated Leslie's™ revisions in ADAMS and the link is provided below. Please review the clean ADAMS versions and provide me with comments. The package is due to SECY for publication **May 4, 2016**.

[View ADAMS P8 Properties ML16061A114](#)

[Open ADAMS P8 Package \(PRM-50-108 Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents \(NRC-2014-0171\).\)](#)

Thank you,

Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

Location: OWFN 12-G07



301-415-3647



jennifer.borges@nrc.gov

From: Terry, Leslie

Sent: Friday, April 29, 2016 1:28 PM

To: DeJesus, Anthony

Cc: Borges, Jennifer

Subject: RE: Petition for rulemaking for SECY signature (NRC-2014-0171)

Attached are my edits.

Thanks,

Leslie

From: DeJesus, Anthony

Sent: Friday, April 29, 2016 6:23 AM

To: Terry, Leslie <Leslie.Terry@nrc.gov>

Cc: Borges, Jennifer <Jennifer.Borges@nrc.gov>

Subject: RE: Petition for rulemaking for SECY signature (NRC-2014-0171)

Good morning Leslie, I reviewed this package for Jennifer. They incorporated all of the changes from the SRM. I did make some minor changes to the FRN and the Congressional letters. I had no additional changes to make to the letter to the petitioner.

Jennifer, I will leave this for you to finish up and submit to SECY next week after Leslie and Cindy provide you with their comments. I have not incorporated any of these changes into the ADAMS documents yet. Let me know if either of you have questions.

a

From: Terry, Leslie

Sent: Wednesday, April 27, 2016 2:04 PM

To: DeJesus, Anthony <Anthony.DeJesus@nrc.gov>

Subject: FW: Petition for rulemaking for SECY signature (NRC-2014-0171)

From: Doyle, Daniel

Sent: Wednesday, April 27, 2016 11:21 AM

To: Notice_Publish Resource <Notice_Publish.Resource@nrc.gov>

Cc: Bladey, Cindy <Cindy.Bladey@nrc.gov>; Borges, Jennifer <Jennifer.Borges@nrc.gov>; Terry, Leslie <Leslie.Terry@nrc.gov>

Subject: Petition for rulemaking for SECY signature (NRC-2014-0171)

MEMORANDUM TO: Cindy Bladey, Chief

Rules, Announcements, and Directives Branch

Division of Administrative Services

Office of Administration

FROM: Daniel Doyle, Acting Chief

Rulemaking Branch

Division of Policy and Rulemaking

Office of Nuclear Reactor Regulation

SUBJECT: PETITION FOR RULEMAKING: FUEL-CLADDING ISSUES IN POSTULATED SPENT FUEL POOL ACCIDENTS (NRC-2014-0171)

The *Federal Register* notice (FRN) referenced in the subject line is ready for transmittal to SECY for signature. ADM/DAS/RDB and SECY have been given owner's rights to the *Federal Register* notice package (ADAMS Accession No. ML16061A114).^{*} The ADAMS accession number for this FRN, and all other associated documents referenced in this memorandum are provided at the end of this document.

In addition to the FRN, this package includes the following documents:

• The letter to the petitioner (ML16022A187)

• The Congressional letters for transmittal to the Office of Congressional Affairs. ADM/DAS/RDB and OCA have been given owner rights to these documents.

• The staff requirements memorandum (SRM and the two enclosures). A redline/strikeout file showing Commission requested changes to the FRN and letter to the petitioner is attached to this email.

All publicly available NRC documents referenced in the notice have been finalized in ADAMS and profiled for public release. The ADAMS accession numbers for all such documents are provided in the text of the FRN.

The FRN must be submitted to SECY by May 4, 2016.

The Office of the General Counsel has reviewed this notice and provided an NLO on April 22, 2016. A copy of the NLO e-mail is attached to this email.

Enclosures:

1. FRN* (ML16022A185)
2. Congressional letters* (ML14307A845)
3. SRM (Pkg: ML16096A192, SRM: ML16096A197, Encl. 1: ML16096A201, Encl. 2: ML16096A203)
4. Redline showing changes made by program office post SRM (see attached files)

CONTACT: Daniel Doyle, NRR/DPR/PRMB

301-415-3748

^{*}ADM/DAS/RDB has been given owner's rights to the package and these documents in ADAMS. Owner rights is needed for the package so that ADM's redline/strikeout can be added into the package. SECY will contact the PM after the package has been submitted to the OFR and the PM will be responsible for removing ADM's redline/strikeout from the package.

[7590-01-P]

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM or the petition), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking with respect to SFPs or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on [INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*].

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action petition by any of the following methods:

Comment [TL]: Change made because we use both.

Comment [TL]: Consistent with how we have defined it in the previous section.

Comment [TL]: To be consistent with previous sentence.

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):**
You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

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I. **The Petition**

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III. Conclusion:

IV. Availability of Documents:

I. The Petition

Section 2.802 of ~~File title~~ 10 of the *Code of Federal Regulations* (10 CFR), ~~Petition for rulemaking—requirements for filing~~, provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition ~~for rulemaking~~ dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of:

Comment [TL]: OFR formatting requirement.

Comment [TL]: OFR formatting requirement.

Comment [AdJ]: Should we be using the new title? I forgot to do this in the PRM I sent to SECY last week. YES

Comment [TL]: For consistency.

postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR simulations predict. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner stated that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested

regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations that would be required by the fourth requested regulation would be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of an SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for

regulatory decisionmaking, and the evaluations would not prevent or mitigate an SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to an SFP fire. In order for an SFP fire to occur, all SFP systems, backup systems, and operator actions that are intended to prevent the spent fuel in the pool from being uncovered would have to fail. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of an SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner stated that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that an SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and, ultimately, an SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response:

Spent nuclear fuel offloaded from a reactor is initially stored in an SFP. The SFPs at all nuclear plants in the United States are robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage.

Studies conducted over the last four decades have consistently shown the risk of an accident causing a zirconium fire in an SFP to be low. The risk of an SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools," (ADAMS Accession No. ML082330232), in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public

health objectives (51 FR 30028; August 21, 1986) and that no new regulatory requirements were warranted.

The risk of an SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, an SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even with this conservative assumption, the study found the risk of an SFP fire to be low and well within the Commission's Safety Goals.

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability and, accordingly, the risk of an SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC took extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the

Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

Also, in 2014, the NRC documented a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). In COMSECY-13-0030, the NRC staff concluded that SFPs are robust structures with large safety margins and recommended to the Commission that assessments of possible regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage were not warranted. The Commission subsequently approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this ~~noticed document~~, the NRC has determined that the risk of an SFP severe accident is low. While the risk of a severe accident in an SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures in place if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's

Comment [TL]: Will publish in proposed rules section of the Federal Register, therefore, we do not call it a "notice."

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (77 FR 74788; December 18, 2012) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response:

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and license amendment reviews. In addition, baseline NRC inspections provide ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate an SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and their results proposed to be provided to the NRC are not needed for the effectiveness of the NRC's approach to ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's safety analysis report. Licensees are required to operate the plant,

including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs and protective actions for plant personnel and the public to limit exposure to radioactive materials.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. At least two NRC resident inspectors are assigned to each site to provide monitoring and inspection of routine and special activities.

They are aware of, and routinely observe, SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees as a result of an NRC order or a change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects and noncompliances associated with basic components, which include SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and noncompliances. The NRC is also informed of events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, a nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant or licensee as having a significant implication for public health and safety or common defense and security must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The annual evaluations requested in the petition would not provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-

coolant and subsequent uncovering of the fuel, the information that would be obtained from the proposed requirement in the petition would not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2. The petitioner stated that there are serious flaws with MELCOR, which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how such an evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's statements that MELCOR is flawed.

There are inherent uncertainties in the progression of severe accidents. There are many interrelated phenomena that need to be properly understood; otherwise, conservatism in one area may lead to overall non-conservative results. Conservatism can be meaningfully

introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

The important question for a severe accident analysis is whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussing the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multi-unit or concurrent accident, or fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and, even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has been validated against experimental data, and it represents the current state of the art in severe accident analysis. In NUREG-2161, the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment, core relocation to the vessel lower head, and ex-vessel core concrete interaction." Furthermore, MELCOR has been benchmarked against many experiments, including separate and integral effects tests for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

Additional information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161. The NRC also addressed questions regarding MELCOR in Appendix D to

NUREG-2157, Volume 2, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," (ADAMS Accession No. ML14196A107).

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-----------------|--|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |

| | | |
|-------------------|---|-------------|
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leye. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

_____ Dated at Rockville, Maryland, this day of , 2016.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Comment [TL]: Make this change to all letters.

The Honorable James M. Inhofe
Chairman, Committee on Environment
and Public Works
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

The U.S. Nuclear Regulatory Commission (NRC) is publishing the following document in the *Federal Register*.

- Title: Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents [NRC-2014-0171].
- Description of the document: This document denies a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse. The petition requests that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool accident scenarios for use by the NRC in severe accident response.
- Dates: The docket for the petition, the petition for rulemaking, PRM-50-108, will be closed on the date of publication.

For more information, see the enclosed document.

Please contact me at 301-415-1776 if you have questions or need more information.

Sincerely,

Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Senator Barbara Boxer



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

The Honorable Shelley Moore Capito
Chairman, Subcommittee on Clean Air
and Nuclear Safety
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

Dear Madam Chairwoman:

The U.S. Nuclear Regulatory Commission (NRC) is publishing the following document in the Federal Register:

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Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Senator Thomas R. Carper



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

The Honorable Fred Upton
Chairman, Committee on Energy
and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

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Sincerely,

Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Representative Frank Pallone, Jr.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

The Honorable Ed Whitfield
Chairman, Subcommittee on Energy
and Power
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

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Sincerely,

Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Representative Bobby L. Rush



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

The Honorable John Shimkus
Chairman, Subcommittee on Environment
and the Economy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

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For more information, see the enclosed document.

Please contact me at 301-415-1776 if you have questions or need more information.

Sincerely,

Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Representative Paul Tonko

The Honorable John Shimkus
Chairman, Subcommittee on Environment
and the Economy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

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Sincerely,

Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Representative Paul Tonko

IDENTICAL LETTERS SENT TO:

The Honorable James M. Inhofe with cc: to Senator Barbara Boxer

The Honorable Shelley Moore Capito with cc: to Senator Thomas R. Carper

The Honorable Fred Upton with cc: to Representative Frank Pallone, Jr.

The Honorable Ed Whitfield with cc: to Representative Bobby L. Rush

ADAMS Accession Nos: LTR: ML14307A845; FRN: ML14307A630

| | | | | |
|---------------|----------------------------|--------------------------|-----------------|------------|
| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR:DD |
| NAME | DDoyle | GLappert | TInverso | AMohseni |
| DATE | 7/14/2015 | 7/16/2015 | 7/27/2015 | 7/27/2015 |
| OFFICE | NRR/DPR:D | ADM/DAS/RADB:BC* | OCA | |
| NAME | LKokajko (AMohseni for) | CBladey (JBorges for) | EDacus | |
| DATE | 7/31/2015 | 8/24/2015 | | |

OFFICIAL RECORD COPY



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition did not present information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC, as requested by the petition, is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the FR.

The docket for this petition, PRM-50-108, is closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

From: Doyle, Daniel
Sent: 20 May 2016 10:57:03 +0000
To: Terry, Leslie; Bladey, Cindy
Subject: FW: PRM-50-108 - email from petitioner
Attachments: RE: Re: Re: Status of PRM-50-108, PRM-50-108_81FR29761.pdf

-----Original Appointment-----

From: Doyle, Daniel
Sent: Monday, May 16, 2016 11:01 AM
To: Doyle, Daniel; Mizuno, Geary; Hernandez, Raul; Esmaili, Hossein; Casto, Greg; Witt, Kevin
Cc: Borges, Jennifer
Subject: PRM-50-108 - email from petitioner
When: Friday, May 20, 2016 9:00 AM-10:00 AM (UTC-05:00) Eastern Time (US & Canada).
Where: HQ-OWFN-12B02-12p

The purpose of this meeting is to develop a working group recommendation for the path forward based on the considerations identified by Geary in the email attached below.



Here is the final FRN denying PRM-50-108:



From: Mizuno, Geary
Sent: 16 May 2016 10:39:57 -0400
To: Doyle, Daniel;Borges, Jennifer;Hernandez, Raul;Esmaili, Hossein;Casto, Greg;Witt, Kevin
Subject: RE: Re: Re: Status of PRM-50-108

Dan:

The staff should be prepared at the meeting to:

- (i) identify any new rationales in the request for reconsideration, and whether the request included a basis for these rationales. We will need this to accurately identify why these cannot be the basis for reconsideration.
- (ii) identify any new technical considerations raised in the request for reconsideration that apply to the NRC's bases for denial. We will need this to accurately identify why these cannot be the basis for reconsideration.

From: Doyle, Daniel
Sent: Monday, May 16, 2016 10:00 AM
To: Mizuno, Geary <Geary.Mizuno@nrc.gov>; Borges, Jennifer <Jennifer.Borges@nrc.gov>; Hernandez, Raul <Raul.Hernandez@nrc.gov>; Esmaili, Hossein <Hossein.Esmaili@nrc.gov>; Casto, Greg <Greg.Casto@nrc.gov>; Witt, Kevin <Kevin.Witt@nrc.gov>
Subject: FW: Re: Re: Status of PRM-50-108

PRM-50-108 working group,

Please review the email from the petitioner below and the italicized guidance from our office instruction. I will add his email to ADAMS and regulations.gov. I will set up a meeting this week to discuss path forward.

Instances in which the Petitioner disagrees with the Commission's final decision may be presented to the PM in the form of a letter, email, fax or even a telephone call. The Commission's rules regarding the 10 CFR 2.802 process do not provide for "reconsideration" of a decision, but the Petitioner may still want to respond to the NRC once he/she receives the letter informing the Commission's decision and rationale. If a written communication is submitted by the Petitioner, the PM needs to docket it and include it on regulations.gov. The PM must immediately consult OGC to determine appropriate actions to be taken. It is possible that the letter simply contains a statement disagreeing with the NRC, which would require no further action. However, the letter could raise new issues not previously considered by the NRC, which could be considered as a new PRM, or it could raise an allegation, which needs to be forwarded to the NRC Allegations team in a timely manner. If the communication is received via telephone, the PM should explain the NRC process to the Petitioner. The PM should encourage the Petitioner to submit the concern in writing so that it is docketed and that the NRC could take appropriate actions. As discussed above, immediately after receiving the call, the PM should consult with OGC for appropriate actions to be taken.

(link to guidance in office instruction)

Dan

From: Mark Leyse [mailto:markleyse@gmail.com]

Sent: Monday, May 16, 2016 6:59 AM

To: Doyle, Daniel <Daniel.Doyle@nrc.gov>; Mohseni, Aby <Aby.Mohseni@nrc.gov>

Cc: Burnell, Scott <Scott.Burnell@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>; Dave Lochbaum <dlochbaum@ucsusa.org>; Gordon Thompson <gthompson@irss-usa.org>; Matthew G. McKinzie <mmckinzie@nrdc.org>; Geoffrey Fettus <gfettus@nrdc.org>; Thomas B. Cochran <tcochran@nrdc.org>; Alemayehu, Bemnet <balemayehu@nrdc.org>; Ed Lyman <elyman@ucsusa.org>; Robert Alvarez <kitbob@erols.com>; Robert H. Leyse <Bobleyse@aol.com>; Paul Gallay <PGallay@riverkeeper.org>; Paul Gunter <paul@beyondnuclear.org>; Michel Lee <ciecplee@verizon.net>; Mary Lampert <mary.lampert@comcast.net>; CHAIRMAN Resource <CHAIRMAN.Resource@nrc.gov>; Valliere, Nanette <Nanette.Valliere@nrc.gov>; Moore, Johari <Johari.Moore@nrc.gov>; Patrick.Castlennan@nrc.gov; Frazier, Alan <Alan.Frazier@nrc.gov>; Cubbage, Amy <Amy.Cubbage@nrc.gov>; Bloomer, Tamara <Tamara.Bloomer@nrc.gov>; Krsek, Robert <Robert.Krsek@nrc.gov>; michal freedhoff@markey.senate.gov; Diane Curran <dcurran@harmoncurran.com>

Subject: [External_Sender] Re: Re: Status of PRM-50-108

Dear Mr. Doyle:

Thank you for sending me the PDF.

The NRC's decision to deny PRM-50-108 seems to be based on **dogma**, rather than **science**. Your Federal Register notice doesn't even mention the April 2000 letter from Dana A. Powers, Chairman of the Advisory Committee on Reactor Safeguards, to Richard A. Meserve, Chairman of the NRC, stating, "that nitrogen from air depleted of oxygen will interact exothermically with zircaloy cladding."

The April 2000 letter says that "The [NRC] staff analysis of the interaction of air with cladding *has relied on relatively geriatric work*. Much more is known now about air interactions with cladding" [emphasis added]. That was 16 years ago! And since then the NRC has done nothing but persist in relying on geriatric work for its analyses of spent fuel pool accidents.

(Please see pages 3 and 4 of the April 2000 letter, available at: <http://www.nrc.gov/docs/ML0037/ML003704532.pdf>)

I quoted from the the April 2000 letter on page 3 of my cover letter and on pages 5, 25, and 38 of PRM-50-108. (Please see PRM-50-108: <http://www.nrc.gov/docs/ML1419/ML14195A388.pdf>)

Dogma:

Here is an example of dogma from the NRC's Federal Register notice: "The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has been validated against experimental data, and it represents the current state of the art in severe accident analysis."

(Please see page 29764 of the Federal Register notice: <https://www.gpo.gov/fdsys/pkg/FR-2016-05-13/pdf/2016-11212.pdf>)

The NRC's claim is not supported by facts.

Science:

As I state on page 29 of PRM-50-108, the Paul Scherrer Institute recently assessed MELCOR 1.8.6's ability to predict fuel-cladding behavior in accidents involving air ingress into the reactor vessel-which is pertinent to MELCOR's ability to predict zirconium-air reaction rates in spent fuel pool fires-and "concluded that development of MELCOR was needed to *capture the accelerated cladding oxidation that can take place under air ingress conditions* (characterized by transition from formation of a protective oxide film to non-protective 'breakaway' oxidation at a significantly higher rate)" [emphasis added].

I request that the NRC reconsider its decision to deny PRM-50-108.

If there is a scientific foundation for denying PRM-50-108, please explain it.

If the ACRS was incorrect in 2000 that the NRC has relied on relatively geriatric work for its analysis of the interaction of air with cladding, please explain why.

In 2000, the ACRS pointed out that the effects of nitrogen were not modeled by the NRC. To this date, MELCOR still does not model how nitrogen would effect fuel cladding in a spent fuel pool fire. That is one of the reasons why I submitted PRM-50-108.

Sincerely,

Mark Leyse

P.S. Please place this letter in ADAMS.

On Fri, May 13, 2016 at 10:13 AM, Doyle, Daniel <Daniel.Doyle@nrc.gov> wrote:

Mr. Leyse,

Here is the PDF. The notice is also available at the following link:

<https://federalregister.gov/a/2016-11212>

Sincerely,

Dan Doyle

Project Manager
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov

(301) 415-3748

From: Doyle, Daniel
Sent: Wednesday, May 11, 2016 5:08 PM
To: 'Mark Leyse' <markleyse@gmail.com>
Cc: Burnell, Scott <Scott.Burnell@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>
Subject: RE: Re: Status of PRM-50-108

Mr. Leyse,

Yes. I expect it to be available on Friday.

Sincerely,

Dan Doyle

Project Manager
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748

From: Mark Leyse [<mailto:markleyse@gmail.com>]
Sent: Wednesday, May 11, 2016 4:57 PM
To: Doyle, Daniel <Daniel.Doyle@nrc.gov>
Cc: Burnell, Scott <Scott.Burnell@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>
Subject: [External_Sender] Re: Status of PRM-50-108

Dear Mr. Doyle:

Would you please send me a PDF copy of the Federal Register notice when it's available?

Thank you,

Mark Leyse

On Tue, May 10, 2016 at 12:34 PM, Doyle, Daniel <Daniel.Doyle@nrc.gov> wrote:

Mr. Leyse,

The NRC has completed its evaluation of PRM-50-108, and a notice will be published in the *Federal Register* within the next few days. Also, you should receive very soon a letter signed by the Secretary of the Commission.

Sincerely,

Dan Doyle

Project Manager
U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov
(301) 415-3748

From: Doyle, Daniel

Sent: Friday, January 15, 2016 1:07 PM

To: 'markleyse@gmail.com' (markleyse@gmail.com) <markleyse@gmail.com>

Cc: Burnell, Scott <Scott.Burnell@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>; Inverso, Tara <Tara.Inverso@nrc.gov>

Subject: Status of PRM-50-108

Mr. Leyse,

I am writing to provide an update on your letter dated June 19, 2014, in which you submitted a petition for rulemaking to the U.S. Nuclear Regulatory Commission (NRC). In your letter, you requested that the NRC develop new regulations requiring that (1) spent fuel pool (SFP) accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The NRC docketed your letter as petition for rulemaking (PRM) 50-108. A notice of docketing was published in the *Federal Register* on October 7, 2014 (79 FR 60383).

The NRC is evaluating the petition. Once the petition has been resolved, the NRC will publish a notice in the *Federal Register* explaining the NRC's finding. You will also receive a letter at that time notifying you of the action the NRC has taken.

Please contact me at Daniel.Doyle@nrc.gov or (301) 415-3748 if you have any questions.

Sincerely,

Dan Doyle

Project Manager
U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov
(301) 415-3748

Rules and Regulations

Federal Register

Vol. 81, No. 93

Friday, May 13, 2016

This section of the FEDERAL REGISTER contains regulatory documents having general applicability and legal effect, most of which are keyed to and codified in the Code of Federal Regulations, which is published under 50 titles pursuant to 44 U.S.C. 1510.

The Code of Federal Regulations is sold by the Superintendent of Documents. Prices of new books are listed in the first FEDERAL REGISTER issue of each week.

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM or the petition), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking with respect to SFPs or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition, PRM-50-108, is closed on May 13, 2016.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this petition by any of the following methods:

- **Federal Rulemaking Web site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; email: Carol.Gallagher@nrc.gov. For

technical questions, contact the individual listed in the **FOR FURTHER INFORMATION CONTACT** section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):** You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "ADAMS Public Documents" and then select "Begin Web-Based ADAMS Search." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by email to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the **SUPPLEMENTARY INFORMATION** section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; email: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

Table of Contents

- I. The Petition
- II. Reasons for Denial
- III. Conclusion
- IV. Availability of Documents

I. The Petition

Section 2.802 of title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking—requirements for filing," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the **Federal Register** (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition

because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR simulations predict. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner stated that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as

well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations that would be required by the fourth requested regulation would be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of an SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual

evaluations are not needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate an SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to an SFP fire. In order for an SFP fire to occur, all SFP systems, backup systems, and operator actions that are intended to prevent the spent fuel in the pool from being uncovered would have to fail. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of an SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The Requested Regulations Pertaining to SFP Accident Evaluation Models Are Needed Because the Probability of the Type of Events That Could Lead to SFP Accidents Is Relatively High

The petitioner stated that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that an SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and, ultimately, an SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response

Spent nuclear fuel offloaded from a reactor is initially stored in an SFP. The SFPs at all nuclear plants in the United States are robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions

(e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage.

Studies conducted over the last four decades have consistently shown the risk of an accident causing a zirconium fire in an SFP to be low. The risk of an SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools," in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (51 FR 30028; August 21, 1986) and that no new regulatory requirements were warranted.

The risk of an SFP accident was reassessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, an SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even with this conservative assumption, the study

found the risk of an SFP fire to be low and well within the Commission's Safety Goals.

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability and, accordingly, the risk of an SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC took extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

Also, in 2014, the NRC documented a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the

Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). In COMSECY-13-0030, the NRC staff concluded that SFPs are robust structures with large safety margins and recommended to the Commission that assessments of possible regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage were not warranted. The Commission subsequently approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this document, the NRC has determined that the risk of an SFP severe accident is low. While the risk of a severe accident in an SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures in place if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (77 FR 74788; December 18, 2012) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

Issue 2: Annual Licensee SFP Safety Evaluations and Submission of Results to the NRC Is Necessary So That the NRC Is Aware of Potential Consequences of Postulated SFP Accident/Fire Scenarios as Fuel Assemblies Are Added, Removed, or Reconfigured in Licensees' SFPs

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and license amendment reviews. In addition, baseline NRC inspections provide ongoing oversight to ensure adequate

protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate an SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and their results proposed to be provided to the NRC are not needed for the effectiveness of the NRC's approach to ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs and protective actions for plant personnel and the public to limit exposure to radioactive materials.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISC-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

use of equipment; and observing "dry runs" of procedures. At least two NRC resident inspectors are assigned to each site to provide monitoring and inspection of routine and special activities. They are aware of, and routinely observe, SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees as a result of an NRC order or a change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects and noncompliances associated with basic components, which include SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and noncompliances. The NRC is also informed of events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, a nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant or licensee as having a significant implication for public health and safety or common defense and security must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The annual evaluations requested in the petition would not provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent uncovering of the fuel, the information that would be obtained

from the proposed requirement in the petition would not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR Is Not Currently Sufficient To Provide a Conservative Evaluation of Postulated SFP Accident/Fire Scenarios

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2. The petitioner stated that there are serious flaws with MELCOR, which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how such an evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's statements that MELCOR is flawed.

There are inherent uncertainties in the progression of severe accidents. There are many interrelated phenomena that need to be properly understood; otherwise, conservatism in one area may lead to overall non-conservative results. Conservatism can be meaningfully introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

The important question for a severe accident analysis is whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussing the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multi-unit or concurrent accident, or fuel loading). In addition, the regulatory

analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and, even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has been validated against experimental data, and it represents the current state of the art in severe accident analysis. In NUREG-2161, the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment, core relocation to the vessel lower head, and ex-vessel core concrete interaction." Furthermore, MELCOR has been benchmarked against many experiments, including separate and integral effects tests for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

Additional information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161. The NRC also addressed questions regarding MELCOR in Appendix D to NUREG-2157, Volume 2, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel" (ADAMS Accession No. ML14196A107).

III. Conclusion

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents

The documents identified in the following table are available to

interested persons as indicated. For more information on accessing ADAMS,

see the **ADDRESSES** section of this document.

| Date | Document | ADAMS accession number/ Federal Register citation |
|-------------------------|---|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028. |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools". | ML082330232. |
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants". | ML010430066. |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events". | ML12054A735. |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide". | ML12242A378. |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events". | ML12229A174. |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools ... | 77 FR 74788. |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel". | ML13329A918. |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements—COMSECY-13-0030—Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel". | ML14143A360. |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse | ML14195A388. |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107. |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor". | ML14255A365. |
| October 7, 2014 | Notice of Docketing for PRM-50-108 | 79 FR 60383. |

Dated at Rockville, Maryland, this 5th day of May, 2016.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,

Secretary of the Commission.

[FR Doc. 2016-11212 Filed 5-12-16; 8:45 am]

BILLING CODE 7590-01-P

PENSION BENEFIT GUARANTY CORPORATION

29 CFR Parts 4010, 4041, 4071, and 4302

RIN 1212-AB33

Adjustment of Civil Penalties

AGENCY: Pension Benefit Guaranty Corporation.

ACTION: Interim final rule.

SUMMARY: The Pension Benefit Guaranty Corporation is amending its regulations to adjust the penalties provided for in sections 4071 and 4302 of the Employee Retirement Income Security Act of 1974. This action is being taken in accordance with the Federal Civil Penalties Inflation Adjustment Act Improvements Act of 2015 and Office of Management and Budget memorandum M-16-06. The regulations being amended are those on Penalties for Failure to Provide Certain Notices or Other Material Information (29 CFR part 4071) and

Penalties for Failure to Provide Certain Multiemployer Plan Notices (29 CFR part 4302). Conforming amendments are also being made to the regulations on Annual Financial and Actuarial Information Reporting (29 CFR part 4010) and Termination of Single-Employer Plans (29 CFR part 4041).

DATES: The amendments are effective August 1, 2016. Also see Applicability, below.

FOR FURTHER INFORMATION CONTACT:

Deborah C. Murphy, Deputy Assistant General Counsel for Regulatory Affairs (murphy.deborah@pbgc.gov), Office of the General Counsel, Pension Benefit Guaranty Corporation, 1200 K Street NW., Washington, DC 20005-4026; 202-326-4400 extension 3451. (TTY and TDD users may call the Federal relay service toll-free at 800-877-8339 and ask to be connected to 202-326-4400 extension 3451.)

SUPPLEMENTARY INFORMATION:

Executive Summary

Purpose of the Regulatory Action

This rule is needed to carry out the requirements of the Federal Civil Penalties Inflation Adjustment Act Improvements Act of 2015. The rule adjusts the maximum civil penalties that PBGC may assess for failure to provide certain notices or other material information.

PBGC's legal authority for this action comes from the Federal Civil Penalties Inflation Adjustment Act of 1990 as amended by the Federal Civil Penalties Inflation Adjustment Act Improvements Act of 2015 and from sections 4002(b)(3), 4071, and 4302 of the Employee Retirement Income Security Act of 1974.

Major Provisions of the Regulatory Action

This rule adjusts the maximum civil penalties that PBGC may assess under sections 4071 and 4302 of ERISA. The new maximum amounts are \$2,063 for section 4071 penalties and \$275 for section 4302 penalties.

Background

The Pension Benefit Guaranty Corporation (PBGC) administers title IV of the Employee Retirement Income Security Act of 1974 (ERISA). Title IV has two provisions that authorize PBGC to assess civil monetary penalties.¹ Section 4302, added to ERISA by the Multiemployer Pension Plan

¹ Under the Federal Civil Penalties Inflation Adjustment Act of 1990, a penalty is a civil monetary penalty if (among other things) it is for a specific monetary amount or has a maximum amount specified by Federal law. Title IV also provides (in section 4007) for penalties for late payment of premiums, but those penalties are neither in a specified amount nor subject to a specified maximum amount.

From: Borges, Jennifer
Sent: 17 Jul 2014 13:48:51 +0000
To: Gallagher, Carol
Subject: FW: PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents

Hi Carol,
Would you please assign a docket number in FDMS for the subject PRM.
Thank you,


Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

Location: 3WFN 6-A38

 301-287-0999

 jennifer.borges@nrc.gov

From: Bladey, Cindy
Sent: Monday, July 14, 2014 3:21 PM
To: Borges, Jennifer
Subject: FW: PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents

fyi

From: RulemakingComments Resource
Sent: Monday, July 14, 2014 3:16 PM
To: Bladey, Cindy
Cc: Glitter, Rebecca; Julian, Emile; Newell, Brian; RulemakingComments Resource
Subject: PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents

Cindy,

The following Petition has been docketed and a folder for PRM-50-108 has been created in the "ELECTRONIC RULEMAKING COMMENTS" folder in ADAMS.

ML14195A388 - PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents.

Thanks.

Herald

Herald M. Speiser

Rulemakings and Adjudications Staff

Office of the Secretary

Nuclear Regulatory Commission

(301) 415-1675

From: Doyle, Daniel
Sent: 18 Sep 2015 17:51:42 -0400
To: Mizuno, Geary
Cc: Borges, Jennifer; Hernandez, Raul; Esmaili, Hossein; Casto, Greg; Witt, Kevin; Inverso, Tara
Subject: FW: PRM-50-108 - please provide NLO
Attachments: FRN PRM-50-108 deny GSM1.docx, SECY PRM-50-108 GSM1.docx

Geary,
I reviewed your edits and comments and I will work on getting this back to you next week.
Working group,
Here are Geary's edits/comments, FYI. I don't think we need to meet to discuss anything here. Please let me know if you have any concerns. Otherwise, I'll let you know if I need anything from you.
Dan

From: Mizuno, Geary
Sent: Friday, September 18, 2015 5:23 PM
To: Doyle, Daniel
Cc: Spencer, Mary; Biggins, James
Subject: RE: PRM-50-108 - please provide NLO

SECY (ML14307A134)

See attached file. My main issue is with the NRC's proposed response to the Third Issue. It does not accurately describe the argument as set forth in the FRN.

FRN (ML14307A630)

See attached file. Just some small changes.

Letter to Mark Leyse (ML14307A157)

No comments or changes.

Daily Note:

No comments or changes.

Congressional Letter

Editorial: please revise the second bullet to read (in its entirety) as follows:

- Description of the document: This document denies a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse. The petition requests that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool accident scenarios, for use by the NRC in severe accident response.

If you have any questions, please call or set up a meeting so we can have a relatively fast review and approval when the package is re-submitted for NLO.

Geary

From: Doyle, Daniel
Sent: Wednesday, September 02, 2015 3:39 PM
To: OGCMailCenter Resource <OGCMailCenter.Resource@nrc.gov>
Cc: Mizuno, Geary <Geary.Mizuno@nrc.gov>
Subject: PRM-50-108 - please provide NLO

Please review and provide NLO on the draft denial package for PRM-50-108 (links below). I would like to get this back by COB on Friday, September 18.

[View ADAMS P8 Properties ML14307A691](#)

Open ADAMS P8 Package (SECY-xx-xxxx Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108).)

View ADAMS P8 Properties ML14307A891

Open ADAMS P8 Document (Daily Note Regarding PRM-50-108: Annual Spent Fuel Pool Evaluations)

View ADAMS P8 Properties ML14307A845

Open ADAMS P8 Document (PRM-50-108 Annual Spent Fuel Pool Evaluations Congressional Letters)

Dan

415-3748

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):** You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

TABLE OF CONTENTS:

- I. The Petition.
- II. Reasons for Denial.
- III. Conclusion.
- IV. Availability of Documents.

I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. On June 19, 2014, the NRC received a petition for rulemaking from Mr. Mark Edward Leyse, and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air

Comment [MG]: Recognizing that there is some flexibility here, I am wondering why we are not adhering to the approach used in a number of other recent PRMs:

PRM-51-14, 80 FR 8235:

- I. Background
- II. <Essentially a discussion of the technical and regulatory merits of the petition>
- III. Determination of Petitions
- IV. Availability of Documents.

Compare this with Jessica Kratchman's PRM denial which uses yet another different scheme:

- Background.
- II. Petitioner's Requests.
- III. Petitioner's Rationale for Requested Actions.
- IV. Public Comments on the Petition
- V. Reasons for Denial.
- VI. Conclusion.
- VII. Availability of Documents.

I ask that Tara Inverso be advised of this lack of consistency and we have a meeting to discuss how to address this issue.

Comment [MG]: This says that the NRC received the PRM on June 19. The FRN for the notice of docketing says correctly that the PRM is dated June 19. I think that it would be better to refer only to the date of the PRM, rather than setting a precedent and stating the date that the NRC received the PRM. If the OPRM were sent by mail, it may be that the PRM date and the date of NRC receipt would be different -- and following this precedent, the NRC staff PM in the future may feel compelled to provide both dates. Inasmuch as the date of the PRM is ordinarily the only relevant date, I would rewrite this to say that the PRM is dated June 19, 2014. This is an example of how small wording changes have very different meanings.

reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR indicates. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner claimed that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential

consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant new information or arguments that would warrant the requested amendments. The first three requested regulations would establish requirements for how the detailed annual evaluations in the fourth requested regulation should be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of a SFP

Comment [MG]: "new" as compared to what information or arguments? Nothing here identifies the basis for comparison. In the absence of that and a further discussion in this notice, "new" must be removed.

Comment [MG]: IMO, it is going to be difficult for the reader to relate back to the description of the four regulations which are the subject of this sentence. I also point out that the previous sentence uses the term, "amendments," but this sentence uses "requested regulations." This is neither consistent nor helpful to the reader's understanding.

severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate a SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to a SFP fire. In order for a SFP fire to occur, all SFP systems, backup systems, and operator actions would have to fail to prevent the spent fuel in the pool from being uncovered. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose as requested by the petitioner because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of a SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner claimed that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that a SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and ultimately a SFP

accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in a SFP. The SFPs at all nuclear plants in the United States are extremely robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding as a result of the significant volume of water above the spent fuel. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage. As spent fuel cools, older fuel is sometimes removed from a plant's SFP for on-site dry cask storage, depending on the space available in the SFP. Fuel removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure. They are monitored and routinely inspected for integrity, and they are protected by security measures.

Studies conducted over the last four decades have consistently shown that the probability of an accident causing a zirconium fire in a SFP to be lower than that for severe reactor accidents. The risk of a SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools", in light of increased use of high-density

storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (August 21, 1986; 51 FR 30028) and that no new regulatory requirements were warranted.

The risk of a SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, a SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even when all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in a SFP zirconium fire, the study found the risk of a SFP fire to be low and well within the Commission's Safety Goals.

In light of the changes in storage configuration of the SFP (increased to high density racks), inadvertent partial draindown events, as well as monumental events such as the September 11, 2001, terrorist attacks and the 2011 accident at the Fukushima Dai-ichi nuclear power plant, the NRC continues to examine the issue of SFP safety. Recently, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS

Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). The COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk of a SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC has taken extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying

establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of a SFP severe accident is low. While the risk of a severe accident in a SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which has been accepted for consideration in the rulemaking process (December 18, 2012; 77 FR 74788).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and for license amendment requests and provides ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate a SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and its results proposed to be provided to the NRC is not needed for the effectiveness of the NRC's approach for ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's final safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. The NRC resident inspectors are permanently stationed on-site to provide monitoring and inspection of routine and special activities. They are aware of and routinely observe SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be

conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees to an NRC order or change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects in and failures to conform to the NRC requirements with respect to basic components, which includes SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and failures to conform. The NRC is also informed of the events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, the nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant and licensee as having a significant implication for public health and safety or common defense and security, must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident require redundant equipment and strategies to address loss of cooling to SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.

It is unclear how the annual evaluations requested in the petition would provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent fuel uncover, the information that would be obtained from the proposed requirement in the petition does not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2.

The petitioner claimed that there are serious flaws with MELCOR which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

Comment [MG]: This is the correct approach – it should be reflected in the SECY.

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how the evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's claims that MELCOR is flawed.

The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request for a new requirement for licensees to perform annual evaluations of SFPs. The petitioner's request to address perceived deficiencies in current severe accident models go hand-in-hand with the petitioner's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC is providing the following information about how MELCOR is used and the NRC's views on some of the phenomena discussed in the petition.

The petitioner claimed that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petitioner also claimed that MELCOR under-predicts the

zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petitioner claimed, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petitioner pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.

The MELCOR is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. The MELCOR has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation as discussed later in this section.

The MELCOR code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as, otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., "zirconium fire") occurs. A

self-sustaining zirconium fire will develop if the heat-generation rate from reaction with oxidant exceeds the heat-loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a zirconium fire will occur.

Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher temperatures, the presence of any measurable amount of oxygen in the gas (steam or air) attacking the cladding is sufficient to prevent the formation of surface ZrN. Further, if ZrN does form it can be converted readily to zirconium oxide (ZrO₂) when exposed to oxygen. The heat generation from the reaction of cladding to form ZrN followed by oxidation of the ZrN to form ZrO₂ is essentially the same as the direct reaction of Zr to form ZrO₂. This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in the petition. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre- to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental increase in clad reaction will be insignificant compared to the extensive and rapid reaction of

oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.

With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS B9R), these phenomena are well understood and recognized in the formulations of models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a SFP. The code assessment against zirconium fire experiments conducted at Sandia National Laboratory (SNL) and code-to-code comparison documented in NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident" (ADAMS Accession No. ML13072A056), address fire propagation phenomena.

The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys" (ADAMS Accession No. ML041900069). The MELCOR was used in the zirconium fire experiments (see NUREG/CR-7143) and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code-to-code comparisons) as well as the SFP study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.

The recent Sandia Fuel Project by the Organisation for Economic Co-operation and Development Nuclear Energy Agency provided experimental data relevant for hydraulic and ignition phenomena of prototypic pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results

from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petitioner asserted that the SNL SFP accident experiments are unrealistic because they were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100 micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.

The important question for an analysis is if the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multiunit or concurrent accident, fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates. The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volumes 1 and 2 (ADAMS Accession Nos. ML14196A105 and ML14196A107))

are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 feet above the top of the fuel in the pool, therefore encompassing the effects of some of the phenomena mentioned by the petition.

In summary, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. The NRC has considered the most important phenomena, and continues to improve the models to further reduce the uncertainties.

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any significant new information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

Comment [MG]: I request that the staff develop standard guidance for how to construct a table of documents for use only in PRMs.

In my view, the table should have internal subdividers/headings in somewhat the following order (subdivider/heading titles are subject to joint refinement by the staff and OGC):

1. PRM and NRC notices related to the PRM
2. Documents referenced in PRM
3. Other Documents referenced by the NRC in this PRM notice.

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-------------------|---|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| June 2004 | NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys." | ML041900069 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| March 2013 | NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident." | ML13072A056 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |

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| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 2015.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

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|-----------------|---|-------------|
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Dated at Rockville, Maryland, this day of , 2015.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

ADAMS Accession Nos: PKG: ML14307A691; FRN: ML14307A630

*via email

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| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D |
| NAME | DDoyle | GLappert | TInverso | AMohseni | LKokajko (AMohseni for) |
| DATE | 7/14/2015 | 7/16/2015 | 7/17/2015 | 7/27/2015 | 7/31/2015 |
| OFFICE | NRR/DSS:D* | NRR/JLD:D* | RES:D* | NRO:D* | ADM/DAS/RADB:BC Tech Editing* |
| NAME | TMcGinty | JDavis (JBowen for) | BSheron (SCoffin for) | GTracy (JMonninger for) | CBladey (LTerry for) |
| DATE | 8/24/2015 | 8/25/2015 | 8/27/2015 | 8/28/2015 | 8/24/2015 |
| OFFICE | OGC/GCLR/RMR | NRR:D | EDO | | |
| NAME | MSpencer | WDean | MSatorius | | |
| DATE | | | | | |

OFFICIAL RECORD COPY

FOR: The Commissioners

FROM: Mark A. Satorius
Executive Director for Operations

SUBJECT: DENIAL OF PETITION FOR RULEMAKING REQUESTING AMENDMENTS
REGARDING SPENT FUEL POOL SEVERE ACCIDENT EVALUATIONS
(PRM-50-108; NRC-2014-0171)

PURPOSE:

To obtain Commission approval to deny a petition for rulemaking (PRM) submitted by Mr. Mark Edward Leyse (the petitioner). This paper does not address any new commitments or resource implications.

BACKGROUND:

The petitioner filed its petition, PRM-50-108, with the Commission on June 19, 2014 (Accession No. ML14195A388 in the U.S. Nuclear Regulatory Commission's (NRC) Agencywide Documents Access and Management System (ADAMS)). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC published a notice of docketing in the *Federal Register* on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

CONTACT: Daniel I. Doyle, NRR/DPR
301-415-3748

DISCUSSION:

The Petition

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

Section II, "Reasons for Denial," of the enclosed *Federal Register* notice provides detailed NRC responses to the three issues identified in the petition.

NRC Evaluation of Issues Raised in the Petition

Issue 1: The petitioner stated that a long-term station blackout can happen in multiple ways, and a loss of SFP cooling and a SFP fire is a likely outcome. The petitioner argued that this is a sufficient basis for the requested regulations. The NRC staff disagrees. Numerous evaluations have shown that the risk of a SFP fire is low. There are multiple layers of protection to prevent uncovering of spent fuel and the potentially resulting fire.

Issue 2: The petitioner stated that the purpose of the evaluations would be to keep the NRC informed of potential consequences. The NRC staff disagrees. The SFP safety is provided by: conservative design of the SFP; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of the NRC's approach for providing SFP safety.

[Issue 3: The petitioner stated that there are serious flaws with MELCOR, and, therefore, MELCOR is not currently sufficient for use in the requested annual SFP evaluations. The NRC staff disagrees. MELCOR is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. MELCOR has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena.]

RECOMMENDATION:

The NRC staff recommends that the Commission deny PRM-50-108 because the petitioner failed to present any significant new information or arguments that would warrant the requested amendments. The NRC staff does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC staff continues to believe conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The enclosed *Federal Register* notice provides a detailed response to the issues raised in the petition.

The NRC staff requests the Commission's approval to publish the *Federal Register* notice denying the petition (Enclosure 1).

The enclosed letter for signature by the Secretary of the Commission (Enclosure 2) informs the petitioner of the Commission's decision to deny the petition.

The NRC staff will inform the appropriate [congressional committees]

RESOURCES:

Denial of this petition will not affect budgeted resource needs.

Comment [MG]: This needs to be re-done to match the FRN (p. 14) which is what has been the long-standing WG approach and which was approved by the PRB:

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how the evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's claims that MELCOR is flawed.

Comment [MG]: I am fairly sure that our editorial conventions require that Congressional Committees be capitalized.

The Commissioners

- 4 -

COORDINATION:

The Office of the General Counsel has no legal objection to the denial of this petition and the documents in this package. The Office of Administration has reviewed and concurred on this paper.

Mark A. Satorius
Executive Director
for Operations

Enclosures:

1. *Federal Register* notice
2. Letter to the Petitioner

The Commissioners

- 4 -

COORDINATION:

The Office of the General Counsel has no legal objection to the denial of this petition. The Office of Administration has reviewed and concurred on this paper.

Mark A. Satorius
Executive Director
for Operations

Enclosures:

1. *Federal Register* notice
2. Letter to the Petitioner

ADAMS Accession Nos: PKG: ML14307A691, SECY: ML14307A134, FRN: ML14307A630, Petition: ML14195A388, LTR to Petitioner: ML14307A157, Daily Note: ML14307A891 *via email

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| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D | NRR/DSS:D* |
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| DATE | 8/25/2015 | 8/27/2015 | 8/28/2015 | 8/24/2015 | | |
| OFFICE | EDO | | | | | |
| NAME | MSatorius | | | | | |
| DATE | | | | | | |

OFFICIAL RECORD COPY

From: Doyle, Daniel
Sent: 23 Feb 2015 11:52:44 -0500
To: Hernandez, Raul; Esmaili, Hossein; Greenleaf, Michael; Casto, Greg; Witt, Kevin; Mizuno, Geary; Borges, Jennifer
Subject: FW: PRM-50-108 - second draft of FRN
Attachments: PRM-50-108 draft frn (2-4-2015) sbpb comments.docx

FYL. Here is input from NRR/SBPB on the second draft. We will discuss comments at the working group meeting on Wednesday.

Thanks,

Dan

From: Casto, Greg
Sent: Friday, February 20, 2015 3:11 PM
To: Doyle, Daniel
Cc: Greenleaf, Michael
Subject: RE: PRM-50-108 - second draft of FRN

Daniel, attached is SBPB mark up. Overall, I believe less may be better to answer the petitioner. Reference to other generic information is good, but some of the prior discussion was not specifically accurate where someone could find contradiction. We tried where we could to use previously documented passages (ie "Waste Confidence EIS). Tx greg

From: Doyle, Daniel
Sent: Wednesday, February 18, 2015 4:18 PM
To: Hernandez, Raul; Esmaili, Hossein; Greenleaf, Michael; Casto, Greg; Witt, Kevin; Mizuno, Geary; Borges, Jennifer
Subject: RE: PRM-50-108 - second draft of FRN

Quick reminder—we are meeting next Wednesday. Please review the comments in the file and let me know if you think any edits are necessary or if you have additional comments. I am looking for informal approval from the working group that we are ready to go to the petition review board.

Thanks,

Dan

From: Doyle, Daniel
Sent: Wednesday, February 04, 2015 4:31 PM
To: Hernandez, Raul; Esmaili, Hossein; Greenleaf, Michael; Casto, Greg; Witt, Kevin; Mizuno, Geary; Borges, Jennifer
Subject: PRM-50-108 - second draft of FRN

Here is the second draft of the FRN. I incorporated all the edits and comments on the first draft. I added an overall response at the beginning of Section II as suggested by Geary. Please take a look at that and let me know if you have any edits or comments. Also, there are a number of comment bubbles throughout the FRN—please review them and let me know if you can answer any of the questions.

Please review the attached file and provide specific edits/comments before our next meeting. We didn't get to issue 3 at the last meeting so I am hoping to get through everything at our next meeting and have a clear path to the PRB.

I will set up another working group meeting in about 2 weeks.

Thanks,

Dan

From: Doyle, Daniel
Sent: Monday, January 05, 2015 11:25 AM
To: Hernandez, Raul; Esmaili, Hossein; Greenleaf, Michael; Witt, Kevin; Mizuno, Geary; Borges, Jennifer
Subject: PRM-50-108 - first draft of FRN

Welcome back from the holidays!

Attached is the first draft of the FRN to respond to PRM-50-108. I inserted the first drafts developed by Kevin, Mike, and Hossein for each of the three issues and I made some edits based on our discussion at the last working group meeting on 12/15/14 and my review of the petition and other related documents. The response needs to flow as a coherent and logical response to the requests in the petition.

Please review the attached draft FRN and provide specific edits or comments that you think need to be addressed before our next meeting so we figure out what needs to be done to get to a PRB.

I'll send out a request for a meeting in the next few weeks soon.

Thanks,

Dan

From: Doyle, Daniel

Sent: Wednesday, November 12, 2014 12:54 PM

To: Hernandez, Raul; Esmaili, Hossein; Greenleaf, Michael; Witt, Kevin; Mizuno, Geary; Borges, Jennifer

Subject: PRM-50-108 - working on first draft

Here is the skeleton for the FRN to respond to PRM-50-108. Please use this for writing the first draft of the response to the issues. The summary of the issues and the NRC's response will go on page 3 under "II. NRC Technical Evaluation." I will maintain the master version of this draft FRN in ADAMS (ML14307A360) there as we move along and anyone can feed edits to it through me.

As we discussed today, Kevin will do the first draft for issue 1, Mike will do the first draft for issue 2, and Hossein will do the first draft for issue 3.

I'll set up another meeting in mid-December so we can all review the first drafts.

The summary and issues documents that we discussed today are on the SharePoint site (link below).

Thanks,

Dan

From: Doyle, Daniel

Sent: Monday, October 27, 2014 2:09 PM

To: Hernandez, Raul; Esmaili, Hossein; Greenleaf, Michael; Witt, Kevin; Mizuno, Geary; Borges, Jennifer

Subject: summary of PRM-50-108 and issues for consideration

PRM-50-108 working group,

Please review the attached files before our next working group meeting. I haven't sent out the meeting request yet but I will do that soon. When we met last week, I said I would take a first crack at an outline for you all to review and provide feedback. We will review this at our next working group meeting.

The first file is a summary of PRM-50-108. I went through the whole petition and grouped the related paragraphs and wrote down what I believe his main point is in each of those portions of the petition.

The second file is a table that re-organizes his arguments into an outline form on the left side and then shows the outline of a possible NRC response on the right side. I developed this based on our discussion and previous emails from earlier this year during the docketing review.

TAC: MF4673

SharePoint site: <http://fusion.nrc.gov/nrr/team/dpr/prmb/rulemaking/PRM-50-108/SitePages/Home.aspx>

Dan

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking dated June 19, 2014. The petition requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is necessary for effective NRC regulatory decisionmaking to ensure adequate protection of public health and safety with respect to spent fuel pools.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may access publicly-available information related to this petition by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search on Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-287-3422; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):**
You may access publicly available documents online in the NRC Library at <http://www.nrc.gov/reading-rm.html>. To begin the search, select "ADAMS Public Documents" and then select "Begin Web-Based ADAMS Search." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdf.resource@nrc.gov. The ADAMS Accession Number for each document referenced in this document (if that document is available in ADAMS) is provided the first time that a document is referenced. In addition, for the convenience of the reader, the ADAMS Accession Numbers are provided in a table in Section III, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

- I. Background
- II. NRC Technical Evaluation
- III. Determination of the Petition
- IV. Availability of Documents

I. Background

The NRC received a petition for rulemaking (ADAMS Accession No. ML14195A388) dated June 19, 2014, and assigned it Docket No. PRM-50-108. The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition.

The petition requests that the NRC develop new regulations requiring that (1) spent fuel pool (SFP) accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petition references recent NRC post-Fukushima MELCOR simulations of BWR Mark I SFP accident/fire scenarios. The petition states that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petition states that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium fires than MELCOR indicates. The petition states that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary

to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petition claims that the new regulations would help improve public and plant-worker safety. The petition asserts that the first three proposed regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petition states that the fourth proposed regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petition states that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs.

Spent Fuel Pool Design Considerations

Spent nuclear fuel offloaded from a reactor is initially stored in a SFP. The SFPs at all nuclear plants in the United States are massive, extremely robust structures constructed with thick, reinforced, concrete walls, welded, stainless-steel liners, and designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration (i.e., so that the fuel is maintained in a sub-critical and coolable geometry). Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25 feet of water, which provides radiation shielding as well as passive cooling as a result of the significant volume of water above spent fuel. Penetrations to pools are limited to prevent inadvertent drainage and located well above spent fuel storage elevations to prevent uncover of fuel from drainage. As

Comment [DID]: Greg Casto suggested inserting somewhere an explanation of all the failures that would have to happen for a SFP fire to occur. Basically, the accident scenario the petitioner is suggesting requires that everything has failed. Must lose water and be in a certain configuration for this to occur. It is not the case that loss of all AC leads to a SFP fire.

Response from Dan: **Greg** or **Raul**, can you write this? Or does the new "Overall Response" section added in response to Geary's comment eliminate the need for this?

spent fuel cools, older fuel is typically removed from a plant's SFP for on-site dry cask storage. Fuel removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure, monitored and routinely inspected for integrity, and protected by security.

II. NRC Technical Evaluation

Overall Response.

The petition raises three issues that require NRC consideration and response. First, the petition makes a general argument that the probability of a SFP severe accident is relatively high. Second, the petition argues that the NRC should require licensees to perform annual SFP safety evaluations of postulated SFP accident/fire scenarios to inform the NRC of potential consequences. Third, the petition argues that the requested annual evaluations should be done using a conservative computer model and that there are serious flaws with the NRC's current severe accident computer code, MELCOR.

A spent fuel pool fire is a beyond design basis accident that has been examined routinely over the last few decades. The issue of spent fuel pool accidents was initially examined in Appendix I of WASH-1400 (NRC, 1975). The risk of an SFP accident was re-examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools," in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment. The analyses in NUREG-1353 (NRC, 1989), supported the resolution of Generic Safety Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools. In 2001, NRC published NUREG-1738 (NRC, 2001), which examined spent fuel pool accident risk at decommissioning nuclear power plants. The analyses examined spent fuel pool zirconium fires. In light of the changes in configuration of the spent fuel pool (increased to high density racks), fuel pool inadvertent partial draindown operating experience, as well as monumental events such as the

Comment [DID]: Comment from Dan: I added this in response to Geary's suggestion at the 1/21 working group meeting. Please review and provide feedback.

Comment [M]: Passage from Waste Confidence EIS, Apx F. as previously approved and consistent response to spent fuel pool fire evaluations, probability, and consequence.

September 11, 2001 terrorist attacks and the 2011 accident at the Fukushima Daiichi site, the issue of spent fuel pool safety is one that continues to be looked at by the NRC. Recently, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel," which considered a broad history of NRC oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor." The analyses determined that because the loss of coolant event frequency is low, the overall risk (probability times consequences) from such an event will also be low. This is in spite of the fact that the consequences for such an event could be high.

~~The petition focuses on a SFP fire accident scenario. It is important to recognize that for this to occur, all SFP systems, backup systems, and operator actions must have failed to prevent the spent fuel in the pool from being uncovered. It is not true that an extended loss of offsite electrical power will necessarily lead to a SFP fire. The NRC recognizes that the consequences of a SFP fire could be large and that is why there are numerous measures in place to prevent a situation where the spent fuel is uncovered. The probability of a SFP fire is extremely remote.~~

The requested annual evaluations would not provide information that is necessary for regulatory decisionmaking. The evaluations would not prevent or mitigate an SFP accident. Since the NRC has concluded that the annual SFP evaluations are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail.

The remainder of Section II provides the NRC's detailed response to each of the three issues raised in the petition.

PRM Issue 1. The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petition claims that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petition states that a SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. In the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost and a SFP accident could occur because many of the safety systems that are required for cooling the SFP need AC power to operate. The petition also provides other examples of events that could lead to a long-term station blackout and ultimately a SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

While the NRC agrees that the consequences of a SFP fire could be significant and destabilizing, the probability of such an event is extremely remote. As shown in numerous evaluations referenced, the NRC has determined that the probability of an SFP accident is low.

Spent nuclear fuel offloaded from a reactor is stored in a SFP. The SFPs at all nuclear plants in the United States are massive, extremely robust structures designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, floods, earthquakes, or tornadoes). SFPs are made of thick, reinforced, concrete walls and floors lined with welded, stainless-steel plates to form a leak-tight barrier. Racks fitted in the SFPs store the fuel assemblies in a controlled configuration (i.e., so that the fuel is both sub-critical and in a coolable geometry). Redundant monitoring, cooling, and makeup-water systems are provided. The spent fuel assemblies are positioned in racks at the bottom of the pool and are typically covered by at least 25 feet of water. SFPs are essentially passive systems.

Comment [DID]: Greg Casto suggested inserting somewhere an explanation of all the failures that would have to happen for a SFP fire to occur. Basically, the accident scenario the petitioner is suggesting requires that everything has failed. Must lose water and be in a certain configuration for this to occur. It is not the case that loss of all AC leads to a SFP fire.

Response from Dan: **Greg** or **Raul**, can you write this? Or does the new "Overall Response" section added in response to Geary's comment eliminate the need for this?

Comment [M]: Moved to earlier, as it did not appear to specifically answer the issue from the petitioner.

Comment [DID]: Comment from Raul: Should we mention the leak detection system, or the requirement of no gates or connections below the top of the fuel?

Comment [M]: Agree, deleted Overall shortened to avoid misunderstanding.

Comment [DID]: Comment from Raul: This statement may cause confusion, since we actually have some pools that are defined as "Passive."

The water in the SFPs provides radiation shielding and spent fuel assembly cooling. It also captures radionuclides in case of fuel rod leaks. The water in the pool is circulated through heat exchangers for cooling. Filters capture any radionuclides and other contaminants that get into the water. Makeup water can also be added to the pool to replace water loss.

SFPs are configured to protect against a substantial loss of coolant inventory by locating penetrations in the SFP wall above the top of the stored fuel and by providing anti-siphon features for piping that extend below the minimum safety limit, or at least 10 feet above the top of the fuel within the pool. These features limit the likelihood of losing substantial coolant inventory due to mechanical failures or operational errors. The NRC's review of operating experience for SFPs have indicated that events involving loss of coolant inventory or loss of forced cooling have had no more than a minor effect (e.g., increases in water temperature) on spent fuel storage conditions.¹

SFPs are located at reactor sites, typically within the fuel handling (pressurized-water reactor) or reactor building (boiling-water reactor). From a structural point of view, nuclear power plants are designed to protect against external events such as tornadoes, hurricanes, fires, and floods. These structural features, complemented by the deployment of effective and visible physical security protection measures, are also deterrents to physical attacks. Additionally, the emergency procedures developed for reactor accidents provide a means for mitigating the potential consequences of physical attacks.

Studies conducted over the last four decades have consistently shown that the probability of an accident causing a zirconium fire in an SFP to be lower than that for severe reactor accidents. The risk of beyond design-basis accidents (DBAs) in SFPs was first examined as part of the landmark "Reactor Safety Study: An Assessment of Accident Risks in

¹ The staff completed a detailed review of SFP operating experience in NUREG 1275, Volume 12, "Operating Experience Feedback Report, Assessment of Spent Fuel Cooling," dated February 1997 (ADAMS Accession No. ML010670175), and the staff performs annual reviews of U.S. and international operating experience with spent fuel storage and handling.

U.S. Commercial Nuclear Power Plants" (WASH-1400, NUREG-75/014), and was found to be several orders of magnitude below those involving the reactor core. The risk of an SFP accident was re-examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools," in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment. The risk assessment and cost-benefit analyses developed through this effort, NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools," Section 6.2, concluded that the risk of a severe accident in the SFP was low and appears to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (August 21, 1986; 51 FR 30028) and that no new regulatory requirements were warranted.

SFP accident risk was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants," conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, an SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even when all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in an SFP zirconium fire, the study found the risk of an SFP fire to be low and well within the Commission's Safety Goals.

~~Furthermore, significant additional analyses have been performed since September 11, 2001, that support the view that the risk of a successful terrorist attack (i.e., one that results in an SFP zirconium fire) is very low. These analyses were conducted by the Sandia National Laboratories and are collectively referred to herein as the "Sandia studies." The Sandia studies are sensitive security related information and are not available to the public. The Sandia studies considered spent fuel loading patterns and other aspects of a pressurized-water reactor SFP~~

and a boiling-water reactor SFP, including the role that the circulation of air plays in the cooling of spent fuel. The Sandia studies indicated that there may be a significant amount of time between the initiating event (i.e., the event that causes the SFP water level to drop) and the spent fuel assemblies becoming partially or completely uncovered. In addition, the Sandia studies indicated that for those hypothetical conditions where air cooling may not be effective in preventing a zirconium fire (i.e., partial drain down), there is a significant amount of time between the spent fuel becoming uncovered and the possible onset of such a zirconium fire, thereby providing a substantial opportunity for both operator and system event mitigation.

The Sandia studies, which more fully account for relevant heat transfer and fluid flow mechanisms, also indicated that air cooling of spent fuel would be sufficient to prevent SFP zirconium fires at a point much earlier following fuel offload from the reactor than previously considered (e.g., in NUREG-1738). Thus, the fuel is more easily cooled, and the likelihood of an SFP fire is therefore reduced.

Additional mitigation strategies implemented subsequent to September 11, 2001, enhance spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire. The Sandia studies also confirmed the effectiveness of additional mitigation strategies to maintain spent fuel cooling in the event the pool is drained and its initial water inventory is reduced or lost entirely. Based on this more recent information and the implementation of additional strategies following September 11, 2001, the probability, and accordingly, the risk, of a SFP zirconium fire initiation is expected to be less than reported in NUREG-1738 and previous studies.

Following the accident at the Fukushima Dai-ichi nuclear facility, the NRC evaluated whether regulatory action should be taken to require the expedited transfer of spent fuel from SFPs to dry cask storage at nuclear power plants in the United States. The NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel," which considered a broad

Comment [DID]: Comment from Hossein: I don't think this is what we said last time. This is very sensitive. Consider cutting this down.

Response from Dan: **Hossein** or **Kevin**, please review these paragraphs and the comment again and propose edits.

history of NRC oversight of spent fuel storage, SFP operating experience (domestic and international), and past studies of SFP safety including NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor." In addition, the staff considered international activities on SFPs and stakeholder comments received during two public meetings. COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that regulatory action need not be pursued in SRM-COMSECY-13-0030.

Although regulatory action was not pursued to require expedited transfer of spent fuel to dry cask storage, the NRC has taken extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the NEI guidance to meet the requirements of this order.² That guidance also establishes additional mechanisms for mitigating a loss of SFP cooling water beyond that currently required by 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

~~Given the physical robustness of SFPs, physical security measures, and SFP accident mitigation measures, the NRC concludes that the risk of an SFP zirconium fire, whether caused by an accident or a physical attack, is very low.~~

Comment [M]: Addressing security specifically is not advised, and if we want to cover security, we should refer to a public document that discusses security. There are ongoing studies, so concluding statements should not be used.

² See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378) and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96 which has been accepted for consideration in the rulemaking process. For more information, please see the *Federal Register* notice published on December 18, 2012 (77 FR 74788).

PRM Issue 2. The NRC should require that licensees perform annual SFP safety evaluations and submit the results to the NRC to inform the NRC of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petition states that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs. The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and for license amendment requests and provides ongoing oversight to ensure adequate protection. There are no benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate an SFP accident or provide information that is necessary for regulatory decisionmaking.

The NRC issues plant specific licenses after reviewing and evaluating the Safety Analysis Report written by the licensee and compares it against the acceptance criteria derived from the General Design Criteria and other regulatory requirements approving the design and licensing bases contained in the plant's final safety analysis report. Regulatory Guides and Standard Review Plans include accepted methods of satisfying the general design criteria (GDC) and applicable regulations. Licensees are required to operate the plant, including performing spent fuel related operations and surveillances in accordance with technical specifications and established practices and procedures for that plant. Any licensee considered changes to design, operational or surveillance practices, or approved spent fuel inventory limits

Comment [DID]: Comment from Hossein: Need to be clear we are talking about beyond design basis.

Response from Dan: **Hossein** or anyone else, please propose edits.

Comment [DID]: There was some discussion about this statement at the 1/21 working group meeting. Can this statement be revised to be a positive statement? Or perhaps "no safety benefit." Please propose edits.

Comment [DID]: Greg Casto suggested simplifying this discussion as follows: 1) licensee conditions for maintaining the SFP in a safe configuration. Monitor and maintain. (Normal conditions). 2) BDB. Release of material. EP. Done.

Response from Dan: **Greg**, please propose edits to this discussion to refocus as necessary.

or configuration changes must be evaluated per 10 CFR 50.59 requirements, must be documented and retained for the length of the operating license, and if warranted, must be submitted to the NRC for prior approval.

The current process in which SFPs are reconfigured is based upon two parameters: (where) the fuel may be placed to maintain the pool temperature below an established threshold and where the fuel may be placed to maintain the fuel criticality below a certain threshold.

These two thresholds are covered in the licensee's technical specifications (TS) and the licensee may not exceed these thresholds except through one of several methods. These methods to change a licensee's TSs include the completion of 10 CFR 50.59 or a license amendment request (LAR). In the event of a LAR, NRC technical staff will review the proposed amendment, submit a safety evaluation determining the impact of the proposed amendment on the public health and safety, and either approve or deny the LAR. After performing these steps, an update of the FSAR (as required in 10 CFR 50.71(e)) is performed.

After these changes have been made, the NRC provides oversight to the licensee's overall plant operations of the SFP in several ways. NRC resident inspectors are permanently stationed onsite to provide routine monitoring and inspection of routine and special activities. These inspectors are typically present for fuel movement activities during refueling, and maintain cognizance of and routinely observe spent fuel pool activities involving fuel manipulation. Inspection procedures are used by resident or other inspectors to guide periodic inspection activities, which are published in publically available inspection reports. Special inspections may be conducted, as necessary, to evaluate causes and licensee corrective actions if site specific events occur, or to evaluate generic actions taken by some or all licensees to an NRC order or change in regulations. During refueling, Inspection Procedure 71111.20 provides for NRC oversight of the fuel storage which is further controlled by the licensee's TSs. Also, triennial fire protection inspection procedure (71111.05T) ensures that mitigation strategies (10 CFR 50.54(hh)(2)) are implemented by licensees to maintain SFP

Comment [D1D]: Comment from Raul: How about how many fuel assemblies are stored? The pool thermal evaluation is dominated by the number of fuel assemblies and their residual heat (determined based on how long since the reactor shutdown). The actual location of the assemblies within the racks has no impact on the bulk thermal evaluation. The storage pattern is more relevant to the criticality evaluation. Further discussion of pattern considerations could be Safeguards.

~~cooling capabilities under postulated event scenarios that could cause large areas of the facility to be lost. Finally, surveillance requirements in the TSS are required to be performed on the SFP to ensure that the thresholds previously described are not exceeded.~~

General Design Criteria (GDC) in 10 CFR 50, Appendix A establish general expectations that licensees must meet through compliance with their plant specific licensing basis. Several GDC apply to spent fuel pools, including the following: The NRC ensures adequate protection of the spent fuel pool against boil-off and criticality accidents via the methods previously described. In addition, licensees are required to meet certain design criteria and show that the SFP can meet the following criteria:

- Protection against natural phenomena and equipment failures (GDC 2 and 4)
- Preventing a substantial loss of coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61)
- Preventing criticality of the spent fuel (GDC 62)
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63)

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR 50, as well as recent Orders following the Fukushima Daiichi reactors accident require redundant equipment and strategies to address loss of cooling to spent fuel pools as well as protective actions for plant personnel and the public to limit radioactive exposure.

~~Additionally, the TSS contain procedures for normal operations, maintenance, and responses to abnormal/alarm conditions providing a basis to ensure the licensee does not allow the SFP to boil off or allow the spent fuel to achieve criticality. The TSS design features accomplish this in a variety of ways including preventing inadvertent drainage of the SFP, as~~

Comment [D1D]: Comment from Greg Casto: Licensees don't have to comply with GDC. Revise.

Response from Dan: Greg, please propose edits to correct this. Perhaps mention 10 CFR 50.34(a)(3)(i)?

~~well as requiring reliable cooling and makeup systems, and monitoring instrumentation. This provides an acceptable level of safety and an adequate basis for regulatory decisionmaking.~~

~~In the extremely unlikely event that a beyond design basis accident were to occur and that potentially boil off or otherwise diminish coolant inventory, required mitigation strategies (10 CFR 50.54(hh)(2)) developed by the licensee with NRC approval are in place to maintain an alternative source of coolant injection into the SFP.~~

It is unclear how the annual evaluations requested in the petition would provide information that is necessary for regulatory decisionmaking. The evaluations included in the petition postulates a scenario in which the normal and emergency cooling systems have failed, the backup cooling methods and the mitigation strategies have failed to cool the stored fuel and it calculates the time it would take for the stored fuel to ignite and how much of it would ignite. Since the regulations require that the pool be designed to prevent the loss of coolant and subsequent fuel uncover, the information obtained from the proposed petition does not support the regulatory decisionmaking process.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection.

PRM Issue 3. The NRC should require the use of conservative computer models in the SFP accident evaluations in the requested regulations.

The petition requests that the NRC establish requirements for SFP accident evaluation models to be used in the annual SFP evaluations requested in PRM Issue 2. The petition also claims that there are serious flaws with MELCOR which has been used by the NRC to model severe accident progression in SFPs.

The NRC disagrees agrees in part and disagrees in part with these comments this issue, as models and evaluation methodologies that have been used provide an appropriately

conservative basis for regulatory decisionmaking. The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition for rulemaking, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request for a new requirement for licensees to perform annual evaluations of SFPs. The petition's requests to address perceived deficiencies in current severe accident models go hand-in-hand with the petition's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in PRM Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC will provide additional information about how MELCOR is used and what the NRC's view is on some of the phenomena discussed in the petition.

The petition asserts that there are serious flaws with MELCOR. The petition claims that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petition also claims that MELCOR under-predicts the zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petition claims, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petition points to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.

MELCOR is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. MELCOR has been benchmarked against many experiments including separate and integral effects tests for a wide range of

phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation.

The MELCOR code is used to perform “best estimate” analysis with “uncertainty analysis” to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a “conservative” computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced in the analysis after the best estimate analysis is done and uncertainties are properly taken into account.

Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., “zirconium fire”) occurs. A self-sustaining zirconium fire will develop if the heat-generation rate from reaction with oxidant exceeds the heat-loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a zirconium fire will occur.

Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher oxygen potentials the presence of any measurable amount of oxidant in

the gas attacking the cladding is sufficient to prevent the formation of surface ZrN. Further, if ZrN does form it can be converted readily to ZrO₂ when exposed to oxidant. The heat generation from the reaction of cladding to form ZrN followed by oxidation of the ZrN to form ZrO₂ is essentially the same as the direct reaction of Zr to form ZrO₂. This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in comments. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre- to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.

With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS B9R), these phenomena are well understood and recognized in the formulations of models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a spent fuel pool. The code assessment against zirconium fire experiments conducted at Sandia National Laboratory and code-code comparison documented in NUREG/CR-7143 address fire propagation phenomena.

The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846. MELCOR was used in the zirconium fire experiments (see NUREG/CR-7143) and the

predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code-to-code comparisons) as well as the spent fuel pool study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.

The recent OECD/NEA Sandia Fuel Project provided experimental data relevant for hydraulic and ignition phenomena of prototypic pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petition asserts that the Sandia National Laboratory (SNL) SFP accident experiments are unrealistic because they were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100 micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.

The important question for an analysis is if the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the spent fuel pool study (NUREG-2161) is devoted to discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core-concrete interaction, multiunit or concurrent accident, fuel loading). In addition, the regulatory analysis in COMSECY 13-0030

Comment [M]: This is not exactly accurate, and the discussion of NUREG-2161 should be limited to a reference plant detailed case study, and SECY 13-0030 to the consideration for expedited SF transfer to dry storage. I don't think excerpts from either of these is appropriate to discuss MELCOR capabilities.

only relied on spent fuel pool study insights for the BWRs with Mark I and II containment, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates. The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 ft above the top of the fuel in the pool, thereby encompassing the effects of some of the phenomena mentioned by the petition.

In summary, the NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate initiation and progression of spent fuel pool fires. The NRC has considered the most important phenomena, and continues to improve the models to further reduce the uncertainties. However, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP evaluations requested in PRM Issue 2 are not necessary for regulatory decisionmaking.

III. Determination of the Petition

The NRC does not believe that the information which would be reported to the NRC as requested by the petition is necessary for effective NRC regulatory decisionmaking with respect to spent fuel pools. As discussed in Section II, NRC Technical Evaluation, of this notice, the NRC does not believe that the arguments raised by the petition warrant changing the current regulations. The NRC continues to conclude that the current design and licensing requirements for spent fuel pools provide adequate protection of public health and safety. For these reasons, the NRC declines to undertake rulemaking to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool

accident scenarios. Accordingly, the NRC is denying PRM-50-108 in accordance with 10 CFR 2.803, "Determination of petition."

IV. Availability of Documents

The following table provides information on how to access the documents referenced in this document. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-----------------|--|--|
| October 1975 | WASH-1400 (NUREG-75/014), "Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants." | ML070610293, ML070530533, ML070600389, ML070600376 |
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, 'Beyond Design Basis Accidents in Spent Fuel Pools.'" | ML082330232 |
| February 1997 | NUREG-1275, Volume 12, "Operating Experience Feedback Report, Assessment of Spent Fuel Cooling." | ML010670175 |
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-------------------|---|--|
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-----------------|---|--|
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| October 7, 2014 | Notice of Docketing. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 20__.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

[insert text from previous page]

ADAMS Accession Nos: ML14307A630 (FRN), ML14307A691 (Package)

*Concurrence via email

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|--------|-----------------|-----------------|-----------------|-----------------|---------------------------------|
| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D |
| NAME | DDoyle | GLappert | TInverso | AMohseni | LKokajko |
| DATE | | | | | |
| OFFICE | NRR/DSS:D | NRR/JLD:D | RES:D | NRO:D | ADM/DAS/RADB:BC Tech Editing |
| NAME | TMcGinty | JDavis | BSheron | GTracy | CBladey |
| DATE | | | | | |
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| NAME | MSpencer | WDean | MSatorius | | |
| DATE | | | | | |

OFFICIAL RECORD COPY

From: Doyle, Daniel
Sent: 12 Dec 2014 09:06:21 -0500
To: Greenleaf, Michael; Hernandez, Raul; Esmaili, Hossein; Borges, Jennifer; Mizuno, Geary
Cc: Witt, Kevin
Subject: FW: PRM-50-108 - working on first draft
Attachments: draft FRN for PRM-50-108-issue1KW.docx

Please review the attached first draft for issue 1 from Kevin before our working group meeting on Monday.

Thanks,

Dan

From: Witt, Kevin
Sent: Thursday, December 11, 2014 4:09 PM
To: Doyle, Daniel
Subject: RE: PRM-50-108 - working on first draft

Hi Dan, see my attached rough draft input for issue 1. Please let me know if you think I need to add any more info.

Thanks,

Kevin

From: Doyle, Daniel
Sent: Wednesday, November 12, 2014 12:54 PM
To: Hernandez, Raul; Esmaili, Hossein; Greenleaf, Michael; Witt, Kevin; Mizuno, Geary; Borges, Jennifer
Subject: PRM-50-108 - working on first draft

Here is the skeleton for the FRN to respond to PRM-50-108. Please use this for writing the first draft of the response to the issues. The summary of the issues and the NRC's response will go on page 3 under "II. NRC Technical Evaluation." I will maintain the master version of this draft FRN in ADAMS (ML14307A360) there as we move along and anyone can feed edits to it through me.

As we discussed today, Kevin will do the first draft for issue 1, Mike will do the first draft for issue 2, and Hossein will do the first draft for issue 3.

I'll set up another meeting in mid-December so we can all review the first drafts.

The summary and issues documents that we discussed today are on the SharePoint site (link below).

Thanks,

Dan

From: Doyle, Daniel
Sent: Monday, October 27, 2014 2:09 PM
To: Hernandez, Raul; Esmaili, Hossein; Greenleaf, Michael; Witt, Kevin; Mizuno, Geary; Borges, Jennifer
Subject: summary of PRM-50-108 and issues for consideration

PRM-50-108 working group,

Please review the attached files before our next working group meeting. I haven't sent out the meeting request yet but I will do that soon. When we met last week, I said I would take a first crack at an outline for you all to review and provide feedback. We will review this at our next working group meeting.

The first file is a summary of PRM-50-108. I went through the whole petition and grouped the related paragraphs and wrote down what I believe his main point is in each of those portions of the petition.

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TAC: MF4673

SharePoint site: <http://fusion.nrc.gov/nrr/team/dpr/prmb/rulemaking/PRM-50-108/SitePages/Home.aspx>

Dan

II. NRC Technical Evaluation

PRM Issue 1. Spent Fuel Pool Accident Evaluations

The petitioner requests new regulations requiring all nuclear power plant licensees to conduct periodic evaluations of SFP accident consequences utilizing state of the art conservative computer models because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner states that a SFP accident could happen as a result of a leak or boil off. Additionally, in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost and a SFP accident could occur. The petitioner also provided other examples of events that could lead to a long-term station blackout and ultimately a SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a coordinated cyber, physical, and blended attack.

The NRC reviewed PRM Issue 1 and acknowledges that SFPs contain significant quantities of radioactive materials that need to be kept sufficiently cooled in order to prevent a release. The NRC's current regulatory position is that the SFPs are safe and secure and no additional regulatory action is needed to assure their safety. The NRC has an extensive history of assessing the safety and security of spent fuel stored in pools. The NRC's regulatory activities and past studies have shown that SFPs are effectively designed to prevent accidents. In addition, the NRC has robust security requirements in place to ensure the protection of spent fuel from sabotage and that nuclear power plants operate SFPs without compromising the common defense and security or the health and safety of the public.

All SFPs were designed and licensed to maintain a large inventory of coolant to protect and cool the fuel under accident conditions, including external natural hazards. SFPs were constructed with thick walls, floors, and stainless steel liner to help maintain the coolant inventory and protect the fuel from the effects of natural phenomena. SFPs are also configured to protect against a substantial loss of coolant inventory by locating penetrations in the SFP wall

above the top of the stored fuel, and by providing anti-siphon features for piping that extend below the top of the fuel within the pool. These features limit the likelihood of losing substantial coolant inventory due to mechanical failures or operational errors. The NRC's review of operating experience for SFPs have indicated that events involving loss of coolant inventory or loss of forced cooling have had no more than a minor effect (e.g., increases in water temperature) on spent fuel storage conditions.

The NRC has previously conducted a number of studies on SFP safety, including NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, 'Beyond Design Basis Accidents in Spent Fuel Pools'"; NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants"; and NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." These studies have all concluded that SFPs continue to provide adequate protection of public health and safety.

Following the accident at the Fukushima Dai-ichi nuclear facility, the NRC evaluated whether regulatory action should be taken to require the expedited transfer of spent fuel from spent fuel pools to dry cask storage at nuclear power plants in the United States. The NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel," dated November 12, 2013, which considered a broad history of NRC oversight of spent fuel storage, SFP operating experience (domestic and international), past studies of SFP safety, including NUREG-2161. In addition, the staff considered international activities on SFPs, and stakeholder comments received during two public meetings. COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins, and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that regulatory action need not be pursued in SRM-COMSECY-13-0030, issued on May 23, 2014.

Although regulatory action was not pursued to require expedited transfer of spent fuel to dry cask storage, the NRC has taken extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the NEI guidance to meet the requirements of this order. That guidance also establishes additional mechanisms for mitigating a loss of SFP cooling water beyond that currently required by 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP make up water that can be accessed away from the SFP refueling floor.

Therefore, because the petitioner does not provide any new or significant information that shows that the NRC's current regulatory oversight of SFPs is insufficient, the NRC disagrees with the petitioner's assertions that regulations are required for SFP accident evaluations.

From: Doyle, Daniel
Sent: 15 Dec 2014 12:20:50 -0500
To: Greenleaf, Michael; Hernandez, Raul; Borges, Jennifer; Mizuno, Geary; Witt, Kevin
Cc: Esmaili, Hossein
Subject: FW: PRM-50-108 - working on first draft
Attachments: issue3_HEsmaili.docx

Here is the draft for issue 3 from Hossein.

Thanks for sending, Hossein. I haven't had a chance to read it yet.

Dan

From: Esmaili, Hossein
Sent: Monday, December 15, 2014 11:33 AM
To: Doyle, Daniel
Subject: RE: PRM-50-108 - working on first draft

Hi Dan,

Here is my draft response. Let me know if it is OK.

Thanks

-hossein

From: Doyle, Daniel
Sent: Friday, December 12, 2014 9:06 AM
To: Greenleaf, Michael; Hernandez, Raul; Esmaili, Hossein; Borges, Jennifer; Mizuno, Geary
Cc: Witt, Kevin
Subject: FW: PRM-50-108 - working on first draft

Please review the attached first draft for issue 1 from Kevin before our working group meeting on Monday.

Thanks,

Dan

From: Witt, Kevin
Sent: Thursday, December 11, 2014 4:09 PM
To: Doyle, Daniel
Subject: RE: PRM-50-108 - working on first draft

Hi Dan, see my attached rough draft input for issue 1. Please let me know if you think I need to add any more info.

Thanks,

Kevin

From: Doyle, Daniel
Sent: Wednesday, November 12, 2014 12:54 PM
To: Hernandez, Raul; Esmaili, Hossein; Greenleaf, Michael; Witt, Kevin; Mizuno, Geary; Borges, Jennifer
Subject: PRM-50-108 - working on first draft

Here is the skeleton for the FRN to respond to PRM-50-108. Please use this for writing the first draft of the response to the issues. The summary of the issues and the NRC's response will go on page 3 under "II. NRC Technical Evaluation." I will maintain the master version of this draft FRN in ADAMS (ML14307A360) there as we move along and anyone can feed edits to it through me.

As we discussed today, Kevin will do the first draft for issue 1, Mike will do the first draft for issue 2, and Hossein will do the first draft for issue 3.

I'll set up another meeting in mid-December so we can all review the first drafts.

The summary and issues documents that we discussed today are on the SharePoint site (link below).

Thanks,

Dan

From: Doyle, Daniel

Sent: Monday, October 27, 2014 2:09 PM

To: Hernandez, Raul; Esmaili, Hossein; Greenleaf, Michael; Witt, Kevin; Mizuno, Geary; Borges, Jennifer

Subject: summary of PRM-50-108 and issues for consideration

PRM-50-108 working group,

Please review the attached files before our next working group meeting. I haven't sent out the meeting request yet but I will do that soon. When we met last week, I said I would take a first crack at an outline for you all to review and provide feedback. We will review this at our next working group meeting.

The first file is a summary of PRM-50-108. I went through the whole petition and grouped the related paragraphs and wrote down what I believe his main point is in each of those portions of the petition.

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TAC: MF4673

SharePoint site: <http://fusion.nrc.gov/nrr/team/dpr/prmb/rulemaking/PRM-50-108/SitePages/Home.aspx>

Dan

PRM Issue 3: The NRC should require the use of conservative computer models in the SFP accident evaluations in the requested regulations.

The MELCOR code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced in the computer safety model after the best estimate analysis is done and uncertainties are properly taken into account.

The petitioner asserts that there are serious flaws with MELCOR since the code does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen and it does not simulate how nitrogen affects the oxidation of zirconium in air. The petitioner points to a number of references published over the last few years to assert that the MELCOR computer code is inadequate. The Staff disagrees. MELCOR is the NRC's best estimate tool for severe accident analysis and has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. MELCOR adequately models the effects of zirconium-nitrogen reaction for the purposes of the spent fuel pool study (NUREG-2161). The energy generation from the reaction of cladding to form ZrN followed by oxidation of the ZrN to form ZrO₂ is the same as the direct reaction of Zr to form ZrO₂ which is explicitly considered in MELCOR. Nitriding refers to the formation of ZrN when zirconium cladding oxidizes at high-temperatures in an air environment. The effect of nitrogen is

taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre- to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.

MELCOR has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation. The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846. MELCOR was used in the zirconium fire experiments (see NUREG/CR-7143) and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code to code comparisons) as well as the spent fuel pool study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.

The Staff agrees that in April 2000, the ACRS wrote a letter stating that NRC analyses of postulated SFP accidents and fires did not consider that the chemical reaction of zirconium and nitrogen gas (in air) generates a significant quantity of heat. However, the ACRS confirmed the applicability of MELCOR and the technical adequacy of the spent fuel pool study during their reviews in 2013 (ADAMS Accession Numbers ML13318A505 and ML13198A433).

The important question for an analysis is, are the uncertainties appropriately considered in the analysis results. For example, Section 9 of the spent fuel pool study (NUREG-2161) is devoted to discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multiunit or concurrent accident, fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on spent fuel pool study insights for the BWRs with Mark I and II containment, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates. In addition, the NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent GEIS (NUREG-2157) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 ft above the top of the fuel in the pool, thereby encompassing the effects of some of the phenomena mentioned by the petitioner.

In summary, the NRC recognizes that the phenomena discussed in the comments are important to realistically evaluate initiation and progression of spent fuel pool fires. The NRC has considered the most important phenomena, and continues to improve the models to further reduce the uncertainties. However, NRC has relied on conservative estimates in the decision making process.

From: Doyle, Daniel
Sent: 15 Apr 2016 23:26:05 -0400
To: Borges, Jennifer;Hernandez, Raul;Esmaili, Hossein;Casto, Greg;Witt, Kevin
Subject: FW: PRM-50-108 (post-SRM) - please provide NLO
Attachments: PRM-50-108 - frn (post srm).docx, PRM-50-108 - letter to petitioner (post srm).docx, frn - redline strikeout.docx, letter to petitioner - redline strikeout.docx

I have completed incorporating the edits from the Commission and I am asking for confirmation of NLO from OGC before I send this to ADM for final processing. This was pretty straight forward so I do not expect that you would have any comments, but if you do please let me know.

Thanks,

Dan

From: Doyle, Daniel
Sent: Friday, April 15, 2016 11:16 PM
To: OGCMailCenter Resource
Cc: Mizuno, Geary
Subject: PRM-50-108 (post-SRM) - please provide NLO

I am requesting NLO on the attached *Federal Register* notice and letter to the petitioner for PRM-50-108. ADAMS links are also provided below. These documents include the edits directed by the Commission in SRM-SECY-15-0146 (ML16096A192). Also, as requested by Geary in his email 4/5/16 at 2:34pm, the word "renew" was deleted from the letter to the petitioner so it matches the conclusion in the FRN. For your convenience, I have attached a redline/strikeout version of both documents showing all changes from the versions in SECY-15-0146.

[View ADAMS P8 Properties ML16022A185](#)

[Open ADAMS P8 Document \(FRN: Petition for Rulemaking: Denial: Spent Fuel Pool Evaluations \(PRM-50-108\)\)](#)

[View ADAMS P8 Properties ML16022A187](#)

[Open ADAMS P8 Document \(LTR to Mark Leyse, Petitioner from Annette Vietti-Cook RE: Denial of Petition for Rulemaking: Spent Fuel Pool Evaluations \(PRM-50-108\)\)](#)

Dan

415-3748

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking with respect to SFPs or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):**
You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search.](#)" For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

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I. The Petition.

II. Reasons for Denial.

III. Conclusion.

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I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of:

postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR simulations predict. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner stated that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested

regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations that would be required by the fourth requested regulation would be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of an SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for

regulatory decisionmaking, and the evaluations would not prevent or mitigate an SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to an SFP fire. In order for an SFP fire to occur, all SFP systems, backup systems, and operator actions that are intended to prevent the spent fuel in the pool from being uncovered would have to fail. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of an SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner stated that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that an SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and, ultimately, an SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in an SFP. The SFPs at all nuclear plants in the United States are robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage.

Studies conducted over the last four decades have consistently shown the risk of an accident causing a zirconium fire in an SFP to be low. The risk of an SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools," in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health

objectives (51 FR 30028; August 21, 1986) and that no new regulatory requirements were warranted.

The risk of an SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, an SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even with this conservative assumption, the study found the risk of an SFP fire to be low and well within the Commission's Safety Goals.

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability and, accordingly, the risk of an SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC took extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the

Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

Also, in 2014, the NRC documented a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). In COMSECY-13-0030, the NRC staff concluded that SFPs are robust structures with large safety margins and recommended to the Commission that assessments of possible regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage were not warranted. The Commission subsequently approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of an SFP severe accident is low. While the risk of a severe accident in an SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures in place if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (77 FR 74788; December 18, 2012) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and license amendment reviews. In addition, baseline NRC inspections provide ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate an SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and their results proposed to be provided to the NRC are not needed for the effectiveness of the NRC's approach to ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's safety analysis report. Licensees are required to operate the plant,

including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs and protective actions for plant personnel and the public to limit exposure to radioactive materials.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. At least two NRC resident inspectors are assigned to each site to provide monitoring and inspection of routine and special activities.

They are aware of, and routinely observe, SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees as a result of an NRC order or a change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects and noncompliances associated with basic components, which include SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and noncompliances. The NRC is also informed of events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, a nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant or licensee as having a significant implication for public health and safety or common defense and security must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The annual evaluations requested in the petition would not provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-

coolant and subsequent uncovering of the fuel, the information that would be obtained from the proposed requirement in the petition would not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2. The petitioner stated that there are serious flaws with MELCOR, which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how such an evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's statements that MELCOR is flawed.

There are inherent uncertainties in the progression of severe accidents. There are many interrelated phenomena that need to be properly understood; otherwise, conservatism in one area may lead to overall non-conservative results. Conservatism can be meaningfully

introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

The important question for a severe accident analysis is whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussing the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multi-unit or concurrent accident, or fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and, even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has been validated against experimental data, and it represents the current state of the art in severe accident analysis. In NUREG-2161, the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment, core relocation to the vessel lower head, and ex-vessel core concrete interaction." Furthermore, MELCOR has been benchmarked against many experiments, including separate and integral effects tests for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

Additional information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161. The NRC also addressed questions regarding MELCOR in Appendix D to

NUREG-2157, Volume 2, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," (ADAMS Accession No. ML14196A107).

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-----------------|--|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |

| | | |
|-------------------|---|-------------|
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leye. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 2016.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition did not present information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC, as requested by the petition, is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the FR.

The docket for this petition closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking with respect to SFPs or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):**
You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search.](#)" For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

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I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of:

postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR ~~indicates~~simulations predict. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner ~~claimed~~stated that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested

regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations ~~in that would be required by~~ the fourth requested regulation ~~should~~would be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of an SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not

needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate aan SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to aan SFP fire. In order for aan SFP fire to occur, all SFP systems, backup systems, and operator actions ~~would have to fail~~ that are intended to prevent the spent fuel in the pool from being uncovered would have to fail. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of aan SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner ~~claimed~~ stated that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that aan SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and, ultimately, ~~a~~, an SFP

accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in aan SFP. The SFPs at all nuclear plants in the United States are ~~extremely~~ robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding ~~as a result of the significant volume of water above the spent fuel.~~ Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage. ~~As spent fuel cools, older fuel is sometimes removed from a plant's SFP for on-site dry cask storage, depending on the space available in the SFP. Fuel removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure. They are monitored and routinely inspected for integrity, and they are protected by security measures.~~

Studies conducted over the last four decades have consistently shown that the probability/risk of an accident causing a zirconium fire in aan SFP to be ~~lower than that for severe reactor accidents.~~ low. The risk of aan SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools", in light of increased

use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (51 FR 30028; August 21, 1986; ~~51 FR 30028~~) and that no new regulatory requirements were warranted.

The risk of ~~aan~~ SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, ~~aan~~ SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. ~~Even when all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in a SFP zirconium fire with this conservative assumption,~~ the study found the risk of ~~aan~~ SFP fire to be low and well within the Commission's Safety Goals.

~~In light of the changes in storage configuration of the SFP (increased to high density racks), inadvertent partial draindown events, as well as monumental events such as the September 11, 2001, terrorist attacks and the 2011 accident at the Fukushima Dai-ichi nuclear power plant, the NRC continues to examine the issue of SFP safety. Recently, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation~~

for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). ~~The COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).~~

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of ~~ef~~ and, accordingly, the risk of aan SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC ~~has taken~~took extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance

establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

Also, in 2014, the NRC documented a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). In COMSECY-13-0030, the NRC staff concluded that SFPs are robust structures with large safety margins and recommended to the Commission that assessments of possible regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage were not warranted. The Commission subsequently approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of an SFP severe accident is low. While the risk of a severe accident in an SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures in place if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (77 FR 74788; December 18, 2012; ~~77 FR 74788~~) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and ~~for license amendment requests and provides reviews.~~ In addition, baseline NRC inspections provide ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate an SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and ~~its~~their results proposed to be provided to the NRC ~~is~~are not needed for the effectiveness of the NRC's approach ~~for~~to ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's final-safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs and protective actions for plant personnel and the public to limit exposure to radioactive materials.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly

inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. ~~The~~ At least two NRC resident inspectors are ~~permanently stationed on~~ assigned to each site to provide monitoring and inspection of routine and special activities. They are aware of, and routinely observe, SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees ~~as a result of an NRC order or a change in regulations.~~

In accordance with 10 CFR part 21, the NRC is informed of defects ~~in and failures to conform to the NRC requirements and noncompliances associated with respect to basic components, which includes~~ include SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and ~~failures to conform, noncompliances.~~ The NRC is also informed of the events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, ~~the~~ a nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant ~~and/or~~ or licensee as having a significant implication for public health and safety or common defense and security, must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. ~~Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident require redundant equipment and strategies to address loss of cooling to SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.~~

~~It is unclear how the~~The annual evaluations requested in the petition would not provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent uncovering of the fuel~~uncovery~~, the information that would be obtained from the proposed requirement in the petition ~~does~~would not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2. The petitioner ~~claimed~~stated that there are serious flaws with MELCOR, which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how ~~the~~such an evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's ~~claims~~statements that MELCOR is flawed. ~~The following discussion is provided in order to address the petitioner's claims about the adequacy of MELCOR, even though this discussion does not form the basis for denial of this petition for rulemaking.~~

~~The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request~~

for a new requirement for licensees to perform annual evaluations of SFPs. The petitioner's request to address perceived deficiencies in current severe accident models go hand-in-hand with the petitioner's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC is providing the following information about how MELCOR is used and the NRC's views on some of the phenomena discussed in the petition.

The petitioner claimed that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petitioner also claimed that MELCOR under-predicts the zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petitioner claimed, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petitioner pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. The MELCOR computer code has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation as discussed later in this section.

The MELCOR computer code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as; otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., "zirconium fire") occurs. A self-sustaining zirconium fire will develop if the heat generation rate from reaction with oxidant exceeds the heat loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a self-sustaining zirconium fire will occur.

Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher temperatures, the presence of any measurable amount of oxygen in the gas (steam or air) attacking the cladding is sufficient to prevent the formation of surface ZrN.

Further, if ZrN does form it can be converted readily to zirconium oxide (ZrO_2) when exposed to oxygen. The heat generation from the reaction of cladding to form ZrN followed by oxidation of the ZrN to form ZrO_2 is essentially the same as the direct reaction of Zr to form ZrO_2 . This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in the petition. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre- to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.

With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS-B9R), these phenomena are well understood and recognized in the formulations of models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a SFP. The code assessment against zirconium fire experiments conducted at Sandia National Laboratory (SNL) and code-to-code comparison documented in NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling-Water Reactor Spent-Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident" (ADAMS Accession No. ML13072A056), address fire propagation phenomena.

The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys" (ADAMS Accession No. ML041900069). The MELCOR computer code was used in the zirconium fire experiments (see NUREG/CR-7143) and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code-to-code comparisons) as well as the SFP study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.

The recent Sandia Fuel Project by the Organisation for Economic Co-operation and Development Nuclear Energy Agency provided experimental data relevant for hydraulic and ignition phenomena of prototypic pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petitioner asserted that the SNL SFP accident experiments are unrealistic because they were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100 micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the

~~complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.~~

The important question for ~~ana~~ a severe accident analysis is ~~if~~whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to ~~discussion of~~discussing the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, ~~multiunit~~multi-unit or concurrent accident, or fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and, even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates. ~~The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volumes 1 and 2 (ADAMS Accession Nos. ML14196A105 and ML14196A107)) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 feet above the top of the fuel in the pool, therefore encompassing the effects of some of the phenomena mentioned by the petition.~~

In conclusion, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. ~~The NRC has considered the most important phenomena and continues to improve the models to further reduce the uncertainties. However, the NRC wishes to emphasize that these improvement efforts do not reflect an NRC determination that the models are unacceptable for their intended use by the NRC.~~

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has been validated against experimental data, and it represents the current state of the art in severe accident analysis. In NUREG-2161, the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment, core relocation to the vessel lower head, and ex-vessel core concrete interaction." Furthermore, MELCOR has been benchmarked against many experiments, including separate and integral effects tests for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

Additional information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161. The NRC also addressed questions regarding MELCOR in Appendix D to NUREG-2157, Volume 2, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," (ADAMS Accession No. ML14196A107).

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude

that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-----------------|---|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| June 2004 | NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys." | ML041900069 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |

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| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| March 2013 | NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling-Water-Reactor Spent-Fuel-Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident." | ML13072A056 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , ~~2015~~2016.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,

Secretary of the Commission.

| | | |
|-------------------|---|-------------|
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements—COMSECY-13-0030—Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leye. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

_____ Dated at Rockville, Maryland, this _____ day of _____, 2015.

_____ For the Nuclear Regulatory Commission.

_____ Annette L. Vietti-Cook,
 _____ Secretary of the Commission.

ADAMS Accession Nos: PKG: ML14307A691; FRN: ML14307A630 _____ *via email

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|--------|-------------------------------|---------------------|-----------------------|----------------------------|----------------------------------|
| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D |
| NAME | DDoyle | GLappert | TInverso | AMohseni | LKokajko (AMohseni for) |
| DATE | 7/14/2015 | 7/16/2015 | 7/17/2015 | 7/27/2015 | 7/31/2015 |
| OFFICE | NRR/DSS:D* | NRR/JLD:D* | RES:D* | NRO:D* | ADM/DAS/RADB:BC Tech Editing* |
| NAME | TMcGinty | JDavis (JBowen for) | BSheron (SCoffin for) | GTracy (JMonninger for) | CBladey (JBorges for) |
| DATE | 8/24/2015 | 8/25/2015 | 8/27/2015 | 8/28/2015 | 8/24/2015 |
| OFFICE | OGG/GCLR/RMR* | NRR:D | EDO | | |
| NAME | MSpencer (GMizuno for)-NLO | WDean | VMcGree | | |
| DATE | 9/23/2015 | 10/6/15 | 11/19/15 | | |

OFFICIAL RECORD COPY



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition ~~failed to~~ did not present any significant new information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC, as requested by the petition, is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the FR.

The docket for this petition closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition failed to present any significant new information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petition is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the *Federal Register*.

The docket for this petition closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

ADAMS Accession Nos: PKG: ML14307A691; LTR to Petitioner: ML14307A157; FRN: ML14307A630

*Concurrence via e-mail

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|--------|-------------------------------|---------------------|--------------------------|----------------------------|----------------------------|
| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D |
| NAME | DDoyle | GLappert | Tinverse | AMohseni | LKekajko (AMohseni for) |
| DATE | 7/14/2015 | 7/16/2015 | 7/17/2015 | 7/27/2015 | 7/31/2015 |
| OFFICE | NRR/DSS:D* | NRR/JLD:D* | RES:D* | NRO:D* | ADM/DAS/RADB:BC* |
| NAME | TMcGinty | JDavis (JBowen for) | BSheron (SCoffin for) | GTracy (JMenninger for) | GBladey (JBorges for) |
| DATE | 8/24/2015 | 8/25/2015 | 8/27/2015 | 8/28/2015 | 8/24/2015 |
| OFFICE | OGC/GCLR/RMR* | NRR:D | EDO | | |
| NAME | MSpencer (GMizuno for) NLO | WDean | VMcGree | | |
| DATE | 9/23/2015 | 10/6/15 | 11/19/15 | | |

OFFICIAL RECORD COPY

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

From: Borges, Jennifer
Sent: 18 Apr 2016 10:55:39 +0000
To: DeJesus, Anthony
Subject: FW: PRM-50-108 (post-SRM) - please provide NLO
Attachments: PRM-50-108 - frn (post srm).docx, PRM-50-108 - letter to petitioner (post srm).docx, frn - redline strikeout.docx, letter to petitioner - redline strikeout.docx

FYI

From: Doyle, Daniel

Sent: Friday, April 15, 2016 11:26 PM

To: Borges, Jennifer ; Hernandez, Raul ; Esmaili, Hossein ; Casto, Greg ; Witt, Kevin

Subject: FW: PRM-50-108 (post-SRM) - please provide NLO

I have completed incorporating the edits from the Commission and I am asking for confirmation of NLO from OGC before I send this to ADM for final processing. This was pretty straight forward so I do not expect that you would have any comments, but if you do please let me know.

Thanks,

Dan

From: Doyle, Daniel

Sent: Friday, April 15, 2016 11:16 PM

To: OGCMailCenter Resource <OGCMailCenter.Resource@nrc.gov>

Cc: Mizuno, Geary <Geary.Mizuno@nrc.gov>

Subject: PRM-50-108 (post-SRM) - please provide NLO

I am requesting NLO on the attached *Federal Register* notice and letter to the petitioner for PRM-50-108. ADAMS links are also provided below. These documents include the edits directed by the Commission in SRM-SECY-15-0146 (ML16096A192). Also, as requested by Geary in his email 4/5/16 at 2:34pm, the word "renew" was deleted from the letter to the petitioner so it matches the conclusion in the FRN. For your convenience, I have attached a redline/strikeout version of both documents showing all changes from the versions in SECY-15-0146.

[View ADAMS P8 Properties ML16022A185](#)

[Open ADAMS P8 Document \(FRN: Petition for Rulemaking: Denial: Spent Fuel Pool Evaluations \(PRM-50-108\)\)](#)

[View ADAMS P8 Properties ML16022A187](#)

[Open ADAMS P8 Document \(LTR to Mark Leyse, Petitioner from Annette Vietti-Cook RE: Denial of Petition for Rulemaking: Spent Fuel Pool Evaluations \(PRM-50-108\)\)](#)

Dan

415-3748

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking with respect to SFPs or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):**
You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search.](#)" For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

TABLE OF CONTENTS:

I. The Petition.

II. Reasons for Denial.

III. Conclusion.

IV. Availability of Documents.

I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of:

postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR simulations predict. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner stated that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested

regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations that would be required by the fourth requested regulation would be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of an SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for

regulatory decisionmaking, and the evaluations would not prevent or mitigate an SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to an SFP fire. In order for an SFP fire to occur, all SFP systems, backup systems, and operator actions that are intended to prevent the spent fuel in the pool from being uncovered would have to fail. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of an SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner stated that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that an SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and, ultimately, an SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in an SFP. The SFPs at all nuclear plants in the United States are robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage.

Studies conducted over the last four decades have consistently shown the risk of an accident causing a zirconium fire in an SFP to be low. The risk of an SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools," in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health

objectives (51 FR 30028; August 21, 1986) and that no new regulatory requirements were warranted.

The risk of an SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, an SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even with this conservative assumption, the study found the risk of an SFP fire to be low and well within the Commission's Safety Goals.

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability and, accordingly, the risk of an SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC took extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the

Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

Also, in 2014, the NRC documented a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). In COMSECY-13-0030, the NRC staff concluded that SFPs are robust structures with large safety margins and recommended to the Commission that assessments of possible regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage were not warranted. The Commission subsequently approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of an SFP severe accident is low. While the risk of a severe accident in an SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures in place if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (77 FR 74788; December 18, 2012) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and license amendment reviews. In addition, baseline NRC inspections provide ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate an SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and their results proposed to be provided to the NRC are not needed for the effectiveness of the NRC's approach to ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's safety analysis report. Licensees are required to operate the plant,

including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs and protective actions for plant personnel and the public to limit exposure to radioactive materials.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. At least two NRC resident inspectors are assigned to each site to provide monitoring and inspection of routine and special activities.

They are aware of, and routinely observe, SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees as a result of an NRC order or a change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects and noncompliances associated with basic components, which include SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and noncompliances. The NRC is also informed of events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, a nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant or licensee as having a significant implication for public health and safety or common defense and security must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The annual evaluations requested in the petition would not provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-

coolant and subsequent uncovering of the fuel, the information that would be obtained from the proposed requirement in the petition would not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2. The petitioner stated that there are serious flaws with MELCOR, which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how such an evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's statements that MELCOR is flawed.

There are inherent uncertainties in the progression of severe accidents. There are many interrelated phenomena that need to be properly understood; otherwise, conservatism in one area may lead to overall non-conservative results. Conservatism can be meaningfully

introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

The important question for a severe accident analysis is whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussing the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multi-unit or concurrent accident, or fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and, even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has been validated against experimental data, and it represents the current state of the art in severe accident analysis. In NUREG-2161, the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment, core relocation to the vessel lower head, and ex-vessel core concrete interaction." Furthermore, MELCOR has been benchmarked against many experiments, including separate and integral effects tests for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

Additional information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161. The NRC also addressed questions regarding MELCOR in Appendix D to

NUREG-2157, Volume 2, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," (ADAMS Accession No. ML14196A107).

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-----------------|--|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |

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| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 2016.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition did not present information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC, as requested by the petition, is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the FR.

The docket for this petition closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking with respect to SFPs or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):**
You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search.](#)" For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

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IV. Availability of Documents.

I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of:

postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

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The petitioner ~~claimed~~ stated that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested

regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
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Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations ~~in that would be required by~~ the fourth requested regulation ~~should~~would be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of an SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not

needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate aan SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to aan SFP fire. In order for aan SFP fire to occur, all SFP systems, backup systems, and operator actions ~~would have to fail~~ that are intended to prevent the spent fuel in the pool from being uncovered would have to fail. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of aan SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner ~~claimed~~ stated that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that aan SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and, ultimately, ~~a,~~ an SFP

accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in aan SFP. The SFPs at all nuclear plants in the United States are ~~extremely~~ robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding ~~as a result of the significant volume of water above the spent fuel.~~ Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage. ~~As spent fuel cools, older fuel is sometimes removed from a plant's SFP for on-site dry cask storage, depending on the space available in the SFP. Fuel removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure. They are monitored and routinely inspected for integrity, and they are protected by security measures.~~

Studies conducted over the last four decades have consistently shown that the probability risk of an accident causing a zirconium fire in aan SFP to be lower than that for ~~severe reactor accidents.~~low. The risk of aan SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools",¹ in light of increased

use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (51 FR 30028; August 21, 1986; ~~51 FR 30028~~) and that no new regulatory requirements were warranted.

The risk of aan SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, aan SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. ~~Even when all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in a SFP zirconium fire~~ with this conservative assumption, the study found the risk of aan SFP fire to be low and well within the Commission's Safety Goals.

~~In light of the changes in storage configuration of the SFP (increased to high density racks), inadvertent partial draindown events, as well as monumental events such as the September 11, 2001, terrorist attacks and the 2011 accident at the Fukushima Dai-ichi nuclear power plant, the NRC continues to examine the issue of SFP safety. Recently, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation~~

for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel” (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC’s oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, “Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor” (ADAMS Accession No. ML14255A365). ~~The COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).~~

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk of an SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC ~~has taken~~took extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, “Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events” (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance

establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

Also, in 2014, the NRC documented a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). In COMSECY-13-0030, the NRC staff concluded that SFPs are robust structures with large safety margins and recommended to the Commission that assessments of possible regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage were not warranted. The Commission subsequently approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of aan SFP severe accident is low. While the risk of a severe accident in aan SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures in place if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (77 FR 74788; December 18, 2012; ~~77 FR 74788~~) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and ~~for license amendment requests and provides reviews.~~ In addition, baseline NRC inspections provide ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate an SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and ~~its~~their results proposed to be provided to the NRC ~~is~~are not needed for the effectiveness of the NRC's approach ~~for~~to ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's final-safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs and protective actions for plant personnel and the public to limit exposure to radioactive materials.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly

inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. ~~The~~At least two NRC resident inspectors are ~~permanently stationed on~~assigned to each site to provide monitoring and inspection of routine and special activities. They are aware of, and routinely observe, SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees ~~as a result of~~as a result of an NRC order or a change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects ~~in and failures to conform to the NRC requirements~~and noncompliances associated with respect to basic components, which ~~includes~~include SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and ~~failures to conform~~noncompliances. The NRC is also informed of the events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, ~~the~~a nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant ~~and~~or licensee as having a significant implication for public health and safety or common defense and security, must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. ~~Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident require redundant equipment and strategies to address loss of cooling to SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.~~

~~It is unclear how the~~The annual evaluations requested in the petition would not provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent uncovering of the ~~fuel uncover~~y, the information that would be obtained from the proposed requirement in the petition ~~does~~would not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2. The petitioner ~~claimed~~stated that there are serious flaws with MELCOR, which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how ~~the~~such an evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's ~~claims~~statements that MELCOR is flawed. ~~The following discussion is provided in order to address the petitioner's claims about the adequacy of MELCOR, even though this discussion does not form the basis for denial of this petition for rulemaking.~~

~~The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request~~

for a new requirement for licensees to perform annual evaluations of SFPs. The petitioner's request to address perceived deficiencies in current severe accident models go hand-in-hand with the petitioner's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC is providing the following information about how MELCOR is used and the NRC's views on some of the phenomena discussed in the petition.

The petitioner claimed that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petitioner also claimed that MELCOR under-predicts the zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petitioner claimed, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petitioner pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. The MELCOR computer code has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation as discussed later in this section.

The MELCOR computer code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as; otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., "zirconium fire") occurs. A self-sustaining zirconium fire will develop if the heat generation rate from reaction with oxidant exceeds the heat loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a self-sustaining zirconium fire will occur.

Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher temperatures, the presence of any measurable amount of oxygen in the gas (steam or air) attacking the cladding is sufficient to prevent the formation of surface ZrN.

Further, if ZrN does form it can be converted readily to zirconium oxide (ZrO_2) when exposed to oxygen. The heat generation from the reaction of cladding to form ZrN followed by oxidation of the ZrN to form ZrO_2 is essentially the same as the direct reaction of Zr to form ZrO_2 . This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in the petition. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre- to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.

With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS-B9R), these phenomena are well understood and recognized in the formulations of models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a SFP. The code assessment against zirconium fire experiments conducted at Sandia National Laboratory (SNL) and code-to-code comparison documented in NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling-Water Reactor Spent-Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident" (ADAMS Accession No. ML13072A056), address fire propagation phenomena.

The air-oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys" (ADAMS Accession No. ML041900069). The MELCOR computer code was used in the zirconium fire experiments (see NUREG/CR-7143) and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code-to-code comparisons) as well as the SFP study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.

The recent Sandia Fuel Project by the Organisation for Economic Co-operation and Development Nuclear Energy Agency provided experimental data relevant for hydraulic and ignition phenomena of prototypic pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petitioner asserted that the SNL SFP accident experiments are unrealistic because they were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100 micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the

~~complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.~~

The important question for ~~ana~~ a severe accident analysis is ~~if~~whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to ~~discussion of~~discussing the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, ~~multiunit~~multi-unit or concurrent accident, or fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and, even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates. ~~The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volumes 1 and 2 (ADAMS Accession Nos. ML14196A105 and ML14196A107)) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 feet above the top of the fuel in the pool, therefore encompassing the effects of some of the phenomena mentioned by the petition.~~

In conclusion, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. The NRC has considered the most important phenomena and continues to improve the models to further reduce the uncertainties. However, the NRC wishes to emphasize that these improvement efforts do not reflect an NRC determination that the models are unacceptable for their intended use by the NRC.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has been validated against experimental data, and it represents the current state of the art in severe accident analysis. In NUREG-2161, the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment, core relocation to the vessel lower head, and ex-vessel core concrete interaction." Furthermore, MELCOR has been benchmarked against many experiments, including separate and integral effects tests for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

Additional information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161. The NRC also addressed questions regarding MELCOR in Appendix D to NUREG-2157, Volume 2, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," (ADAMS Accession No. ML14196A107).

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude

that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-----------------|---|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| June 2004 | NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys." | ML041900069 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |

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| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| March 2013 | NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling-Water-Reactor-Spent-Fuel-Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident." | ML13072A056 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , ~~2015~~2016.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,

Secretary of the Commission.

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| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements—COMSECY-13-0030—Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leye. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

_____ Dated at Rockville, Maryland, this _____ day of _____, 2015.

_____ For the Nuclear Regulatory Commission.

_____ Annette L. Vietti-Cook,
Secretary of the Commission.

ADAMS Accession Nos: PKG: ML14307A691; FRN: ML14307A630 _____ *via-email

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| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D |
| NAME | DDoyle | GLappert | TInverso | AMohseni | LKokajko (AMohseni for) |
| DATE | 7/14/2015 | 7/16/2015 | 7/17/2015 | 7/27/2015 | 7/31/2015 |
| OFFICE | NRR/DSS:D* | NRR/JLD:D* | RES:D* | NRO:D* | ADM/DAS/RADB:BC Tech-Editing* |
| NAME | TMcGinty | JDavis (JBowen for) | BSheron (SCoffin for) | GTraey (JMenninger for) | CBladey (JBorges for) |
| DATE | 8/24/2015 | 8/25/2015 | 8/27/2015 | 8/28/2015 | 8/24/2015 |
| OFFICE | OGC/GCLR/RMR* | NRR:D | EDO | | |
| NAME | MSpencer (GMizuno for)-NLO | WDean | VMcCree | | |
| DATE | 9/23/2015 | 10/6/15 | 11/19/15 | | |

OFFICIAL RECORD COPY



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition ~~failed to~~ did not present any significant new information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC, as requested by the petition, is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the FR.

The docket for this petition closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

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The NRC has determined that your petition failed to present any significant new information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petition is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the *Federal Register*.

The docket for this petition closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

ADAMS Accession Nos: PKG: ML14307A691; LTR to Petitioner: ML14307A157; FRN: ML14307A630

*Concurrence via email

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| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D |
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| OFFICE | OGC/GCLR/RMR* | NRR:D | EDO | | |
| NAME | MSpencer (GMizuno for) NLO | WDean | VMcGree | | |
| DATE | 9/23/2015 | 10/6/15 | 11/19/15 | | |

OFFICIAL RECORD COPY

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

From: DeJesus, Anthony
Sent: 23 Sep 2015 13:40:08 -0400
To: Borges, Jennifer
Subject: FW: PRM-50-108 Denial package (OGC Ticket 2015-3943)
Attachments: FRN PRM-50-108 deny GSM 9-23-2008.docx, SECY PRM-50-108 deny GSM 9-23-2015.docx

FYI

From: Mizuno, Geary
Sent: Wednesday, September 23, 2015 1:37 PM
To: Doyle, Daniel; Inverso, Tara
Cc: Spencer, Mary; Biggins, James; England, Christina; Irvin, Ian; Bladey, Cindy; Terry, Leslie; DeJesus, Anthony
Subject: RE: PRM-50-108 Denial package (OGC Ticket 2015-3943)

Dan and Tara:

By this e-mail, OGC/RMR is providing a NLO on the package proposing to deny PRM-50-108, subject to the changes in the attached files for the SECY paper and the FRN. This PRM addresses spent fuel pool modeling, and was submitted by Mark Leyse. The other parts of the package are acceptable.

We urge the staff to voluntarily prepare, for an FRN denying a PRM, the table of documents available (in the FRN under the heading "Availability of Documents") with the following subdivisions (listed in order):

- ① ▪ PRM documents and FRN notices
- ① ▪ documents referenced in the PRM which the NRC is making available
- ① ▪ other documents referenced in the FRN which the NRC relies upon and is making available

Please note, that OGC's NLO does not apply if there are any changes to the package (other than typographic and grammar corrections) which are made after OGC provides its NLO. Such changes should be brought to the attention of OGC to ensure that the changes themselves do not raise new legal issues not present in the version forming the basis for OGC's NLO, or that the changes upset OGC's previous bases for providing the NLO. This e-mail serves as the official record of OGC's NLO on this package.

Geary

From: Doyle, Daniel
Sent: Tuesday, September 22, 2015 2:12 PM
To: OGCMailCenter Resource <OGCMailCenter.Resource@nrc.gov>
Cc: Mizuno, Geary <Geary.Mizuno@nrc.gov>
Subject: RE: PRM-50-108 - please provide NLO

I am resubmitting for NLO the draft denial package for PRM-50-108 (links below). I have reviewed Geary's comments and updated the package. To facilitate OGC's review, I responded to the comments in the attached files.

[View ADAMS P8 Properties ML14307A691](#)

[Open ADAMS P8 Package \(SECY-xx-xxxx Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations \(PRM-50-108\).\)](#)

[View ADAMS P8 Properties ML14307A891](#)

[Open ADAMS P8 Document \(Daily Note Regarding PRM-50-108: Annual Spent Fuel Pool Evaluations\)](#)

[View ADAMS P8 Properties ML14307A845](#)

Open ADAMS P8 Document (PRM-50-108 Annual Spent Fuel Pool Evaluations Congressional Letters)

Dan

415-3748

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):** You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search.](#)" For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

TABLE OF CONTENTS:

- I. The Petition.
- II. Reasons for Denial.
- III. Conclusion.
- IV. Availability of Documents.

I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air

reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR indicates. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner claimed that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential

consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations in the fourth requested regulation should be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of a SFP

severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate a SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to a SFP fire. In order for a SFP fire to occur, all SFP systems, backup systems, and operator actions would have to fail to prevent the spent fuel in the pool from being uncovered. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose as requested by the petitioner because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of a SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner claimed that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that a SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and ultimately a SFP

accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in a SFP. The SFPs at all nuclear plants in the United States are extremely robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding as a result of the significant volume of water above the spent fuel. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage. As spent fuel cools, older fuel is sometimes removed from a plant's SFP for on-site dry cask storage, depending on the space available in the SFP. Fuel removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure. They are monitored and routinely inspected for integrity, and they are protected by security measures.

Studies conducted over the last four decades have consistently shown that the probability of an accident causing a zirconium fire in a SFP to be lower than that for severe reactor accidents. The risk of a SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools", in light of increased use of high-density

storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (August 21, 1986; 51 FR 30028) and that no new regulatory requirements were warranted.

The risk of a SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, a SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even when all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in a SFP zirconium fire, the study found the risk of a SFP fire to be low and well within the Commission's Safety Goals.

In light of the changes in storage configuration of the SFP (increased to high density racks), inadvertent partial draindown events, as well as monumental events such as the September 11, 2001, terrorist attacks and the 2011 accident at the Fukushima Dai-ichi nuclear power plant, the NRC continues to examine the issue of SFP safety. Recently, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS

Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). The COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk of a SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC has taken extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012

establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of a SFP severe accident is low. While the risk of a severe accident in a SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which has been accepted for consideration in the rulemaking process (December 18, 2012; 77 FR 74788).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

(ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and for license amendment requests and provides ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate a SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and its results proposed to be provided to the NRC is not needed for the effectiveness of the NRC's approach for ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's final safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. The NRC resident inspectors are permanently stationed on-site to provide monitoring and inspection of routine and special activities. They are aware of and routinely observe SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be

conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees to an NRC order or change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects in and failures to conform to the NRC requirements with respect to basic components, which includes SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and failures to conform. The NRC is also informed of the events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, the nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant and licensee as having a significant implication for public health and safety or common defense and security, must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident require redundant equipment and strategies to address loss of cooling to SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.

It is unclear how the annual evaluations requested in the petition would provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent fuel uncovering, the information that would be obtained from the proposed requirement in the petition does not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2.

The petitioner claimed that there are serious flaws with MELCOR which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how the evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's claims that MELCOR is flawed. The following discussion is provided in to address the petitioner's claims about the adequacy of MELCOR, even though this discussion does not form the basis for denial of this petition for rulemaking.

The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request for a new requirement for licensees to perform annual evaluations of SFPs. The petitioner's request to address perceived deficiencies in current severe accident models go hand-in-hand with the petitioner's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC is providing the following information about how MELCOR is used and the NRC's views on some of the phenomena discussed in the petition.

The petitioner claimed that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petitioner also claimed that MELCOR under-predicts the zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petitioner claimed, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petitioner pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. The MELCOR computer code has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation as discussed later in this section.

The MELCOR computer code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as, otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced

into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., "zirconium fire") occurs. A self-sustaining zirconium fire will develop if the heat-generation rate from reaction with oxidant exceeds the heat-loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a zirconium fire will occur.

Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher temperatures, the presence of any measurable amount of oxygen in the gas (steam or air) attacking the cladding is sufficient to prevent the formation of surface ZrN . Further, if ZrN does form it can be converted readily to zirconium oxide (ZrO_2) when exposed to oxygen. The heat generation from the reaction of cladding to form ZrN followed by oxidation of the ZrN to form ZrO_2 is essentially the same as the direct reaction of Zr to form ZrO_2 . This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in the petition. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre-

to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.

With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS B9R), these phenomena are well understood and recognized in the formulations of models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a SFP. The code assessment against zirconium fire experiments conducted at Sandia National Laboratory (SNL) and code-to-code comparison documented in NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident" (ADAMS Accession No. ML13072A056), address fire propagation phenomena.

The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys" (ADAMS Accession No. ML041900069). The MELCOR computer code was used in the zirconium fire experiments (see NUREG/CR-7143) and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code-to-code comparisons) as well as the SFP study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.

The recent Sandia Fuel Project by the Organisation for Economic Co-operation and Development Nuclear Energy Agency provided experimental data relevant for hydraulic and ignition phenomena of prototypic pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petitioner asserted that the SNL SFP accident experiments are unrealistic because they were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100 micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.

The important question for an analysis is if the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multiunit or concurrent accident, fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or

conservative estimates. The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volumes 1 and 2 (ADAMS Accession Nos. ML14196A105 and ML14196A107)) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 feet above the top of the fuel in the pool, therefore encompassing the effects of some of the phenomena mentioned by the petition. The NRC has considered the most important phenomena, and continues to improve the models to further reduce the uncertainties. However, the NRC wishes to emphasize that these improvement efforts are not being pursued because the models are unacceptable.

In summary, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. The NRC has considered the most important phenomena, and continues to improve the models to further reduce the uncertainties.

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-------------------|---|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| June 2004 | NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys." | ML041900069 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |

| | | |
|-------------------|---|-------------|
| March 2013 | NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident." | ML13072A056 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 2015.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

| | | |
|-----------------|---|-------------|
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leye. | ML14195A388 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 2015.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

ADAMS Accession Nos: PKG: ML14307A691; FRN: ML14307A630

*via email

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|--------|-----------------|---------------------|-----------------------|----------------------------|----------------------------------|
| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D |
| NAME | DDoyle | GLappert | TInverso | AMohseni | LKokajko (AMohseni for) |
| DATE | 7/14/2015 | 7/16/2015 | 7/17/2015 | 7/27/2015 | 7/31/2015 |
| OFFICE | NRR/DSS:D* | NRR/JLD:D* | RES:D* | NRO:D* | ADM/DAS/RADB:BC Tech Editing* |
| NAME | TMcGinty | JDavis (JBowen for) | BSheron (SCoffin for) | GTracy (JMonninger for) | CBladey (LTerry for) |
| DATE | 8/24/2015 | 8/25/2015 | 8/27/2015 | 8/28/2015 | 8/24/2015 |
| OFFICE | OGC/GCLR/RMR | NRR:D | EDO | | |
| NAME | MSpencer | WDean | MSatorius | | |
| DATE | | | | | |

OFFICIAL RECORD COPY

OGC/GSM changes on p.3.

Comment [MG]: This is the same text as in the FRN, under I. The Petition.

FOR: The Commissioners

FROM: Mark A. Satorius
Executive Director for Operations

SUBJECT: DENIAL OF PETITION FOR RULEMAKING REQUESTING AMENDMENTS
REGARDING SPENT FUEL POOL SEVERE ACCIDENT EVALUATIONS
(PRM-50-108; NRC-2014-0171)

PURPOSE:

To obtain Commission approval to deny a petition for rulemaking (PRM) submitted by Mr. Mark Edward Leyse (the petitioner). This paper does not address any new commitments or resource implications.

BACKGROUND:

(The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The petitioner filed its petition, PRM-50-108, with the Commission on June 19, 2014 (Accession No. ML14195A388 in the U.S. Nuclear Regulatory Commission's (NRC) Agencywide Documents Access and Management System (ADAMS)). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC published a notice of docketing in the *Federal Register* on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

CONTACT: Daniel I. Doyle, NRR/DPR
301-415-3748

DISCUSSION:

The Petition

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

Section II, "Reasons for Denial," of the enclosed *Federal Register* notice provides detailed NRC responses to the three issues identified in the petition.

NRC Evaluation of Issues Raised in the Petition

Issue 1: The petitioner stated that a long-term station blackout can happen in multiple ways, and a loss of SFP cooling and a SFP fire is a likely outcome. The petitioner argued that this is a sufficient basis for the requested regulations. The NRC staff disagrees. Numerous evaluations have shown that the risk of a SFP fire is low. There are multiple layers of protection to prevent uncovering of spent fuel and the potentially resulting fire.

Issue 2: The petitioner stated that the purpose of the evaluations would be to keep the NRC informed of potential consequences. The NRC staff disagrees. The SFP safety is provided by: conservative design of the SFP; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of the NRC's approach for providing SFP safety.

Issue 3: The petitioner stated that there are serious flaws with MELCOR, and, therefore, MELCOR is not currently sufficient for use in the requested annual SFP evaluations. The NRC NRC staff does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the requested annual SFP evaluations are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how the evaluation should be conducted. Furthermore, the NRC staff disagrees with the petitioner's claims that MELCOR is flawed. The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. The MELCOR computer code has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. These additional points, which need not be addressed to resolve the petition, are nonetheless discussed in the Federal Register notice denying the petition or rulemaking in order to address the assertions in the petition.

RECOMMENDATION:

The NRC staff recommends that the Commission deny PRM-50-108 because the petitioner failed to present any significant new information or arguments that would warrant the requested amendments. The NRC staff does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC staff continues to believe that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The enclosed *Federal Register* notice provides a detailed response to the issues raised in the petition.

The NRC staff requests the Commission's approval to publish the *Federal Register* notice denying the petition (Enclosure 1).

The enclosed letter for signature by the Secretary of the Commission (Enclosure 2) informs the petitioner of the Commission's decision to deny the petition.

The NRC staff will inform the appropriate congressional committees.

RESOURCES:

Denial of this petition will not affect budgeted resource needs.

The Commissioners

- 4 -

COORDINATION:

The Office of the General Counsel has no legal objection to the denial of this petition and the documents in this package. The Office of Administration has reviewed and concurred on this paper.

Mark A. Satorius
Executive Director
for Operations

Enclosures:

1. *Federal Register* notice
2. Letter to the Petitioner

The Commissioners

- 4 -

COORDINATION:

The Office of the General Counsel has no legal objection to the denial of this petition. The Office of Administration has reviewed and concurred on this paper.

Mark A. Satorius
Executive Director
for Operations

Enclosures:

1. *Federal Register* notice
2. Letter to the Petitioner

ADAMS Accession Nos: PKG: ML14307A691, SECY: ML14307A134, FRN: ML14307A630, Petition: ML14195A388, LTR to Petitioner: ML14307A157, Daily Note: ML14307A891 *via email

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| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D | NRR/DSS:D* |
| NAME | DDoyle | GLappert | TInverso | AMohseni | LKokajko (AMohseni for) | TMcGinty |
| DATE | 7/14/2015 | 7/16/2015 | 7/17/2015 | 7/27/2015 | 7/31/2015 | 8/24/2015 |
| OFFICE | NRR/JLD:D* | RES:D* | NRO:D* | ADM/DAS/RADB:BC* | OGC/GCLR/RMR | NRR:D |
| NAME | JDavis (JBowen for) | BSheron (SCoffin for) | GTracy (JMonninger for) | CBladey (LTerry for) | MSpencer | WDean |
| DATE | 8/25/2015 | 8/27/2015 | 8/28/2015 | 8/24/2015 | | |
| OFFICE | EDO | | | | | |
| NAME | MSatorius | | | | | |
| DATE | | | | | | |

OFFICIAL RECORD COPY

From: Borg s, Jennifer
Sent: 25 Feb 2015 14:31:22 +0000
To: Forder, Dawn
Subject: FW: PRM-50-108 working group meeting
Attachments: PRM-50-108 working group meeting.ics

Hi Dawn,

I stopped by at your desk earlier. I don t have a backup for this working group and I have conflicting meetings at the time. Is there any way you can attend for me? Its today at 10 AM. Jill and Christian have meetings too and I can t find Anthony. If you can t its okay; I ll just let him know to send me any pending actions.

Thank you,

Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

Location: OWFN 12-G07



301-415-3647



jennifer.borges@nrc.gov

From: Doyle, Daniel
Sent: 16 May 2016 10:00:19 -0400
To: Mizuno, Geary;Borges, Jennifer;Hernandez, Raul;Esmaili, Hossein;Casto, Greg;Witt, Kevin
Subject: FW: Re: Re: Status of PRM-50-108

PRM-50-108 working group,

Please review the email from the petitioner below and the italicized guidance from our office instruction. I will add his email to ADAMS and regulations.gov. I will set up a meeting this week to discuss path forward.

Instances in which the Petitioner disagrees with the Commission's final decision may be presented to the PM in the form of a letter, email, fax or even a telephone call. The Commission's rules regarding the 10 CFR 2.802 process do not provide for "reconsideration" of a decision, but the Petitioner may still want to respond to the NRC once he/she receives the letter informing the Commission's decision and rationale. If a written communication is submitted by the Petitioner, the PM needs to docket it and include it on regulations.gov. The PM must immediately consult OGC to determine appropriate actions to be taken. It is possible that the letter simply contains a statement disagreeing with the NRC, which would require no further action. However, the letter could raise new issues not previously considered by the NRC, which could be considered as a new PRM, or it could raise an allegation, which needs to be forwarded to the NRC Allegations team in a timely manner. If the communication is received via telephone, the PM should explain the NRC process to the Petitioner. The PM should encourage the Petitioner to submit the concern in writing so that it is docketed and that the NRC could take appropriate actions. As discussed above, immediately after receiving the call, the PM should consult with OGC for appropriate actions to be taken.

(link to guidance in office instruction)

Dan

From: Mark Leyse [mailto:markleyse@gmail.com]

Sent: Monday, May 16, 2016 6:59 AM

To: Doyle, Daniel ; Mohseni, Aby

Cc: Burnell, Scott ; Bladey, Cindy ; Dave Lochbaum ; Gordon Thompson ; Matthew G. McKinzie ; Geoffrey Fettus ; Thomas B. Cochran ; Alemayehu, Bemnet ; Ed Lyman ; Robert Alvarez ; Robert H. Leyse ; Paul Gallay ; Paul Gunter ; Michel Lee ; Mary Lampert ; CHAIRMAN Resource ; Valliere, Nanette ; Moore, Johari ; Patrick.Castlernan@nrc.gov; Frazier, Alan ; Cabbage, Amy ; Bloomer, Tamara ; Krsek, Robert ; michal_freedhoff@markey.senate.gov; Diane Curran

Subject: [External_Sender] Re: Re: Status of PRM-50-108

Dear Mr. Doyle:

Thank you for sending me the PDF.

The NRC's decision to deny PRM-50-108 seems to be based on **dogma**, rather than **science**.

Your Federal Register notice doesn't even mention the April 2000 letter from Dana A. Powers, Chairman of the Advisory Committee on Reactor Safeguards, to Richard A. Meserve, Chairman of the NRC, stating, "that nitrogen from air depleted of oxygen will interact exothermically with zircaloy cladding."

The April 2000 letter says that "The [NRC] staff analysis of the interaction of air with cladding *has relied on relatively geriatric work*. Much more is known now about air interactions with cladding" [emphasis added]. That was 16 years ago! And since then the NRC has done nothing but persist in relying on geriatric work for its analyses of spent fuel pool accidents.

(Please see pages 3 and 4 of the April 2000 letter, available at:

<http://www.nrc.gov/docs/ML0037/ML003704532.pdf>)

I quoted from the the April 2000 letter on page 3 of my cover letter and on pages 5, 25, and 38 of PRM-50-108. (Please see PRM-50-108: <http://www.nrc.gov/docs/ML1419/ML14195A388.pdf>)

Dogma:

Here is an example of dogma from the NRC's Federal Register notice: "The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has been validated against experimental data, and it represents the current state of the art in severe accident analysis."

(Please see page 29764 of the Federal Register notice: <https://www.gpo.gov/fdsys/pkg/FR-2016-05-13/pdf/2016-11212.pdf>)

The NRC's claim is not supported by facts.

Science:

As I state on page 29 of PRM-50-108, the Paul Scherrer Institute recently assessed MELCOR 1.8.6's ability to predict fuel-cladding behavior in accidents involving air ingress into the reactor vessel—which is pertinent to MELCOR's ability to predict zirconium-air reaction rates in spent fuel pool fires—and "concluded that development of MELCOR was needed to *capture the accelerated cladding oxidation that can take place under air ingress conditions* (characterized by transition from formation of a protective oxide film to non-protective 'breakaway' oxidation at a significantly higher rate)" [emphasis added].

I request that the NRC reconsider its decision to deny PRM-50-108.

If there is a scientific foundation for denying PRM-50-108, please explain it.

If the ACRS was incorrect in 2000 that the NRC has relied on relatively geriatric work for its analysis of the interaction of air with cladding, please explain why.

In 2000, the ACRS pointed out that the effects of nitrogen were not modeled by the NRC. To this date, MELCOR still does not model how nitrogen would effect fuel cladding in a spent fuel pool fire. That is one of the reasons why I submitted PRM-50-108.

Sincerely,

Mark Leyse

P.S. Please place this letter in ADAMS.

On Fri, May 13, 2016 at 10:13 AM, Doyle, Daniel <Daniel.Doyle@nrc.gov> wrote:

Mr. Leyse,

Here is the PDF. The notice is also available at the following link:

<https://federalregister.gov/a/2016-11212>

Sincerely,

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

From: Doyle, Daniel

Sent: Wednesday, May 11, 2016 5:08 PM

To: 'Mark Leyse' <markleyse@gmail.com>

Cc: Burnell, Scott <Scott.Burnell@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>

Subject: RE: Re: Status of PRM-50-108

Mr. Leyse,

Yes. I expect it to be available on Friday.

Sincerely,

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748

From: Mark Leyse [<mailto:markleyse@gmail.com>]

Sent: Wednesday, May 11, 2016 4:57 PM

To: Doyle, Daniel <Daniel.Doyle@nrc.gov>

Cc: Burnell, Scott <Scott.Burnell@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>

Subject: [External_Sender] Re: Status of PRM-50-108

Dear Mr. Doyle:

Would you please send me a PDF copy of the Federal Register notice when it's available?

Thank you,

Mark Leyse

On Tue, May 10, 2016 at 12:34 PM, Doyle, Daniel <Daniel.Doyle@nrc.gov> wrote:

Mr. Leyse,

The NRC has completed its evaluation of PRM-50-108, and a notice will be published in the *Federal Register* within the next few days. Also, you should receive very soon a letter signed by the Secretary of the Commission.

Sincerely,

Dan Doyle

Project Manager,

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

From: Doyle, Daniel

Sent: Friday, January 15, 2016 1:07 PM

To: 'markleyse@gmail.com' (markleyse@gmail.com) <markleyse@gmail.com>

Cc: Burnell, Scott <Scott.Burnell@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>;

Inverso, Tara <Tara.Inverso@nrc.gov>

Subject: Status of PRM-50-108

Mr. Leyse,

I am writing to provide an update on your letter dated June 19, 2014, in which you submitted a petition for rulemaking to the U.S. Nuclear Regulatory Commission (NRC). In your letter, you requested that the NRC develop new regulations requiring that (1) spent fuel pool (SFP) accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The NRC docketed your letter as petition for rulemaking (PRM) 50-108. A notice of docketing was published in the *Federal Register* on October 7, 2014 (79 FR 60383).

The NRC is evaluating the petition. Once the petition has been resolved, the NRC will publish a notice in the *Federal Register* explaining the NRC's finding. You will also receive a letter at that time notifying you of the action the NRC has taken. Please contact me at Daniel.Doyle@nrc.gov or (301) 415-3748 if you have any questions.

Sincerely,

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

From: Borges, Jennifer
Sent: 20 May 2016 10:56:24 +0000
To: Terry, Leslie; Bladley, Cindy
Subject: FW: Re: Re: Status of PRM-50-108
Attachments: response to email from petitioner.docx

Hello,

Attached is the staff proposed repose to Mr. Leyse's reaction on the denial of PRM-50-108.

Thank you,


Jennifer Borges


Regulations Specialist

Rules Team

ADM/DAS/RADB

Location: OWFN 12-G07

 301-415-3647

 jennifer.borges@nrc.gov

From: Doyle, Daniel

Sent: Wednesday, May 18, 2016 10:22 AM

To: Mizuno, Geary ; Borges, Jennifer ; Hernandez, Raul ; Esmaili, Hossein ; Casto, Greg ; Witt, Kevin

Subject: RE: Re: Re: Status of PRM-50-108

Here is my draft response to the petitioner for discussion on Friday.

Dan

From: Mizuno, Geary

Sent: Monday, May 16, 2016 10:40 AM

To: Doyle, Daniel <Daniel.Doyle@nrc.gov>; Borges, Jennifer <Jennifer.Borges@nrc.gov>; Hernandez, Raul <Raul.Hernandez@nrc.gov>; Esmaili, Hossein <Hossein.Esmaili@nrc.gov>; Casto, Greg <Greg.Casto@nrc.gov>; Witt, Kevin <Kevin.Witt@nrc.gov>

Subject: RE: Re: Re: Status of PRM-50-108

Dan:

The staff should be prepared at the meeting to:

(i) identify any new rationales in the request for reconsideration, and whether the request included a basis for these rationales. We will need this to accurately identify why these cannot be the basis for reconsideration.

(ii) identify any new technical considerations raised in the request for reconsideration that apply to the NRC's bases for denial. We will need this to accurately identify why these cannot be the basis for reconsideration.

From: Doyle, Daniel

Sent: Monday, May 16, 2016 10:00 AM

To: Mizuno, Geary <Geary.Mizuno@nrc.gov>; Borges, Jennifer <Jennifer.Borges@nrc.gov>; Hernandez, Raul <Raul.Hernandez@nrc.gov>; Esmaili, Hossein <Hossein.Esmaili@nrc.gov>; Casto, Greg <Greg.Casto@nrc.gov>; Witt, Kevin <Kevin.Witt@nrc.gov>

Subject: FW: Re: Re: Status of PRM-50-108

PRM-50-108 working group,

Please review the email from the petitioner below and the italicized guidance from our office instruction. I will add his email to ADAMS and regulations.gov. I will set up a meeting this week to discuss path forward.

Instances in which the Petitioner disagrees with the Commission's final decision may be presented to the PM in the form of a letter, email, fax or even a telephone call. The

Commission's rules regarding the 10 CFR 2.802 process do not provide for "reconsideration" of a decision, but the Petitioner may still want to respond to the NRC once he/she receives the letter informing the Commission's decision and rationale. If a written communication is submitted by the Petitioner, the PM needs to docket it and include it on regulations.gov. The PM must immediately consult OGC to determine appropriate actions to be taken. It is possible that the letter simply contains a statement disagreeing with the NRC, which would require no further action. However, the letter could raise new issues not previously considered by the NRC, which could be considered as a new PRM, or it could raise an allegation, which needs to be forwarded to the NRC Allegations team in a timely manner. If the communication is received via telephone, the PM should explain the NRC process to the Petitioner. The PM should encourage the Petitioner to submit the concern in writing so that it is docketed and that the NRC could take appropriate actions. As discussed above, immediately after receiving the call, the PM should consult with OGC for appropriate actions to be taken.

([link to guidance in office instruction](#))

Dan

From: Mark Leyse [<mailto:markleyse@gmail.com>]

Sent: Monday, May 16, 2016 6:59 AM

To: Doyle, Daniel <Daniel.Doyle@nrc.gov>; Mohseni, Aby <Aby.Mohseni@nrc.gov>

Cc: Burnell, Scott <Scott.Burnell@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>; Dave Lochbaum <dlochbaum@ucsusa.org>; Gordon Thompson <gthompson@irss-usa.org>; Matthew G. McKinzie <mmckinzie@nrdc.org>; Geoffrey Fettus <gfettus@nrdc.org>; Thomas B. Cochran <tcochran@nrdc.org>; Alemayehu, Bemnet <balemayehu@nrdc.org>; Ed Lyman <elyman@ucsusa.org>; Robert Alvarez <kitbob@erols.com>; Robert H. Leyse <Bobleyse@aol.com>; Paul Gallay <PGallay@riverkeeper.org>; Paul Gunter <paul@beyondnuclear.org>; Michel Lee <ciecplee@verizon.net>; Mary Lampert <mary.lampert@comcast.net>; CHAIRMAN Resource <CHAIRMAN.Resource@nrc.gov>; Valliere, Nanette <Nanette.Valliere@nrc.gov>; Moore, Johari <Johari.Moore@nrc.gov>; Patrick.Castlernan@nrc.gov; Frazier, Alan <Alan.Frazier@nrc.gov>; Cubbage, Amy <Amy.Cubbage@nrc.gov>; Bloomer, Tamara <Tamara.Bloomer@nrc.gov>; Krsek, Robert <Robert.Krsek@nrc.gov>; michal_freedhoff@markey.senate.gov; Diane Curran <dcurran@harmoncurran.com>

Subject: [External_Sender] Re: Re: Status of PRM-50-108

Dear Mr. Doyle:

Thank you for sending me the PDF.

The NRC's decision to deny PRM-50-108 seems to be based on **dogma**, rather than **science**. Your Federal Register notice doesn't even mention the April 2000 letter from Dana A. Powers, Chairman of the Advisory Committee on Reactor Safeguards, to Richard A. Meserve, Chairman of the NRC, stating, "that nitrogen from air depleted of oxygen will interact exothermically with zircaloy cladding."

The April 2000 letter says that "The [NRC] staff analysis of the interaction of air with cladding *has relied on relatively geriatric work*. Much more is known now about air interactions with cladding" [emphasis added]. That was 16 years ago! And since then the NRC has done nothing but persist in relying on geriatric work for its analyses of spent fuel pool accidents.

(Please see pages 3 and 4 of the April 2000 letter, available at:

<http://www.nrc.gov/docs/ML0037/ML003704532.pdf>)

I quoted from the the April 2000 letter on page 3 of my cover letter and on pages 5, 25, and 38 of PRM-50-108. (Please see PRM-50-108: <http://www.nrc.gov/docs/ML1419/ML14195A388.pdf>)

Dogma:

Here is an example of dogma from the NRC's Federal Register notice: "The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has been validated against experimental data, and it represents the current state of the art in severe accident analysis."

(Please see page 29764 of the Federal Register notice: <https://www.gpo.gov/fdsys/pkg/FR-2016-05-13/pdf/2016-11212.pdf>)

The NRC's claim is not supported by facts.

Science:

As I state on page 29 of PRM-50-108, the Paul Scherrer Institute recently assessed MELCOR 1.8.6's ability to predict fuel-cladding behavior in accidents involving air ingress into the reactor vessel—which is pertinent to MELCOR's ability to predict zirconium-air reaction rates in spent fuel pool fires—and “concluded that development of MELCOR was needed to *capture the accelerated cladding oxidation that can take place under air ingress conditions* (characterized by transition from formation of a protective oxide film to non-protective ‘breakaway’ oxidation at a significantly higher rate)” [emphasis added].

I request that the NRC reconsider its decision to deny PRM-50-108.

If there is a scientific foundation for denying PRM-50-108, please explain it.

If the ACRS was incorrect in 2000 that the NRC has relied on relatively geriatric work for its analysis of the interaction of air with cladding, please explain why.

In 2000, the ACRS pointed out that the effects of nitrogen were not modeled by the NRC. To this date, MELCOR still does not model how nitrogen would effect fuel cladding in a spent fuel pool fire. That is one of the reasons why I submitted PRM-50-108.

Sincerely,

Mark Leyse

P.S. Please place this letter in ADAMS.

On Fri, May 13, 2016 at 10:13 AM, Doyle, Daniel <Daniel.Doyle@nrc.gov> wrote:

Mr. Leyse,

Here is the PDF. The notice is also available at the following link:

<https://federalregister.gov/a/2016-11212>

Sincerely,

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

From: Doyle, Daniel

Sent: Wednesday, May 11, 2016 5:08 PM

To: 'Mark Leyse' <markleyse@gmail.com>

Cc: Burnell, Scott <Scott.Burnell@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>

Subject: RE: Re: Status of PRM-50-108

Mr. Leyse,

Yes. I expect it to be available on Friday.

Sincerely,

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

From: Mark Leyse [<mailto:markleyse@gmail.com>]

Sent: Wednesday, May 11, 2016 4:57 PM

To: Doyle, Daniel <Daniel.Doyle@nrc.gov>

Cc: Burnell, Scott <Scott.Burnell@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>

Subject: [External_Sender] Re: Status of PRM-50-108

Dear Mr. Doyle:

Would you please send me a PDF copy of the Federal Register notice when it's available?

Thank you,

Mark Leyse

On Tue, May 10, 2016 at 12:34 PM, Doyle, Daniel <Daniel.Doyle@nrc.gov> wrote:

Mr. Leyse,

The NRC has completed its evaluation of PRM-50-108, and a notice will be published in the *Federal Register* within the next few days. Also, you should receive very soon a letter signed by the Secretary of the Commission.

Sincerely,

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

From: Doyle, Daniel

Sent: Friday, January 15, 2016 1:07 PM

To: 'markleyse@gmail.com' (markleyse@gmail.com) <markleyse@gmail.com>

Cc: Burnell, Scott <Scott.Burnell@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>;

Inverso, Tara <Tara.Inverso@nrc.gov>

Subject: Status of PRM-50-108

Mr. Leyse,

I am writing to provide an update on your letter dated June 19, 2014, in which you submitted a petition for rulemaking to the U.S. Nuclear Regulatory Commission (NRC). In your letter, you requested that the NRC develop new regulations requiring that (1) spent fuel pool (SFP) accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The NRC docketed your letter as petition for rulemaking (PRM) 50-108. A notice of docketing was published in the *Federal Register* on October 7, 2014 (79 FR 60383).

The NRC is evaluating the petition. Once the petition has been resolved, the NRC will publish a notice in the *Federal Register* explaining the NRC's finding. You will also receive a letter at that time notifying you of the action the NRC has taken. Please contact me at Daniel.Doyle@nrc.gov or (301) 415-3748 if you have any questions.

Sincerely,

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

To: markleyse@gmail.com
Cc: Scott.Burnell@nrc.gov; Cindy.Bladey@nrc.gov

Subject: Status of PRM-50-108

Mr. Leyse,

In your email dated 5/16/2016, you requested that the NRC reconsider its decision to deny PRM-50-108. On 5/13/2016, the NRC published a *Federal Register* notice (81 FR 29761) that officially closed the docket for PRM-50-108. The Commission's denial in that notice constitutes a final action on your rulemaking petition. The NRC does not have a formal process for seeking reconsideration of a Commission action on a rulemaking petition. Although you may submit additional information on the Commission's denial for its consideration, the NRC is not obligated to consider that information or to provide you a response on such a submission. You may submit a new petition for rulemaking under Section 2.802 of Title 10 of the *Code of Federal Regulations* that contains the information you wish to submit to the NRC.

Sincerely,

Dan Doyle

Project Manager
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748

From: Borges, Jennifer
Sent: 20 May 2016 17:40:45 +0000
To: Terry, Leslie
Subject: FW: Redrafted form of response to email from Leyse
Attachments: response to email from petitioner rev 1.docx, [External_Sender] Re: Re: Status of PRM-50-108

Leslie,

Attached is the revised response. Based on the working group feedback during today's meeting, Dan added information regarding NAS's recommendations about spent fuel safety and security. The NRC published a [blog post](#) this morning in regards to NAS's report.

Thank you,

Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

Location: OWFN 12-G07



301-415-3647



jennifer.borges@nrc.gov

From: Doyle, Daniel

Sent: Friday, May 20, 2016 1:29 PM

To: Mizuno, Geary ; Esmaili, Hossein ; Borges, Jennifer ; Hernandez, Raul ; Casto, Greg ; Witt, Kevin

Subject: RE: Redrafted form of response to email from Leyse

Here is my revised response based on our discussion this morning and the [blog post](#). Please let me know if you have any concerns. I would like to send this today, if possible.

Dan

From: Mizuno, Geary

Sent: Wednesday, May 18, 2016 3:36 PM

To: Doyle, Daniel <Daniel.Doyle@nrc.gov>; Case, Michael <Michael.Case@nrc.gov>; Lund, Louise <Louise.Lund@nrc.gov>; Gavrilas, Mirela <Mirela.Gavrilas@nrc.gov>; Webber, Kimberly <Kimberly.Webber@nrc.gov>; Esmaili, Hossein <Hossein.Esmaili@nrc.gov>

Subject: Redrafted form of response to email from Leyse

The attached is what I had in mind as a starting point for discussion. The first paragraph is largely taken from the staff's draft letter.

Geary

Subject: Correspondence Regarding Denial of PRM-50-108

Dear Mr. Leyse:

You have not provided any new technical information or rationale in your e-mail. The U.S. Nuclear Regulatory Commission (NRC) considered the information in your petition about the capabilities of MELCOR and responded on page 29764 of the *Federal Register* notice (81 FR 29761; May 13, 2016).

The NRC does not have a formal process for seeking reconsideration of a Commission action on a petition for rulemaking. Therefore, the Commission's denial constitutes the final agency action. Although you may submit additional information on the Commission's denial for its consideration, the NRC is not obligated to consider that information or to provide you a response on such a submission.

Please note that the National Academy of Sciences (NAS) released a report today with recommendations about spent fuel safety and security. Our first look at the report did not identify any safety or security issues that would require immediate action by the NRC. Looking at all the available information, we remain confident that U.S. spent fuel is safely and securely stored. The report looks ahead to some areas that NAS believes warrant further study or action. We will evaluate the report and its recommendations to see if we need to take any further action in the long run. The staff plans to provide the Commission with its assessment of the NAS report later this year.

Sincerely,

Dan Doyle

Project Manager
U.S. Nuclear Regulatory Commission
daniel.doyle@nrc.gov
(301) 415-3748

From: Mark Leyse
Sent: 16 May 2016 06:58:48 -0400
To: Doyle, Daniel;Mohseni, Aby
Cc: Burnell, Scott;Bladey, Cindy;Dave Lochbaum;Gordon Thompson;Matthew G. McKinzie;Geoffrey Fettus;Thomas B. Cochran;Alemayehu, Bemnet;Ed Lyman;Robert Alvarez;Robert H. Leyse;Paul Gallay;Paul Gunter;Michel Lee;Mary Lampert;CHAIRMAN Resource;Valliere, Nanette;Moore, Johari;Patrick.Castlernan@nrc.gov;Frazier, Alan;Cubbage, Amy;Bloomer, Tamara;Krsek, Robert;michal_freedhoff@markey.senate.gov;Diane Curran
Subject: [External_Sender] Re: Re: Status of PRM-50-108

Dear Mr. Doyle:

Thank you for sending me the PDF.

The NRC's decision to deny PRM-50-108 seems to be based on **dogma**, rather than **science**. Your Federal Register notice doesn't even mention the April 2000 letter from Dana A. Powers, Chairman of the Advisory Committee on Reactor Safeguards, to Richard A. Meserve, Chairman of the NRC, stating, "that nitrogen from air depleted of oxygen will interact exothermically with zircaloy cladding."

The April 2000 letter says that "The [NRC] staff analysis of the interaction of air with cladding *has relied on relatively geriatric work*. Much more is known now about air interactions with cladding" [emphasis added]. That was 16 years ago! And since then the NRC has done nothing but persist in relying on geriatric work for its analyses of spent fuel pool accidents.

(Please see pages 3 and 4 of the April 2000 letter, available at: <http://www.nrc.gov/docs/ML0037/ML003704532.pdf>)

I quoted from the the April 2000 letter on page 3 of my cover letter and on pages 5, 25, and 38 of PRM-50-108. (Please see PRM-50-108: <http://www.nrc.gov/docs/ML1419/ML14195A388.pdf>)

Dogma:

Here is an example of dogma from the NRC's Federal Register notice: "The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has been validated against experimental data, and it represents the current state of the art in severe accident analysis."

(Please see page 29764 of the Federal Register notice: <https://www.gpo.gov/fdsys/pkg/FR-2016-05-13/pdf/2016-11212.pdf>)

The NRC's claim is not supported by facts.

Science:

As I state on page 29 of PRM-50-108, the Paul Scherrer Institute recently assessed MELCOR 1.8.6's ability to predict fuel-cladding behavior in accidents involving air ingress into the reactor vessel-which is pertinent to MELCOR's ability to predict zirconium-air reaction rates in spent fuel pool fires-and "concluded that development of MELCOR was needed to *capture the accelerated cladding oxidation that can take place under air ingress conditions* (characterized by transition from formation of a protective oxide film to non-protective 'breakaway' oxidation at a significantly higher rate)" [emphasis added].

I request that the NRC reconsider its decision to deny PRM-50-108.

If there is a scientific foundation for denying PRM-50-108, please explain it.

If the ACRS was incorrect in 2000 that the NRC has relied on relatively geriatric work for its analysis of the interaction of air with cladding, please explain why.

In 2000, the ACRS pointed out that the effects of nitrogen were not modeled by the NRC. To this date, MELCOR still does not model how nitrogen would effect fuel cladding in a spent fuel pool fire. That is one of the reasons why I submitted PRM-50-108.

Sincerely,

Mark Leyse

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On Fri, May 13, 2016 at 10:13 AM, Doyle, Daniel <Daniel.Doyle@nrc.gov> wrote:

Mr. Leyse,

Here is the PDF. The notice is also available at the following link:

<https://federalregister.gov/a/2016-11212>

Sincerely,

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

From: Doyle, Daniel

Sent: Wednesday, May 11, 2016 5:08 PM

To: 'Mark Leyse' <markleyse@gmail.com>

Cc: Burnell, Scott <Scott.Burnell@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>

Subject: RE: Re: Status of PRM-50-108

Mr. Leyse,

Yes. I expect it to be available on Friday.

Sincerely,

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

From: Mark Leyse [<mailto:markleyse@gmail.com>]

Sent: Wednesday, May 11, 2016 4:57 PM

To: Doyle, Daniel <Daniel.Doyle@nrc.gov>

Cc: Burnell, Scott <Scott.Burnell@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>
Subject: [External_Sender] Re: Status of PRM-50-108

Dear Mr. Doyle:

Would you please send me a PDF copy of the Federal Register notice when it's available?

Thank you,

Mark Leyse

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Mr. Leyse,

The NRC has completed its evaluation of PRM-50-108, and a notice will be published in the *Federal Register* within the next few days. Also, you should receive very soon a letter signed by the Secretary of the Commission.

Sincerely,

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

From: Doyle, Daniel
Sent: Friday, January 15, 2016 1:07 PM
To: 'markleyse@gmail.com' (markleyse@gmail.com) <markleyse@gmail.com>
Cc: Burnell, Scott <Scott.Burnell@nrc.gov>; Bladey, Cindy <Cindy.Bladey@nrc.gov>; Inverso, Tara <Tara.Inverso@nrc.gov>
Subject: Status of PRM-50-108

Mr. Leyse,

I am writing to provide an update on your letter dated June 19, 2014, in which you submitted a petition for rulemaking to the U.S. Nuclear Regulatory Commission (NRC). In your letter, you requested that the NRC develop new regulations requiring that (1) spent fuel pool (SFP) accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The NRC docketed your letter as petition for rulemaking (PRM) 50-108. A notice of docketing was published in the *Federal Register* on October 7, 2014 (79 FR 60383).

The NRC is evaluating the petition. Once the petition has been resolved, the NRC will publish a notice in the *Federal Register* explaining the NRC's finding. You will also receive a letter at that time notifying you of the action the NRC has taken.

Please contact me at Daniel.Doyle@nrc.gov or (301) 415-3748 if you have any questions.

Sincerely,

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

From: Borges, Jennifer
Sent: 21 Aug 2015 18:37:19 +0000
To: Terry, Leslie
Cc: DeJesus, Anthony
Subject: FW: Request for Review and Concurrence on PRM-50-108
Attachments: Congressional Letters PRM-50-108.docx, Letter to Petitioner PRM-50-108.docx, SECY PRM-50-108.docx, PRM 50-108 FRN ADM.docx

Leslie,

Attached is the denial package for PRM-50-108. Please review and provide concurrence. Concurrence is due by close of business on Friday, August 28th.

The incoming petition is available at:

[View ADAMS P8 Properties ML14195A388](#)

[Open ADAMS P8 Document \(PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents.\)](#)

Thanks,
Jennifer

From: Doyle, Daniel

Sent: Friday, August 07, 2015 3:44 PM

To: RidsNrrDss Resource; RidsNRRJLD Resource; RidsNroMailCenter Resource; RidsResOd Resource; Bladey, Cindy

Cc: McGinty, Tim; Anderson, Shaun; Casto, Greg; Greenleaf, Michael; Davis, Jack; Proffitt, Andrew; Bowman, Gregory; Witt, Kevin; Tracy, Glenn; Monninger, John; ODriscoll, James; Dias, Antonio; Hernandez, Raul; Case, Michael; Armstrong, Kenneth; Lee, Richard; Esmaili, Hossein; Terry, Leslie; Borges, Jennifer; Mizuno, Geary; Kokajko, Lawrence; Mohseni, Aby; Inverso, Tara; Tobin, Jennifer

Subject: Request for Review and Concurrence on PRM-50-108

Good afternoon,

I am requesting concurrence from NRR/DSS, NRR/JLD, NRO, RES, and ADM/RADB on the denial package for petition for rulemaking (PRM) 50-108. The package consists of a SECY paper, a *Federal Register* notice, the incoming petition, and a letter to the petitioner. A daily note and congressional letters are also included as background.

Requested action:

Please review and provide me with your concurrence by close of business on Friday, August 28. Links to the documents are provided below.

[View ADAMS P8 Properties ML14307A691](#)

[Open ADAMS P8 Package \(SECY-xx-xxxx Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations \(PRM-50-108\).\)](#)

[View ADAMS P8 Properties ML14307A891](#)

[Open ADAMS P8 Document \(Daily Note Regarding PRM-50-108: Annual Spent Fuel Pool Evaluations\)](#)

[View ADAMS P8 Properties ML14307A845](#)

[Open ADAMS P8 Document \(PRM-50-108 Annual Spent Fuel Pool Evaluations Congressional Letters\)](#)

Background: PRM-50-108 requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool accident scenarios. A working group was formed to evaluate the PRM. A petition review board met on May 27, 2015, and unanimously approved the working group's recommendation to deny the petition.

DPR Project Manager: Dan Doyle, NRR/DPR/PRMB, 415-3748

TAC: MF4673

Cognizant individuals:

| Name | Organization |
|-------------------|--------------|
| Michael Greenleaf | NRR/DSS |
| Greg Casto | NRR/DSS |
| Kevin Witt | NRR/JLD |
| Raul Hernandez | NRO/DSRA |
| Hossein Esmaili | RES/DSA |
| Jennifer Borges | ADM/RADB |

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

Comment [JLB]: Please use e-letterhead for these letters. ADM will transmit the package to SECY electronically.

The Honorable James M. Inhofe
Chairman, Committee on Environment
and Public Works
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

The U.S. Nuclear Regulatory Commission (NRC) is publishing the following document in the *Federal Register*:

- Title: Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents.
- Description: This *Federal Register* notice denies a petition for rulemaking (docketed as PRM-50-108) that requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes.
- Dates: The docket for the petition for rulemaking PRM-50-108 is closed on the date of publication.

For more information, see the enclosed document.

Please contact me at 301-415-1776 if you have questions or need more information.

Sincerely,

Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Senator Barbara Boxer

The Honorable Shelly Moore Capito
Chairman, Subcommittee on Clean Air
and Nuclear Safety
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

Dear Madam Chairwoman:

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Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Senator Thomas R. Carper

The Honorable Fred Upton
Chairman, Committee on Energy
and Commerce
United States House of Representatives
Washington, DC 20515

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Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Representative Frank Pallone, Jr.

The Honorable Ed Whitfield
Chairman, Subcommittee on Energy
and Power
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

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Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Representative Bobby L. Rush

The Honorable John Shimkus
Chairman, Subcommittee on Environment
and the Economy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC -20515

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Eugene Dacus, Director,
Office of Congressional Affairs.

Enclosure:
Federal Register notice

cc: Representative Paul Tonko

The Honorable John Shimkus
Chairman, Subcommittee on Environment
and the Economy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

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Enclosure:
Federal Register notice

cc: Representative Paul Tonko

IDENTICAL LETTERS SENT TO:

The Honorable James M. Inhofe with cc: to Senator Barbara Boxer

The Honorable Shelly Moore Capito with cc: to Senator Thomas R. Carper

The Honorable Fred Upton with cc: to Representative Frank Pallone, Jr.

The Honorable Ed Whitfield with cc: to Representative Bobby L. Rush

ADAMS Accession Nos: LTR: ML14307A845; FRN: ML14307A630

| OFFICE | NRR/DPR/PRMB/PM | NRR/DPR/PRMB/RS | NRR/DPR/PRMB/BC | NRR/DPR/DD |
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| DATE | 7/31/15 | | | |

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- 2 -

Comment [JLB]: Please use e-letterhead for these letters. ADM will transmit the package to SECY electronically.

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your letter dated June 19, 2014,¹ by which you submitted to the U.S. Nuclear Regulatory Commission (NRC) a petition for rulemaking (PRM). Specifically, you requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* on October 7, 2014 (79 FR 60383), and on www.regulations.gov under Docket ID NRC-2014-0171. The NRC did not request comments on the petition.

The NRC has considered the petition and the arguments raised therein. For the reasons stated in the enclosed *Federal Register* notice, your petition for rulemaking is denied.

In summary, the NRC has concluded that the information that would be reported to the NRC as requested by the petition is not necessary for effective NRC regulatory decisionmaking with respect to spent fuel pools. The current design and licensing requirements for spent fuel provide adequate protection of public health and safety.

This petition is considered closed. Any questions you may have regarding this matter should be directed to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

¹ Agencywide Documents Access and Management System (ADAMS) Accession No. ML14195A388.

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your letter dated June 19, 2014,² by which you submitted to the U.S. Nuclear Regulatory Commission (NRC) a petition for rulemaking (PRM). Specifically, you requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* on October 7, 2014 (79 FR 60383), and on www.regulations.gov under Docket ID NRC-2014-0171. The NRC did not request comments on the petition.

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Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

ADAMS Accession Nos: PKG: ML14307A691; LTR to Petitioner: ML14307A157; FRN: ML14307A630

*Concurrence via email

| OFFICE | NRR/DPR/PRMB/PM | NRR/DPR/PRMB/RS | NRR/DPR/PRMB/BC | NRR/DPR/PRMB/DD | NRR/DPR/D |
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| NAME | DDoyle | GLappert | Tinverso | AMohseni | LKokajko (AMohseni for) |
| DATE | 7/14/2015 | 7/16/2015 | 7/17/2015 | 7/27/2015 | 7/31/2015 |
| OFFICE | NRR/DSS/D | NRR/JLD/D | RES/D | NRO/D | ADM/DAS/RADBBC |
| NAME | TMcGinty | JDavis | Bsheron | GTracy | CBladey |
| DATE | | | | | |
| OFFICE | OGC/GCLR/RMR | NRR/D | EDO | | |
| NAME | MSpencer | WDean | MSatorius | | |
| DATE | | | | | |

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² Agencywide Documents Access and Management System (ADAMS) Accession No. ML14195A388.

FOR: The Commissioners

FROM: Mark A. Satorius
Executive Director for Operations

SUBJECT: DENIAL OF PETITION FOR RULEMAKING (PRM-50-108)

PURPOSE:

To obtain Commission approval to publish a *Federal Register* notice (Enclosure 1) denying a petition for rulemaking (PRM) submitted by Mr. Mark Edward Leyse (the petitioner). This paper does not address any new commitments or resource implications.

BACKGROUND:

The petitioner filed the petition for rulemaking (PRM-50-108) on June 19, 2014 with the U.S. Nuclear Regulatory Commission (NRC) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14195A388) (Enclosure 2). The petition requests that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC published a notice of docketing in the *Federal Register* on October 7, 2014 (79 FR 60383).

CONTACT: Daniel I. Doyle, NRR/DPR
301-415-3748

DISCUSSION:

The Petition

The specific issues raised by the petitioner are:

PRM Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petition states that a long-term station blackout can happen in multiple ways, and a loss of SFP cooling and a SFP fire is a likely outcome. The petition argues that this is a sufficient basis for the requested regulations.

The NRC staff disagrees. Numerous evaluations have shown that the risk of a SFP fire is low. There are multiple layers of protection to prevent uncovering of spent fuel and the potentially resulting fire.

PRM Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petition states that the purpose of the evaluations would be to keep the NRC informed of potential consequences.

The NRC staff disagrees. The SFP safety is provided by: conservative design of the SFP; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of the NRC's approach for providing SFP safety.

PRM Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petition states that there are serious flaws with MELCOR, and, therefore, MELCOR is not currently sufficient for use in the requested annual SFP evaluations.

The NRC staff disagrees. Updated computer modeling of SFP accidents is not needed for SFP accident evaluations or for mitigative response by the licensee. Normal, off-normal, and mitigative response use appropriate assumptions.

The Commissioners

3

RECOMMENDATION:

That the Commission:

1. Approve the denial of the petition for rulemaking and publication of the *Federal Register* notice (Enclosure 1) announcing the denial;
2. Inform appropriate Congressional committees; and
3. Note that a letter is attached for the Secretary's signature (Enclosure 3), informing the petitioner of the Commission's decision on the petition.

COORDINATION:

The Office of the General Counsel has no legal objection to the denial of this petition.

Mark A. Satorius
Executive Director
for Operations

Enclosures:

1. *Federal Register* notice
2. Incoming Petition
3. Letter to the Petitioner

The Commissioners

4

RECOMMENDATION:

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Mark A. Satorius
Executive Director
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1. *Federal Register* notice
2. Incoming Petition
3. Letter to the Petitioner

ADAMS Accession Nos: PKG: ML14307A691, SECY: ML14307A134, FRN: ML14307A630, Petition: ML14195A388, LTR to Petitioner: ML14307A157, Daily Note: ML14307A891 *via email

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| DATE | | | | | | |
| OFFICE | EDO | | | | | |
| NAME | MSatorius | | | | | |
| DATE | | | | | | |

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NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM) dated June 19, 2014, submitted by Mr. Mark Edward Leyse (the petitioner). The petition requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking or for public safety or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may access publicly-available information related to this petition by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search on the petition Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

Comment [JLB]: I added place holders for the documents that did not list the ADAMS Accession No.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):**
You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "ADAMS Public Documents" and then select "Begin Web-Based ADAMS Search." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdf.resource@nrc.gov. [The ADAMS accession number for each document referenced in this document (if that document is available in ADAMS) is provided the first time that a document is referenced.] In addition, for the convenience of the reader, the ADAMS accession numbers are provided in a table in Section V, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

- I. The Petition.
- II. Reasons for Denial.
- III. Determination of the Petition.

IV. Conclusion.

V. Availability of Documents.

I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. On June 19, 2014 (ADAMS Accession No. ML14195A388), the NRC received a petition for rulemaking (~~ADAMS Accession No. ML14195A388~~) from Mr. Mark Edward Leyse, and assigned it Docket No. PRM-50-108. The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) spent fuel pool (SFP) accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petition referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petition stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petition asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR indicates. The petition stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petition claimed that the new regulations would help improve public and plant-worker safety. The petition asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petition stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petition stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petition stated that the requested regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC's understanding of the overall argument in the PRM is:

- Since the probability of the types of events that could lead to SFP accidents is relatively high (PRM Issue 1), the NRC should require licensees to perform annual SFP severe accident safety evaluations (PRM Issue 2). The safety evaluations should use conservative computer models, and MELCOR is not currently sufficient (PRM Issue 3).

The NRC addresses these issues in the following section.

II. Reasons for Denial.

NRC Technical Evaluation

The requested regulations are not necessary. The first three requested regulations would establish requirements for how the detailed annual evaluations in the fourth requested regulation should be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the probability of a SFP severe accident is very low, and, therefore, the risk of a SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate a SFP accident. The petition describes multiple ways that an extended loss of offsite electrical power could occur and how this could lead to a SFP fire. In order for a SFP fire to occur, all SFP systems, backup systems, and operator actions would have to fail to prevent the spent fuel in the pool from being uncovered. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose as requested by the petition because the requested annual evaluations are not needed for regulatory

decisionmaking. The NRC recognizes that the consequences of a SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

The following discussion~~remainder of Section II~~ provides the NRC's detailed responses to the primary arguments in the petition.

PRM Issue 1. The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petition claimed that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petition stated that a SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petition notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petition also provided several examples of events that could lead to a long-term station blackout and ultimately a SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

PRM Issue 1. NRC Technical Evaluation.

Spent nuclear fuel offloaded from a reactor is initially stored in a SFP. The SFPs at all nuclear plants in the United States are extremely robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal,

and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25 feet of water, which provides passive cooling as well as radiation shielding as a result of the significant volume of water above the spent fuel. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage. As spent fuel cools, older fuel is sometimes removed from a plant's SFP for on-site dry cask storage, depending on the space available in the SFP. Fuel removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure. They are monitored and routinely inspected for integrity, and they are protected by security measures.

Studies conducted over the last four decades have consistently shown that the probability of an accident causing a zirconium fire in a SFP to be lower than that for severe reactor accidents. The risk of a SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools," (ADAMS Accession No. MLXXXXXX), in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment. The risk assessment and cost-benefit analyses developed through this effort, NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools," Section 6.2 (ADAMS Accession No. MLXXXXXXXX), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (August 21, 1986; 51 FR-ER 30028) and that no new regulatory requirements were warranted.

The risk of a SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants," (ADAMS Accession No. MLXXXXXXXXX), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, a SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even when all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in a SFP zirconium fire, the study found the risk of a SFP fire to be low and well within the Commission's Safety Goals.

In light of the changes in storage configuration of the SFP (increased to high density racks), inadvertent partial draindown events, as well as monumental events such as the September 11, 2001, terrorist attacks and the 2011 accident at the Fukushima Dai-ichi nuclear power plant, the NRC continues to examine the issue of spent fuel pool SFP safety. Recently, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel," (ADAMS Accession No. MLXXXXXXXXX), which considered a broad history of the NRC oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor." (MLXXXXXXXXX). The COMSECY-13-0030, concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action need not to be pursued in SRM-COMSECY-13-0030.

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk of a SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC has taken extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events:" (ADAMS Accession No. MLXXXXXXXXXX). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance establishes additional mechanisms for mitigating a loss of SFP cooling water beyond ~~that currently required by requirements in 10 CFR 50.54(hh)(2)§ 50.54(hh)(2)~~, such as installing a remote connection for SFP make-up water that can be accessed away from the SFP refueling floor.

As supported by numerous evaluations referenced in this notice, the NRC has determined that the probability of a SFP severe accident is very low, and, therefore, the risk of a SFP severe accident is low. While the risk of a severe accident in a SFP is not negligible, the

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378) and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's approach for providing SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96 (December 18, 2012; 77 FR 74788), which has been accepted for consideration in the rulemaking process.²

PRM Issue 2. Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petition stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

PRM Issue 2. NRC Technical Evaluation.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and for license amendment requests and provides ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate a SFP accident or provide information that is necessary for regulatory decisionmaking.

² See the *Federal Register* notice published on December 18, 2012 (77 FR 74788).

The annual licensee SFP safety evaluations and its results information proposed to be provided to the NRC is not needed for the effectiveness of the NRC's approach for providing SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's final safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any changes considered by a licensee to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in §10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. The NRC resident inspectors are permanently stationed on-site to provide monitoring and inspection of routine and special activities. They are aware of and routinely observe spent fuel pool activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees to an NRC order or change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects in and failures to conform with the NRC requirements with respect to basic components, which includes spent fuel pools and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as

necessary with respect to defects and failures to conform. The NRC is also informed of the events and conditions at nuclear power plants, as set forth in sections §§ 50.72 and 50.73. Depending upon the nature of the event or condition, the nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant and licensee as having a significant implication for public health and safety or common defense and security, must be reported to the NRC within two days of the applicant's or licensee's identification of the information.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to spent fuel pools:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident require redundant equipment and strategies to address loss of cooling to ~~spent fuel pools~~ SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.

It is unclear how the annual evaluations requested in the petition would provide information that is necessary for regulatory decisionmaking. The evaluations requested in the

petition postulate scenarios in which the normal cooling systems have failed, the backup cooling methods have failed, and the mitigation strategies have all also failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent fuel uncovering, the information that would be obtained from the proposed requirement in the petition does not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to spent fuel pools SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of spent fuel pools.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

PRM Issue 3. MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petition requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in PRM Issue 2. The petition claims that there are serious flaws with MELCOR that has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

PRM Issue 3. NRC Technical Evaluation.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in PRM Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to

establish requirements for how the evaluation should be conducted. Furthermore, the NRC disagrees with the petition's claims that MELCOR is flawed. Updated computer modeling of SFP accidents is not needed for SFP accident evaluations or for mitigative response by the licensee. Normal, off-normal, and mitigative response use appropriate assumptions.

The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition for rulemaking PRM-50-108, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request for a new requirement for licensees to perform annual evaluations of SFP spent fuel pools. The petition's requests to address perceived deficiencies in current severe accident models go hand-in-hand with the petition's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in PRM Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC is providing the following information about how MELCOR is used and the NRC's views on some of the phenomena discussed in the petition.

The petition claimed that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petition also claims that MELCOR under-predicts the zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petition claims, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petition pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.

MELCOR is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. MELCOR has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation as discussed later in this section.

The MELCOR code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as, otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., "zirconium fire") occurs. A self-sustaining zirconium fire will develop if the heat-generation rate from reaction with oxidant exceeds the heat-loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a zirconium fire will occur.

Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher oxygen potentials, the presence of any measurable amount of oxidant in the gas attacking the cladding is sufficient to prevent the formation of surface ZrN. Further, if ZrN does form it can be converted readily to ZrO_2 when exposed to oxidant. The heat generation from the reaction of cladding to form ZrN followed by oxidation of the ZrN to form ZrO_2 is essentially the same as the direct reaction of Zr to form ZrO_2 . This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in the petition. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre- to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.

Comment [JLB]: spell first time.

With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS B9R), these phenomena are well understood and recognized in the formulations of

models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a spent fuel pool. The code assessment against zirconium fire experiments conducted at Sandia National Laboratory (SNL) and code-to-code comparison documented in NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident," (ADAMS Accession No. MLXXXXXXXXXX), address fire propagation phenomena.

The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846. MELCOR was used in the zirconium fire experiments (see NUREG/CR-7143) and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code-to-code comparisons) as well as the spent fuel pool study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.

The recent OECD/NEA Sandia Fuel Project provided experimental data relevant for hydraulic and ignition phenomena of prototypic pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petition asserts that the SNL SFP accident experiments are unrealistic because they were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new

fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100 micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.

The important question for an analysis is if the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the spent fuel pool study (NUREG-2161), ~~"Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor"~~ is devoted to discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multiunit or concurrent accident, fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on spent fuel pool study insights for the boiling-water reactors with Mark I and II containment, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates. The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volumes 1 and Volume 2 (ADAMS Accession No. MLXXXXXXXXXX)) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 feet above the top of the fuel in the pool, ~~therefore, re~~by encompassing the effects of some of the phenomena mentioned by the petition.

In summary, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP evaluations requested in PRM Issue 2 are not necessary for regulatory decisionmaking. The NRC has considered the most important phenomena, and continues to improve the models to further reduce the uncertainties.

III. Determination of the Petition.

Comment [JLB]: This title will change upon publication of the 2.803 final rule.

The NRC does not believe that the information that would be reported to the NRC as requested by the petition is necessary for effective NRC regulatory decisionmaking with respect to spent fuel pools. As discussed in Section II, Reasons for Denial, of this notice, the NRC does not believe that the arguments raised by the petition warrant changing the current regulations. The NRC continues to conclude that the current design and licensing requirements for spent fuel pools provide adequate protection of public health and safety. For these reasons, the NRC declines to undertake rulemaking to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool accident scenarios. Accordingly, the NRC is denying PRM-50-108 in accordance with § 10 CFR 2.803,

"Determination of petition."

IV. Conclusion.

For the reasons cited in this document, the NRC is denying PRM-50-108. The petition failed to present any significant new information or arguments that would warrant the requested amendments. The NRC elected not to request public comment on PRM-50-108, because the NRC determined that it had enough information to evaluate the requests in the petition; accordingly, there were no public comments on this petition.

V. Availability of Documents.

The following table provides information on how to access the documents referenced in this document. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-----------------|--|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |

| | | |
|-------------------|---|-------------|
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| March 2013 | NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident." | ML13072A056 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |

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|--------------------------------|---|-------------|
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| October 7, 2 , 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 2015.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

| | | |
|-----------------|---|-------------|
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Comment [JLB]: Make conforming changes to this page.

Dated at Rockville, Maryland, this day of , 2015.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

ADAMS Accession Nos: PKG: ML14307A691; FRN: ML14307A630

*via email

| | | | | | |
|--------|-----------------|-----------------|-----------------|-----------------|---------------------------------|
| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D |
| NAME | DDoyle | GLappert | TInverso | AMohseni | LKokajko (AMohseni for) |
| DATE | 7/14/2015 | 7/16/2015 | 7/17/2015 | 7/27/2015 | 7/31/2015 |
| OFFICE | NRR/DSS:D | NRR/JLD:D | RES:D | NRO:D | ADM/DAS/RADB:BC Tech Editing |
| NAME | TmcGinty | Jdavis | BSheron | GTracy | CBladey |
| DATE | | | | | |
| OFFICE | OGC/GCLR/RMR | NRR:D | EDO | | |
| NAME | MSpencer | WDean | MSatorius | | |
| DATE | | | | | |

OFFICIAL RECORD COPY

From: Doyle, Daniel
Sent: 23 Feb 2016 11:35:35 -0500
To: Mizuno, Geary;Borges, Jennifer;Hernandez, Raul;Esmaili, Hossein;Casto, Greg;Witt, Kevin
Cc: Mohseni, Aby
Subject: FW: Request for Vote - SECY-15-0146 (Denial of PRM - Spent Fuel Pool Severe Accident Evaluations)
Attachments: 15-0146 notice KLS.docx

FYI. If Commissioner Svinicki does not vote on PRM-50-108 or request an extension by COB Thursday, it will be presumed that she is not participating in this action. Also, the Chairman's office stated that the Chairman's vote only includes comments on the FRN.

Dan

From: Ellmers, Glenn
Sent: Tuesday, February 23, 2016 8:36 AM
To: SECYOPS_Reactors
Cc: SECYOPS_Admin_Assist ; Doyle, Daniel
Subject: Request for Vote - SECY-15-0146 (Denial of PRM - Spent Fuel Pool Severe Accident Evaluations)
Addressed to Commissioner Svinicki.

February 23, 2016

MEMORANDUM TO: Commissioner Svinicki
FROM: Annette L. Vietti-Cook, Secretary */RA/*
SUBJECT: SECY-15-0146 – DENIAL OF PETITION FOR RULEMAKING
REQUESTING AMENDMENTS REGARDING SPENT FUEL
POOL SEVERE ACCIDENT EVALUATIONS (PRM-50-108; NRC-
2014-0171)

The status of the subject paper is as follows:

- The period for Commissioner comments has expired.
- A majority of the Commission has provided views.

Chairman Burns – approved with comments – 02/22/16
Commissioner Ostendorff – approved with comments – 01/07/16
Commissioner Baran – approved with comments – 02/18/16

Your vote on this staff paper within three business days indicating your views would be appreciated. The Secretary will honor a request for extension of time submitted within the three business day period, if needed. Extensions of voting time are normally limited to five business days. Any extension after the initial request can be granted unless a majority of the Commission objects. If you have not responded by COB Thursday, February 25, 2016 it will be presumed that, in accordance with the Commission's rules of procedure, you are not participating in this action.

cc: Chairman Burns
Commissioner Ostendorff
Commissioner Baran

From: Doyle, Daniel
Sent: 15 Jan 2015 17:03:25 -0500
To: Hernandez, Raul; Esmaili, Hossein; Greenleaf, Michael; Witt, Kevin; Mizuno, Geary; Borges, Jennifer
Subject: FW: Responses to Questions
Attachments: Input on SFP protective features.docx

FYI! Mike provided this input in response to the questions I included in the draft FRN for PRM-50-108 on pages 9 and 11. We will discuss the plan for the next revision at the working group meeting.

Thanks,

Dan

From: Greenleaf, Michael
Sent: Thursday, January 15, 2015 2:50 PM
To: Doyle, Daniel
Cc: Casto, Greg
Subject: Responses to Questions

Dan,

Attached is my input for the petition for rulemaking. Steve Jones fact checked and provided input.

Thanks,

Mike

Michael C. Greenleaf, PhD
General Engineer (NSPDP)
NRR/DSS/SBPB

Rm. O11G11 / Mailstop O10F04
301.415.1023 (w)
904.540.3063 (m)

1) Insert a discussion of the initial licensing process as it relates to SFPs.

a) What are the applicable requirements and guidance?

- i) Section 182a of Atomic Energy Act requires TSs included as part of the license.
- ii) By Title X Code of Federal Regulations some of the requirements and guidance of the licensing process are as follows:
 - 10 CFR 50 (Construction Permits, Operating License)
 - 10 CFR 50.34 requires PSAR with construction permit
 - Evaluate: major structures, systems, and components.
 - Adhere to GDC or show protection (pre-GDC)
 - Design basis accident analysis (10 CFR 50.34(a)(4)).
 - 10 CFR 50.36 requires applicants to provide proposed technical specifications (TSs). These TSs will include safety limits, limiting safety system settings, and limiting control settings. These TSs are the same TSs operating reactors operate by.
 - 10 CFR 50.57 provides guidelines for the issuance of an operating license after construction has been completed within conformity of the construction permit and application. This further requires the facility to operate in conformity to the application.
 - Once a license has been issued, 10 CFR 50.59 limits the capability of licensees to change the parameters of their license without prior NRC approval.
 - 10 CFR 50.68 provides regulation on SFP criticality prevention measures.
 - 10 CFR 52 (Early Site Permit, Standard Design Certifications, Combined Licenses)
 - 10 CFR 52.12 requires:
 - Site safety analysis report
 - An environmental report.
 - 10 CFR 52.47 requires the application to contain:
 - Final Safety Analysis Report (FSAR) presenting the design bases and limits on its operation.
 - Part 52 requires TSs and much the same requirements of a Part 50 license.

b) What information do applicants submit about the SFP when they are applying for a construction permit/operating license/combined license?

See the outline in 1(a).

c) What does the NRC look for specifically during its review of the SFP portion of those applications?

NRC specifically looks at the SAR written by the licensee and compares it against the acceptance criteria derived from the General Design Criteria and other regulatory requirements. Regulatory Guides and Standard Review Plans include accepted methods of satisfying the GDC and applicable regulations.

d) What accidents do licensees have to design against or evaluate?

The licensee has to meet general design criteria (GDC) requirements including:

1. Protection against natural phenomena and equipment failures (GDC 2 and 4)
2. Prevent a substantial loss of coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61)
3. Prevent criticality of the spent fuel (GDC 62)
4. Adequately monitor the SFP conditions for loss of decay heat removal and radiation (GDC 63).

e) Can we/should we provide specific examples of NRC safety evaluations?

No. Not needed.

2) It is unclear how the annual evaluations requested in the petition would provide information that is necessary for regulatory decision making.

a) Why is it unclear?

It is not unclear. Annual evaluations requested in this petition will not provide previously unknown information needed for regulatory decision making. The proposed evaluations would serve no benefit to the licensee, the NRC, or the general public in the event of an accident (design basis or otherwise). Current regulations in place are sufficient.

b) Would the requested annual evaluations tell us something that we don't already know?

No.

c) If they wouldn't, please explain.

Reconfiguration of SFP is done by licensee and is done in such a way as to ensure the licensee does not deviate from key aspects of the safety analysis. Certain SFP design features and operating conditions that either prevent accidents (criticality and pool drainage) or mitigate the effects of accidents (water level to contain release from fuel handling accident) are required by technical specifications. The plant TSs also require procedures addressing normal operations, maintenance, and responses to abnormal/alarm conditions providing a basis to ensure the licensee does not allow the SFP to boil off or allow the spent fuel to achieve criticality. These measures provide assurance that SFP storage remains within acceptable bounds.

The SFP meets GDC requirements in a variety of ways including preventing inadvertent drainage of the SFP, as well as providing reliable cooling and makeup systems, and monitoring instrumentation. This has provided an acceptable level of safety (as demonstrated by numerous studies) and has provided an adequate basis for regulatory decision making for design basis accidents.

That said, even in the extremely unlikely event that a beyond design basis accident were to occur with diminishing coolant inventory, required mitigation strategies (10 CFR 50.54(hh)(2) and Post-Fukushima Mitigating Strategies Order EA-12-049) developed by the licensee with NRC review and approval are in place to maintain an alternative source of coolant injection into the SFP before the fuel were to become uncovered.

d) If they would, please explain why we don't need this information for effective regulatory decision making.

N/A.

From: Borges, Jennifer
Sent: 6 Oct 2014 16:00:02 +0000
To: Doyle, Daniel
Subject: FW: SCHEDULED: Document Number - 2014-23949 Publication Date: 10-07-2014

-----Original Message-----

From: Notice_Publish Resource
Sent: Monday, October 06, 2014 11:44 AM
To: Borges, Jennifer
Subject: FW: SCHEDULED: Document Number - 2014-23949 Publication Date: 10-07-2014

Hi Dan,

The FRN is scheduled for publication. See below for more information.

-Jennifer

-----Original Message-----

From: Brooks, Edward B. (Brad) [<mailto:ebrooks@gpo.gov>]
Sent: Friday, October 03, 2014 11:24 AM
To: Notice_Publish Resource
Subject: SCHEDULED: Document Number - 2014-23949 Publication Date: 10-07-2014

Attention : Cindy Bladey

Document 2014-23949, Category PROPOSED RULES, has been scheduled to publish on 10-07-2014.

This document will be placed on public inspection on 10-06-2014 08:45:00.

The subject of this document is Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents.

The Agency Id is Docket No. PRM-50-108; NRC-2014-0171, CFR Title is 10, CFR Part is 50.

The RIN is NA.

This document has an effective date of .

The comments due date is .

The separate part # for this document is NA.

From: Notice_Publish Resource
Sent: 11 May 2016 06:01:57 -0400
To: Doyle, Daniel
Cc: Borges, Jennifer
Subject: FW: SCHEDULED: Document Number - 2016-11212

Dan,
The FRN for PRM-50-108 will be published on 5/13/2016.
a

From: noreply@fedreg.gov [mailto:noreply@fedreg.gov]

Sent: Tuesday, May 10, 2016 3:54 PM

To: Notice_Publish Resource

Cc: KGILES@GPO.GOV

Subject: [External_Sender] SCHEDULED: Document Number - 2016-11212

Please do not reply directly to this e-mail. If you have any questions or comments regarding this email, please contact Kent Giles.

Attention : Cindy Bladey, (NRC) Nuclear Regulatory Commission

Document 2016-11212, Category RULES has been scheduled to publish on 05-13-2016.
This document will be placed on public inspection on 05-12-2016 08:45:00.

The subject of this document is Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents.
The submitting Agency is (NRC) Nuclear Regulatory Commission.
The Docket Id is Docket Nos. PRM-50-108; NRC-2014-0171.

Agency/CFR Title/CFR Part:

(NRC) Nuclear Regulatory Commission, CFR Title is 10, CFR Part is 50

From: Doyle, Daniel
Sent: 14 Dec 2015 12:53:01 -0500
To: Mizuno, Geary;Borges, Jennifer;Hernandez, Raul;Esmaili, Hossein;Casto, Greg;Witt, Kevin
Cc: Inverso, Tara
Subject: FW: SECY-15-0146 - PRM 50-108
Attachments: SP-15-0146_Encl 1 WCO Edits.docx

Please see the request below from Amy Cubbage and let me know if you have questions or concerns with the edits. I will consolidate any feedback and provide it via OEDO. I would like to get the feedback by 1pm tomorrow (Tuesday) if possible.

Thanks,
Dan

From: Cubbage, Amy
Sent: Monday, December 14, 2015 12:02 PM
To: Doyle, Daniel
Cc: Krsek, Robert; Gilles, Nanette; Castleman, Patrick; Inverso, Tara; Dudek, Michael; Mohseni, Aby; Kokajko, Lawrence
Subject: RE: SECY-15-0146 - PRM 50-108

Thanks Dan – I have incorporated reference to this info in the attached draft revised FRN. Please let me know asap if the staff has any questions or concerns with the language I have inserted/deleted.

From: Doyle, Daniel
Sent: Friday, December 11, 2015 10:52 AM
To: Cubbage, Amy <Amy.Cubbage@nrc.gov>
Cc: Krsek, Robert <Robert.Krsek@nrc.gov>; Gilles, Nanette <Nanette.Gilles@nrc.gov>; Castleman, Patrick <Patrick.Castleman@nrc.gov>; Inverso, Tara <Tara.Inverso@nrc.gov>; Quichocho, Jessie <Jessie.Quichocho@nrc.gov>; Dudek, Michael <Michael.Dudek@nrc.gov>; Mohseni, Aby <Aby.Mohseni@nrc.gov>; Kokajko, Lawrence <Lawrence.Kokajko@nrc.gov>
Subject: RE: SECY-15-0146 - PRM 50-108

Amy,

The NRC has already responded to similar concerns about MELCOR in the Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel (NUREG-2157).

- See comment D.2.39.18 and the NRC's response on pages D-436 to D-438 in ML14196A107.

- See comment D.2.39.24 and the NRC's response on pages D-444 to D-446 in ML14196A107.

The NRC has also responded to similar concerns in the Consequence Study (NUREG-2161).

- See comment #74 from Mark Kelly and the NRC's response on page E-30 in ML14255A365.

- See comment #83 from Harmon et al. and the NRC's response on pages E-34 and E-35 in ML14255A365.

Dan

From: Cubbage, Amy
Sent: Friday, December 11, 2015 10:26 AM
To: Doyle, Daniel
Cc: Krsek, Robert; Gilles, Nanette; Castleman, Patrick
Subject: SECY-15-0146 - PRM 50-108

Dan – as we discussed the other day, our office is concerned about the level of detail in response to issue 3 (MELCOR). Are there other publicly available documents I could insert as a reference rather than the detail provided in the draft FRN?

Thanks,

Amy

NUCLEAR REGULATORY COMMISSION**10 CFR Part 50****[Docket Nos. PRM-50-108; NRC-2014-0171]****Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents**

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):**
You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search.](#)" For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

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I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of:

postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR indicates. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner ~~claimed~~ stated that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested

regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations in the fourth requested regulation should be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of a SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for regulatory

decisionmaking, and the evaluations would not prevent or mitigate a SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to a SFP fire. In order for a SFP fire to occur, all SFP systems, backup systems, and operator actions would have to fail to prevent the spent fuel in the pool from being uncovered. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose as requested by the petitioner because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of a SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner ~~claimed~~stated that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that a SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and ultimately a SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in a SFP. The SFPs at all nuclear plants in the United States are extremely robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding as a result of the significant volume of water above the spent fuel. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage. ~~As spent fuel cools, older fuel is sometimes removed from a plant's SFP for on-site dry cask storage, depending on the space available in the SFP. Fuel removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure. They are monitored and routinely inspected for integrity, and they are protected by security measures.~~

Studies conducted over the last four decades have consistently shown that the risk of an ~~probability of an~~ accident causing a zirconium fire in a SFP to be lower than that for severe reactor accidents. The risk of a SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools", in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit

analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (August 21, 1986; 51 FR 30028) and that no new regulatory requirements were warranted.

The risk of a SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, a SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. ~~Even when all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in a SFP zirconium fire, t~~Even with these conservatisms, the study found the risk of a SFP fire to be low and well within the Commission's Safety Goals.

In light of the changes in storage configuration of the SFP (increased to high density racks), inadvertent partial draindown events, as well as monumental events such as the September 11, 2001, terrorist attacks and the 2011 accident at the Fukushima Dai-ichi nuclear power plant, the NRC continues to examine the issue of SFP safety. Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire. (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of

and, accordingly, the risk of a SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

~~Recently, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). The COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).~~

~~Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk of a SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.~~

Following the 2011 accident at Fukushima Dai-ichi, the NRC has taken extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS

Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

Also, in 2014, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). The COMSECY-13-0030 concluded that SFPs are robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of a SFP severe accident is low. While the risk of a severe accident in a SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

maintain cooling capability; mitigation measures if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (December 18, 2012; 77 FR 74788) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and for license amendment requests and provides ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate a SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and its results proposed to be provided to the NRC is are not needed for the effectiveness of the NRC's approach for ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's final safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. The NRC resident inspectors are permanently stationed on-site to provide monitoring and inspection of routine and special activities. They are aware of and routinely observe SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees to an NRC order or change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects in and failures to conform to the NRC requirements with respect to basic components, which includes SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and failures to conform. The NRC is also informed of the events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the

nature of the event or condition, the nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant and licensee as having a significant implication for public health and safety or common defense and security, must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident require redundant equipment and strategies to address loss of cooling to SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.

~~It is unclear how t~~The annual evaluations requested in the petition would not provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would

ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent fuel uncover, the information that would be obtained from the proposed requirement in the petition does not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2. The petitioner ~~claimed-stated~~ that there are serious flaws with MELCOR which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how the evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's ~~claims-concerns~~ that MELCOR is flawed.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis and has been validated against experimental data. The MELCOR computer code represents the current state of the art in severe accident analysis. In SECY-13-0112, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor", Enclosure 1, the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment, core relocation to the vessel lower head, and ex-vessel core concrete interaction." Further, MELCOR has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

Further information about the capabilities of the MELCOR code to model spent fuel pool accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor," (ADAMS Accession Number ML14255A365, see comment #74 from Mark Kelly and the NRC's response on page E-30 and comment #83 from Harmon et al. and the NRC's response on pages E-34 and E-35). The NRC also addressed questions regarding MELCOR in Appendix D to NUREG-2157, Volume 2, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," (ADAMS Accession Number ML14196A107, see comment D.2.39.18 and the NRC's response on pages D-436 to D-438 and comment D.2.39.24 and the NRC's response on pages D-444 to D-446). The following discussion is provided in order to address the petitioner's claims about the

adequacy of MELCOR, even though this discussion does not form the basis for denial of this petition for rulemaking.

The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request for a new requirement for licensees to perform annual evaluations of SFPs. The petitioner's request to address perceived deficiencies in current severe accident models go hand in hand with the petitioner's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC is providing the following information about how MELCOR is used and the NRC's views on some of the phenomena discussed in the petition.

The petitioner claimed that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petitioner also claimed that MELCOR under predicts the zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petitioner claimed, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petitioner pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given

inherent uncertainties in accident progression phenomenology. The MELCOR computer code has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation as discussed later in this section.

The MELCOR computer code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as, otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., "zirconium fire") occurs. A self-sustaining zirconium fire will develop if the heat generation rate from reaction with oxidant exceeds the heat loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a self-sustaining zirconium fire will occur.

Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact

during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher temperatures, the presence of any measurable amount of oxygen in the gas (steam or air) attacking the cladding is sufficient to prevent the formation of surface ZrN. Further, if ZrN does form it can be converted readily to zirconium oxide (ZrO_2) when exposed to oxygen. The heat generation from the reaction of cladding to form ZrN followed by oxidation of the ZrN to form ZrO_2 is essentially the same as the direct reaction of Zr to form ZrO_2 . This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in the petition. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre- to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.

With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS-B9R), these phenomena are well understood and recognized in the formulations of models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a SFP. The code assessment

against zirconium fire experiments conducted at Sandia National Laboratory (SNL) and code-to-code comparison documented in NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss of Coolant Accident" (ADAMS Accession No. ML13072A056), address fire propagation phenomena.

The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys" (ADAMS Accession No. ML041900069). The MELCOR computer code was used in the zirconium fire experiments (see NUREG/CR-7143) and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code-to-code comparisons) as well as the SFP study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.

The recent Sandia Fuel Project by the Organisation for Economic Co-operation and Development Nuclear Energy Agency provided experimental data relevant for hydraulic and ignition phenomena of prototypic pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petitioner asserted that the SNL SFP accident experiments are unrealistic because they were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went

through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100 micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.

The important question for an analysis is if the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core-concrete interaction, multiunit or concurrent accident, fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates. The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volumes 1 and 2 (ADAMS Accession Nos. ML14196A105 and ML14196A107)) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 feet above the top of the fuel in the pool, therefore encompassing the effects of some of the phenomena mentioned by the petition.

In conclusion, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. The NRC has considered the most important phenomena and continues to improve the models to further

~~reduce the uncertainties. However, the NRC wishes to emphasize that these improvement efforts do not reflect an NRC determination that the models are unacceptable for their intended use by the NRC.~~

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-----------------|--|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |

| | | |
|-------------------|---|-------------|
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| June 2004 | NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys." | ML041900069 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| March 2013 | NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident." | ML13072A056 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |

| | | |
|-----------------|--|-------------|
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 2015.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

| | | |
|-------------------|---|-------------|
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 2015.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

ADAMS Accession Nos: PKG: ML14307A691; FRN: ML14307A630

*via email

| | | | | | |
|--------|-------------------------------|---------------------|-----------------------|----------------------------|----------------------------------|
| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D |
| NAME | DDoyle | GLappert | TInverso | AMohseni | LKokajko (AMohseni for) |
| DATE | 7/14/2015 | 7/16/2015 | 7/17/2015 | 7/27/2015 | 7/31/2015 |
| OFFICE | NRR/DSS:D* | NRR/JLD:D* | RES:D* | NRO:D* | ADM/DAS/RADB:BC Tech Editing* |
| NAME | TMcGinty | JDavis (JBowen for) | BSheron (SCoffin for) | GTracy (JMonninger for) | CBladey (JBorges for) |
| DATE | 8/24/2015 | 8/25/2015 | 8/27/2015 | 8/28/2015 | 8/24/2015 |
| OFFICE | OGC/GCLR/RMR* | NRR:D | EDO | | |
| NAME | MSpencer (GMizuno for) NLO | WDean | VMcCree | | |
| DATE | 9/23/2015 | 10/6/15 | 11/19/15 | | |

OFFICIAL RECORD COPY

From: Terry, Leslie
Sent: 19 Apr 2016 11:25:30 -0400
To: DeJesus, Anthony;Borges, Jennifer
Subject: FW: SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171
Attachments: SRM-15-0146.docx, SRM-15-0146.encl1.docx, SRM-15-0146.encl2.docx

From: Araguas, Christian
Sent: Tuesday, April 19, 2016 11:23 AM
To: Bladey, Cindy ; Terry, Leslie
Subject: FW: SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171
From: Jimenez, Patricia
Sent: Tuesday, April 05, 2016 12:18 PM
To: Averbach, Andrew <Andrew.Averbach@nrc.gov>; Baggett, Steven <Steven.Baggett@nrc.gov>; Baran, Jeff <Jeff.Baran@nrc.gov>; Bates, Andrew <Andrew.Bates@nrc.gov>; Baval, Rochelle <Rochelle.Baval@nrc.gov>; Blake, Kathleen <Kathleen.Blake@nrc.gov>; Bloomer, Tamara <Tamara.Bloomer@nrc.gov>; Bollwerk, Paul <Paul.Bollwerk@nrc.gov>; Bozin, Sunny <Sunny.Bozin@nrc.gov>; Brown, Theron <Theron.Brown@nrc.gov>; Burns, Stephen <Stephen.Burns@nrc.gov>; Butler, Gail <Gail.Butler@nrc.gov>; Castleman, Patrick <Patrick.Castleman@nrc.gov>; Chairman Temp <Chairman.Temp@nrc.gov>; Chazell, Russell <Russell.Chazell@nrc.gov>; Cianci, Sandra <Sandra.Cianci@nrc.gov>; Clark, Brooke <Brooke.Clark@nrc.gov>; Cohen, Miriam <Miriam.Cohen@nrc.gov>; Cubbage, Amy <Amy.Cubbage@nrc.gov>; Cutchin, James <James.Cutchin@nrc.gov>; Dapas, Marc <Marc.Dapas@nrc.gov>; Doane, Margaret <Margaret.Doane@nrc.gov>; Johnson, Michael <Michael.Johnson@nrc.gov>; McCree, Victor <Victor.McCree@nrc.gov>; Pham, Bo <Bo.Pham@nrc.gov>; Rasouli, Houman <Houman.Rasouli@nrc.gov>; Tracy, Glenn <Glenn.Tracy@nrc.gov>; Araguas, Christian <Christian.Araguas@nrc.gov>; Bowen, Jeremy <Jeremy.Bowen@nrc.gov>; Cai, June <June.Cai@nrc.gov>; Clark, Theresa <Theresa.Clark@nrc.gov>; Crane, Samantha <Samantha.Crane@nrc.gov>; Franovich, Rani <Rani.Franovich@nrc.gov>; Gallalee, Trish <Trish.Gallalee@nrc.gov>; Inverso, Tara <Tara.Inverso@nrc.gov>; Jessie, Janelle <Janelle.Jessie@nrc.gov>; Jolicoeur, John <John.Jolicoeur@nrc.gov>; Khanna, Meena <Meena.Khanna@nrc.gov>; Lemoncelli, Mauri <Mauri.Lemoncelli@nrc.gov>; Lewis, Robert <Robert.Lewis@nrc.gov>; McIntyre, David <David.McIntyre@nrc.gov>; Merilos, Joyce <Joyce.Merilos@nrc.gov>; Rakovan, Lance <Lance.Rakovan@nrc.gov>; Rasouli, Houman <Houman.Rasouli@nrc.gov>; Rihm, Roger <Roger.Rihm@nrc.gov>; Sampson, Michele <Michele.Sampson@nrc.gov>; Schofer, Maria <Maria.Schofer@nrc.gov>; Ellmers, Glenn <Glenn.Ellmers@nrc.gov>; Frazier, Alan <Alan.Frazier@nrc.gov>; Fuller, Justin <Justin.Fuller@nrc.gov>; Gilles, Nanette <Nanette.Gilles@nrc.gov>; Hackley, Elizabeth <Elizabeth.Hackley@nrc.gov>; Hawkens, Roy <Roy.Hawkens@nrc.gov>; Henderson, Karen <Karen.Henderson@nrc.gov>; Herr, Linda <Linda.Herr@nrc.gov>; Hudson, Sharon <Sharon.Hudson@nrc.gov>; Johnson, Michael <Michael.Johnson@nrc.gov>; Jones, Bradley <Bradley.Jones@nrc.gov>; Kasputys, Clare <Clare.Kasputys@nrc.gov>; KLS Temp <KLS.Temp@nrc.gov>; Krsek, Robert <Robert.Krsek@nrc.gov>; Laufer, Richard <Richard.Laufer@nrc.gov>; Lepre, Janet <Janet.Lepre@nrc.gov>; Lewis, Robert <Robert.Lewis@nrc.gov>; Mamish, Nader <Nader.Mamish@nrc.gov>; Marsh, Molly <Molly.Marsh@nrc.gov>; Martin, Jody <Jody.Martin@nrc.gov>; McCree, Victor <Victor.McCree@nrc.gov>; McGovern, Denise <Denise.McGovern@nrc.gov>; Moore, Johari <Johari.Moore@nrc.gov>; Muessle, Mary <Mary.Muessle@nrc.gov>; Adams, Darrell

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 Tracy, Glenn <Glenn.Tracy@nrc.gov>; Valentin, Andrea <Andrea.Valentin@nrc.gov>; Vietti-Cook,
 Annette <Annette.Vietti-Cook@nrc.gov>; Williamson, Edward <Edward.Williamson@nrc.gov>; Zobler,
 Marian <Marian.Zobler@nrc.gov>; Zorn, Jason <Jason.Zorn@nrc.gov>
Cc: Jimenez, Patricia <Patricia.Jimenez@nrc.gov>; Akstulewicz, Brenda <Brenda.Akstulewicz@nrc.gov>;
 Temp, SECY <SECY.Temp@nrc.gov>; McCloskey, Bridin <Bridin.McCloskey@nrc.gov>

Subject: SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding
 Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171

Good Afternoon,

In an effort to keep the NRC staff informed of Commission decisions in a timely manner,
 attached for your information is Staff Requirements Memorandum (SRM) SRM-SECY-15-0146:
**Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool
 Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)(ML16096A192)**, signed by the
 Secretary, Monday, Tuesday, April 04, 2016. Please make additional distribution to interested
 staff members in your office.

Please note: This SRM is to be released to the public 5 working days after dispatch of the letter to the petitioner.

If you have any questions, I can be reached at 415-1969

Thank you,

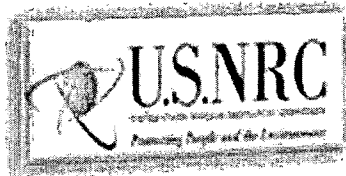
Patty Jimenez

Office of the Secretary

U.S. Nuclear Regulatory Commission

Phone: 301-415-1969

Email: Patricia.Jimenez@nrc.gov





UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 4, 2016

SECRETARY

MEMORANDUM TO: Victor M. McCree
Executive Director for Operations

FROM: Annette L. Vietti-Cook, Secretary **/RA/**

SUBJECT: STAFF REQUIREMENTS – SECY-15-0146 – DENIAL OF
PETITION FOR RULEMAKING REQUESTING AMENDMENTS
REGARDING SPENT FUEL POOL SEVERE ACCIDENT
EVALUATIONS (PRM-50-108; NRC-2014-0171)

The Commission has approved the denial of the petition for rulemaking submitted by Mr. Mark Edward Leyse (the petitioner) and publication of the related *Federal Register* notice, subject to the edits provided in the enclosures.

Enclosure: 1. Changes to the *Federal Register* notice in SECY-15-0146
2. Changes to the letters to the petitioner

cc: Chairman Burns
Commissioner Svinicki
Commissioner Ostendorff
Commissioner Baran
OGC
CFO
OCA
OPA
ODs, RAs, ACRS, ASLBP (via E-Mail)
PDR

**SECY NOTE: THIS SRM TO BE RELEASED TO THE PUBLIC FIVE WORKING DAYS
AFTER DISPATCH OF THE LETTER TO THE PETITIONER**

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking with respect to SFPs or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher;

telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):**

You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

TABLE OF CONTENTS:

- I. The Petition.
- II. Reasons for Denial.
- III. Conclusion.
- IV. Availability of Documents.

I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding

temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR indicates simulations predict. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner ~~claimed~~ stated that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations that would be required by in the fourth requested regulation ~~should~~ would be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of an SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate an SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to an SFP fire. In order for an SFP fire to occur, all SFP systems, backup systems, and operator actions ~~would have to fail~~ that are intended to prevent the spent fuel in the pool from being uncovered would have to fail. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of an SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

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Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner ~~claimed~~ stated that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that an SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and, ultimately, an SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in an SFP. The SFPs at all nuclear plants in the United States are extremely robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding ~~as a result of the significant volume of water above the spent fuel~~. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage. ~~As spent fuel cools, older fuel is sometimes removed from a~~

~~plant's SFP for on-site dry cask storage, depending on the space available in the SFP. Fuel removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure. They are monitored and routinely inspected for integrity, and they are protected by security measures.~~

Studies conducted over the last four decades have consistently shown that the probability risk of an accident causing a zirconium fire in an SFP to be lower than that for severe reactor accidents. The risk of an SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools," in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (51 FR 30028; August 21, 1986; ~~51 FR 30028~~) and that no new regulatory requirements were warranted.

The risk of an SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, an SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. ~~Even when all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in a SFP zirconium fire with this~~

conservative assumption, the study found the risk of an SFP fire to be low and well within the Commission's Safety Goals.

~~In light of the changes in storage configuration of the SFP (increased to high density racks), inadvertent partial draindown events, as well as monumental events such as the September 11, 2001, terrorist attacks and the 2011 accident at the Fukushima Dai-ichi nuclear power plant, the NRC continues to examine the issue of SFP safety.~~ Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk, of an SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Recently, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). The COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional

strategies, the probability of and, accordingly, the risk of a SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC ~~has taken~~took extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

~~Recently~~Also, in 2014, the NRC ~~conducted~~documented a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). ~~The~~In COMSECY-13-0030, the NRC staff concluded that SFPs are ~~very~~ robust structures with large safety margins and recommended to the Commission that assessments of possible~~proposed~~ regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage~~further enhance safety~~ were not warranted. The Commission subsequently ~~concluded~~

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

~~that no regulatory action needed to be pursued~~approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of an SFP severe accident is low. While the risk of a severe accident in an SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures in place if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (77 FR 74788; December 18, 2012; ~~77 FR 74788~~) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and ~~for license amendment~~ reviews requests. In addition, baseline NRC inspections provide~~and provides~~ ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in

the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate an SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and ~~its~~their results proposed to be provided to the NRC ~~is~~are not needed for the effectiveness of the NRC's approach ~~for~~to ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's final-safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs ~~as well as~~and protective actions for plant personnel and the public to limit exposure to radioactive materials.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. ~~The~~ At least two NRC resident inspectors are ~~permanently stationed on-~~ assigned to each site to provide monitoring and inspection of routine and special activities. They are aware of, and routinely observe, SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees ~~to as a result of an NRC order or a change in regulations.~~

In accordance with 10 CFR part 21, the NRC is informed of defects ~~in and failures to conform to the NRC requirements with respect to~~ and noncompliances associated with basic components, which includes SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and ~~failures to conform~~ noncompliances. The NRC is also informed of ~~the~~ events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, ~~the~~ a nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant ~~and or~~ or licensee as having a significant implication for public health and safety or common defense and security, must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident require redundant equipment and strategies to address loss of cooling to SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.

~~It is unclear how t~~The annual evaluations requested in the petition would not provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent uncovering of the fuel-~~uncovery~~, the information that would be obtained from the proposed requirement in the petition ~~does~~-would not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2. The petitioner ~~claimed~~ stated that there are serious flaws with MELCOR, which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how the such an evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's ~~claims~~ statements that MELCOR is flawed. ~~The following discussion is provided in order to address the petitioner's claims about the adequacy of MELCOR, even though this discussion does not form the basis for denial of this petition for rulemaking.~~

~~The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request for a new requirement for licensees to perform annual evaluations of SFPs. The petitioner's request to address perceived deficiencies in current severe accident models go hand-in-hand with the petitioner's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC is providing the~~

following information about how MELCOR is used and the NRC's views on some of the phenomena discussed in the petition.

There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as, otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

The important question for a severe accident analysis is whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussing the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multi-unit or concurrent accident, or fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis and has been validated against experimental data. The MELCOR computer code and it represents the current state of the art in severe accident analysis. In NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor," the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment,

core relocation to the vessel lower head, and ex-vessel core concrete interaction.” Furthermore, MELCOR has been benchmarked against many experiments, including separate and integral effects tests testing for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

FurtherAdditional information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161, “Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark-I Boiling-Water Reactor,” (ADAMS Accession No. ML14255A365). The NRC also addressed questions regarding MELCOR in Appendix D to NUREG-2157, Volume 2, “Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel,” (ADAMS Accession Nno. ML14196A107).

~~The petitioner claimed that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petitioner also claimed that MELCOR under-predicts the zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petitioner claimed, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petitioner pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.~~

The MELCOR computer code is the NRC’s best estimate tool for severe accident analysis. ~~It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. The MELCOR computer code has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation as discussed later in this section.~~

The MELCOR computer code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as, otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., "zirconium fire") occurs. A self-sustaining zirconium fire will develop if the heat generation rate from reaction with oxidant exceeds the heat loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a self-sustaining zirconium fire will occur.

Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher temperatures, the presence of any measurable amount of oxygen in the gas (steam or air) attacking the cladding is sufficient to prevent the formation of surface ZrN. Further, if ZrN does form it can be converted readily to zirconium oxide (ZrO_2) when exposed to oxygen. The heat generation from the reaction of cladding to form ZrN followed by oxidation of

the ZrN to form ZrO_2 is essentially the same as the direct reaction of Zr to form ZrO_2 . This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in the petition. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre- to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.

With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS-B9R), these phenomena are well understood and recognized in the formulations of models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a SFP. The code assessment against zirconium fire experiments conducted at Sandia National Laboratory (SNL) and code to code comparison documented in NUREG/CR-7143, "Characterization of Thermal Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss of Coolant Accident" (ADAMS Accession No. ML13072A056), address fire propagation phenomena.

The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zircaloy and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys" (ADAMS Accession No. ML041900069). The MELCOR computer code was used in the zirconium fire experiments (see NUREG/CR-7143)

and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code to code comparisons) as well as the SFP study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.

The recent Sandia Fuel Project by the Organisation for Economic Co-operation and Development Nuclear Energy Agency provided experimental data relevant for hydraulic and ignition phenomena of prototype pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petitioner asserted that the SNL SFP accident experiments are unrealistic because they were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100 micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.

The important question for an analysis is if the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multiunit or concurrent accident, fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for

~~the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates. The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volumes 1 and 2 (ADAMS Accession Nos. ML14196A105 and ML14196A107)) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 feet above the top of the fuel in the pool, therefore encompassing the effects of some of the phenomena mentioned by the petition.~~

~~In conclusion, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. The NRC has considered the most important phenomena and continues to improve the models to further reduce the uncertainties. However, the NRC wishes to emphasize that these improvement efforts do not reflect an NRC determination that the models are unacceptable for their intended use by the NRC.~~

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents

Comment (LR):
Delete documents no longer
referenced in this FRN from the table
below.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/Federal Register Citation |
|-------------------|---|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| June 2004 | NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys." | ML041900069 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| March 2013 | NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss of Coolant Accident." | ML13072A056 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |

| | | |
|-----------------|---|-------------|
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , ~~2015~~2016.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition ~~failed to~~ did not present any significant new information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC, as requested by the petition, is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the FR.

The docket for this petition closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

From: Doyle, Daniel
Sent: 5 Apr 2016 13:19:22 -0400
To: Mizuno, Geary;Borges, Jennifer;Hernandez, Raul;Esmaili, Hossein;Casto, Greg;Witt, Kevin
Cc: Mohseni, Aby
Subject: FW: SRM-SECY-15-0146 - PRM denial on SFP accident evaluations (PRM-50-108)
Attachments: SRM-15-0146.docx, SRM-15-0146.encl1.docx, SRM-15-0146.encl2.docx

Here is the final SRM approving denial of PRM-50-108. I will develop the final version for publication incorporating these edits and send it to you for your awareness and a final check (not concurrence). I expect this will be due to SECY within 30 days. I will confirm with OGC that we still have NLO with these edits and then I will send the publication version to ADM for verification (with a redline strikeout version) and they will send it to SECY for final review and signature and publication. Thanks for your support on this project and please let me know if you have any questions.

Dan

415-3748

From: Clark, Theresa

Sent: Tuesday, April 05, 2016 1:05 PM

To: Doyle, Daniel ; Tobin, Jennifer ; Kokajko, Lawrence ; Mohseni, Aby ; Dean, Bill ; Evans, Michele ; McDermott, Brian

Subject: FYI: SRM-SECY-15-0146 - PRM denial on SFP accident evaluations (PRM-50-108)

Here's the final SRM on the PRM denial on SFP accident evaluations. Soon, I'd expect the typical tasking request about when the updated FRN will be provided (though ADM) to SECY for signature. I'll pass that forward as soon as I see it. Thanks!

From: Jimenez, Patricia

Sent: Tuesday, April 05, 2016 12:18 PM

Subject: SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)

Good Afternoon,

In an effort to keep the NRC staff informed of Commission decisions in a timely manner, attached for your information is Staff Requirements Memorandum (SRM) **SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)(ML16096A192)**, signed by the Secretary, Monday, Tuesday, April 04, 2016. Please make additional distribution to interested staff members in your office.

Please note: This SRM is to be released to the public 5 working days after dispatch of the letter to the petitioner.

If you have any questions, I can be reached at 415-1969

Thank you,

Patty Jimenez

Office of the Secretary

U.S. Nuclear Regulatory Commission

Phone: 301-415-1969

Email: Patricia.Jimenez@nrc.gov





UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 4, 2016

SECRETARY

MEMORANDUM TO: Victor M. McCree
Executive Director for Operations

FROM: Annette L. Vietti-Cook, Secretary **/RA/**

SUBJECT: STAFF REQUIREMENTS – SECY-15-0146 – DENIAL OF
PETITION FOR RULEMAKING REQUESTING AMENDMENTS
REGARDING SPENT FUEL POOL SEVERE ACCIDENT
EVALUATIONS (PRM-50-108; NRC-2014-0171)

The Commission has approved the denial of the petition for rulemaking submitted by Mr. Mark Edward Leyse (the petitioner) and publication of the related *Federal Register* notice, subject to the edits provided in the enclosures.

Enclosure: 1. Changes to the *Federal Register* notice in SECY-15-0146
2. Changes to the letters to the petitioner

cc: Chairman Burns
Commissioner Svinicki
Commissioner Ostendorff
Commissioner Baran
OGC
CFO
OCA
OPA
ODs, RAs, ACRS, ASLBP (via E-Mail)
PDR

**SECY NOTE: THIS SRM TO BE RELEASED TO THE PUBLIC FIVE WORKING DAYS
AFTER DISPATCH OF THE LETTER TO THE PETITIONER**

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking with respect to SFPs or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher;

telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):**

You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdrr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

TABLE OF CONTENTS:

- I. The Petition.
- II. Reasons for Denial.
- III. Conclusion.
- IV. Availability of Documents.

I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding

temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR indicates simulations predict. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner ~~claimed~~ stated that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations that would be required by in the fourth requested regulation ~~should~~ would be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of an SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate an SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to an SFP fire. In order for an SFP fire to occur, all SFP systems, backup systems, and operator actions ~~would have to fail~~ that are intended to prevent the spent fuel in the pool from being uncovered would have to fail. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of an SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner ~~claimed-stated~~ stated that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that an SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and, ultimately, an SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in an SFP. The SFPs at all nuclear plants in the United States are extremely-robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding ~~as a result of the significant volume of water above the spent fuel~~. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage. ~~As spent fuel cools, older fuel is sometimes removed from a~~

~~plant's SFP for on-site dry cask storage, depending on the space available in the SFP. Fuel removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure. They are monitored and routinely inspected for integrity, and they are protected by security measures.~~

Studies conducted over the last four decades have consistently shown that the probability-risk of an accident causing a zirconium fire in an SFP to be lower than that for severe reactor accidents. The risk of an SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools," in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (51 FR 30028; August 21, 1986; ~~51 FR 30028~~) and that no new regulatory requirements were warranted.

The risk of an SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, an SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even when ~~all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in a SFP zirconium fire~~ with this

conservative assumption, the study found the risk of an SFP fire to be low and well within the Commission's Safety Goals.

~~In light of the changes in storage configuration of the SFP (increased to high density racks), inadvertent partial draindown events, as well as monumental events such as the September 11, 2001, terrorist attacks and the 2011 accident at the Fukushima Dai-ichi nuclear power plant, the NRC continues to examine the issue of SFP safety.~~ Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk, of an SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Recently, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). The COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional

strategies, the probability of and, accordingly, the risk of a SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC ~~has taken~~took extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

~~Recently~~Also, in 2014, the NRC ~~conducted~~documented a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). ~~The~~In COMSECY-13-0030, the NRC staff concluded that SFPs are ~~very~~-robust structures with large safety margins and recommended to the Commission that assessments of possible~~proposed~~ regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage~~further enhance safety~~ were not warranted. The Commission subsequently ~~concluded~~

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

~~that no regulatory action needed to be pursued~~approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of an SFP severe accident is low. While the risk of a severe accident in an SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures in place if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (77 FR 74788; December 18, 2012; ~~77 FR 74788~~) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and ~~for license amendment~~ reviews requests. In addition, baseline NRC inspections provide~~and provides~~ ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in

the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate an SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and ~~its~~ their results proposed to be provided to the NRC ~~is~~ are not needed for the effectiveness of the NRC's approach ~~for to~~ ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's ~~final~~ safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs ~~as well as~~ and protective actions for plant personnel and the public to limit exposure to radioactive materials.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. ~~The~~ At least two NRC resident inspectors ~~are permanently stationed on-~~ assigned to each site to provide monitoring and inspection of routine and special activities. They are aware of, and routinely observe, SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees ~~to-~~ as a result of an NRC order or a change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects ~~in and failures to conform to the NRC requirements with respect to-~~ and noncompliances associated with basic components, which includes SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects ~~and failures to conform-~~ noncompliances. The NRC is also informed of ~~the~~ events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, ~~the-~~ a nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant ~~and-or~~ or licensee as having a significant implication for public health and safety or common defense and security, must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident require redundant equipment and strategies to address loss of cooling to SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.

~~It is unclear how t~~The annual evaluations requested in the petition would not provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent uncovering of the fuel ~~uncovery~~, the information that would be obtained from the proposed requirement in the petition ~~does~~would not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2. The petitioner ~~claimed~~ stated that there are serious flaws with MELCOR, which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how the such an evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's ~~claims~~ statements that MELCOR is flawed. The following discussion is provided in order to address the petitioner's claims about the adequacy of MELCOR, even though this discussion does not form the basis for denial of this petition for rulemaking.

~~The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request for a new requirement for licensees to perform annual evaluations of SFPs. The petitioner's request to address perceived deficiencies in current severe accident models go hand-in-hand with the petitioner's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC is providing the~~

following information about how MELCOR is used and the NRC's views on some of the phenomena discussed in the petition.

There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as, otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

The important question for a severe accident analysis is whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussing the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multi-unit or concurrent accident, or fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis and has been validated against experimental data. The MELCOR computer code and it represents the current state of the art in severe accident analysis. In NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor," the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment,

core relocation to the vessel lower head, and ex-vessel core concrete interaction.” Furthermore, MELCOR has been benchmarked against many experiments, including separate and integral effects tests testing for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

FurtherAdditional information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161, “Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark-I Boiling-Water Reactor,” (ADAMS Accession No. ML14255A365). The NRC also addressed questions regarding MELCOR in Appendix D to NUREG-2157, Volume 2, “Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel,” (ADAMS Accession Nno. ML14196A107).

~~The petitioner claimed that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petitioner also claimed that MELCOR under-predicts the zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petitioner claimed, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petitioner pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.~~

The MELCOR computer code is the NRC’s best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. The MELCOR computer code has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation as discussed later in this section.

The MELCOR computer code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as, otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., "zirconium fire") occurs. A self-sustaining zirconium fire will develop if the heat generation rate from reaction with oxidant exceeds the heat loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a self-sustaining zirconium fire will occur.

Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher temperatures, the presence of any measurable amount of oxygen in the gas (steam or air) attacking the cladding is sufficient to prevent the formation of surface ZrN . Further, if ZrN does form it can be converted readily to zirconium oxide (ZrO_2) when exposed to oxygen. The heat generation from the reaction of cladding to form ZrN followed by oxidation of

the ZrN to form ZrO_2 is essentially the same as the direct reaction of Zr to form ZrO_2 . This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in the petition. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre- to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.

With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS-B9R), these phenomena are well understood and recognized in the formulations of models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a SFP. The code assessment against zirconium fire experiments conducted at Sandia National Laboratory (SNL) and code-to-code comparison documented in NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident" (ADAMS Accession No. ML13072A056), address fire propagation phenomena.

The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys" (ADAMS Accession No. ML041900069). The MELCOR computer code was used in the zirconium fire experiments (see NUREG/CR-7143)

and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code-to-code comparisons) as well as the SFP study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.

The recent Sandia Fuel Project by the Organisation for Economic Co-operation and Development Nuclear Energy Agency provided experimental data relevant for hydraulic and ignition phenomena of prototypic pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petitioner asserted that the SNL SFP accident experiments are unrealistic because they were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100 micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.

The important question for an analysis is if the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core-concrete interaction, multiunit or concurrent accident, fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for

the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates. The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volumes 1 and 2 (ADAMS Accession Nos. ML14196A105 and ML14196A107)) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 feet above the top of the fuel in the pool, therefore encompassing the effects of some of the phenomena mentioned by the petition.

In conclusion, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. The NRC has considered the most important phenomena and continues to improve the models to further reduce the uncertainties. However, the NRC wishes to emphasize that these improvement efforts do not reflect an NRC determination that the models are unacceptable for their intended use by the NRC.

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents

Comment [LR]:
Delete documents no longer
referenced in this FRN from the table
below.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/Federal Register Citation |
|-------------------|---|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| June 2004 | NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys." | ML041900069 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| March 2013 | NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss of Coolant Accident." | ML13072A056 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |

| | | |
|-----------------|---|-------------|
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , ~~2015~~2016.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition ~~failed to~~ did not present any significant new information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC, as requested by the petition, is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the FR.

The docket for this petition closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.

From: Borges, Jennifer
Sent: 8 Oct 2014 14:02:00 +0000
To: Doyle, Daniel
Subject: FW: Update - Rulemaking Training Available

Hi Dan,
Could you please forward this information to the PRM-50-108 working group?
Thank you,

Jennifer Borges

Regulations Specialist

Rules Team

ADM/DAS/RADB

Location: 3WFN 6-A38



301-287-0999



jennifer.borges@nrc.gov

From: Rulemaker [mailto:Rulemaker@nrc.gov]
Sent: Monday, September 15, 2014 11:43 AM
To: Borges, Jennifer
Subject: Update - Rulemaking Training Available



New Rulemaking Training Available

The Rulemaking Coordinating Committee is pleased to announce the availability of expanded rulemaking training this fall at the Professional Development Center. The following courses are open for registration through iLearn:

Rulemaking at the NRC – Course ID 37143 . This 2-day course provides an overview of the statutory bases, policies and procedures, and key documents related to rulemaking at the NRC. The course covers, among other things, the NRC's authority for rulemaking, the development of rulemaking documents, and key rulemaking requirements. This course serves as a foundation for NRC staff who participate in NRC rulemakings, and is a prerequisite for some training modules focusing on specific rulemaking procedures. (Please note that this course has been modified slightly from the pilot offering in October 2013 and subsequent offering in May 2014. Participants in these offerings are NOT required to repeat this course before registering for the other courses.)

Dates: Tuesday, October 28, 2014, through Wednesday, October 29, 2014, from 8:30 a.m. – 4:00 p.m.

Prerequisite: None

Advanced Rulemaking at the NRC – Course ID 68146 . This 1-day course

provides advanced instruction on the statutory bases, policies and procedures, and key documents related to rulemaking at the NRC. The course covers the application of backfitting and issue finality, regulatory analysis, addressing public comments, and public involvement in the rulemaking process. This course builds upon the material presented in the course titled "Rulemaking at the NRC."

Date: Thursday, October 30, 2014, from 8:30 a.m. to 4:00 p.m.

Prerequisite: Rulemaking at the NRC

Specific Topics in Rulemaking " Course ID 68145 . This 1-day course provides an overview of 4 topics supporting the rulemaking process: 1) the development of guidance documents to support rulemaking, including regulatory guides and NUREGs; 2) periodic rulemaking reports and the Common Prioritization of Rulemaking; 3) Agreement State compatibility requirements; and 4) incorporation by reference and voluntary consensus standards. This course supplements the material presented in the iLearn courses titled "Rulemaking at the NRC" and "Advanced Rulemaking at the NRC."

Date: Friday, October 31, 2014, from 8:30 a.m. to 4:00 p.m.

Prerequisite: Rulemaking at the NRC

Advanced Rulemaking: Writing Amendatory Instructions and Regulatory Text " Course ID 68144 . This 1-day course provides advanced instruction on developing amendatory instructions and regulatory text to meet the publishing requirements of the NRC and the Office of the Federal Register. This course builds upon the overview of amendatory instructions and regulatory text presented in the course titled "Rulemaking at the NRC." This course focuses on the proper use of amendatory terms and special characters, numbering of amendments, and drafting of regulatory text.

Date: Tuesday, November 4, 2014, from 8:30 a.m. to 2:30 p.m.

Prerequisite: Rulemaking at the NRC

Please note: These courses are also available to regional staff and others requiring remote access. Please contact Jill Shepherd-Vladimir, Regulations Specialist, ADM, at Jill.Shepherd@nrc.gov , for more information.

Send questions about information in this message or about your subscription to this ListServe to: rulemaker.resource@nrc.gov

To subscribe or unsubscribe send an email message to: rulemaker.resource@nrc.gov

From: Doyle, Daniel
Sent: 29 Mar 2016 16:31:13 -0400
To: Mizuno, Geary;Borges, Jennifer;Hernandez, Raul;Esmaili, Hossein;Casto, Greg;Witt, Kevin
Cc: Mohseni, Aby
Subject: FW: VERSION B - Draft-SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)
Attachments: 15-0146.srm.encl2.b.docx, 15-0146.b.docx, 15-0146.srm.encl1.b.docx

FYI. They sent out a second draft SRM on the denial of PRM-50-108 last week. The Commission offices are reconciling the various edits from the vote sheets and should converge on a final version within the next week or so.

Dan

From: Laufer, Richard
Sent: Tuesday, March 22, 2016 3:32 PM
To: SECYOPS_Materials ; SECYOPS_Reactors
Cc: SECYOPS_Admin_Assist ; SECYOPS_ccDraftSRMs ; Doyle, Daniel
Subject: VERSION B - Draft-SRM-SECY-15-0146: Denial of Petition for Rulemaking Requesting Amendments Regarding Spent Fuel Pool Severe Accident Evaluations (PRM-50-108; NRC-2014-0171)
Please review the changes to the draft SRM on SECY-15-0146 in the attached files (15-0146.b.docx and 15-0146.srm.encl1.b.docx and 15-0146.srm.encl2.b.docx).
This is **Version B**. Please respond by March 24, 2016.
The only items that still need responses are in Enclosure 1, shown in the comment boxes.
Note that proposed additions in Version A that resulted in a 2-2 vote are not included in Version B as there was no majority to include the new language.
Also, proposed deletions in Version A that resulted in a 2-2 vote are still shown as deletions in Version B as there was no majority to include the language.
Thanks,
Rich



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

I am responding to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) June 19, 2014.¹ You requested that the NRC amend its regulations to require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The petition was docketed as PRM-50-108, and the NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The NRC has determined that your petition ~~failed to~~ did not present any significant new information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC, as requested by the petition, is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The reasons for the denial are discussed in detail in the enclosed notice, which will be published in the FR.

The docket for this petition closed.

You may direct any questions regarding this matter to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register notice

¹ Agencywide Documents Access and Management System Accession No. ML14195A388.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SECRETARY

VERSION B; 3/22/16

MEMORANDUM TO: Victor M. McCree
Executive Director for Operations

FROM: Annette L. Vietti-Cook, Secretary

SUBJECT: STAFF REQUIREMENTS – SECY-15-0146 – DENIAL OF
PETITION FOR RULEMAKING REQUESTING AMENDMENTS
REGARDING SPENT FUEL POOL SEVERE ACCIDENT
EVALUATIONS (PRM-50-108; NRC-2014-0171)

The Commission has approved the denial of the petition for rulemaking submitted by Mr. Mark Edward Leyse (the petitioner) and publication of the related *Federal Register* notice, subject to the edits provided in the enclosures.

Enclosure: 1. Changes to the *Federal Register* notice in SECY-15-0146
2. Changes to the letters to the petitioner

cc: Chairman Burns
Commissioner Svinicki
Commissioner Ostendorff
Commissioner Baran
OGC
CFO
OCA
OPA
ODs, RAs, ACRS, ASLBP (via E-Mail)
PDR

**SECY NOTE: THIS SRM TO BE RELEASED TO THE PUBLIC FIVE WORKING DAYS
AFTER DISPATCH OF THE LETTER TO THE PETITIONER**

**Additional Commissioner Comments to be Included in the SRM
if Agreed to by a Majority of the Commission**

1. ~~Consistent with SRM COMSECY-13-0030, the Commission looks forward to reviewing the NRC staff's careful consideration of the National Academy of Sciences (NAS) report on spent fuel pool safety and security, including the staff's identification of any new information contained in the report and determination of whether additional study or action by NRC is warranted in light of the report's findings and recommendations.~~
[deleted by KLS WCO]

**SECY NOTE: THIS SRM TO BE RELEASED TO THE PUBLIC FIVE WORKING DAYS
AFTER DISPATCH OF THE LETTER TO THE PETITIONER**

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking with respect to SFPs or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):**
You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search.](#)" For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

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I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of

zirconium (Zr) fires than MELCOR indicates simulations predict. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner ~~claimed~~ stated that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations that would be required by in the fourth requested regulation ~~should~~ would be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of an SFP severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate an SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to an SFP fire. In order for an SFP fire to occur, all SFP systems, backup systems, and operator actions ~~would have to fail~~ that are intended to prevent the spent fuel in the pool from being uncovered would have to fail. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose, as requested by the petitioner, because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of an SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner ~~claimed~~ stated that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that an SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and, ultimately, an SFP accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in an SFP. The SFPs at all nuclear plants in the United States are ~~extremely-robust~~ structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding ~~as a result of the significant volume of water above the spent fuel~~. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage. ~~As spent fuel cools, older fuel is sometimes removed from a plant's SFP for on-site dry cask storage, depending on the space available in the SFP. Fuel~~

removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure. They are monitored and routinely inspected for integrity, and they are protected by security measures.

Comment [LR]:
KLS & WCO would use "risk"
SGB & JMB would use "probability"

Studies conducted over the last four decades have consistently shown that the ~~probability risk~~ of an accident causing a zirconium fire in an SFP to be lower than that for severe reactor accidents. The risk of an SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools," in light of increased use of high-density storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (51 FR 30028; August 21, 1986; 51 FR 30028) and that no new regulatory requirements were warranted.

The risk of an SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, an SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even when all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in a SFP zirconium fire with this conservative assumption, the study found the risk of an SFP fire to be low and well within the Commission's Safety Goals.

In light of the changes in storage configuration of the SFP (increased to high-density racks), inadvertent partial draindown events, as well as monumental events such as the September 11, 2001, terrorist attacks and the 2011 accident at the Fukushima Dai-ichi nuclear power plant, the NRC continues to examine the issue of SFP safety. Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk of an SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Recently, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). The COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk of a SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC ~~has taken~~took extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

~~Recently~~Also, in 2014, the NRC ~~conducted~~documented a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). ~~The~~In COMSECY-13-0030, the NRC staff concluded that SFPs are ~~very~~-robust structures with large safety margins and recommended to the Commission that assessments of possible~~proposed~~ regulatory actions to require the expedited transfer of spent fuel from SFPs to dry cask storage~~further enhance safety~~ were not warranted. The Commission subsequently ~~concluded~~ that ~~no regulatory action needed to be pursued~~approved the staff's recommendation in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of an SFP severe accident is low. While the risk of a severe accident in

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012 (ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

an SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures in place if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which was accepted for consideration in the rulemaking process (77 FR 74788; December 18, 2012; ~~77 FR 74788~~) and is being addressed by the NRC's rulemaking regarding mitigation of beyond design-basis events (RIN 3150-AJ49; NRC-2014-0240).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and for license amendment reviews. requests In addition, baseline NRC inspections provide ~~and provides~~ ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate an SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and ~~its~~ their results proposed to be provided to the NRC ~~is~~ are not needed for the effectiveness of the NRC's approach ~~for to~~ ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's final-safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident, require redundant equipment and strategies to address loss of cooling to SFPs as well as and protective actions for plant personnel and the public to limit exposure to radioactive materials.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. ~~The At least two~~ NRC resident inspectors are permanently ~~stationed on-~~ assigned to each site to provide monitoring and inspection of routine and special activities. They are aware of, and routinely observe, SFP activities involving

fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees ~~to as a result of an NRC order or a change in regulations.~~

In accordance with 10 CFR part 21, the NRC is informed of defects ~~(in and failures to conform to the NRC requirements with respect to and noncompliances associated with)~~ basic components, which includes SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and ~~failures to conform/noncompliances~~. The NRC is also informed of the events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, ~~the a~~ nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant ~~and or~~ licensee as having a significant implication for public health and safety or common defense and security, must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Comment [LR]:
SGB & KLS would edit as shown.

WCO would edit as: "...NRC is informed of defects in and failures to conform comply to the NRC requirements with respect to basic components..."

JMB would not edit this sentence.

Comment [LR]:
SGB & KLS would edit as shown.

WCO would edit as: "... failures to conform comply."

JMB would not edit this sentence.

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident require redundant equipment and strategies to address loss of cooling to SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.

~~It is unclear how t~~The annual evaluations requested in the petition would not provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent uncovering of the fuel ~~uncovery~~, the information that would be obtained from the proposed requirement in the petition ~~does~~ would not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2. The petitioner ~~claimed~~ stated that there are serious flaws with MELCOR, which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how the such an evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's claims-statements that MELCOR is flawed. The following discussion is provided in order to address the petitioner's claims about the adequacy of MELCOR, even though this discussion does not form the basis for denial of this petition for rulemaking.

The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request for a new requirement for licensees to perform annual evaluations of SFPs. The petitioner's request to address perceived deficiencies in current severe accident models go hand-in-hand with the petitioner's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC is providing the following information about how MELCOR is used and the NRC's views on some of the phenomena discussed in the petition.

There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as, otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced

into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

The important question for a severe accident analysis is whether the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussing the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multi-unit or concurrent accident, or fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis and has been validated against experimental data. The MELCOR computer code and it represents the current state of the art in severe accident analysis. In NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor," the NRC stated that "MELCOR has been developed through the NRC and international research performed since the accident at Three Mile Island in 1979. MELCOR is a fully integrated, engineering-level computer code and includes a broad spectrum of severe accident phenomena with capabilities to model core heatup and degradation, fission product release and transport within the primary system and containment, core relocation to the vessel lower head, and ex-vessel core concrete interaction." Furthermore, MELCOR has been benchmarked against many experiments, including separate and integral effects tests testing for a wide range of phenomena. Therefore, the NRC has determined that MELCOR is acceptable for its intended use.

FurtherAdditional information about the capabilities of the MELCOR code to model SFP accidents can be found in the NRC response to stakeholder comments in Appendix E to NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor," (ADAMS Accession No. ML14255A365).

Comment [EG]:
KLS & WCO would combine sentences as shown.

SGB & JMB would leave as two separate sentences.

Comment [LR]: SGB

Comment [LR]:
WCO & JMB would spell out "spent fuel pool"

SGB & KLS would leave as shown

Comment [LR]: SGB

The NRC also addressed questions regarding MELCOR in Appendix D to NUREG-2157, Volume 2, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," (ADAMS Accession Nno. ML14196A107).

~~The petitioner claimed that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petitioner also claimed that MELCOR under-predicts the zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petitioner claimed, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petitioner pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.~~

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. The MELCOR computer code has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation as discussed later in this section.

The MELCOR computer code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as, otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced

into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., "zirconium fire") occurs. A self-sustaining zirconium fire will develop if the heat-generation rate from reaction with oxidant exceeds the heat-loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a self-sustaining zirconium fire will occur.

Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher temperatures, the presence of any measurable amount of oxygen in the gas (steam or air) attacking the cladding is sufficient to prevent the formation of surface ZrN . Further, if ZrN does form it can be converted readily to zirconium oxide (ZrO_2) when exposed to oxygen. The heat generation from the reaction of cladding to form ZrN followed by oxidation of the ZrN to form ZrO_2 is essentially the same as the direct reaction of Zr to form ZrO_2 . This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in the petition. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre- to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental

increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.

With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS-B9R), these phenomena are well understood and recognized in the formulations of models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a SFP. The code assessment against zirconium fire experiments conducted at Sandia National Laboratory (SNL) and code-to-code comparison documented in NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident" (ADAMS Accession No. ML13072A056), address fire propagation phenomena.

The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys" (ADAMS Accession No. ML041900069). The MELCOR computer code was used in the zirconium fire experiments (see NUREG/CR-7143) and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code-to-code comparisons) as well as the SFP study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.

The recent Sandia Fuel Project by the Organisation for Economic Co-operation and Development Nuclear Energy Agency provided experimental data relevant for hydraulic and ignition phenomena of prototypic pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petitioner asserted that the SNL SFP accident experiments are unrealistic because they

were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100-micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.

The important question for an analysis is if the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core-concrete interaction, multiunit or concurrent accident, fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or conservative estimates. The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volumes 1 and 2 (ADAMS Accession Nos. ML14196A105 and ML14196A107)) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 feet above the top of the fuel in the pool, therefore encompassing the effects of some of the phenomena mentioned by the petition.

In conclusion, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP

~~evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. The NRC has considered the most important phenomena and continues to improve the models to further reduce the uncertainties. However, the NRC wishes to emphasize that these improvement efforts do not reflect an NRC determination that the models are unacceptable for their intended use by the NRC.~~

Comment [LR]:
SGB – delete documents no longer referenced in this FRN from the table below.

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/ <i>Federal Register</i> Citation |
|-----------------|--|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |

| | | |
|---------------------------|--|------------------------|
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| June 2004 | NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys." | ML041900069 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |
| March 2013 | NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling-Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss of Coolant Accident." | ML13072A056 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A106 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Comment [LR]: SGB

Comment [LR]: SGB

Comment [LR]: SGB

Dated at Rockville, Maryland, this day of , 2015.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission

From: Doyle, Daniel
Sent: 18 Feb 2016 12:23:09 -0500
To: Mizuno, Geary;Borges, Jennifer;Hernandez, Raul;Esmaili, Hossein;Casto, Greg;Witt, Kevin
Cc: Mohseni, Aby
Subject: FW: Vote Registered (JMB, SECY-15-0146, Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108))

FYI. The second vote on the PRM-50-108 denial package is in (first link below). Commissioner Baran approved the staff's recommendation with edits. He stated that he looks forward to reviewing the staff's careful consideration of a report from NAS that is expected to be issued in the coming weeks. He generally agreed with the edits from Commissioner Ostendorff, but made a number of minor edits and he also changed the order of the paragraphs in issue 2 (see FRN page 12) and issue 3 (see FRN pages 15 and 16). The two gray paragraphs in issue 3 were the paragraphs Hossein commented on. My opinion is that these edits improve the flow and readability of the FRN.

[Link to JMB vote sheet](#)

[Link to WCO vote sheet](#)

We will see two more vote sheets and then we may have an opportunity to comment on a draft SRM before receiving the final SRM.

Dan

From: Laufer, Richard

Sent: Thursday, February 18, 2016 11:01 AM

To: SECYOPS_EDO-Votes

Cc: Doyle, Daniel

Subject: FW: Vote Registered (JMB, SECY-15-0146, Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108))

From: ADAMS p8_icm_service

Sent: Thursday, February 18, 2016 10:58 AM

To: ICM_STARS_KLS <ICM_STARS_KLS@nrc.gov>; ICM_STARS_WCO <ICM_STARS_WCO@nrc.gov>; ICM_STARS_JMB <ICM_STARS_JMB@nrc.gov>; ICM_STARS_SGB <ICM_STARS_SGB@nrc.gov>; ICM_STARS_SECYVoting <ICM_STARS_SECYVoting@nrc.gov>

Subject: Vote Registered (JMB, SECY-15-0146, Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108))

On 02/18/2016 JMB Vote Record was updated by Schumann, Stacy (sms9).The Vote Record information can be found below

Vote Record Info

Document Number SECY-15-0146

Subject Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108)

Originating Organization Executive Director for Operations

Due Date 12/07/2015

Vote Approved/Edits

Vote Date 02/18/2016

| | |
|---------------|---|
| Edits? | Yes |
| Comments? | Yes |
| Vote Comments | Commissioner Baran's vote with comments and edits attached. |
| Assignee | RGK |

From: Borges, Jennifer
Sent: 18 Feb 2016 17:30:55 +0000
To: Terry, Leslie
Cc: DeJesus, Anthony
Subject: FW: Vote Registered (JMB, SECY-15-0146, Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108))

FYI

From: Doyle, Daniel
Sent: Thursday, February 18, 2016 12:23 PM
To: Mizuno, Geary; Borges, Jennifer; Hernandez, Raul; Esmaili, Hossein; Casto, Greg; Witt, Kevin
Cc: Mohseni, Aby
Subject: FW: Vote Registered (JMB, SECY-15-0146, Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108))

FYI. The second vote on the PRM-50-108 denial package is in (first link below). Commissioner Baran approved the staff's recommendation with edits. He stated that he looks forward to reviewing the staff's careful consideration of a report from NAS that is expected to be issued in the coming weeks. He generally agreed with the edits from Commissioner Ostendorff, but made a number of minor edits and he also changed the order of the paragraphs in issue 2 (see FRN page 12) and issue 3 (see FRN pages 15 and 16). The two gray paragraphs in issue 3 were the paragraphs Hossein commented on. My opinion is that these edits improve the flow and readability of the FRN.

[Link to JMB vote sheet](#)

[Link to WCO vote sheet](#)

We will see two more vote sheets and then we may have an opportunity to comment on a draft SRM before receiving the final SRM.

Dan

From: Laufer, Richard
Sent: Thursday, February 18, 2016 11:01 AM
To: SECYOPS_EDO-Votes <SECYOPS_EDO-Votes@nrc.gov>
Cc: Doyle, Daniel <Daniel.Doyle@nrc.gov>
Subject: FW: Vote Registered (JMB, SECY-15-0146, Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108))
From: ADAMS p8_icm_service
Sent: Thursday, February 18, 2016 10:58 AM
To: ICM_STARS_KLS <ICM_STARS_KLS@nrc.gov>; ICM_STARS_WCO <ICM_STARS_WCO@nrc.gov>; ICM_STARS_JMB <ICM_STARS_JMB@nrc.gov>; ICM_STARS_SGB <ICM_STARS_SGB@nrc.gov>; ICM_STARS_SECYVoting <ICM_STARS_SECYVoting@nrc.gov>
Subject: Vote Registered (JMB, SECY-15-0146, Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108))

On 02/18/2016 JMB Vote Record was updated by Schumann, Stacy (sms9). The Vote Record information can be found below

Vote Record Info

Document Number SECY-15-0146

Subject Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108)

| | |
|--------------------------|---|
| Originating Organization | Executive Director for Operations |
| Due Date | 12/07/2015 |
| Vote | Approved/Edits |
| Vote Date | 02/18/2016 |
| Edits? | Yes |
| Comments? | Yes |
| Vote Comments | Commissioner Baran's vote with comments and edits attached. |
| Assignee | RGK |

From: Borges, Jennifer
Sent: 23 Feb 2016 13:38:49 +0000
To: DeJesus, Anthony
Subject: FW: Vote Registered (SGB, SECY-15-0146, Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108))

For bi-weekly update

From: Doyle, Daniel
Sent: Monday, February 22, 2016 6:34 PM
To: Mizuno, Geary ; Borges, Jennifer ; Hernandez, Raul ; Esmaili, Hossein ; Casto, Greg ; Witt, Kevin
Cc: Mohseni, Aby
Subject: FW: Vote Registered (SGB, SECY-15-0146, Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108))

FYI. We just received the third vote on the PRM-50-108 denial package. Chairman Burns approved the staff's recommendation with edits. He accepted most of Commissioner Baran's edits, and the deviations appear to be minor. The vote sheet states that edits to the letter to the petitioner are attached, but they are not, so I will ask the EDO ETA if we can get those. One more vote to go and then we may have an opportunity to comment on a draft SRM before receiving the final SRM.

[Link to SGB vote sheet \(2/22/16\)](#)

[Link to JMB vote sheet \(2/18/16\)](#)

[Link to WCO vote sheet \(1/7/16\)](#)

Dan

From: Ellmers, Glenn
Sent: Monday, February 22, 2016 3:00 PM
To: SECYOPS_EDO-Votes <SECYOPS_EDO-Votes@nrc.gov>
Cc: Doyle, Daniel <Daniel.Doyle@nrc.gov>
Subject: FW: Vote Registered (SGB, SECY-15-0146, Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108))

From: ADAMS p8_icm_service
Sent: Monday, February 22, 2016 2:48 PM
To: ICM_STARS_KLS <ICM_STARS_KLS@nrc.gov>; ICM_STARS_WCO <ICM_STARS_WCO@nrc.gov>; ICM_STARS_JMB <ICM_STARS_JMB@nrc.gov>; ICM_STARS_SGB <ICM_STARS_SGB@nrc.gov>; ICM_STARS_SECYVoting <ICM_STARS_SECYVoting@nrc.gov>

Subject: Vote Registered (SGB, SECY-15-0146, Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108))

On 02/22/2016 SGB Vote Record was updated by Cianci, Sandra (ssc1).The Vote Record information can be found below



Vote Record Info

Document Number SECY-15-0146

Subject Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108)

Originating Organization Executive Director for Operations

Due Date 12/07/2015

| | |
|---------------|----------------|
| Vote | Approved/Edits |
| Vote Date | 02/22/2016 |
| Edits? | Yes |
| Comments? | Yes |
| Vote Comments | |
| Assignee | JAM |

From: Doyle, Daniel
Sent: 7 Jan 2016 14:45:38 -0500
To: Mizuno, Geary;Borges, Jennifer;Hernandez, Raul;Esmaili, Hossein;Casto, Greg;Witt, Kevin
Cc: Inverso, Tara
Subject: FW: Vote Registered (WCO, SECY-15-0146, Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108))

FYI.

The first vote on the PRM-50-108 denial package is in. Commissioner Ostendorff approved the staff recommendation with edits: [Link to WCO vote sheet](#)

The staff feedback was accepted. The two discussions Hossein commented on were retained, and the reference to specific comments on page 15 was removed.

We will see three more vote sheets and then we may have an opportunity to comment on a draft SRM before receiving the final SRM.

Dan

From: Ellmers, Glenn

Sent: Thursday, January 07, 2016 1:41 PM

To: SECYOPS_EDO-Votes

Cc: Doyle, Daniel

Subject: FW: Vote Registered (WCO, SECY-15-0146, Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108))

From: ADAMS p8_icm_service

Sent: Thursday, January 07, 2016 1:35 PM

To: ICM_STARS_KLS <ICM_STARS_KLS@nrc.gov>; ICM_STARS_WCO <ICM_STARS_WCO@nrc.gov>;

ICM_STARS_JMB <ICM_STARS_JMB@nrc.gov>; ICM_STARS_SGB <ICM_STARS_SGB@nrc.gov>;

ICM_STARS_SECYVoting <ICM_STARS_SECYVoting@nrc.gov>

Subject: Vote Registered (WCO, SECY-15-0146, Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108))

On 01/07/2016 WCO Vote Record was updated by Temp, WCO (wcot).The Vote Record information can be found below



Vote Record Info

Document Number SECY-15-0146

Subject Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations (PRM-50-108)

Originating Organization Executive Director for Operations

Due Date 12/07/2015

Vote Approved/Edits

Vote Date 01/07/2016

Edits? Yes

Comments? Yes

Vote Comments Commissioner Ostendorff approved.

Assignee AEC

From: Terry, Leslie
Sent: 31 Aug 2015 06:55:13 -0400
To: Whaley, Sheena;Cox, Vanessa
Cc: DeJesus, Anthony;Bladey, Cindy;Borges, Jennifer
Subject: FW: Working Group for 10 CFR Part 20 petition for rulemaking
Attachments: CommentExtensionFRN.PDF, MarkMiller.pdf, CarolMarcus.pdf, MohanDoss.pdf, FRNForComment.pdf

Anthony de Jesus will serve as the ADM contact and Jennifer Borges will serves as the ADM backup.

Thanks,
Leslie

From: Whaley, Sheena
Sent: Wednesday, August 26, 2015 02:45 PM
To: Shoop, Undine; McCoppin, Michael; Gonzalez, Hipolito; Bollock, Douglas; Bladey, Cindy; Safford, Carrie; Tadesse, Rebecca
Cc: Sahle, Solomon; Cox, Vanessa
Subject: Working Group for 10 CFR Part 20 petition for rulemaking

Good afternoon,

NMSS's Division of Materials Safety, States, Tribal, and Rulemaking, Rulemaking and Project Management Branch (NMSS/MISTR/RPMB) is seeking members for a working group to review and resolve a petition for rulemaking. The petitioner requests that the NRC amend its "Standards for Protection Against Radiation" regulations and change the basis of those regulations from the Linear No-Threshold (LNT) model of radiation protection to the radiation hormesis model.

The NRC has already published in the Federal Register a notice of receipt of the petition and a request for public comments [80 FR 35870]. The incoming petition and the Federal Register notice are attached.

During review of the petition, we anticipate meeting on a bi-weekly basis as well as consultations by phone and email to develop the draft documents and to obtain input on intermediate drafts. The primary role of the working group is to propose a resolution for the petition to the Petition Review Board for approval. A petition is considered to be resolved when the regulatory decision for the petition is made. The decision can be to consider the issue(s) raised in the petition in a future rulemaking (all or in part), or to determine that the issue(s) do not warrant consideration in rulemaking and deny the petition (all or in part). We plan for the working group to begin its activities in November 19, 2015, after the close of the public comment period, and we anticipate scheduling the Petition Review Board meeting in March 2016 to review and approve the proposed petition resolution. We anticipate publishing a Federal Register notice of the petition resolution approximately three months after the Petition Review Board meets.

The working group member you identify from your organization is expected to bring your organization's views to the working group and to facilitate your organization's concurrence. The level of routine involvement of the representative from your organization will be commensurate with the level of interest your organization has in the petition issue, and the petition process overall.

The Project Manager for the petition is Vanessa Cox (301-415-8342).

We request that you nominate a working group member from your respective organization to be your representative for the review of this petition for rulemaking. We would appreciate your response by November 12, 2015.

Please contact me or Vanessa Cox if you have any questions. Thank you in advance.
Sheena Whaley, Chief
Rulemaking and Project Management Branch
Division of Materials Safety, States, Tribal, and Rulemaking
Office of Nuclear Material Safety and Safeguards (NMSS)
(301) 415-0213

conflict with this rule. The rule will impact marketing programs that regulate the handling of processed raisins under 7 CFR part 989. Raisins under a marketing order have to meet certain requirements set forth in the grade standards. In addition, raisins are subject to section 8e import requirements under the Agricultural Marketing Act of 1937, as amended (7 U.S.C. 601–674), which requires imported raisins to meet grade, size, and quality under the applicable marketing order (7 CFR part 999).

Background

AMS continually reviews all fruit and vegetable grade standards to ensure their usefulness in the industry, and to modernize language and remove duplicative terminology. On May 13, 2013, AMS received a petition from the Little People of America stating that they “are trying to raise awareness around and eliminate the use of the word midget.” The petition further stated that, “Though the use of the word midget by the USDA when classifying certain food products is benign, Little People of America, and the dwarfism community, hopes that the USDA would consider phasing out the term midget.”

AMS determined that the processed raisin grade standard contained “small or midget” terminology for the same requirement. Before developing these proposed revisions, AMS solicited comments and suggestions about the grade standards from the RAC. The RAC represents the entire California raisin industry; no other state produces raisins commercially. On August 14, 2014, the RAC approved the removal of the term midget from the standards.

AMS is proposing to remove five references to the term “midget” in the following sections: 52.1845(b) and (c), 52.1850(a)(2) and (a)(3), and Table I. The proposed revisions would modernize and help clarify the language of the standard by removing dual terminology for the same requirement.

The proposed rule provides a 60-day period during which interested parties may comment on the revisions to the standard.

List of Subjects in 7 CFR Part 52

Food grades and standards, Food labeling, Frozen foods, Fruit juices, Fruits, Reporting and recordkeeping requirements, Vegetables.

For reasons set forth in the preamble, 7 CFR part 52 is proposed to be amended as follows:

PART 52—[AMENDED]

- 1. The authority citation for part 52 continues to read as follows:

Authority: 7 U.S.C. 1621–1627.

- 2. In § 52.1845, paragraphs (b) and (c) are revised to read as follows:

§ 52.1845 [Amended]

* * * * *

(b) *Small* size raisins means that 95 percent, by weight, of all the raisins will pass through round perforations 24/64-inch in diameter, and not less than 70 percent, by weight, of all raisins will pass through round perforations 22/64-inch in diameter.

(c) *Mixed* size raisins means a mixture which does not meet either the requirements for “select” size; or for “small” size.

* * * * *

- 3. In § 52.1846, Table I, is amended, under “Substandard Development and Undeveloped” by revising the entry for “small size” to read as follows:

§ 52.1846 Grades of seedless raisins.

* * * * *

TABLE I

| | Defects | U.S. Grade A | U.S. Grade B | U.S. Grade C |
|---|---------|--------------|--------------|--------------|
| Substandard Development and Undeveloped | | Total | Total | Total |
| Small size | | 2 | 3 | 5 |

- 4. In § 52.1850, paragraphs (a)(2) and (3) are revised to read as follows:

§ 52.1850 [Amended]

* * * * *

(a) * * *

(2) *Small* size raisins means that all of the raisins will pass through round perforations 34/64-inch in diameter and not less than 90 percent, by weight, of all the raisins will pass through round perforations 22/64-inch in diameter.

(3) *Mixed* size raisins means a mixture does not meet either the requirements for “select” size or for “small” size.

* * * * *

Dated: August 13, 2015.

Rex A. Barnes,
Associate Administrator, Agricultural
Marketing Service.

[FR Doc. 2015–20391 Filed 8–20–15; 8:45 am]

BILLING CODE P

NUCLEAR REGULATORY COMMISSION

10 CFR Part 20

[Docket Nos. PRM–20–28, PRM–20–29, and PRM–20–30; NRC–2015–0057]

Linear No-Threshold Model and Standards for Protection Against Radiation

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; notice of docketing and request for comment; extension of comment period.

SUMMARY: On June 23, 2015, the U.S. Nuclear Regulatory Commission (NRC) requested public comment on three petitions for rulemaking (PRM) requesting that the NRC amend its “Standards for Protection Against Radiation” regulations and change the basis of those regulations from the linear no-threshold model of radiation protection to the radiation hormesis model. The public comment period was originally scheduled to close on September 8, 2015. The NRC is extending the public comment period to allow more time for members of the public to develop and submit their comments.

DATES: The comment period for the document published on June 23, 2015, at 80 FR 35870, is extended. Comments should be filed no later than November 19, 2015. Comments received after this date will be considered, if it is practical to do so, but the Commission is able to ensure consideration only for comments received on or before this date.

ADDRESSES: You may submit comments by any of the following methods (unless this document describes a different method for submitting comments on a specific subject):

- **Federal Rulemaking Web site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2015-0057. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; email: Carol.Gallagher@nrc.gov. For technical questions contact the individual listed in the **FOR FURTHER INFORMATION CONTACT** section of this document.

- **Email comments to:** Rulemaking.Comments@nrc.gov. If you do not receive an automatic email reply confirming receipt, then contact us at 301-415-1677.

- **Fax comments to:** Secretary, U.S. Nuclear Regulatory Commission at 301-415-1101.

- **Mail comments to:** Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, ATTN: Rulemakings and Adjudications Staff.

- **Hand deliver comments to:** 11555 Rockville Pike, Rockville, Maryland 20852, between 7:30 a.m. and 4:15 p.m. (Eastern Time) Federal workdays; telephone: 301-415-1677.

For additional direction on obtaining information and submitting comments, see "Obtaining Information and Submitting Comments" in the **SUPPLEMENTARY INFORMATION** section of this document.

FOR FURTHER INFORMATION CONTACT: Solomon Sahle, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington DC 20555-0001; telephone: 301-415-3781, email: Solomon.Sahle@nrc.gov.

SUPPLEMENTARY INFORMATION:

I. Obtaining Information and Submitting Comments

A. Obtaining Information

Please refer to Docket ID NRC-2015-0057 when contacting the NRC about the availability of information for this action. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2015-0057.

- **NRC's Agencywide Documents Access and Management System (ADAMS):** You may obtain publicly-available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "ADAMS Public Documents" and then select "Begin Web-based ADAMS Search." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by email to pdr.resource@nrc.gov.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

B. Submitting Comments

Please include Docket ID NRC-2015-0057 in your comment submission.

The NRC cautions you not to include identifying or contact information that you do not want to be publicly disclosed in your comment submission. The NRC will post all comment submissions at <http://www.regulations.gov> as well as enter the comment submissions into ADAMS. The NRC does not routinely edit comment submissions to remove identifying or contact information.

If you are requesting or aggregating comments from other persons for submission to the NRC, then you should inform those persons not to include identifying or contact information that they do not want to be publicly disclosed in their comment submission. Your request should state that the NRC does not routinely edit comment submissions to remove such information before making the comment submissions available to the public or entering the comment into ADAMS.

II. Discussion

On June 23, 2015, the NRC requested public comment on three PRMs, PRM-20-28, PRM-20-29, and PRM-20-30, requesting that the NRC amend its "Standards for Protection Against Radiation" regulations and change the basis of those regulations from the linear no-threshold model of radiation protection to the radiation hormesis model. The NRC is examining the issues raised in these PRMs to determine whether they should be considered in rulemaking.

The public comment period was originally scheduled to close on September 8, 2015. The NRC is extending the public comment period on this document until November 19, 2015, to allow more time for members of the public to submit their comments.

Dated at Rockville, Maryland, this 17th day of August, 2015.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

[FR Doc. 2015-20722 Filed 8-20-15; 8:45 am]

BILLING CODE 7590-01-P

FEDERAL HOUSING FINANCE AGENCY

12 CFR Part 1238

RIN 2590-AA74

Proposed Amendments to the Stress Test Rule

AGENCY: Federal Housing Finance Agency.

ACTION: Notice of proposed rulemaking with request for comment.

SUMMARY: The Federal Housing Finance Agency (FHFA) is proposing amendments to its stress testing rule adopted in 2013 to implement section 165(i) of the Dodd-Frank Wall Street Reform and Consumer Protection Act. The amendments would modify the start date of the stress test cycles from October 1 of a calendar year to January 1 of the following calendar year. The amendments would also modify the dates for FHFA to issue scenarios for the upcoming cycle, the dates for the regulated entities to report the results of their stress tests to FHFA, and the dates for the regulated entities to publicly disclose a summary of their stress test results for the severely adverse scenario. These amendments would align FHFA's rule with rules adopted by other financial institution regulators that implement the Dodd-Frank stress testing requirements.

DATES: Comments on the proposed amendments must be received on or before September 21, 2015.

ADDRESSES: You may submit your comments, identified by regulatory identification number (RIN) 2590-AA74, by any of the following methods:

- **Agency Web site:** www.fhfa.gov/open-for-comment-or-input.
- **Federal eRulemaking Portal:** <http://www.regulations.gov>. Follow the instructions for submitting comments. If you submit your comment to the Federal eRulemaking Portal, please also send it by email to FHFA at RegComments@fhfa.gov to ensure timely receipt by the agency. Please include "RIN 2590-AA74" in the subject line of the message.

- **Hand Delivered/Courier:** The hand delivery address is: Alfred M. Pollard, General Counsel, Attention: Comments/

Mark L. Miller, CHP
PHONE: (505) 275-8154
E-MAIL: marklmiller20@gmail.com

February 13, 2015

Annette L. Vietti-Cook,
Secretary, USNRC
Attention: Rulemakings and Adjudications Staff
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

Dear Ms. Vietti-Cook:

I am submitting this petition for rulemaking pursuant to 10 CFR Part 2.802. The petitioner requests that the NRC amend 10 CFR Part 20, *Standards for Protection Against Radiation*, based on new science and evidence that contradicts the Linear No-Threshold (LNT) hypothesis, a model that has served as the basis for radiation protection regulations. I will present scientific data as reported in study after study to justify that safety regulations and policies should no longer be based on the scientifically unjustified LNT model. This overly-simplified concept assumes that all radiation absorbed doses, no matter how small, have a finite probability of causing a fatal cancer. This is demonstrably false, as evidenced by over 60 years of operational dose data, countless peer-reviewed studies and the practices of radiation oncology and radionuclide therapy. Use of the LNT assumption encourages regulators to ratchet down permissible worker and public radiation levels, either through actual dose limits or use of the "as low as reasonably achievable" (ALARA) principle, giving the illusion that they are making everyone safer. Ironically, it is the erroneous use of LNT and its use to justify ALARA that has led to persistent radiophobia that we see everywhere today. There has never been scientifically valid support for this LNT hypothesis since its use was recommended by the U.S. National Academy of Sciences Committee on Biological Effects of Atomic Radiation (BEAR I)/Genetics Panel in 1956. The costs of complying with these LNT-based regulations are incalculable. Dr. Gunnar Walinder has summed it up: "The LNT is the greatest scientific scandal of the 20th century (1)."

On the contrary, there are numerous experiments which document no effects and even protective effects at relatively low-dose and low-dose-rate radiation exposures. The literature showing no effects supports a threshold concept, in which radiation below a certain level is of no concern because it causes no deleterious effects. The literature showing protective effects supports the concept of hormesis, in which low levels of potentially stressful agents, such as toxins, other chemicals, ionizing radiation, etc., protect against the deleterious effects that high levels of these stressors produce and result in beneficial effects (e.g. lower cancer rates). To properly characterize risk at low radiation doses, a range of health outcomes, including beneficial or zero health effects, must be acknowledged.

Biological organisms are exceedingly complex, and have evolved in a world full of stressors, particularly oxygen, and also the bombardment by low dose background radiation from above, below, and within our own bodies. More than 150 genes have been recognized so far that are involved in defense of the organism and the production of defensive systems to protect against noxious agents. Although low-level radiation absorbed dose may cause cellular damage (including single- and double-strand breaks in DNA), this radiation also up-regulates a system of protective mechanisms in cells, tissues, animals, and humans that counteract the damage and then protect far more than they were damaged in the first place. It turns out that counting single- and double-strand breaks is a good measure of radiation dose, but is completely meaningless in estimating risk from low-dose radiation. As the levels of radiation absorbed dose rise, the damage and benefits equalize, and at higher doses the overall effect is harm, which is widely understood and acknowledged (2).

The fortunes of the United States have been founded upon advances in science and technology. Americans in general have embraced progress. Why then do regulators adhere to the LNT model to put a choke hold on radiation-related activities? Why is valid science being denied, while the invalidated LNT ideology based on erroneous evidence continues to be embraced? It is important to answer this question to fully understand how such a myth perpetrated on society could have survived for so long.

Regulators use the LNT assumption because nationally and internationally respected bodies recommend and advocate it. NCRP, ICRP, IAEA, and NAS-NRC's BEIR Committee care some of them. However, it seems that they are willing to abandon their scientific principles to maintain the *status quo*. It is going to take a good deal of courage to stand up and state that "The Emperor has no clothes." However, it is inevitable.

In 2001 the NCRP published Report No. 136 entitled "Evaluation of the Linear-Nonthreshold Dose-Response Model for Ionizing Radiation" (3), in which the LNT was upheld. In 2003 Zbigniew Jaworowski of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and Michael Waligorski destroyed that Report with an astonishing exposé of scientific misconduct (4). Every radiation regulator should read this scathing indictment of the NCRP Report. It is not highly technical, and requires no advanced mathematical ability.

Prof. Edward J. Calabrese of the Univ. of Massachusetts has traced amazing scientific misconduct by the nation's leading geneticists in mid-twentieth century (5, 6, 7). He states, "This paper extends a series of historical papers which demonstrated that the linear-no-threshold model for cancer risk assessment was founded on ideological-based scientific deceptions by key radiation genetics leaders. Based on an assessment of recently uncovered personal correspondence, it is shown that some members of the United States (US) National Academy of Sciences (NAS) Biological Effects of Atomic Radiation I (BEAR I) Genetics Panel were motivated by self-interest to exaggerate risks to promote their science and personal/professional agenda. Such activities have profound implications for public policy and may have had a significant impact on the adoption of the LNT model for cancer risk assessment." It should be acknowledged, at that point in history, there was no scientific data available to definitively conclude whether or not radiation caused radiation damage. Therefore, it might be

understandable that genetic risk was a reasonable concern and a precautionary approach, combined with Cold War concerns, provided the pressure to adopt a simplified LNT approach that might have been reasonable at the time. However, since then, scientific studies have conclusively shown that radiation does not cause genetic damage that affects future generations. Nevertheless, the antinuclear movement of the Cold War era continued to promote the scientifically unfounded myth that harm at any level of radiation would occur as part of their antinuclear-everything agenda.

There are countless peer-reviewed scientific papers that show that the LNT model is in error. There are several textbooks in this field, and journals that publish scientific findings that refute the LNT model. This is an entire field of science that regulators apparently pretend does not exist. Its continued existence certainly doesn't reflect the tenants of the scientific method. Imposing it upon the citizens of the United States (and the world, since others look to the practices observed in the USA) must stop.

There are numerous human situations in which we have good data that support radiation hormesis. Sadly, there are scientists who look at these data and ignore the apparent beneficial effect of low doses of radiation. When they make graphs of relative cancer risk vs. radiation absorbed dose, they simply draw a straight line **that misses the low dose points** and then proclaim that their data support the LNT model. The most commonly referenced study is the Life Span Study of the Radiation Effects Research Foundation (RERF) which studies the **Japanese atomic bomb survivors**. Recent data (8) show a hormetic effect for all solid cancers in the 0.3-0.7 Gy (30-70 rad) dose range, and the study of leukemia rates in the 96,000 survivors (9) showed hormesis at low doses, with a threshold at about 500 mSv (50 rem).

Workers exposed in the **nuclear power industry** comprise the largest group of occupationally exposed workers studied. They generally receive low radiation doses. Over 400,000 workers were studied from 154 facilities in 15 countries (10, 11) and the study showed a decrease in the risk of all cancers including leukemia. The BEIR VII report from the National Academy of Sciences points out that in most of the nuclear industry worker studies, mortality from all cancer and all causes is substantially lower than the reference population. While they have no explanation for this phenomenon, which could be caused by radiation hormesis, the National Academy Committee suggested the possibility of a "healthy worker effect". This mysterious effect is often cited to explain lower cancer rates in workers receiving low doses of radiation, but a little thought will show that the "healthy worker effect" is not supported by the data, while hormesis is a perfectly good alternative explanation.

Thirty-one thousand, seven hundred and ten female patients with tuberculosis in Canadian sanatoriums from 1930-1952 were subjected to multiple fluoroscopies to monitor their disease status. Of these patients, 26.4 % received radiation doses to the affected side of 10 cGy (10 rads) or more, and therefore most received lower doses. The relative risk of eventual breast cancer was studied in all these patients. **Patients who received a total radiation absorbed dose in the range from 5 – 30 cGy (5-30 rads) had a breast cancer incidence up to one third less than the background incidence.** Only at radiation absorbed doses above 50 cGy (50 rads) did the cancer incidence begin to increase above baseline (14, 15).

The radium dial watch painters comprise another group of radiation exposed workers. In some 900 young women who sharpened paint brushes with their tongues, there were 54 bone sarcomas and 25 carcinomas of the mastoids and paranasal sinuses. Radium is a bone seeker. **None of these malignancies occurred at a radiation absorbed dose to bone less than 10 Gy (1000 rads) (16).** While these studies were not designed to demonstrate hormesis, they do show a threshold, and a very high one, for the induction of bone cancer.

Following World War II, after the construction of nuclear reactors and the expansion of peaceful uses of atomic energy, patients with hyperthyroidism were treated with radioactive iodine-131 (I-131); this is still the treatment of choice today. While the I-131 cured the hyperthyroidism, there was a concern about late effects from the radiation. The Cooperative Thyrotoxicosis Therapy Follow-Up Study of over 36,000 treated hyperthyroid patients looked at eventual leukemia rates in these patients, as leukemia is considered the most radiosensitive of cancers and occurs faster than other radiogenic cancers. The total body radiation doses to these patients were 130-140 mSv (13-14 rem). **The age-adjusted leukemia incidence rate was 11/100,000 patient years in the I-131 treated patients and 14/100,000 patient years in patients treated by surgical removal of the thyroid gland (the standard procedure before I-131 became the therapy of choice).** While the authors concluded that there was no increased incidence of leukemia at this low whole body radiation dose (17), **the 22% decrease in the I-131 treated patients suggests a possible hormetic effect.**

The explosion of radioactive waste from a nuclear fuel reprocessing facility called "Mayak" in 1957 resulted in a stream of radioactive waste affecting an area in the East Urals of Russia. Research was performed on data collected from 1957-1987 on occupants of the 22 villages evacuated from the radioactive waste zone (18). Radiation absorbed dose groups were made for those receiving 40 mSv (4 rem), 120 mSv (12 rem), and 500mSv (50 rem). **Although all three groups had less cancer than the baseline expected in the area, the 50 rem and 12 rem groups were statistically significantly lower than the baseline cancer rate expected, suggesting hormesis.** The cancer death rate in the 50 rem group was 29% lower than the controls, and in the 12 rem group was 39% lower than the controls.

In 1982, several orphan cobalt-60 (Co-60) sources were recycled accidentally in the steel scrap industry in northern Taiwan. This resulted in the Co-60 contamination of more than 20,000 tons of steel used in the construction of over 200 residential, industrial and school buildings in Taiwan. In 1992, this contamination was identified and the exposed population was studied for cancer incidence (19). The population of 7271 people representing 101,560 person-years at risk was exposed to chronic radiation amounting to an average of about 5 cGy (5 rads) from 1983-2002. The range of radiation exposure was <1-2363 mSv (<0.1-236 rem). **The standardized incidence ratios (SIR) and the 95% confidence intervals calculated for all cancers was 0.8 (0.7, 1.0), for all cancers except leukemia was 0.8 (0.6, 0.9), and for solid cancers was 0.7 (0.6, 0.9).** (A SIR of 1.0 means the same as that of unirradiated controls.) The lowered cancer incidence rate was significant at the 95% confidence interval for all cancers except leukemia and for solid cancers. The lowered cancer incidence rate for all cancers was significant at the 90% confidence interval. The lowered cancer incidence rates in these people exposed to chronic, low levels of radiation suggest radiation hormesis.

The situation with residential radon exposure and lung cancer is most interesting. The seminal research of Bernard Cohen (20, 21, 22, 23) in the United States showed that **increasing levels of residential radon were associated with decreasing levels of lung cancer**. His data were carefully corrected for 54 socioeconomic variables, including smoking, but the inverse correlation of radon levels with lung cancer did not change. Dr. Bobby Scott (24) has analyzed the situation and has shown that low-level radon and its radioactive daughters cause activated natural protection against lung cancer, including smoking-related lung cancer, at levels up to the Environmental Protection Agency's (EPA's) action level of 4 picocuries/L (about 150 Bq m⁻³). Somewhat above this level, the activated natural protection effect progressively goes to zero and it is here that we see an increase in lung cancer. From this, we must conclude that **low levels of radon are hormetic**. Klaus Becker (25) has shown similar correlations in data from Central Europe.

In 1986, the Chernobyl reactor accident riveted much of the world, prompting huge hysteria (26). In the former Soviet Union, 336,000 people were forcibly evacuated, some from areas with five times lower radiation levels than are present in Grand Central Station in New York City, which is constructed with natural granite. There were large numbers of unnecessary abortions in Western Europe due to fears of mutant babies. Huge amounts of food were wasted because of miniscule levels of contamination which would hurt no one. The LNT was responsible for much of the hysteria, multiplying very small radiation doses times hundreds of millions of people to estimate huge numbers of cancer deaths. The affected population in the former Soviet Union was followed for increased cancer incidence. According to UNSCEAR 2000b (27) and the United Nations Chernobyl Forum in 2006, except for thyroid cancers in the highly contaminated areas, there was no increased incidence of leukemias or solid tumors, and no evidence of increased genetic diseases. The increase in thyroid cancers was found in children under 15 years of age in 1987, the year after the accident. However, the radiation doses were too low to have caused this, and there was no dose-response relationship. In addition, the timing was off---the mean latent period for radiation-induced thyroid cancer is about 28 years (27). However, the increase was highly likely due to a mass screening effect (22). Occult thyroid cancer is actually extremely common, with an autopsy prevalence in various countries of 4.5% to 36% (28, 29). These are small cancers that never caused problems and were unknown during the person's lifetime. The development of sensitive ultrasound techniques have made the diagnosis of these occult cancers, or "incidentalomas", much more common. In the United States, a screening program uncovered a 2100% increase in thyroid nodules (30), and mandatory yearly screening in children in the contaminated areas around Chernobyl resulted in a similar phenomenon. **According to Jaworowski (26), the natural incidence of occult thyroid cancers is approximately 1000 times higher than the highest incidence of reported thyroid cancers in the countries with the greatest fallout from the Chernobyl accident. The supposed increased finding of thyroid cancer due to radiation from the Chernobyl accident is instead due to intense screening (31).** The Chernobyl accident resulted in 28 radiation deaths among rescue workers and employees of the power station who received 2.9-16 Gy (290-1600 rads). Three others died of different causes. The surviving workers show a 15-30% lower mortality from solid cancers than the general Russian population and the residents of the Bryansk district, which received the highest contamination, had a 5% lower solid tumor incidence than expected (26). Informative reviews on **molecular mechanisms of hormesis** and related phenomena may be found in the papers by Tang and Loke (32) and Brooks and Dauer (33).

It is important to compare a joint report of the French Academy of Sciences and of the French Academy of Medicine (34) on low radiation dose carcinogenic effects, published in 2005, shortly before a comparable report of BEIR VII/Phase 2 of the National Academy of Sciences-National Research Council (35) was published. Covering the same questions, the two groups of experts came to different conclusions (36). The French report finds that as epidemiological studies have been unable to detect any significant increases in cancer after radiation doses of up to about 100 mSv (10 rem), that there are no convincing data showing any increase in cancer in adults, children, or infants receiving doses under about 100 mSv (10 rem). The LNT therefore greatly overestimates the risk of these low doses. The Health Physics Society in 2010 published a position paper on this topic (PS010-2), "Radiation Risk in Perspective".

In contrast, the BEIR VII report concludes that "The committee judges that the balance of evidence from epidemiologic, animal and mechanistic studies tends to favor a simple proportionate relationship at low doses between radiation dose and cancer risk. Uncertainties on this judgment are recognized and noted." The BEIR VII report recommends the continued use of LNT at low or very low doses. However, the BEIR VII report does not consider the cancer threshold data of the radium dial watch painters or that of patients in whom Thorotrast was used as an x-ray contrast agent (liver dose of 2 Gy [200 rads] required for hepatomas). The French report does. The two groups differ in their interpretation of the results of the Hiroshima/Nagasaki Life Span Study. The French report finds no significant increase in cancer after doses below 100 mSv (10 rem), while the BEIR VII report tends to lump the low dose data with higher dose data to find cancer increases. Animal studies have not shown increased cancer at doses below 100 mSv (10 rem); many show thresholds and about 40% show hormesis. The French report points out the high efficacy of DNA repair mechanisms and apoptosis (death of damaged cells), while the BEIR VII report minimizes this research because all the biological mechanisms have not yet been worked out. An important difference between the two reports concerns *in utero* radiation. While the BEIR VII report concludes that fetal doses of 10-20 mSv (1-2 rem) caused increased levels of leukemias and solid cancers, the French report doubts a causal relationship because this represents a biased sample of fetuses in which only pregnant women with problems were subjected to x-ray studies. The randomly irradiated fetuses in the Hiroshima/Nagasaki Life Span Study showed no such cancer increase, nor have *post partum* twin studies where one was irradiated and the other was not. More detailed comparisons are in (36). It is interesting to note that the BEIR VII report was funded by the EPA, the NRC, and the NIST. As the present radiation programs of the EPA and the NRC are based upon the LNT, one wonders about the appearance of a conflict of interest.

RECOMMENDED CHANGES FOR 10 CFR PART 20

Based on the forgoing discussion, it is requested that the NRC greatly simplify and change Part 20 to eliminate the use of the LNT paradigm and take radiation hormesis into account. The following recommendations are made:

- 1) Worker dose limit should remain at present levels, with allowance of up to 100 mSv (10 rem) effective dose per year if the doses are chronic.
- 2) ALARA should be removed entirely from the regulations, as it perpetuates radiophobia among workers and the public and makes no sense to decrease radiation doses that are not only harmless but may be hormetic.

3) Public dose limits should be raised to match worker dose limits, as these low doses may be hormetic. Low-dose limits for the public perpetuates radiophobia.

Obviously there will have to be many other changes to NRC regulations when 10 CFR Part 20 is brought up to present scientific standards. Examples include the medical regulations and low-level radioactive waste regulations. But it all needs to start with eliminating the use of the LNT model.

Thank you for your attention and consideration.

Sincerely,

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February 9, 2015

Annette L. Vietti-Cook
Secretary, USNRC
Attention: Rulemakings and Adjudications Staff
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

Dear Ms. Vietti-Cook:

I am submitting this petition for rulemaking pursuant to 10 CFR Part 2.802. The petitioner requests that the NRC amend 10 CFR Part 20, *Standards for Protection Against Radiation*, based on new science and evidence that contradicts the Linear No-Threshold (LNT) hypothesis, a model that has served as the basis for radiation protection regulations. I will present scientific data as reported in study after study to justify that safety regulations and policies should no longer be derived from the LNT model in order to ensure these requirements are more risk-informed. This ultra-simplistic concept assumes that all radiation absorbed doses, no matter how small, have a finite probability of causing a fatal cancer. The lower the quantity of radiation absorbed dose, the lower the probability of cancer induction, but the probability is never zero, let alone negative (i.e. beneficial or hormetic). The rate of radiation delivery is irrelevant, and all absorbed doses are additive; this is demonstrably false as evidenced by the practices of radiation oncology and of radionuclide therapy. Use of the LNT assumption enables regulators to feel justified in ratcheting down permissible worker and public radiation levels, either through actual dose limits or use of the "as low as reasonably achievable" (ALARA) principle, giving the illusion that they are making everyone safer (and creating ever-increasing workload for themselves and their licensees). There has never been scientifically valid support for this LNT hypothesis since its use was recommended by the U.S. National Academy of Sciences Committee on Biological Effects of Atomic Radiation (BEAR I)/Genetics Panel in 1956. The costs of complying with these LNT-based regulations are enormous. Prof. Dr. Gunnar Walinder has summed it up: "The LNT is the greatest scientific scandal of the 20th century (1)."

On the other hand, there is a vast literature demonstrating **no effects** or **protective effects** at relatively low doses of radiation. The literature showing no effects supports a **threshold** concept, in which radiation below a certain level is of no concern because it causes no deleterious effects. The literature showing **protective effects** supports the

concept of **hormesis**, in which low levels of potentially stressful agents, such as toxins, other chemicals, ionizing radiation, etc., **protect** against the deleterious effects that high levels of these stressors produce and result in **beneficial effects** (e.g. lower cancer rates). To properly characterize risk at low radiation doses, a range of health outcomes, including beneficial or zero health effects, must be acknowledged.

Biological organisms are exceedingly complex, and have evolved in a world full of stressors, particularly oxygen, and also the bombardment by low dose background radiation from above, below, and within our own bodies. **More than 150 genes** have been recognized so far that are involved in defense of the organism and the production of defensive systems to protect against noxious agents. Although low level radiation absorbed dose may cause cellular damage, this radiation also up-regulates a system of protective mechanisms in cells, tissues, animals, and humans that counteract the damage and then protect far more than they were damaged in the first place. As the levels of radiation absorbed dose rise, the damage and benefits equalize, and at higher doses the overall effect is harm (2).

The fortunes of the United States have been founded upon advances in science and technology. Agriculture, medicine, energy production, communication, and materials science, to name only a few areas, have revolutionized the way we live. Americans in general have embraced progress. Why then have regulators chosen to use the LNT model to put a choke hold on radiation-related activities? Why is valid science being denied, while the LNT ideology based on erroneous evidence is embraced? It is important to answer this question to fully understand how such a myth perpetrated on society could have survived for so long.

Regulators use the LNT assumption because nationally and internationally respected bodies recommend and advocate it. NCRP, ICRP, IAEA, and NAS-NRC's BEIR Committee come to mind. However, they appear to have lost their sheen of expertise and appear mostly committed to maintaining the *status quo*. An army of regulators at NRC, EPA, FDA, as well as DOE, would be unbudgeted if the LNT disappeared. In addition, there are politicians whose anti-nuclear stand gets them votes. Most regulators are fearful of political anger at their actions because they don't know how to successfully defend themselves and because they rely on Congress for their budgets. Those people who are against nuclear weapons are against nuclear everything, in general, and this thinking affects mass media such as the press, movies, and television. Children are taught lies about radiation, and we therefore have a badly misinformed citizenry. Lawyers make money on bogus radiation damage lawsuits. One of the most shameful groups are scientists themselves, established professors in fine universities whose grants, graduate programs, consulting jobs, and membership in prestigious supposedly scientific groups require toeing the LNT line. It is going to take a good deal of courage to stand up and state that "The Emperor has no clothes." But, it must happen.

In 2001 the NCRP published Report no. 136 entitled "Evaluation of the Linear-Nonthreshold Dose-Response Model for Ionizing Radiation" (3), in which the LNT was upheld. In 2003 Zbigniew Jaworoski of the United Nations Scientific Committee on the

Effects of Atomic Radiation (UNSCEAR) and Michael Waligorski destroyed that Report with an astonishing exposé of scientific misconduct (4). What they did not include in their scathing rebuttal is that the group that paid for the NCRP study was none other than the NRC, which created the appearance of a conflict of interest. Every radiation regulator should read this paper. It is not highly technical, and requires no advanced mathematical ability. It is a scathing indictment of the NCRP Report.

Prof. Edward J. Calabrese of the Univ. of Massachusetts has traced amazing misconduct by the nation's leading geneticists in mid-twentieth century (5, 6, 7). He states, "This paper extends a series of historical papers which demonstrated that the linear-no-threshold model for cancer risk assessment was founded on ideological-based scientific deceptions by key radiation genetics leaders. Based on an assessment of recently uncovered personal correspondence, it is shown that some members of the United States (US) National Academy of Sciences (NAS) Biological Effects of Atomic Radiation I (BEAR I) Genetics Panel were motivated by self-interest to exaggerate risks to promote their science and personal/professional agenda. Such activities have profound implications for public policy and may have had a significant impact on the adoption of the LNT model for cancer risk assessment." In addition, the antinuclear movement of the Cold War era promoted the lie that harm at any level of radiation would occur as part of their antinuclear everything agenda. There was no science here. The LNT is based on hogwash.

I am not talking about a few scientific papers that show that the LNT model is in error. **We are talking about thousands.** There are a couple of textbooks in this field, and journals that publish scientific findings that refute the LNT model. This is a whole field of science that regulators pretend does not exist. The attitude of today's regulators is reminiscent of the Catholic Church at the time of Galileo. The Church taught that the earth was flat, and Galileo insisted that it was round, and instead of looking at the evidence, the Church threatened to torture Galileo to death unless he rescinded his point of view. Galileo retracted his statements but was kept under house arrest for the remainder of his life. And while today's regulators do not have the tools of torture available that the Catholic Church used, today's regulators will certainly destroy careers for regulatory violations of questionable importance. The LNT model is more like a religion than anything else. It certainly isn't science. Imposing it upon the citizens of the United States must stop.

There are numerous human situations in which we have good data that support radiation hormesis. Sadly, there are scientists who look at these data and ignore the apparent beneficial effect of low doses of radiation. When they make graphs of relative cancer risk vs. radiation absorbed dose, they simply draw a straight line **that misses the low dose points** and then proclaim that their data support the LNT model. The most commonly referenced study is the Life Span Study of the Radiation Effects Research Foundation (RERF) which studies the **Japanese atomic bomb survivors**. Recent data (8) show a hormetic effect for all solid cancers in the 0.3-0.7 Gy (30-70 rad) dose range, and the study of leukemia rates in the 96,000 survivors (9) showed hormesis at low doses with a threshold at about 500 mSv (50 rem).

Workers exposed in the **nuclear power industry** comprise the largest group of occupationally exposed workers studied. They generally receive low radiation doses. Over 400,000 workers were studied from 154 facilities in 15 countries (10, 11) and the study showed a decrease in the risk of all cancers including leukemia. The BEIR VII report from the National Academy of Sciences points out that in most of the nuclear industry worker studies, mortality from all cancer and all causes is substantially lower than the reference population. While they have no explanation for this phenomenon, which could be caused by radiation hormesis, the National Academy Committee suggested the possibility of a “healthy worker effect”. This mysterious effect is often cited to explain lower cancer rates in workers receiving low doses of radiation, but a little thought will show that the “healthy worker effect” is actually backwards (12). Most radiation workers get into that industry in their twenties and thirties, when most people are healthy. Cancer is largely a disease of older people, with more than half of all cancers occurring in people over 65 years old (13). You have to be healthy to get old enough to die of cancer. Sickly people don’t live long lives and generally don’t die of cancer. People with hyperlipidemia die early of myocardial infarctions, people with cystic fibrosis often die early of infections, and people with juvenile onset diabetes often die early from infections, myocardial infarctions, renal failure, or complications from dialysis or kidney transplants. The “healthy worker effect” idea needs to quietly die. Hormesis is a perfectly good alternative explanation.

Thirty-one thousand, seven hundred and ten female patients with tuberculosis in Canadian sanatoriums from 1930-1952 were subjected to multiple fluoroscopies to monitor their disease status. Of these patients, 26.4 % received radiation doses to the affected side of 10 cGy (10 rads) or more, and therefore most received lower doses. The relative risk of eventual breast cancer was studied in all these patients. **Patients who received a total radiation absorbed dose in the range from 5 – 30 cGy (5-30 rads) had a breast cancer incidence up to one third less than the background incidence.** Only at radiation absorbed doses above 50 cGy (50 rads) did the cancer incidence begin to increase above baseline (14, 15).

The radium dial watch painters comprise another group of radiation exposed workers. In some 900 young women who sharpened paint brushes with their tongues, there were 54 bone sarcomas and 25 carcinomas of the mastoids and paranasal sinuses. Radium is a bone seeker. **None of these malignancies occurred at a radiation absorbed dose to bone less than 10 Gy (1000 rads) (16).** While these studies were not designed to demonstrate hormesis, they do show a threshold, and a very high one, for the induction of bone cancer.

Following World War II, after the invention of nuclear reactors and the expansion of peaceful uses of atomic energy, patients with hyperthyroidism were treated with radioactive iodine-131 (I-131); this is still the treatment of choice today. While the I-131 cured the hyperthyroidism, there was a concern about late effects from the radiation. The Cooperative Thyrotoxicosis Therapy Follow-Up Study of over 36,000 treated hyperthyroid patients looked at eventual leukemia rates in these patients, as leukemia is

considered the most radiosensitive of cancers and occurs faster than other radiogenic cancers. The total body radiation doses to these patients were 130-140 mSv (13-14 rem). **The age-adjusted leukemia incidence rate was 11/100,000 patient years in the I-131 treated patients and 14/100,000 patient years in patients treated by surgical removal of the thyroid gland (the standard procedure before I-131 became the therapy of choice).** While the authors concluded that there was no increased incidence of leukemia at this low whole body radiation dose (17), **the 22% decrease in the I-131 treated patients suggests a possible hormetic effect.**

The explosion of radioactive waste from a nuclear fuel reprocessing facility called "Mayak" in 1957 resulted in a stream of radioactive waste affecting an area in the East Urals of Russia. Research was performed on data collected from 1957-1987 on occupants of the 22 villages evacuated from the radioactive waste zone (18). Radiation absorbed dose groups were made for those receiving 40 mSv (4 rem), 120 mSv (12 rem), and 500mSv (50 rem). **Although all three groups had less cancer than the baseline expected in the area, the 50 rem and 12 rem groups were statistically significantly lower than the baseline cancer rate expected, suggesting hormesis.** The cancer death rate in the 50 rem group was 29% lower than the controls, and in the 12 rem group was 39% lower than the controls.

In 1982 several orphan cobalt-60 (Co-60) sources were recycled accidentally in the steel scrap industry in northern Taiwan. This resulted in the Co-60 contamination of more than 20,000 tons of steel used in the construction of over 200 residential, industrial and school buildings in Taiwan. In 1992 this contamination was identified, and the exposed population was studied for cancer incidence (19). The population of 7271 people representing 101,560 person-years at risk was exposed to chronic radiation amounting to an average of about 5 cGy (5 rads) from 1983-2002. The range of radiation exposure was <1-2363 mSv (<0.1-236 rem). **The standardized incidence ratios (SIR) and the 95% confidence intervals calculated for all cancers was 0.8 (0.7, 1.0), for all cancers except leukemia was 0.8 (0.6, 0.9), and for solid cancers was 0.7 (0.6, 0.9).** (A SIR of 1.0 means the same as that of unirradiated controls.) The lowered cancer incidence rate was significant at the 95% confidence interval for all cancers except leukemia and for solid cancers. The lowered cancer incidence rate for all cancers was significant at the 90% confidence interval. The lowered cancer incidence rates in these people exposed to chronic, low levels of radiation suggest radiation hormesis.

The situation with residential radon exposure and lung cancer is most interesting. The seminal research of Bernard Cohen (20, 21, 22, 23) in the United States showed that **increasing levels of residential radon were associated with decreasing levels of lung cancer.** His data were carefully corrected for 54 socioeconomic variables, including smoking, but the inverse correlation of radon levels with lung cancer did not change. Bobby Scott (24) has analyzed the situation and has shown that low level radon and its radioactive daughters cause activated natural protection against lung cancer, including smoking-related lung cancer, at levels up to the Environmental Protection Agency's (EPA's) action level of 4 picocuries/L (about 150 Bq m⁻³). Somewhat above this level, the activated natural protection effect progressively goes to zero and it is here that we see

an increase in lung cancer. **Low levels of radon are hormetic.** Klaus Becker (25) has shown similar correlations in data from Central Europe.

In 1986, the Chernobyl reactor accident riveted much of the world, prompting huge hysteria (26). In the former Soviet Union, 336,000 people were forcibly evacuated, some from areas with five times lower radiation levels than are present in Grand Central Station in New York City, which is constructed with natural granite. There were large numbers of unnecessary abortions in Western Europe due to fears of mutant babies. Huge amounts of food were wasted because of miniscule levels of contamination which would hurt no one. The LNT was responsible for much of the hysteria, multiplying very small radiation doses times hundreds of millions of people to estimate huge numbers of cancer deaths. The affected population in the former Soviet Union was followed for increased cancer incidence. According to UNSCEAR 2000b (27) and the United Nations Chernobyl Forum in 2006, except for thyroid cancers in the highly contaminated areas, there was no increased incidence of leukemias or solid tumors, and no evidence of increased genetic diseases. The increase in thyroid cancers was found in children under 15 years of age in 1987, the year after the accident. However, the radiation doses were too low to have caused this, and there was no dose-response relationship. In addition, the timing was off---the mean latent period for radiation induced thyroid cancer is about 28 years (27). However, the increase was highly likely due to a mass screening effect (22). Occult thyroid cancer is actually extremely common, with an autopsy prevalence in various countries of 4.5% to 36% (28, 29). These are small cancers that never caused problems and were unknown during the person's lifetime. The development of sensitive ultrasound techniques have made the diagnosis of these occult cancers, or "incidentalomas", much more common. In the United States, a screening program uncovered a 2100% increase in thyroid nodules (30), and mandatory yearly screening in children in the contaminated areas around Chernobyl resulted in a similar phenomenon. **According to Jaworowski (26), the natural incidence of occult thyroid cancers is approximately 1000 times higher than the highest incidence of reported thyroid cancers in the countries with the greatest fallout from the Chernobyl accident. The supposed increased finding of thyroid cancer due to radiation from the Chernobyl accident is instead due to intense screening (31).** The Chernobyl accident resulted in 28 radiation deaths among rescue workers and employees of the power station who received 2.9-16 Gy (290-1600 rads). Three others died of different causes. The surviving workers show a 15-30% lower mortality from solid cancers than the general Russian population and the residents of the Bryansk district, which received the highest contamination, had a 5% lower solid tumor incidence than expected (26).

Informative reviews on **molecular mechanisms of hormesis** and related phenomena may be found in the papers by Tang and Loke (32) and Brooks and Dauer (33).

It is important to compare a joint report of the French Academy of Sciences and of the French Academy of Medicine (34) on low radiation dose carcinogenic effects, published in 2005, shortly before a comparable report of BEIR VII/Phase 2 of the National Academy of Sciences-National Research Council (35) was published. Covering the same questions, the two groups of experts came to different conclusions (36). The French

report finds that as epidemiological studies have been unable to detect any significant increases in cancer after radiation doses of up to about 100 mSv (10 rem), that there are no convincing data showing any increase in cancer in adults, children, or infants receiving doses under about 100 mSv (10 rem). The LNT therefore greatly overestimates the risk of these low doses, and its use is unjustified and should be discouraged for doses below 20 mSv (2 rem). In contrast, the BEIR VII report concludes that "The committee judges that the balance of evidence from epidemiologic, animal and mechanistic studies tends to favor a simple proportionate relationship at low doses between radiation dose and cancer risk. Uncertainties on this judgment are recognized and noted." The BEIR VII report recommends the continued use of LNT at low or very low doses. The BEIR VII report does not consider the cancer threshold data of the radium dial watch painters or that of patients in whom Thorotrast was used as an x-ray contrast agent (liver dose of 2 Gy [200 rads] required for hepatomas). The French report does. The two groups differ in their interpretation of the results of the Hiroshima/Nagasaki Life Span Study. The French report finds no significant increase in cancer after doses below 100 mSv (10 rem), while the BEIR VII report tends to lump the low dose data with higher dose data to find cancer increases. Animal studies have not shown increased cancer at doses below 100 mSv (10 rem); many show thresholds and about 40% show hormesis. The French report points out the high efficacy of DNA repair mechanisms and apoptosis (death of damaged cells), while the BEIR VII report minimizes this research because all the mechanisms have not yet been worked out. An important difference between the two reports concerns *in utero* radiation. While the BEIR VII report concludes that fetal doses of 10-20 mSv (1-2 rem) caused increased levels of leukemias and solid cancers, the French report doubts a causal relationship because this represents a biased sample of fetuses in which only pregnant women with problems were subjected to x-ray studies. The randomly irradiated fetuses in the Hiroshima/Nagasaki Life Span Study showed no such cancer increase, nor have *post partum* twin studies where one was irradiated and the other was not. More detailed comparisons are in (36). It is interesting to note that the BEIR VII report was funded by the EPA, the NRC, and the NIST. As the present radiation programs of the EPA and the NRC are based upon the LNT, one wonders about the appearance of a conflict of interest.

RECOMMENDED CHANGES FOR 10 CFR PART 20

It is therefore requested that the NRC greatly simplify and change Part 20 to take radiation hormesis into account. The following recommendations are made:

- 1) Worker doses should remain at present levels, with allowance of up to 100 mSv (10 rem) effective dose per year if the doses are chronic.
- 2) ALARA should be removed entirely from the regulations, as it makes no sense to decrease radiation doses that are not only harmless but may be hormetic.
- 3) Public doses should be raised to worker doses, as these low doses may be hormetic. Why deprive the public of the benefits of low dose radiation?
- 4) End differential doses to pregnant women, embryos and fetuses, and children under 18 years of age.

Obviously there will have to be many other changes to NRC regulations when 10 CFR Part 20 is brought up to present scientific standards. Examples include the medical regulations and low level radioactive waste regulations. But it all needs to start with ending reliance on the LNT model.

Thank you for your attention and consideration.

Sincerely,



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February 24, 2015

Annette L. Vietti-Cook
Secretary, USNRC
Attention: Rulemakings and Adjudications Staff
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Dear Ms. Vietti-Cook:

We are submitting this petition for rulemaking pursuant to 10 CFR Part 2.802. The petitioners request that the NRC amend 10 CFR Part 20, Standards for Protection Against Radiation, based on science and evidence that contradicts the Linear No-Threshold (LNT) hypothesis, a model that has served as the basis for radiation protection regulations since the 1950s. This petition supports and supplements the recent petition dated Feb 9, 2015, submitted by Dr. Carol S. Marcus, a copy of which is enclosed for completeness and ease of reference.

The LNT model claims an excess risk of cancers from even the smallest amount of radiation exposure due to DNA damage. Though, on the face of it, the model seems logical, it is not correct because it ignores the fact that our bodies have very powerful defenses against all damages that occur. In fact, there is considerable naturally-occurring DNA damage in our bodies even without any radiation exposure. Although a small amount of radiation produces a small amount of damage, it stimulates the activities of our defenses, including production of antioxidants, DNA repair, damage removal, and improved immune responses (1). As a result, there would be less naturally-occurring damage, and therefore fewer diseases including fewer cancers.

Whereas many publications have claimed support for the LNT model or for low-dose radiation (LDR) cancer risk, careful scrutiny has shown these claims to be without merit, as major deficiencies have been identified in their study design, data, analysis, and/or interpretation. For example, two recent studies claimed increased cancers following childhood CT scans (2, 3), and these publications have been frequently cited in both public and professional media, raising fear of childhood CT scans. However, deficiencies identified in these publications make them not credible (4-7). The 15-country study of radiation workers (8), cited in the BEIR VII report (9) as supplementary evidence for LDR cancer concerns, no longer supports such concerns because the Canadian data in that report were assessed to be incorrect and have been withdrawn from use by Health Canada (10, 11). By referring exclusively to such faulty publications and ignoring publications which present evidence against the LNT model (without explaining why those publications were ignored), advisory bodies and regulatory agencies are able to maintain the appearance of adhering to the scientific method in their continuing support for the LNT model. This strategy was in full display at the recent BEIR VIII Scoping Meeting at the National Academy of Sciences where the faulty pieces of evidence cited above were discussed by speakers (12) while other evidences against the LNT model (mentioned in the petition by Dr. Marcus and in the discussion below) were ignored and not mentioned.

The primary data generally used for estimating the health effects of LDR are the atomic bomb survivor data as stated in the BEIR VII report (9) and in other publications (13). The conclusion of the BEIR VII report was that the data are consistent with the LNT model. However, the latest update to the atomic bomb survivor cancer mortality data by Ozasa et al., published in 2012, is no longer consistent with the LNT model, since the dose-response data have a significant curvature or deviation from linearity in the 0-2 Gy dose range, resulting from the lower than expected cancer rates in the 0.3-0.7 Gy region (14). Ozasa et al. had no explanation for the observed reduction of

cancers in this dose range. When a correction was applied for a likely negative bias in the baseline cancer mortality rate (based on radiation hormesis occurring in the lowest dose cohorts), the corrected dose response was shown to attain a shape consistent with radiation hormesis (15, 16). Thus, the radiation hormesis hypothesis (i.e., a favorable biological response to low doses of ionizing radiation) can provide a possible explanation for the shape of the dose-response data, whereas there is no explanation using the LNT model.

Though Ozasa et al. performed a dose-threshold analysis and concluded that zero dose is the best estimate of the threshold dose, their dose-threshold analysis was flawed, since it used a restricted functional form for dose response that did not cover the full range of the observed data. Analysis with a more general functional form has shown that a non-zero dose threshold cannot be excluded (16, 17). Thus, the atomic bomb survivor data do not lead to the conclusion of zero dose threshold, contrary to the claim by Ozasa et al.

In view of the above analysis, the use of the LNT model is no longer justifiable, since the atomic bomb survivor data, which are recognized as the most important data for estimating the health effects of LDR, do not support the LNT model. This has been recognized in the latest published debate on the health effects of LDR (18), where the atomic bomb survivor data were not quoted to support LDR carcinogenic concerns in the opening statement, in contrast to earlier such debates (19).

There are additional data (supplementing those presented in the petition by Dr. Marcus) that support the concept that low-dose radiation reduces cancer risk. These include: (i) The nuclear shipyard worker study in which radiation workers with radiation dose of ~4 cGy had significantly lower cancer mortality rates in comparison to workers from the same shipyard who received no occupational radiation dose (20), (ii) A study of childhood cancer survivors who had undergone radiation therapy showed reduced second cancers per kg of tissue in regions of the body that had received radiation dose of ~20 cGy in comparison to regions of body that had received no radiation dose from the radiation treatments (21), (iii) Clinical trials of low-dose radiation treatment given to the whole body repeatedly over a five week period showed a cancer therapeutic effect from the LDR treatments with similar or better patient survival compared to chemotherapy, and with no observable side effects (22-24), and (iv) A clinical trial of low-dose radiation treatment administered to the whole body or half body between standard radiotherapy of the tumor showed improved patient survival (25).

Many ecological studies have also shown reduction of cancers with increased background radiation. Though ecological studies have been challenged (e.g. by BEIR V and BEIR VII reports) with the claim that they are subject to ecological fallacy, important discoveries have indeed been made from such studies (26), and so ecological studies should not be dismissed without due consideration. A study of cancer mortality rates in the states of the USA as a function of mean background radiation dose rates showed reduced cancer mortality rates for the states with the highest background radiation dose rates (27). Comparison of residential radon levels and lung cancer rates in the counties of the USA has shown an inverse correlation between radon levels and lung cancer rates (28). A comparison of maps of radon levels and lung cancer rates has shown repeatedly that the areas with the highest radon levels generally have lower levels of lung cancer, and the areas having the highest rates of lung cancer generally have lower radon levels (29). The repeated observation of this pattern in different countries and states, states with low smoking prevalence, states with high smoking prevalence, states with lower mean radon levels, states with higher mean radon levels, etc., and the consistency of the observation with other evidence for the cancer preventive effect of LDR indicate the observation of reduced lung cancers with increased radon levels

is likely to be a causal effect rather than due to confounding by other factors. In view of this, supplementation of radon levels in residences having low radon levels would likely result in reducing lung cancer rates. However, clinical trials to test this concept would not be feasible with the current NRC regulations based on the LNT model. Since lung cancer is one of the most deadly cancers and the leading cause of cancer death in the USA, the current LNT model-based regulations, by discouraging and preventing such clinical trials, have likely had a major detrimental effect on public health. The LNT-model-based radon remediation program, recommended by government agencies such as EPA, is likely leading to increased lung cancer risk in the population, based on the observations in these ecological studies.

The use of the LNT model-based regulations over the years has resulted in a tremendous increase in the staffing of the regulatory agencies and a huge financial benefit for industries and personnel that support compliance with the regulations. The regulations have, however, had a major detrimental effect on public health, since they have prevented the study of LDR for controlling aging-related diseases such as cancer, Alzheimer's disease, Parkinson's disease, etc. in spite of studies showing the promise of LDR for the diseases (30, 31).

Considering that the LNT model originated in the 1950s due to the self-interest motivation of members of advisory bodies (32), as mentioned in the petition by Dr. Marcus, similar motivation cannot be ruled out for its continuing support by later advisory bodies, since they have failed to respond to accumulating evidence against the LNT model and have continued to support the use of the LNT model. Regulatory agencies such as EPA and NRC also have a self-interest motivation for the continued use of the LNT model, since the model justifies the current regulations relating to low radiation doses, and the use of a threshold model would reduce and eliminate these regulations, resulting in a tremendous downsizing of the regulatory agencies and their scope. Hence, petitions which ask for the discontinuation of the use of the LNT model should not be dealt with by NRC directly, but by an independent committee set up external to the NRC, in order to avoid major conflict of interest issues.

One reason for the urgency of action on this petition is that any potential future accident involving release of radioactive materials in the USA would likely result in panic evacuation because of the LNT- model-based cancer fears and concerns, resulting in considerable casualties and economic damage such as have occurred in Fukushima. The recognition of a threshold dose by NRC would obviate the need for such panic evacuations, associated casualties, and economic harm.

Whereas the government (through the regulatory agencies) has looked to advisory bodies for guidance on LDR health effects in the past, considering the self-interest motivation of the advisory bodies in the origin of the LNT model and its persistence, it would be advisable for the government to conduct its own evaluation of the evidence in order to set its policies rather than relying on the recommendations of the present advisory bodies or the present regulatory agencies, because of the major conflict of interest issues. This evaluation should be done by a committee independent of the current regulatory agencies.

Since the main body of evidence that has been used to justify LDR cancer concerns and the LNT model, the atomic bomb survivor data, does not support the LNT model but is more consistent with radiation hormesis, and in view of the large body of unrefuted evidence for radiation hormesis, the LNT model-based regulations have likely caused a large number of preventable cancer deaths over the years, by prohibiting the study and application of radiation hormesis to prevent cancers. The large magnitude of these preventable deaths would justify a

Congressional inquiry to determine why the scientific leaderships of the regulatory agencies and advisory bodies have failed to recognize the published evidence against the LNT model and supporting radiation hormesis for such a long period of time, and what role self-interest may have played in motivating these actions by the agencies and advisory bodies.

In conclusion, we support the changes recommended in the petition by Dr. Marcus. Obviously there will have to be many other major changes to NRC regulations (in addition to those listed in the petition by Dr. Marcus) when 10 CFR Part 20 is brought up to present scientific standards. But it all needs to start with ending reliance on the LNT model.

Thank you for your attention and consideration.

Sincerely,

Mohan Doss, Fox Chase Cancer Center, USA (mohan.doss@fccc.edu)

Rod Adams, Publisher, Atomic Insights, USA

Wade Allison, Emeritus Professor of Physics, Oxford University, UK

Mervyn D. Cohen, Indiana University School of Medicine, USA

Leslie Corrice, Publisher: The Hiroshima Syndrome, USA

Jerry Cuttler, Cuttler & Associates, Canada

Chris Davey, King Abdullah University of Science and Technology, Saudi Arabia

Ludwik Dobrzynski, National Centre for Nuclear Research, Poland

Scott Dube, Morton Plant Hospital, USA

Vincent J. Esposito, University of Pittsburgh, USA

Ludwig E. Feinendegen, Heinrich-Heine University, Germany

Krzysztof Fornalski, Polish Nuclear Society, Poland

Leo S. Gomez, Leo S. Gomez Consulting, USA

Robert Hargraves, Author of THORIUM: energy cheaper than coal, USA

Marek K. Janiak, Military Institute of Hygiene and Epidemiology, Poland

Andrea Jennetta, Publisher, Fuel Cycle Week, USA

Jeffrey Mahn, Sandia National Laboratories (Retired), USA

Mark L. Miller, Sandia National Laboratories, USA

Jane M. Orient, Doctors for Disaster Preparedness, USA

Charles W. Pennington, Executive Nuclear Energy Consultant, USA and Japan.

Bill Sacks, FDA's Center for Devices and Radiological Health (Retired), USA

Charles L. Sanders, Korea Adv. Inst. of Science and Technology, S. Korea (Retired), USA

Andrzej Strupczewski, Chairman of Nuclear Safety Commission, National Center for Nuclear Research, Poland

Shizuyo Sutou, Shujitsu University, Japan

Note: All signers of this petition are members or associate members of SARI (Scientists for Accurate Radiation Information, <http://radiationeffects.org/>). The above letter represents the professional opinions of the signers, and does not necessarily represent the views of their affiliated institutions.

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From: Entz, Kathleen
Sent: 29 Jul 2015 15:33:11 -0400
To: RidsNrrDpr Resource;RidsNrrDss Resource;Bladey, Cindy;Spencer, Mary;Monninger, John;Case, Michael;RidsNRRJLD Resource;Casto, Greg;Inverso, Tara;Doyle, Daniel;Mizuno, Geary;Borges, Jennifer;Hernandez, Raul;Esmaili, Hossein;Greenleaf, Michael;Witt, Kevin
Subject: 05/27/2015 PRM-50-108 Petition Review Board Presentation RE: Fuel Cladding Issues in Postulated Spent Fuel Pool Accidents

Please follow the link below for the electronic distribution of:

DATE: July 2, 2015

TO: Lawrence Kokajko

FROM: Daniel Doyle

SUBJECT: 05/27/2015 PRM-50-108 Petition Review Board Presentation RE: Fuel Cladding Issues in Postulated Spent Fuel Pool Accidents

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Kathy Entz

Administrative Assistant (DPR/PGCB)

Office of Nuclear Reactor Regulation

U.S. Nuclear Regulatory Commission

Phone: 301-415-8501

Email: Kathleen.entz@nrc.gov

Location: O-12D19

Mailstop: O-12D20

From: Borges, Jennifer
Sent: 24 Jul 2014 15:03:49 -0400
To: Shepherd, Jill
Cc: Bladey, Cindy
Subject: ACTION: PRM-50-108 Docketing Package; Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents
Attachments: Notice of docketing PRM-50-108.docx, Congressional letters PRM-50-104.docx, Letter to petitioner NoR PRM-50-108.docx

 He  II  O,

Please find attached the documents pertaining to PRM-50-108. Please review and provide me with comments. I will add the documents into ADAMS before submitting the package to the group for concurrence.

The incoming petition is available in ADAMS under accession No. ML14195A388.

https://adamsxt.nrc.gov/WorkplaceXT/getContent?id=current&vsId=%7B89D76C94-E4A2-4976-8094-B0CA9C1CBC3C%7D&objectStoreName=Main,_.Library&objectType=document

Your message is ready to be sent with the following file or link attachments:

Notice of docketing PRM-50-108.docx
Congressional letters PRM-50-104.docx
Letter to petitioner NoR PRM-50-108.docx

Note: To protect against computer viruses, e-mail programs may prevent sending or receiving certain types of file attachments. Check your e-mail security settings to determine how attachments are handled.

Thank you,

Jennifer Borges
Regulations Specialist
Rules Team
ADM/DAS/RADB

Location: 3WFN 6-A38
301-287-0999

[7590-01-P]

Comment [JLB]: Is the staff requesting comments?

Comment [JLB]: Revise if not requesting comments.

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket No. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; notice of docketing and request for comments.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is publishing for comment a notice of docketing of a petition for rulemaking (PRM) filed with the Commission by Mr. Mark Edwards Leyse (the petitioner) on December 23, 2013, and supplemented on June 19, 2014. The petition was docketed by the NRC on July 14, 2014, and has been assigned Docket No. PRM-50-108. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models.

DATES: Submit comments by **[INSERT DATE THAT IS 75 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]**. Comments received after this date will be considered if it is practical to do so, but the NRC is able to assure consideration only for comments received on or before this date.

ADDRESSES: You may submit comments by any of the following methods (unless this document describes a different method for submitting comments on a specific subject):

- **Federal rulemaking Web site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2014-0171**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-287-3422; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **E-mail comments to:** Rulemaking.Comments@nrc.gov. If you do not receive an automatic e-mail reply confirming receipt, then contact us at 301-415-1677.

- **Fax comments to:** Secretary, U.S. Nuclear Regulatory Commission at 301-415-1101.

- **Mail comments to:** Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, ATTN: Rulemakings and Adjudications Staff.

- **Hand deliver comments to:** 11555 Rockville Pike, Rockville, Maryland 20852, between 7:30 a.m. and 4:15 p.m. (Eastern Time) Federal workdays; telephone: 301-415-1677.

For additional direction on accessing information and submitting comments, see "Obtaining Information and Submitting Comments" in the SUPPLEMENTARY INFORMATION section of this document.

FOR FURTHER INFORMATION CONTACT: Cindy Bladey, Chief, Rules, Announcements, and Directives Branch, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-287-0949, e-mail: Jennifer.Borges@nrc.gov.

SUPPLEMENTARY INFORMATION:

Comment [JLB]: Revise if not requesting comments.

Obtaining Information and Submitting Comments

A. Obtaining Information

Please refer to Docket ID **NRC-2014-0171** when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this petition by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2014-0171**.

- **NRC's Agencywide Documents Access and Management System (ADAMS):**

You may obtain publicly available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced in this document (if that document is available in ADAMS) is provided the first time that a document is referenced.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

B. Submitting Comments

Please include Docket ID **NRC-2014-0171** in the subject line of your comment submission, in order to ensure that the NRC is able to make your comment submission available to the public in this docket.

The NRC cautions you not to include identifying or contact information that you do not want to be publicly disclosed in your comment submission. The NRC will post all comment submissions at <http://www.regulations.gov> as well as enter the comment submissions into ADAMS. The NRC does not routinely edit comment submissions to remove identifying or contact information.

If you are requesting or aggregating comments from other persons for submission to the NRC, then you should inform those persons not to include identifying or contact information that they do not want to be publicly disclosed in their comment submission. Your request should state that the NRC does not routinely edit comment submissions to remove such information before making the comment submissions available to the public or entering the comment submissions into ADAMS.

II. The Petition.

Mr. Mark Edward Leyse, submitted a PRM on December 23, 2013 (ADAMS Accession No. ML14008A427), requesting that the NRC make new regulations stipulating (1) that the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium2-steam reaction be calculated by spent fuel pool (SFP) accident evaluation models using data from multi-rod bundle (assembly) severe accident experiments; (2) that the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction be calculated by SFP accident evaluation models using data from multi-rod bundle (assembly) severe accident experiments conducted

with pre-oxidized fuel cladding; (3) that SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior, which causes the protective zirconium dioxide layer on fuel cladding to degrade and oxidation rates to accelerate; and (4) that licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

On March 21, 2014 (ADAMS Accession No. ML14023A743), the NRC requested supplemental information to further clarify the request. On June 19, 2014 (ADAMS Accession No. ML14195A388), the petitioner responded to the request and submitted supplemental information. After evaluating the petition, as supplemented, the NRC has determined that the petition meets the threshold sufficiency requirements for a petition for rulemaking under § 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," and the petition has been docketed as PRM-50-108. **The NRC is requesting public comment on the petition for rulemaking.**

Comment [JLB]: Delete if this is not true.

III. Discussion of the Petition.

The petitioner proposes the development of four new regulations that he believes would help improve public and plant-worker safety. The petitioner asserts that three of the proposed regulations, regarding to zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios.

The fourth regulation proposed in the petition is intended to require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of:

- (1) postulated complete LOCA scenarios, (2) postulated partial LOCA scenarios, and
- (3) postulated boil-off accident scenarios. The petitioner notes that such evaluations would

keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs.

The petitioner references recent NRC Post-Fukushima MELCOR simulations of boiling water reactor (BWR) Mark I SFP accident/fire scenarios. The petitioner notes that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading, because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner is concerned that in actual SFP fires, there would be quicker fuelcladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium fires than MELCOR indicates. Furthermore, the petitioner states that in accordance with NRC's philosophy of defense-in-depth, which requires the application of conservative models, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner believes that, if implemented, the regulations proposed in the petition would improve public and plant-worker safety. Therefore, the petitioner requests that the NRC develop new regulations regarding SFP accident evaluation models because the probability of the type of events that could lead to SFP accidents is relatively high and recent SFP accident simulation scenarios have only considered accidents with very slight probabilities of occurring.

Dated at Rockville, Maryland, this XX day of XXXX, 2014.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

The Honorable Barbara Boxer
Chairman, Committee on Environment
and Public Works
United States Senate
Washington, DC 20510

Dear Madam Chairman:

Enclosed is a copy of a notice of receipt and request for public comments for a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edwards Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Amy Powell, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Senator David Vitter

The Honorable Sheldon Whitehouse
Chairman, Subcommittee on Clean Air
and Nuclear Safety
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public comments for a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edwards Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Amy Powell, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Senator Jeff Sessions

The Honorable Fred Upton
Chairman, Committee on Energy
and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public comments for a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edwards Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Amy Powell, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Henry A. Waxman

The Honorable Ed Whitfield
Chairman, Subcommittee on Energy
and Power
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

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Sincerely,

Amy Powell, Acting Director
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Enclosure: *Federal Register* Notice

cc: Representative Bobby L. Rush

The Honorable John Shimkus
Chairman, Subcommittee on Environment
and the Economy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

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cc: Representative Paul Tonko

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Office of Congressional Affairs

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cc: Representative Paul Tonko

IDENTICAL LETTERS SENT TO:

The Honorable Barbara Boxer with cc: to Senator David Vitter

The Honorable Sheldon Whitehouse with cc: to Senator Jeff Sessions

The Honorable Fred Upton with cc: to Representative Henry A. Waxman

The Honorable Ed Whitfield with cc: to Representative Bobby L. Rush

ADAMS Accession No: MLXXXXXXXXXX

*via e-mail

| OFFICE | ADM/DAS/RADB/ RT | ADM/DAS/RADB /TL | ADM/DAS/RADB /BC | | OGC | OCA/D |
|--------|---------------------|---------------------|---------------------|--|-----|---------|
| NAME | JBorges | LTerry | CBladey | | | APowell |
| DATE | | | | | | |

OFFICIAL AGENCY RECORD



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Comment [BJ]: Delete if not true.

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

This letter is in reference to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) on June 19, 2014 (NRC's Agencywide Documents Access and Management System Accession No. ML14195A388). In your petition, you request that the NRC develop new regulations stipulating that (1) the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium2-steam reaction be calculated by spent fuel pool (SFP) accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments; (2) the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction be calculated by SFP accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments, conducted with pre-oxidized fuel cladding; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior, which causes the protective zirconium dioxide layer on fuel cladding to degrade and oxidation rates to accelerate; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

Your petition has been docketed under § 2.802 of Title 10 of the *Code of Federal Regulations*, "Petition for rulemaking," to acknowledge your request and has been assigned Docket No. PRM-50-108. Please reference this docket number on any correspondence you may have concerning the petition. The enclosed notice acknowledging receipt of the petition will be published in the *Federal Register*. [The NRC is requesting public comment on your petition for rulemaking. As the staff reviews your petition, it may be necessary to request additional information.]

You can monitor the docket for your petition on the Federal rulemaking Web site, <http://www.regulations.gov>, by searching on Docket ID NRC-2014-0174. In addition, the Federal rulemaking Web site allows you to receive alerts when changes or additions occur in a docket folder. To subscribe: (1) navigate to the docket folder NRC-2014-0174; (2) click the "E-mail Alert" link; and (3) enter your e-mail address and select how frequently you would like to receive e-mails (daily, weekly, or monthly). The NRC also tracks all petition actions on its Web site at <http://www.nrc.gov/reading-rm/doc-collections/rulemaking-ruleforum/petitions-by-year.html>.

M. Leyse

- 2 -

You may direct any questions you have concerning the petition process or the status of your petition to Cindy Bladey at 301-287-0949 (e-mail: Cindy.Bladey@nrc.gov) or to Jennifer Borges at 301-287-0999 (e-mail: Jennifer.Borges@nrc.gov).

Sincerely,

Annette L. Vietti-Cook,
Secretary of the Commission.

Enclosure
Notice of docketing of petition
for rulemaking

M. Leyse

- 2 -

You may direct any questions you have concerning the petition process or the status of your petition to Cindy Bladey at 301-287-0949 (e-mail: Cindy.Bladey@nrc.gov) or to Jennifer Borges at 301-287-0999 (e-mail: Jennifer.Borges@nrc.gov).

Sincerely,

Annette L. Vietti-Cook,
Secretary of the Commission.

Enclosure
Notice of docketing of petition
for rulemaking

DISTRIBUTION:

RADB R/F CBladey, ADM JBorges, ADM LTerry, ADM

ADAMS Accession No.:

| OFFICE | ADM/DAS/RADB/RT | ADM/DAS/RADB/RT | ADM/DAS/RADB/BC |
|--------|-----------------|-----------------|-----------------|
| NAME | JBorges | LTerry | CBladey |
| DATE | / /14 | / /14 | / /14 |

OFFICIAL RECORD COPY

From: Borges, Jennifer
Sent: 11 Aug 2014 16:02:33 -0400
To: RidsNrrMailCenter Resource;RidsNroMailCenter Resource;RidsOgcMailCenter Resource
Cc: Shepherd, Jill;Mizuno, Geary;Doyle, Daniel;Jones, Bradley;Baum, Robin;Inverso, Tara;Colaccino, Joseph;Bladey, Cindy
Subject: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Hello,

Below is a link to the notice of docketing package for a petition for rulemaking prepared for PRM-50-108 filed with the Commission by Mr. Mark Edward Leyse. Also, for your information, I have provided the link to the incoming petition. Please review and provide me with your concurrence by **August 25, 2014**.

If you have any questions concerning this matter, please let me know or contact Jill Shepherd at 301-287-0950 (Jill.Shepherd@nrc.gov).

PACKAGE:

(*Federal Register* Notice, Congressional Letters, & Letter to Petitioner)

[View ADAMS P8 Properties ML14223B127](#)

[Open ADAMS P8 Package \(PRM-50-108 Notice of Docketing RE: Fuel-Cladding Issues in Postulated SFP Accidents\)](#)

INCOMING:

[View ADAMS P8 Properties ML14008A427](#)

[Open ADAMS P8 Document \(Spent Fuel Pool \(Fuel Cladding\) Rulemaking Petition submitted by Atomic Safety Organization\)](#)

INCOMING:

(Additional Information)

[View ADAMS P8 Properties ML14195A388](#)

[Open ADAMS P8 Document \(PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents.\)](#)

Thank you,

Jennifer Borges
Regulations Specialist
Rules Team
ADM/DAS/RADB
301-287-0999

From: Terry, Leslie
Sent: 3 Sep 2015 13:49:34 -0400
To: Bladey, Cindy
Cc: Forder, Dawn
Subject: August 2015 PRM Status Report - Due to DAS September 8th
Attachments: August 2015 Status Report on PRMs 9-3-2015.Final.docx, Memo to EDO on August 2015 PRM Status Report 9-3-15.Final.docx
Importance: High

Cindy-

Attached are the status report and EDO memo. We received OGC NLO today. I have added PRM-50-112 but waiting for NRR to provide the contact.

I will be adding these documents into ADAMS and providing the ADAMS accession numbers to Dawn.

Please provide your changes to Dawn to incorporate into the documents in ADAMS.

The package is due to DAS on September 8th.



Thanks,

Leslie S. Terry, Rules Team Lead

Rules, Announcements, and Directives Branch

Division of Administrative Services

Office of Administration

(301-415-1167) |  OWFN-12H08 |  Leslie.Terry@nrc.gov

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STATUS REPORT ON PETITIONS FOR RULEMAKING

AUGUST 2015

Enclosure

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INTRODUCTION

The Status Report on Petitions for Rulemaking (PRM) is provided to the Executive Director for Operations (EDO) bi-annually. The purpose of this report is to inform the EDO of petitions currently before the agency and to provide an update on U.S. Nuclear Regulatory Commission (NRC) staff progress toward their completion. This report includes petitions docketed since the last report, dated April 2, 2015 (Package Accession No. ML14280A029 in the Agencywide Documents Access and Management System (ADAMS)). The Office of Administration, in consultation with the Office of Nuclear Reactor Regulation (NRR), the Office of Nuclear Material Safety (NMSS) and Safeguards, the Office of New Reactors (NRO), and the Office of the General Counsel, compiles the information for each open petition. Since the last report, the staff has docketed one new petition. Eighteen petitions were closed during the reporting period.

The report presents open petitions by office, beginning with the newest dockets and ending with the oldest dockets. The report captures the progression of each petition as it moves through the agency's process. The report includes hyperlinks to the docket for each petition on <http://www.regulations.gov>, thereby making additional pertinent documentation, including any public comments received, readily available to the reader. A compilation of reports since 2010 is available on [The NRC Rulemaker](#).¹ If you have a comment or suggestion for additional improvements to this report, please contact Dawn Forder at 301-415-3407.

¹<http://fusion.nrc.gov/adm/team/DAS/RADB/resource/Lists/Status%20Report%20on%20Petitions%20for%20Rulemaking/AllItems.aspx>.

LIST OF COMMON ABBREVIATIONS

| | |
|---------------|--|
| 10 CFR | Title 10 of the <i>Code of Federal Regulations</i> |
| ADAMS | Agencywide Documents Access and Management System |
| ASLB | Atomic Safety Licensing Board |
| ASME | American Society of Mechanical Engineers |
| COL | Combined operating license |
| EP | emergency preparedness |
| FR | <i>Federal Register</i> |
| FRN | <i>Federal Register</i> notice |
| ISFSI | independent spent fuel storage installations |
| LOCA | loss-of-coolant accident |
| mSv | millisievert |
| NEI | Nuclear Energy Institute |
| NMSS | Office of Nuclear Material Safety and Safeguards |
| NPP | nuclear power plant |
| NRC | U.S. Nuclear Regulatory Commission |
| NRO | Office of New Reactors |
| NRR | Office of Nuclear Reactor Regulation |
| NTTF | Near-Term Task Force |
| PRM | petition for rulemaking |
| PRB | Petition Review Board |
| rem | Roentgen equivalent in man |
| SFP | spent fuel pool |
| SRM | staff requirements memorandum |
| WG | working group |

DEFINITIONS

Open PRM: Any docketed² petition for rulemaking (PRM) that the U.S. Nuclear Regulatory Commission (NRC) staff is actively working on.

Closed PRM: The PRM docket is closed, either through publication of a notice of denial or a notice stating that the petition will be fully or partially considered in the rulemaking process.

Estimated Date for Submission to Signature Authority:³ Four months after the date of the meeting of the Petition Review Board (PRB).

Pending PRM: A notice has not been published indicating the closure of the petition docket.

Status of Petition since the Last PRM Report: A brief statement of the actions that have occurred or will occur in the near future. (For example: "Notice of receipt and request for public comment is under development.")

Date of PRB: The date that the PRB and petition working group (WG) determine the regulatory decision on a PRM (i.e., denial, consideration in a current or future rulemaking, or partial consideration in a current or future rulemaking).

Target PRB Date: The PRB and petition WG determine the regulatory decision on a petition within 12 months from the date the notice of receipt is published in the *Federal Register* (FR).

Undetermined: A date has not been established at this time.

Withdrawn: The petitioner no longer wants to pursue the requested action and has notified the NRC. The change in status includes the date that the FR notice (FRN) was published to notify the public that the petition was withdrawn.

Public Comments on the Petition: A brief summary of the comments received from the public or any interested party regarding a PRM, including the number received, type (individual, form letter, etc.), commenters (individual, industry, State organization, etc.), and whether the comments were generally in support of or generally in disagreement of the petition.

Background or Items of Interest (if applicable): Pertinent information related to the PRM that the staff wants to document throughout the process (e.g., congressional interest, changes in the regulatory environment).

² A PRM is docketed by the NRC if it meets the docketing criteria in Title 10 of the *Code of Federal Regulations* (10 CFR) 2.802, "Petition for rulemaking."

³ NRC official who has the ultimate authority to determine whether a PRM will be denied or considered in whole or in part in the rulemaking process.

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OPEN PETITIONS BY OFFICE

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**OPEN PETITIONS FOR THE
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS**

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DOCKET ID: NRC-2015-0057

PRM NOS.: PRM-20-28, PRM-20-29, and PRM-20-30

PETITIONER: Various

PETITION SUBJECT: Linear No-Threshold Model and Standards for Protection against Radiation

NRC CONTACT: Solomon Sahle, Office of Nuclear Material Safety and Safeguards (NMSS), 301-415-3781

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|--|---|----------------------------|--------------------|------------------------------|---|
| February 9, 2015 February 13, 2015 February 24, 2015 | June 23, 2015 80 FR 35870 | March 2016 | Undetermined | Undetermined | July 2016 |

PRM-20-28, PRM-20-29, and PRM-20-30 (continued)

PETITION SUMMARY:

On February 9, 2015, February 13, 2015, and February 24, 2015, Carol S. Marcus, Mark L. Miller, and Mohan Doss, respectively, submitted nearly identical petitions requesting that the Commission amend its regulations in Part 20 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Standards for Protection against Radiation," to take radiation hormesis into account and end the U.S. Nuclear Regulatory Commission's (NRC) reliance on the linear no-threshold hypothesis used to determine dose standards in its regulations. The concept of radiation hormesis claims that low doses of radiation have "no effects or protective effects" on population groups. Consequently, the petitioners request that: (1) worker dose remain at present levels, with allowances up to 100 millisieverts (mSv) (10 roentgen equivalent in man (rem)); (2) the use of the "as low as reasonably achievable" principle be removed entirely from the NRC's regulations; (3) public doses be raised to match worker doses; and (4) the NRC end differential doses to pregnant women, embryos and fetuses, and children under 18 years of age.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG will begin analyzing the specific issues raised in the petitions and the public comments received in November 2015.

PUBLIC COMMENTS ON THE PETITION:

The public comment period closes on September 8, 2015, however, the NRC received requests for an extension of the comment period. The staff extended the comment period by 90 days (80 FR 50804; August 21, 2015).

BACKGROUND/ITEMS OF INTEREST (if applicable):

The staff has received three nearly identical petitions on this subject, and will be addressing them together.

DOCKET ID: NRC-2014-0014

PRM NO.: PRM-51-30

PETITIONER: Diane Curran, on behalf of 34 environmental organizations

PETITION SUBJECT: Spent Fuel Storage and Disposal

NRC CONTACT: Keith McDaniel, NMSS, 301-415-5252

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|--------------------------------------|--|--------------------|----------------|----------------------|---|
| December 20, 2013 January 7, 2014 | April 21, 2014 79 FR 22055 | March 2015 | April 14, 2015 | Denied | September 2015 |

PETITION SUMMARY:

On December 20, 2013, as corrected on January 7, 2014, Diane Curran, on behalf of 34 environmental organizations, submitted a PRM that requests that the Commission revise and integrate all safety and environmental regulations related to spent fuel storage and disposal. The petitioner requests that the NRC conduct a comprehensive review of these regulations and environmental studies, revise them to be consistent with the current state of knowledge, and integrate them into one cohesive regulatory framework in order to comply with the National Environmental Policy Act.

PRM-51-30 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The NRC formed a WG to address both PRM-51-30 and PRM-51-31 (Environmental Impacts of Spent Fuel Storage during Reactor Operation) because both petitions make similar rulemaking requests. The WG met with the PRB on April 14, 2015, and the PRB approved the staff's recommendation to deny the petition. The WG is finalizing the denial package to be submitted for Commission approval.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not request public comment on this petition as the staff believed it had sufficient information to fully evaluate the issues raised in it.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None

DOCKET ID: NRC-2008-0649

PRM NO.: PRM-72-6

PETITIONER: C-10 Research and Education Foundation, Inc.

PETITION SUBJECT: Dry Cask Storage of Spent Fuel

NRC CONTACT: Torre Taylor, NMSS, 301-415-7900

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Date of Final Action/<i>Federal Register</i> Notice Citation |
|------------------------------|---|--|--|---|--|
| November 24, 2008 | March 3, 2009 74 FR 9178 | First PRB: January 2010 Second PRB: May 2015 | First PRB: January 2010 (see also Status of Petition since the last PRM report below) Second PRB: May 18, 2015 | First Review: Denied, Partial Consideration in the Rulemaking Process, and Undetermined (see Background below) Remaining two issues: Denial | First publication: October 16, 2012 77 FR 63254 Publication on remaining two issues after Commission Direction |

PRM-72-6 (continued)

PETITION SUMMARY:

On November 24, 2008, C-10 Research and Education Foundation, Inc. (C-10), submitted a PRM that requests that the Commission amend its regulations governing onsite dry cask storage of spent fuel. The petitioner believes that the current regulations do not provide sufficient requirements for safe storage of spent nuclear fuel in dry cask storage at independent spent fuel storage installations (ISFSIs). The petitioner requests the following 12 changes:

1. The NRC should prohibit the production of nonconforming pre-built full scale casks specifically built for NRC certification testing.
2. The NRC certification of casks should be based on upgraded code requirements that include design criteria and technical specifications for a 100-year minimum age-related degradation timeframe.
3. The NRC should approve, as part of the original ISFSI certification process and construction license, a method for dry cask transfer capacity that will allow for immediate and safe maintenance on a faulty or failing cask.
4. The NRC should require that dry casks be qualified for transport at the time of onsite storage approval certification.
5. The NRC should require mandatory compliance with the American Society of Mechanical Engineers (ASME) codes and standards "without exception."
6. The NRC should require ASME code stamping for fabrication.
7. All materials for fabrication should be supplied by ASME-approved material suppliers.
8. Current ASME codes and standards for conservative heat treatment and leak tightness should be adopted and enforced.
9. A safe and secure hot cell transfer station coupled with an auxiliary pool should be built as part of an upgraded ISFSI design certification and licensing process.
10. The NRC should require real-time heat and radiation monitoring at ISFSIs.
11. The NRC should require hardened onsite storage at all nuclear power plants (NPPs).
12. The NRC should establish funding to conduct ongoing studies to provide the data required to accurately define and monitor for age-related material degradation.

PRM-72-6 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG met with the PRB on May 18, 2015, and the PRB approved the staff's recommendation to deny both open issues (Requests 4 and 9). The staff is preparing a denial package to be submitted to the Commission for approval in October 2015.

PUBLIC COMMENTS ON THE PETITION:

The NRC received approximately 9,000 comments, the vast majority of which were in postcard format and supported the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC published an FRN on October 16, 2012 (77 FR 63254), acknowledging that the petition would be partially considered in the rulemaking process. The FRN stated that the Commission denied nine of the petitioner's requests (Requests 1, 2, 3, 5 through 8, 10, and 12), as listed in the "Petition Summary," and would consider one request in the rulemaking process (Request 11). The FRN stated that the NRC was deferring action on two requests (Requests 4 and 9) for future rulemaking determinations.

The docket for PRM-72-6 will remain open until the Commission acts, at which time the NRC will publish another document in the *Federal Register* to provide notice of the Commission's decision.

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OPEN PETITIONS FOR THE
OFFICE OF NUCLEAR REACTOR REGULATION

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DOCKET ID: NRC-2015-0213 (the docket will be open after September 8, 2015)

PRM NO.: PRM-50-112

PETITIONER: Kurt T. Schaefer

PETITION SUBJECT: Determining what Structures, Systems, and Components and Functions are Important to Safety

NRC CONTACT: X, Office of Nuclear Reactor Regulation (NRR), 301-415-XXXX

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|----------------------------------|--|-----------------|--------------|----------------------|---|
| July 20, 2015 August 31, 2015 | September 2015 | September 2016 | Undetermined | Undetermined | January 2017 |

PETITION SUMMARY:

On July 20, 2015, and supplemented on August 31, 2015, Kurt T. Schaefer submitted a PRM that requests that the Commission amend Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Domestic licensing of production and utilization facilities," by defining and providing a set of criteria "for determining which structures, systems, components and functions are 'important to safety.'"

PRM-50-112 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff will publish a notice of docketing in the *Federal Register* in September 2015.

PUBLIC COMMENTS ON THE PETITION:

The staff is analyzing whether the notice of docketing will request comment.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None

DOCKET ID: NRC-2015-0124

PRM NO.: PRM-50-111

PETITIONER: Mark Edward Leyse

PETITION SUBJECT: Power Reactor In-Core Monitoring

NRC CONTACT: Natreon Jordan, Office of Nuclear Reactor Regulation (NRR), 301-415-7410

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|----------------|--|-----------------|--------------|----------------------|---|
| March 13, 2015 | July 16, 2015 80 FR 42067 | July 2016 | Undetermined | Undetermined | November 2016 |

PETITION SUMMARY:

On July 16, 2015, Mark Edward Leyse submitted a PRM that requests that the Commission amend its regulations to require all nuclear power plant licensees to use in-core monitoring devices at different elevations and radial positions throughout the reactor.

PRM-50-111 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not request public comment on this petition, as the staff believed it had sufficient information to fully evaluate the issues raised in it.

BACKGROUND/ITEMS OF INTEREST (if applicable):

PRM-50-111, which applies to boiling water reactors, is an extension of PRM-50-105, which was submitted by Mr. Leyse. The NRC interpreted PRM-50-105 as limited to pressurized water reactors, and denied the PRM (78 FR 56174; September 12, 2013).

DOCKET ID: NRC-2014-0257

PRM NO.: PRM-50-109

PETITIONER: Sandra Gavutis, on behalf of C-10

PETITION SUBJECT: Improved Identification Techniques against Alkali-Silica Concrete Degradation at Nuclear Power Plants

NRC CONTACT: Jessica Kratchman, NRR, 301-415-5112

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|--------------------|--|-----------------|--------------|----------------------|---|
| September 25, 2014 | January 12, 2015 80 FR 1476 | January 2016 | Undetermined | Undetermined | May 2016 |

PETITION SUMMARY:

On September 25, 2014, Sandra Gavutis, on behalf of C-10 Research and Education Foundation, submitted a PRM that requests that the Commission amend its regulations to provide improved identification techniques against alkali-silica reaction (ASRs) concrete degradation at NPPs. The petitioner asserts that current NRC regulations, which rely on visual inspection to identify ASR degradation, do not adequately identify ASR without petrographic analysis. The petitioner is requesting that the NRC revise

PRM-50-109 (continued)

applicable regulations to require adherence with current American Concrete Institute standards and American Society of Mechanical Engineers Codes.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petition and the public comments received.

PUBLIC COMMENTS ON THE PETITION:

The public comment period closed on March 30, 2015. The NRC received 10 comments on the petition.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The staff confirmed with the petitioner that the petitioner did not intend a portion of the PRM to be treated as an allegation against the licensee.

DOCKET ID: NRC-2014-0171

PRM NO.: PRM-50-108

PETITIONER: Mark Edward Leyse

PETITION SUBJECT: Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

NRC CONTACT: Daniel Doyle, NRR, 301-415-3748

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|---------------|--|-----------------|--------------|----------------------|---|
| June 19, 2014 | October 7, 2014 79 FR 60383 | October 2015 | May 27, 2015 | Denied | November 2015 |

PETITION SUMMARY:

On June 19, 2014, Mark Edward Leyse submitted a PRM that requests that the Commission make new regulations stipulating the following:

1. The rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction should be calculated by spent fuel pool (SFP) accident evaluation models using data from multirod bundle (assembly) severe accident experiments.

PRM-50-108 (continued)

2. The rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction should be calculated by SFP accident evaluation models using data from multirod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding.
3. SFP accident evaluation models should be required to conservatively model nitrogen-induced breakaway oxidation behavior.
4. Licensees should be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG met with the PRB on May 27, 2015, and the PRB approved the staff's recommendation to deny the petition. The WG is finalizing the denial package to be submitted for Commission approval.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not request public comment on this petition as the staff believed it had sufficient information to fully evaluate the issues raised in it.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None

DOCKET ID: NRC-2014-0165

PRM NO.: PRM-73-18

PETITIONER: Anthony Pietrangelo, on behalf of the Nuclear Energy Institute (NEI)

PETITION SUBJECT: Protection of Digital Computer and Communication Systems and Networks

NRC CONTACT: Jason Carneal, NRR, 301-415-1451

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|----------------------|---|------------------------|---------------------|------------------------------|---|
| June 12, 2014 | September 22, 2014 79 FR 56525 | March 2016 | Undetermined | Undetermined | July 2016 |

PETITION SUMMARY:

On June 12, 2014, Anthony Pietrangelo, on behalf of the NEI, submitted a PRM that requests that the Commission revise certain cybersecurity language in its regulations to ensure that the rules are consistent with the NRC's original intent, are less burdensome for NRC licensees, and adequately protect the public health and safety and common defense and security.

PRM-73-18 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG is currently addressing significant and numerous public comments received on the petition.

PUBLIC COMMENTS ON THE PETITION:

The public comment period closed on December 12, 2014. The NRC received 19 public comments on the petition, 15 in support of the petition, 2 opposing the proposed changes, and 2 suggesting alternatives to the changes proposed in the petition. The public comments in support of the proposed changes cited detailed examples of specific equipment that the commenters believe should be out of the scope of the cyber security rule. The public comments that opposed the proposed changes and those that suggested alternatives were very detailed and provided suggestions for alternative approaches to regulating cyber security at nuclear power plants.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None

DOCKET ID: NRC-2014-0055

PRM NO.: PRM-51-31

PETITIONER: Diane Curran, on behalf of 34 environmental organizations

PETITION SUBJECT: Environmental Impacts of Spent Fuel Storage during Reactor Operation

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|------------------------------------|--|-----------------|----------------|----------------------|---|
| February 18, 2014 June 26, 2014 | May 1, 2014 79 FR 24595 July 24, 2014 79 FR 42989 | May 2015 | April 14, 2015 | Denied | September 2015 |

PETITION SUMMARY:

On February 18, 2014 (received by SECY on March 12, 2014), Diane Curran, on behalf of 34 environmental organizations, submitted a PRM that requests that the Commission revise its regulations and consider, in all pending and future licensing and re-licensing

PRM-51-31 (continued)

decisions, what the petitioners consider to be new and significant information bearing on the environmental impacts of high-density spent fuel storage in reactor pools and the costs and benefits for avoiding or mitigating those impacts.

On June 26, 2014, Ms. Curran submitted a document, characterized as an "amended petition" for rulemaking, requesting that the NRC "add to the record of the February 18, 2014, petition the observations made by Chairman Macfarlane in her dissenting comments" on the NRC staff document designated COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel," dated November 12, 2013 (ADAMS Accession No. ML13273A601). The NRC does not consider the June 26, 2014, document to be an amendment to the February 18, 2014, petition as the petitioner does not request that the NRC take any rulemaking actions that were not otherwise requested in the February 18, 2014, petition. Therefore, the NRC will consider the June 26, 2014, document to be a supplement to PRM-51-31, and accordingly, included it in the docket for PRM-51-31 (NRC-2014-0055).

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The NRC formed a WG to address both PRM-51-30 (Spent Fuel Storage and Disposal) and PRM-51-31. The WG met with the PRB on April 14, 2015, and the PRB approved the staff's recommendation to deny the petition. The WG is finalizing the denial package to be submitted for Commission approval.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not request public comment on this petition as the staff believed it had sufficient information to fully evaluate the issues raised in it.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None

DOCKET ID: NRC-2013-0214

PRM NO.: PRM-73-17

PETITIONER: Alan Morris of Morris and Ward, Consulting Engineers

PETITION SUBJECT: Malware and Programmable Logic in Computers in Nuclear Power Plant Systems

NRC CONTACT: Natreon Jordan, NRR, 301-415-7410

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|---|--|-----------------|-------------|----------------------|--|
| March 14, 2013; August 17, 21, 23, and 27, 2013 | February 7, 2014 79 FR 7406 | February 2015 | May 5, 2015 | Denied | October 2015 |

PETITION SUMMARY:

On March 14, 2013, as supplemented by additional information through December 19, 2013, Alan Morris submitted a PRM that requests that the Commission require "new-design programmable logic computers" be installed in the control systems of NPPs to

PRM-73-17 (continued)

block malware attacks on the industrial control systems of those facilities. In addition, the petitioner requests that NPP staff be trained in "the programming and handling of the non-rewriteable memories" for NPPs.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The WG met with the PRB on May 5, 2015, and the PRB approved the staff's recommendation to deny the petition. The WG is finalizing the denial package to be submitted for Commission approval.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not request public comment on this petition as the staff believes it has sufficient information to fully evaluate the issues raised in it.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC received the original request on March 14, 2013. The NRC staff determined that the original request did not meet the requirements in 10 CFR 2.802 for docketing of a PRM, and it notified the petitioner on August 9, 2013. The petitioner supplemented his original petition on August 17, 21, 23, and 27, 2013. In addition, the petitioner provided additional supplemental information through December 19, 2013. On June 12, 2014, NRC staff sent a letter to the petitioner requesting additional information. The petitioner responded with several e-mails on June 18 and 19, 2014.

DOCKET ID: NRC-2012-0177

PRM NO.: PRM-50-106

PETITIONER: Paul M. Blanch and C. Jordan Weaver, Natural Resources Defense Council (NRDC)

PETITION SUBJECT: Environmental Qualification of Electrical Equipment

NRC CONTACT: Margaret S. Ellenson, NRR, 301-415-0894

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|---------------|--|-----------------|--------------------|----------------------|---|
| June 18, 2012 | September 27, 2012 77 FR 59345 | September 2013 | September 18, 2013 | Denied | August 2015 |

PETITION SUMMARY:

On June 18, 2012, Paul M. Blanch and C. Jordan Weaver, of NRDC, jointly submitted a PRM that requests that the Commission "initiate rulemaking to revise its regulations to clearly and unequivocally require the environmental qualification of all safety-related cables, wires, splices, connections, and other ancillary electrical equipment that may be subjected to submergence and/or moisture intrusion during normal operating conditions, severe weather, seasonal flooding, and seismic events, and post-accident conditions, both inside and outside of containment."

PRM-50-106 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff submitted the denial package to the Commission for approval (SECY-15-0098, "Denial of Petition for Rulemaking related to Environmental Qualifications of Electrical Equipment (PRM-50-106)," dated August 5, 2015 (ADAMS Accession No. ML14071A279)).

PUBLIC COMMENTS ON THE PETITION:

The NRC did not request public comment on this petition as the staff believed it had sufficient information to fully evaluate the issues raised in it.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None

DOCKET ID: NRC-2011-0189

PRM NO.: PRM-50-103

PETITIONER: NRDC and Mark Leyse

PETITION SUBJECT: Measurement and Control of Combustible Gas Generation and Dispersal

NRC CONTACT: Richard Dudley, NRR, 301-415-1116

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|------------------|--|-----------------|--------------|----------------------|--|
| October 14, 2011 | January 5, 2012 77 FR 441 | Undetermined | Undetermined | Undetermined | Undetermined |

PETITION SUMMARY:

On October 14, 2011, the NRDC submitted a PRM that requests that the Commission amend its regulations regarding the measurement and control of combustible gas generation and dispersal within a power reactor system.

PRM-50-103 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

Action on this petition has been postponed pending further action on Recommendation 6 of the Fukushima Near-Term Task Force (NTTF) report.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not institute a public comment period, because the hydrogen control issue raised by this petition is being considered by the Commission under Recommendation 6 of the Fukushima NTTF report.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None

DOCKET ID: NRC-2011-0189

PRM NO.: PRM-50-97, PRM-50-98, and PRM-50-99

PETITIONER: NRDC

PETITION SUBJECT: Enhancing Reactor Safety

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|----------------------|---|--|---|---|---|
| July 26, 2011 | September 20, 2011 76 FR 58165 | PRM-50-97 and PRM-50-98: NA PRM-50-99: Undetermined | PRM-50-97 and PRM-50- 98: NA PRM-50-99: Undetermined | PRM-50-97 and PRM-50- 98: Consider in Rulemaking PRM-50-99: Undetermined | PRM-50-97 and PRM-50- 98: September 2015 PRM-50-99: Undetermined |

PRM-50-97, PRM-50-98, and PRM-50-99 (continued)

PETITION SUMMARY:

On July 26, 2011, the NRDC submitted six PRMs (three of which have already been closed) that request that the Commission amend its regulations to require: (1) emergency preparedness (EP) enhancements for prolonged station blackouts, (2) EP enhancements for multiunit events, and (3) licensees to confirm seismic hazards and flooding hazards every 10 years and address any new and significant information. All of the PRMs cite the Fukushima NTTF report as the rationale and bases for the PRMs.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

PRM-50-97 and PRM-50-98 are being considered within the Mitigation Strategies for Beyond-Design-Basis Events (RIN 3150-AJ49) proposed rule and the staff is preparing letters to the petitioner for EDO signature.

Action on PRM-50-99 has been postponed pending further action on the NTTF report.

PUBLIC COMMENTS ON THE PETITION:

Because the issues raised by these PRMs are being considered by the Commission under its review of the Fukushima NTTF report, the NRC did not institute a separate public comment period.

BACKGROUND/ITEMS OF INTEREST (if applicable):

In the SRM to SECY-15-0065, "Proposed Rule: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)," dated August 27, 2015 (ADAMS Accession No. ML15239A767), the Commission approved the staff's recommendation that these three petitions be addressed through the Mitigation of Beyond-Design-Basis Events proposed rulemaking.

DOCKET ID: NRC-2012-0215

PRM NO.: PRM-51-29

PETITIONER: Matthew Brock and Seth Schofield, Assistant Attorney General, Commonwealth of Massachusetts

PETITION SUBJECT: Spent Fuel Pool Storage Impacts from License Renewal Environmental Reviews

NRC CONTACT: Jenny Tobin, NRR, 301-415-2328

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|---------------|--|-----------------|------------------|----------------------|---|
| June 2, 2011 | December 19, 2012 77 FR 75065 | December 2013 | November 4, 2013 | Denied | September 2015 |

PETITION SUMMARY:

On June 2, 2011, Matthew Brock submitted a PRM that requests that the Commission rescind its regulations that establish a generic finding of SFP storage impacts in license renewal environmental review. The petition was initially filed with the NRC's Atomic Safety Licensing Board (ASLB) in conjunction with a request for a waiver of the NRC's generic consideration of SFP storage impacts in license renewal environmental reviews. The petitioner requests that, if the ASLB rejects the Commonwealth's waiver petition,

PRM-51-29 (continued)

the NRC initiate a rulemaking. On November 28, 2011, the ASLB denied the Commonwealth's waiver petition, and on March 8, 2012, in a Commission memorandum and order, the PRM was referred to the NRC staff.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

In SECY-15-0055, "Denial of Petition for Rulemaking submitted by the Commonwealth of Massachusetts (PRM-51-29)," dated April 7, 2015 (ADAMS Accession No. ML14063A378), the staff recommended to the Commission that this petition be denied. On July 28, 2015, in the SRM to SECY-15-0055 (ADAMS Accession No. ML15209A954), the Commission approved denial of the petition and the NRC staff's *Federal Register* notice, with changes. The *Federal Register* notice should be published in the coming weeks.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not request public comment on this petition as the staff believed it had sufficient information to fully evaluate the issues raised in it.

BACKGROUND/ITEMS OF INTEREST (if applicable):

None

DOCKET ID: NRC-2009-0554

PRM NO.: PRM-50-93 and PRM-50-95

PETITIONER: Mark Edward Leyse, on behalf of the New England Coalition

PETITION SUBJECT: Calculated Maximum Fuel Element Cladding Temperature

NRC CONTACT: Daniel Doyle, NRR, 301-415-3748

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|---|---|------------------------|---------------------|------------------------------|---|
| November 17, 2009 June 7, 2010 | January 25, 2010 75 FR 3876 | November 2015 | Undetermined | Undetermined | April 2016 |

PETITION SUMMARY:

On November 17, 2009, and June 7, 2010, Mark Edward Leyse, on behalf of the New England Coalition, submitted PRMs that request that the Commission revise 10 CFR 50.46(b)(1) to require that the calculated maximum fuel element cladding temperature not exceed a limit based on data from multirod (assembly) severe fuel damage experiments. The petitioner also requests revision of Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

PRM-50-93 and PRM-50-95 (continued)

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is continuing to analyze the specific issues raised in the petitions. Specific items from the petitions include 7, 8, 11, 13, and 14. The WG requested and received an extension to August 2016.

PUBLIC COMMENTS ON THE PETITION:

The NRC received 20 comments, the majority of which were in support of the petition, and is preparing to make a presentation in fall 2015 to the Petition Review Board on dispositioning this PRM. The NRC published a second FRN on October 27, 2010 (75 FR 66007), to consolidate PRM-50-93 and PRM-50-95 and re-open the public comment period. The NRC received an additional 12 public comments.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The duration of the NRC's review will exceed the typical review period of PRMs because of the extremely large amount of information in PRMs 50-93/95. As a result, the NRC staff has implemented a special enhanced-transparency review process to increase the visibility of its review to the public. The NRC will publicly release its draft determinations regarding each group or category of issues on a periodic basis as the review progresses. In addition, the NRC will communicate preliminary review information to the petitioners and to other persons or organizations known to be interested in this activity. However, the NRC's conclusions on the issues raised in PRMs 50-93/95 will not be final until the Commission formally acts on the staff's recommendations and publishes a notice of this action in the FR. The staff will place a disclaimer on all preliminary findings to clearly indicate their non-final status.

The NRC explained this special process to the petitioner in a letter on August 25, 2011. The preliminary analyses are included in the docket on www.regulations.gov.

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**OPEN PETITIONS FOR THE
OFFICE OF NEW REACTORS**

~~OFFICIAL USE ONLY - SENSITIVE INTERNAL INFORMATION~~

DOCKET ID: NRC-2015-0028

PRM NO.: PRM-50-110

PETITIONER: Michael D. Tschiltz, on behalf of the Nuclear Energy Institute

PETITION SUBJECT: Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors

NRC CONTACT: Rollie Berry, Office of New Reactors, 301-415-8162

| Date Received | Notice of Receipt Published in the <i>Federal Register</i> | Target PRB Date | Date of PRB | PRB Determination | Estimated Date for Submission to Signature Authority |
|-------------------------|---|------------------------|---------------------|------------------------------|---|
| January 15, 2015 | March 27, 2015 80 FR 16308 | May 2016 | Undetermined | Undetermined | September 2016 |

PETITION SUMMARY:

On January 15, 2015, Michael D. Tschiltz, on behalf of NEI, submitted a PRM that requests that the Commission amend its regulations to clarify the scope of applicability of 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors," to include holders of combined operating licenses (COLs).

PRM-50-110 (continued)

The applicability and scope of the NRC's regulations in § 50.69 currently applies to a holder of an operating license under 10 CFR Part 50; a holder of a renewed operating license under 10 CFR Part 54; an applicant for a construction permit or operating license under 10 CFR Part 50; or an applicant for a design approval, a combined license, or manufacturing license under 10 CFR Part 52. The petitioner is requesting that the rule be amended to include holders of COLs in the scope of applicability.

STATUS OF PETITION SINCE THE LAST PRM REPORT:

The staff is considering the specific issues raised in the petition and developing a recommendation for resolution.

PUBLIC COMMENTS ON THE PETITION:

The NRC did not request public comment on this petition as the staff believed it had sufficient information to fully evaluate the issues raised in it.

BACKGROUND/ITEMS OF INTEREST (if applicable):

The NRC staff has engaged with NEI on this topic in public meetings over the past 2 years before this PRM was filed. The staff is considering a public meeting to determine the need for the proposed amendment.



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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September DD, 2015

MEMORANDUM TO: Mark A. Satorius
Executive Director for Operations

FROM: Darren B. Ash
Deputy Executive Director
for Corporate Management
Office of the Executive Director for Operations

SUBJECT: STATUS REPORT ON PETITIONS FOR RULEMAKING
(AUGUST 2015)

In conjunction with my oversight responsibility for ensuring consistency of rulemaking activities in the program offices, I have reviewed the enclosed Status Report on Petitions for Rulemaking (PRM) and approved the scheduled completion dates included in the report.

The U.S. Nuclear Regulatory Commission (NRC) staff last provided the report to you on April 2, 2015 (Package Accession No. ML14280A029 in the Agencywide Documents Access and Management System). The report captures the progression of each petition as it moves through the agency's process. The staff is reviewing 21 open petitions; currently, all are on schedule for resolution. Since the last report, 1 petition was withdrawn by the petitioner, 18 petitions were closed, and the agency docketed the following new petitions:

CONTACT: Cindy Bladey, ADM/DAS
301-415-3280

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M. Satorius

-2-

| PRM No. | PRM Date | Petitioner | Subject |
|------------|------------------------|-------------------|--|
| PRM-50-111 | 3/13/2015 | Mark Edward Leyse | Power Reactor In-Core Monitoring |
| PRM-50-11 | 7/20/2015 8/31/2015 | Kurt T. Schaefer | Determining what Structures, Systems, and Components and Functions are Important to Safety |

In addition, since the last PRM report on April 2, 2015, the NRC processed four requests that did not meet the petition for rulemaking docketing criteria in § 2.802 of Title 10 of the *Code of Federal Regulations*, "Petition for rulemaking."

All Fukushima-related PRMs are under Docket ID NRC-2011-0189.

A compilation of the Status Reports on Petitions for Rulemaking since 2010 is now available on the NRC Rulemaker SharePoint site.

Enclosure:
Status Report on Petitions for
Rulemaking - August 2015

M. Satorius

| PRM No. | PRM Date | Petitioner | Subject |
|------------|------------------------|-------------------|--|
| PRM-50-111 | 3/13/2015 | Mark Edward Leyse | Power Reactor In-Core Monitoring |
| PRM-50-11 | 7/20/2015 8/31/2015 | Kurt T. Schaefer | Determining what Structures, Systems, and Components and Functions are Important to Safety |

In addition, since the last PRM report on April 2, 2015, the NRC processed four requests that did not meet the petition for rulemaking docketing criteria in § 2.802 of Title 10 of the *Code of Federal Regulations*, "Petition for rulemaking."

All Fukushima-related PRMs are under Docket ID NRC-2011-0189.

A compilation of the Status Reports on Petitions for Rulemaking since 2010 is now available on the NRC Rulemaker SharePoint site.

Enclosure:
Status Report on Petitions for
Rulemaking - August 2015

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ADAMS Accession No.:

***concurrence via e-mail**

| OFFICE | ADM/DAS | ADM/DAS/RADB: TL | ADM/DAS/RADB:BC | QTE | NRR |
|--------|-------------|------------------------------|-----------------|-------------|----------------|
| NAME | DForder | LTerry | CBladey | JDougherty* | TInverso* |
| DATE | / /15 | / /15 | / /15 | 8 / 20 / 15 | 8 / 19 / 15 |
| OFFICE | NMSS | NRO | OGC | ADM/DAS:D | ADM:DD |
| NAME | Swhaley* | JColaccino (GTartal for)* | HBenowitz* | DMeyer | SStewart-Clark |
| DATE | 8 / 14 / 15 | 8 / 17 / 15 | 9 / 3 / 15 | / / 15 | / / 15 |
| OFFICE | ADM:D | DEDCM | | | |
| NAME | CCarpenter | DAsh | | | |
| DATE | / / 15 | / / 15 | | | |

OFFICIAL RECORD COPY

The Honorable Barbara Boxer
Chairman, Committee on Environment
and Public Works
United States Senate
Washington, DC 20510

Dear Madam Chairman:

Enclosed is a copy of a notice of receipt and request for public comments ~~for~~ on a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edwards Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Amy Powell, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Senator David Vitter

The Honorable Sheldon Whitehouse
Chairman, Subcommittee on Clean Air
and Nuclear Safety
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public comments for a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edwards Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Amy Powell, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Senator Jeff Sessions

The Honorable Fred Upton
Chairman, Committee on Energy
and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public comments for a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edwards Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Amy Powell, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Henry A. Waxman

The Honorable Ed Whitfield
Chairman, Subcommittee on Energy
and Power
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public comments for a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edwards Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Amy Powell, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Bobby L. Rush

The Honorable John Shimkus
Chairman, Subcommittee on Environment
and the Economy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public comments for a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edwards Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Amy Powell, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Paul Tonko

The Honorable John Shimkus
Chairman, Subcommittee on Environment
and the Economy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public comments for a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edwards Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Amy Powell, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Paul Tonko

IDENTICAL LETTERS SENT TO:

The Honorable Barbara Boxer with cc: to Senator David Vitter

The Honorable Sheldon Whitehouse with cc: to Senator Jeff Sessions

The Honorable Fred Upton with cc: to Representative Henry A. Waxman

The Honorable Ed Whitfield with cc: to Representative Bobby L. Rush

ADAMS Accession No: MLXXXXXXXXXX

*via e-mail

| OFFICE | ADM/DAS/RADB/ RT | ADM/DAS/RADB /TL | ADM/DAS/RADB /BC | | OGC | OCA/D |
|--------|---------------------|---------------------|---------------------|--|-----|---------|
| NAME | JBorges | LTerry | CBladey | | | APowell |
| DATE | | | | | | |

OFFICIAL AGENCY RECORD

From: Doyle, Daniel
Sent: 5 Aug 2015 09:07:38 -0400
To: Mohseni, Aby;Kokajko, Lawrence;McGinty, Tim;Monninger, John;Case, Michael;Bladey, Cindy;Spencer, Mary;Collins, Timothy;Beaton, Robert;Bajorek, Stephen;Scott, Harold;Landry, Ralph;Mizuno, Geary;Leatherbury (Daniels), Christian;Inverso, Tara
Cc: DSSCAL Resource;Taylor, Robert;Jackson, Christopher;Barczy, Theresa;Terry, Leslie
Subject: Division Director alignment meeting for PRM-50-93/95
Attachments: PRM-50-93-95 DD alignment POP.docx, PRM-50-93-95 issues for consideration.docx

8/5 - Added handouts (POP and outline of issues and staff response):



Please attend a Division Director alignment meeting for petition for rulemaking (PRM) 50-93/95. During this meeting, the working group will present an overview of the petitioner's requests and basis for the requests and the working group's recommended responses. This meeting is intended to be like a petition review board (PRB) except that the draft denial package has not been developed yet and there will not be a vote at this meeting. If you are unable to attend, please arrange to have your deputy division director or another representative attend in your absence.

I will attach a POP and handout to this Outlook appointment prior to the meeting.

Dan Doyle
415-3748

Background:

Mr. Mark Leyse submitted PRM-50-93 in 2009 and PRM-50-95 in 2010, and the NRC is reviewing them together because they are very similar. The petitions request that the NRC:

1. Revise 10 CFR 50.46(b)(1) to require the calculated maximum fuel element cladding temperature not exceed a limit based on data from multi-rod (assembly) severe fuel damage experiments
2. Revise Appendix K to Part 50—ECCS Evaluation Models I(A)(5), *Required and Acceptable Features of the Evaluation Models, Sources of Heat during the LOCA, Metal-Water Reaction Rate*, to require that the rates of energy release, hydrogen generation, and cladding oxidation from the metal-water reaction considered in emergency core cooling system (ECCS) evaluation calculations be based on data from multi-rod (assembly) severe fuel damage experiments. (These same requirements also need to apply to any NRC-approved best-estimate ECCS evaluation models used in lieu of Appendix K to Part 50 calculations.)
3. Make a new regulation stipulating minimum allowable core reflood rates, in the event of a loss-of-coolant accident (LOCA).

Working Group:

An interoffice working group was formed to evaluate the PRM and develop the draft denial package. The working group consists of the following staff members:

| Name | Office/Division |
|-------------|-----------------|
| Dan Doyle | NRR/DPR |
| Tim Collins | NRR/DSS |

| | |
|-----------------------|----------|
| Robert Beaton | NRR/DSS |
| Steve Bajorek | RES/DSA |
| Harold Scott | RES/DSA |
| Ralph Landry | NRO/DSRA |
| Geary Mizuno | OGC |
| Christian Leatherbury | ADM/RADB |

**PRM-50-93/95 Division Director Alignment Meeting
August 6, 2015**

PURPOSE:

- To update Division Directors on the status, path forward, and schedule assumptions for the staff's review of petition for rulemaking PRM-50-93/95.

EXPECTED OUTCOME:

- A common understanding of the status and path forward.
- Alignment on the deliverable for the user need.
- Recognition that getting to the PRB later than November will likely require an extension.

PROCESS:

- Status:
 - Different review process from other PRMs because of the volume and complexity of information.
 - Extended timeline
 - Staff has publicly released four "draft interim reviews" for the most potentially safety significant issues.
 - Staff briefed Commissioners' Assistants and Commissioner Apostolakis on this unique process
 - User need sent to RES for technical evaluation (ML100770117)
 - 16 individual issues identified
 - Draft write-ups for these individual issues are largely completed
 - Outline for an integrated evaluation under development (attached)
 - Need alignment on final deliverable to close user need and due date
 - WITS ticket 201300051 due 8/31/16 (after Commission vote)
- Path forward:
 - Complete integrated evaluation – October 2015
 - PRB (may need two meetings) – November 2015
 - Develop closure package and obtain interoffice concurrence – March 2016
 - OGC, NRR, OEDO – April 2016
 - Commission review – May – July 2016
 - Publish denial, letter sent to petitioner – August 2016

PRM-50-93/95 Issues and NRC Staff Positions

| | Petition Request and Basis | Agree/Disagree | NRC Comment/Counterpoint |
|---|---|----------------|--|
| 1 | <p>Request #1 The NRC should require that the calculated maximum fuel element cladding temperature not exceed a limit based on data from multirod (assembly) severe fuel damage experiments.</p> <p>Assertions The current 10 CFR 50.46(b)(1) PCT limit of 2200°F is non-conservative. (Also stated as "a necessary margin of safety" does not exist.)</p> <p>Bases for Assertions</p> <ol style="list-style-type: none"> 1. Runaway oxidation is indicated at temperatures below 2200°F <ol style="list-style-type: none"> a. Petitioner cites at least 11 experiments or references to support this claim. 2. Eutectic reactions in the control rod assemblies lead to core component melting at temperatures less than 2200°F. | Disagree | <ul style="list-style-type: none"> • Severe accident data has <u>not</u> shown 2200°F to be non-conservative <ul style="list-style-type: none"> ○ Data does <u>not</u> show runaway oxidation at < 2200°F <ul style="list-style-type: none"> ▪ Walk through NRC arguments for each of the tests identified in the petition ○ Significant eutectic reactions will <u>not</u> occur in the control rods or between cladding and Inconel spacer grids if PCT < 2200°F. Bases for WG position: <ul style="list-style-type: none"> ▪ PWROG white paper discussion (ML113500368) ▪ 1995 SMIRT paper |
| 2 | <p>Request #2 The NRC should revise Appendix K to Part 50—ECCS Evaluation Models I(A)(5), <i>Required and Acceptable Features of the Evaluation Models, Sources of Heat during the LOCA, Metal-Water Reaction Rate</i>, to require that the rates of energy release, hydrogen generation, and cladding oxidation from the metal-water reaction considered in emergency core cooling system ("ECCS") evaluation calculations be based on data from multi-rod (assembly) severe fuel damage experiments. (These same requirements also need to apply to any NRC-approved best-estimate ECCS evaluation models used in lieu of Appendix K to Part 50 calculations.)</p> <p>Assertions Baker-Just or Cathcart-Pawel oxidation correlations are non-conservative <i>for use in analyses</i> that would predict the Zr+H₂O reaction rate (and therefore the heat and hydrogen generation and cladding oxidation levels) that would occur in a LOCA because both correlations are non-conservative <i>for use in analyses that would predict</i> the temperature at which an</p> | Disagree | <ul style="list-style-type: none"> • The ability to calculate temperature at onset of runaway oxidation is moot if runaway oxidation does not occur at PCT < 2200°F • Petitioner did not show any technical issue with the NRC's bases for denying PRM-50-76, which asserted the need for more conservative correlations at < 2200°F <ul style="list-style-type: none"> ○ PRM-50-76 denial included discussions about impact of heat transfer on kinetics |

PRM-50-93/95 Issues and NRC Staff Positions

| | | | |
|---|---|----------|--|
| | <p>autocatalytic oxidation reaction of Zircaloy would occur in the event of a LOCA. (The italicized phrases were added as clarifications in ML103340249 on pp 8-11.)</p> <p><u>Bases for Assertions</u></p> <ol style="list-style-type: none"> 1. Calculations performed by the staff for hypothetical LOCAs with models using the Baker-Just or Cathcart-Pawel oxidation correlations predict the onset of runaway oxidation at temperatures higher than the temperatures indicated in multi-rod severe accident experiments. (i.e., if you can't predict when the temperature will "runaway" your calculation is no good) <ol style="list-style-type: none"> a. See App D to ML14104B253 2. BJ and CP were not developed to consider how heat transfer would affect the Zr-H₂O reaction kinetics (p56 ll4-6 of Petition). | | |
| 3 | <p><u>Request #3</u> The NRC should make a new regulation stipulating minimum allowable core reflood rates, in the event of a loss-of-coolant accident ("LOCA").</p> <p><u>Assertions</u> There are conditions that could occur in a LOCA in an actual plant that could result in exceeding the PCT limit unless a minimum reflood rate is required.</p> <p><u>Bases for Assertions</u></p> <ol style="list-style-type: none"> 1. Extrapolation of data from multi-rod severe accident experiments (e.g. combinations low reflood rate and long delay) | Disagree | <ul style="list-style-type: none"> • TRACE calculations: <ul style="list-style-type: none"> ○ Demonstrate bundle can be cooled by steam only ○ Demonstrate low reflood rates can maintain PCT below 2,200°F • NRU test data (Zircaloy) does not show "with high probability" that low reflood rates lead to PCT > 2,200°F • Petitioner is incorrect in assessment of NRU TH-1 Test 130 that the heat generated by the zirconium-steam reaction is significant. <ul style="list-style-type: none"> ○ Claim of cladding temperatures increasing by 190°F after reactor tripped were found to be invalid |

From: Helton, Shana
Sent: 28 Jul 2014 21:18:06 -0400
To: Bladey, Cindy; Jones, Bradley; Inverso, Tara
Subject: FW: Chairman Macfarlane's Vote on COMSECY-13-0030—Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel
Attachments: Letter to Chairman Macfarlane.pdf

This came in the mail – I'm forwarding it to you for awareness as Mr. Leyse mentions his recently-submitted PRM. Likely you are already – or soon will be – aware through the normal channels...

Hope you are all doing well,
Shana

From: Mark Leyse [mailto:markleyse@gmail.com]
Sent: Monday, July 28, 2014 3:10 AM
To: CHAIRMAN Resource
Cc: Niedzielski-Eichner, Phillip; CMRSVINICKI Resource; CMRMAGWOOD Resource; CMROSTENDORFF Resource; Woollen, Mary; Helton, Shana; michal_freedhoff@markey.senate.gov
Subject: Chairman Macfarlane's Vote on COMSECY-13-0030—Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel

Dear Chairman Macfarlane:

Thank you for your dissenting vote on the NRC staff recommendation not to pursue additional studies and regulatory analyses on the need to expedite the transfer of spent fuel assemblies from spent fuel pools to dry cask storage. I believe your dissent is well founded; you certainly provided an excellent explanation for why you dissented in the comments you wrote accompanying your vote.

In the attached letter, I intend to provide additional evidence that you voted correctly.

Sincerely,

Mark Leyse

July 28, 2014

Allison M. Macfarlane
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Chairman Macfarlane's Vote on COMSECY-13-0030—Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel

Dear Chairman Macfarlane:

Thank you for your dissenting vote on the U.S. Nuclear Regulatory Commission ("NRC") staff recommendation not to pursue additional studies and regulatory analyses on the need to expedite the transfer of spent fuel assemblies from spent fuel pools ("SFP") to dry cask storage. I believe your dissent is well founded; you certainly provided an excellent explanation for why you dissented in the comments you wrote accompanying your vote.

I agree with you that there is a need for additional assessments of the expedited removal of spent fuel assemblies from SFPs. As you stated in your comments, SFPs often store four times the amount of spent fuel assemblies that they were designed to hold, constituting several core loads of fuel assemblies. In your comments, you also stated that, in the event of a SFP loss-of-coolant accident and subsequent SFP fire, much more radioactive material could be released than that released from a single reactor core meltdown.

In this letter, I intend to provide additional evidence that you voted correctly. First, I will discuss problems with the NRC staff's recent MELCOR computer model analyses of SFP accidents and fires; these analyses are described in the October 2013 NRC document, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (hereinafter: "SFP Consequence Study").¹

¹ Andrew Barto *et al.*, NRC, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor," October 2013, (ADAMS Accession No. ML13256A342).

As explained in COMSECY-13-0030, the NRC staff used the results of their recent MELCOR computer simulations—comparing postulated SFP accidents for a reference plant’s pool with high-density storage to the same pool with low-density storage²—to help justify their decision that there is no need to further consider expediting the transfer of spent fuel assemblies from SFPs to dry cask storage. (MELCOR version 1.8.6—released to users in July 2005³—was used for the simulations.⁴)

I. Problems with MELCOR Computer Simulations of SFP Accidents and Fires

MELCOR *under-predicts* the severity of postulated SFP accidents and fires; the quantity of radioactive material that would be released in accidents is also *under-predicted*. MELCOR’s model of the reaction of zirconium and air is deficient; this has been known for over a decade.

In April 2000, the Advisory Committee on Reactor Safeguards wrote a letter to Chairman Richard A. Meserve stating that NRC analyses of postulated SFP accidents and fires did not consider that the chemical reaction of zirconium and nitrogen gas (in air) generates a significant quantity of heat.⁵ At the time, NRC analyses used MELCOR to model the kinetics of fuel-cladding reactions.⁶ Nonetheless, MELCOR has *not* been improved to simulate the generation of heat from the zirconium-nitrogen reaction.⁷

² NRC, COMSECY-13-0030, “Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel,” November 12, 2013, (ADAMS Accession No. ML13273A601), p. 3.

³ A Sandia National Laboratories website about MELCOR states that MELCOR version 1.8.6 was released to users in July 2005. See Sandia National Laboratories, “MELCOR: A computer code for analyzing severe accidents in nuclear plants and the design basis accidents for advanced power plant applications,” available at <https://melcor.sandia.gov/about.html> (last visited July 5, 2014).

⁴ Andrew Barto *et al.*, NRC, “Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor,” pp. 92-93. It is noteworthy that the SFP models in MELCOR versions 1.8.6 and 2.1 are functionally the same.

⁵ Dana A. Powers, Chairman of ACRS, Letter to Richard A. Meserve, Chairman of NRC, Regarding ACRS Recommendations for Improvements to the NRC Staff’s “Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants,” April 13, 2000, (ADAMS Accession No. ML003704532), pp. 3-4.

⁶ NRC, “Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants,” NUREG-1738, February 2001 (ADAMS Accession No. ML010430066), Appendix 1 B, pp. A1B-4, A1B-7.

⁷ K. C. Wagner, R. O. Gauntt, Sandia National Laboratories, Analysis and Modeling Division, “Mitigation of Spent Fuel Pool Loss-of-Coolant Inventory Accidents and Extension of Reference

Neglecting to model a heat source that would affect the progression and severity of SFP accidents is a serious flaw.

MELCOR also *does not simulate* how nitrogen affects the oxidation of zirconium in air.⁸ This is a serious flaw because the presence of nitrogen accelerates the oxidation (burning) and degradation of zirconium fuel-cladding in air,⁹ which would affect the progression and severity of a SFP accident, including radioactive releases, “most notabl[y] ruthenium.”¹⁰

In “SFP Consequence Study,” the NRC explains that a new model for the oxidation of zirconium in air was added to MELCOR version 1.8.6 (released to users in July 2005) and that it “provide[s] a better prediction of the measured data, including a transition to accelerated post-breakaway oxidation kinetics.”¹¹ MELCOR version 1.8.6 may provide a “better prediction” of the measured data, than older versions; however, the Paul Scherrer Institute (“PSI”) has criticized MELCOR 1.8.6’s “new” model for the oxidation of zirconium in air.

In 2009, PSI reported that it had assessed MELCOR 1.8.6’s ability to predict fuel-cladding behavior in accidents involving air ingress into the reactor vessel—which is pertinent to MELCOR’s ability to predict zirconium-air reaction rates in SFP accidents—and “concluded that development of MELCOR was needed to *capture the accelerated cladding oxidation that can take place under air ingress conditions* (characterized by

Plant Analyses to Other Spent Fuel Pools,” SANDIA Letter Report, Revision 2, November 2006, (ADAMS Accession No. ML120970086), p. 12; and L. Fernandez-Moguel, J. Birchley, European MELCOR User’s Group, “PSI air oxidation model in MELCOR: Part 2: Analysis of experiments and model assessment,” Stockholm, May 2013, which states: “Neither MELCOR nor SCDAP [a severe accident computer safety model] are able to predict a nitride reaction.”

⁸ *Id.*

⁹ J. Stuckert, M. Große, Z. Hózer, M. Steinbrück, Karlsruhe Institute of Technology, “Results of the QUENCH-16 Bundle Experiment on Air Ingress,” KIT-SR 7634, May 2013, p. 1; and O. Coindreau, C. Duriez, S. Ederli, “Air Oxidation of Zircaloy-4 in the 600-1000°C Temperature Range: Modeling for ASTEC Code Application,” *Journal of Nuclear Materials* 405, 2010, p. 208.

¹⁰ J. Stuckert *et al.*, “Results of the QUENCH-16 Bundle Experiment on Air Ingress,” p. 1.

¹¹ Andrew Barto *et al.*, NRC, “Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor,” pp. 93-94.

transition from formation of a protective oxide film to non-protective ‘breakaway’ oxidation at a significantly higher rate)”¹² [emphasis added].

Regarding limitations of models for the oxidation of zirconium in air, a May 2013 report, “Results of the QUENCH-16 Bundle Experiment on Air Ingress,” states that “[t]he models for air oxidation do not yet cover the whole range of representative conditions. The main aims of new bundle tests should be the investigation of areas where data [are] mostly missing.”¹³ And, a 2009 paper, regarding needed development for MELCOR *in the area of air ingress*, states that “air oxidation cannot be reliably predicted (or even described conservatively) by any of the models used in the currently available codes. A new modeling approach and an appropriate database are therefore necessary.”¹⁴

(On June 19, 2014, I submitted a petition for rulemaking on fuel-cladding issues pertinent to SFP accidents, which has been docketed as PRM-50-108.¹⁵ Among other things, PRM-50-108 requests that MELCOR be required to simulate: 1) the generation of heat from the exothermic chemical reaction of zirconium and nitrogen and 2) how nitrogen accelerates the oxidation and degradation of zirconium fuel-cladding in air.)

Clearly, NRC’s MELCOR simulations of SFP accidents are non-conservative and *misleading*, because their conclusions *under-predict* the severity of such accidents and *underestimate* the probabilities of large radiological releases from SFP accidents. By overlooking the deficiencies of the MELCOR simulations described in “SFP Consequence Study,” the NRC undermines its own philosophy of defense-in-depth, which requires the application of conservative models.¹⁶

I recommend that the Commissioners revoke their approval of the NRC staff COMSECY-13-0030 recommendation *not* to pursue additional studies and regulatory analyses on the need to expedite the transfer of spent fuel assemblies from SFPs to dry

¹² S. Guntay, J. Birchley, “MELCOR Further Development in the Area of Air Ingress and Participation in OECDNEA SFP Project to Be Performed in the Time Frame 2009-2012,” April 2009, p. 2.

¹³ J. Stuckert *et al.*, “Results of the QUENCH-16 Bundle Experiment on Air Ingress,” p. 1.

¹⁴ S. Guntay, J. Birchley, “MELCOR Further Development in the Area of Air Ingress and Participation in OECDNEA SFP Project to Be Performed in the Time Frame 2009-2012,” p. 4.

¹⁵ Mark Leyse, “PRM-50-108,” June 19, 2014, (ADAMS Accession No. ML14195A388).

¹⁶ Charles Miller *et al.*, NRC, “Recommendations for Enhancing Reactor Safety in the 21st Century: The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident,” SECY-11-0093, July 12, 2011, (ADAMS Accession No. ML111861807), p. 3.

cask storage, because that recommendation is largely based on the results of non-conservative MELCOR simulations.

To improve public safety, the NRC staff should consider the issues raised in PRM-51-31,¹⁷ a petition for rulemaking, in the NRC's rulemaking process. Among other things, PRM-51-31 requests that the NRC: 1) consider in all pending and future reactor licensing and re-licensing decisions, new and significant information bearing on the potential environmental impacts of high-density storage in SFPs and 2) consider alternatives for avoiding or mitigating potential environmental impacts of high-density storage in SFPs. Given the seriousness of the issues raised by the petitioners, the NRC's consideration of PRM-51-31 should be expedited.

I.A. Recent Sandia National Laboratory Spent Fuel Pool Accident Experiments Are Unrealistic because They Were Conducted with Clean, Non-Oxidized Cladding

In response to statements of Gordon R. Thompson of Institute for Resource and Security Studies ("IRSS") criticizing the NRC's draft of "SFP Consequence Study" and charging that the NRC lacks adequate SFP accident computer models,¹⁸ the NRC staff answered:

MELCOR is the NRC's best estimate tool for severe accident analysis, and it has been validated against experimental data. ... The study relied on specific SFP models that have been integrated into MELCOR over the past 10 years. These models are supported by experimental data (*e.g.*, new air oxidation kinetics as documented in NUREG/CR-6846). In addition, *MELCOR was validated against NRC-sponsored zirconium fire experiments conducted at Sandia National Laboratory* (see NUREG/CR-7143)¹⁹ [emphasis added].

The NRC staff's response to Dr. Thompson is inadequate and flawed; I will now list three problems with the staff's response.

¹⁷ Diane Curran, Mindy Goldstein, "PRM-51-31," February 18, 2014, (ADAMS Accession No. ML14071A382); and Diane Curran, Mindy Goldstein, "Amended PRM-51-31," June 26, 2014, (ADAMS Accession No. ML14177A660).

¹⁸ Gordon R. Thompson, IRSS, "Comments on Draft Consequence Study, NRC-2013-0136," August 1, 2013, (ADAMS Accession No. ML13225A397).

¹⁹ Andrew Barto *et al.*, NRC, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor," Appendix E, "SFPS Public Comments Summary," p. E-85.

First, the “new” models for the oxidation of zirconium in air are inadequate; as quoted above: “air oxidation cannot be reliably predicted (or even described conservatively) by any of the models used in the currently available codes.”²⁰

Second, even the NRC’s NUREG/CR-7143 concedes that “[t]he role of nitrogen appears critical to the onset of breakaway oxidation in which nitrogen actually enhances the magnitude of the oxidation rate versus pure oxygen.”²¹ MELCOR may have been “validated” against NRC-sponsored zirconium-fire experiments conducted at Sandia National Laboratory (“SNL”) and reported on in NUREG/CR-7143; however, as stated above, MELCOR does *not* simulate how nitrogen affects the oxidation of zirconium in air.²² MELCOR cannot possibly be validated against SNL’s SFP accident experiments until it is capable of simulating how the presence of nitrogen accelerates the oxidation and degradation of zirconium fuel-cladding in air.

Third, the two integral SFP accident experiments, conducted by SNL and reported on in NUREG/CR-7143, are unrealistic because they were both conducted with clean, non-oxidized bundles of zirconium fuel rod simulators;²³ the spent fuel assemblies stored in SFPs have oxide layers. When high burnup (and other) fuel rods are discharged from the reactor core and loaded into the SFP, the fuel cladding can have local zirconium dioxide (ZrO_2) “oxide” layers that are up to 100 μm thick (or greater); there can also be local crud layers on top of the oxide layers. And medium to high burnup fuel cladding typically has a “hydrogen concentration in the range of 100-1000 wppm [weight parts per million];” “[z]irconium-based alloys, in general, have a strong affinity for oxygen, nitrogen, and hydrogen...”²⁴

²⁰ S. Güntay, J. Birchley, “MELCOR Further Development in the Area of Air Ingress and Participation in OECDNEA SFP Project to Be Performed in the Time Frame 2009-2012,” p. 4.

²¹ E. R. Lindgren, Sandia National Laboratory, “Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident,” NUREG/CR-7143, March 2013, (ADAMS Accession No. ML13072A056), p. 147.

²² K. C. Wagner, R. O. Gauntt, “Mitigation of Spent Fuel Pool Loss-of-Coolant Inventory Accidents and Extension of Reference Plant Analyses to Other Spent Fuel Pools,” p. 12.

²³ E. R. Lindgren, SNL, “Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident,” NUREG/CR-7143, pp. 129-130, 155-158.

²⁴ K. Natesan, W.K. Soppet, Argonne National Laboratory, “Hydrogen Effects on Air Oxidation of Zirlo Alloy,” NUREG/CR-6851, October 2004, (ADAMS Accession No: ML042870061), p. iii, 3.

Regarding nitrogen-induced breakaway oxidation, a 2008 Journal of Nuclear Materials paper explains that “[b]reakdown and loss of the dense scale protective effect occur and result in an accelerated degradation;” furthermore, the transition to nitrogen-induced breakaway oxidation occurs *earlier* with pre-oxidized fuel cladding than with fresh, non-oxidized fuel cladding—“nitriding is favored by the ‘corrosion’ scale.”²⁵

It is clear that *in air*, in a SFP accident, there would be a significant degree of zirconium oxidation, because the spent fuel rods in the pool would be “pre-oxidized.” This phenomenon of nitrogen attacking pre-oxidized zirconium alloy cladding is not simulated in SNL’s experiments. Hence, data from SNL’s integral SFP accident experiments is inadequate for benchmarking MELCOR. Benchmarking a computer safety model with data gathered from unrealistic experiments undermines the NRC’s philosophy of defense-in-depth, which requires the application of conservative models.²⁶

II. The NRC Staff Did Not Consider Many Events that Could Lead to SFP Accidents

The NRC staff COMSECY-13-0030 recommendation is largely based on “SFP Consequence Study,” which only considered SFP accidents that would be initiated by beyond-design-basis earthquakes: events assigned with very slight probabilities of occurring.²⁷ In your comments you state that “[t]he staff has not properly explored all potential initiating events—in this case only considering seismic initiators.” I agree with your statement that “[a] more thorough analysis would holistically consider the potential of all natural and human-induced (*e.g.*, accidental, malevolent) events that could cause pool drain down...”²⁸

²⁵ C. Duriez, T. Dupont, B. Schmet, F. Enoch, “Zircaloy-4 and M5 High Temperature Oxidation and Nitriding in Air,” *Journal of Nuclear Materials* 380 (2008), p. 44.

²⁶ Charles Miller *et al.*, NRC, “Recommendations for Enhancing Reactor Safety in the 21st Century: The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident,” SECY-11-0093, p. 3.

²⁷ NRC, “Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor: Draft Report.”

²⁸ Allison M. Macfarlane, “Comments on COMSECY-13-0030—Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel,” dated May 27, 2014, the day the NRC published the Commissioners voting record on its website.

I believe that the probability of the type of events that could lead to SFP accidents is relatively high. The NRC staff seems to agree. In December 2012, the staff decided to consider issues raised in a petition for rulemaking, PRM-50-96,²⁹ arguing that SFP accidents could be initiated by relatively high-probability events, in its rulemaking process.³⁰ PRM-50-96 requests regulations to help prevent SFP fires in the event of prolonged outages of “North American commercial electric power grids...caused by extreme space weather, such as coronal mass ejections and associated geomagnetic disturbances.”³¹

(I commend the NRC staff for considering the issues raised in PRM-50-96 in its rulemaking process. In my opinion, the staff should make legally-binding regulations based on what PRM-50-96 requests.)

According to the NRC staff, an extreme solar storm hitting Earth (geomagnetic disturbance)—with an intensity similar to that of the 1859 Carrington event: the largest solar storm ever recorded—could occur as frequently as once in 153 years to once in 500 years ($6.5 \times 10^{-3}/\text{yr}$ to $2.0 \times 10^{-3}/\text{yr}$) and initiate “a series of events potentially leading to core damage at multiple nuclear sites.”³² Such an extreme geomagnetic disturbance could cause over 300 extra high voltage (“EHV”) transformers³³ to fail, “leading to probable power system collapse[s] in the Northeast, Mid-Atlantic, and Pacific Northwest,” which could last months or longer, “affecting a population in excess of 130 million.”³⁴

(On July 23, 2012, there were two consecutive coronal mass ejections separated by about 10 to 15 minutes that caused an extreme solar storm—deemed to have an

²⁹ Thomas Popik, PRM-50-96, March 14, 2011 (ADAMS Accession No. ML110750145).

³⁰ NRC, “Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools: Proposed Rules,” Docket No. PRM-50-96, NRC-2011-0069, Federal Register, Vol. 77, No. 243, December 18, 2012, pp. 74788-74798.

³¹ *Id.*, p. 74788.

³² *Id.*, p. 74790.

³³ The NRC has explained that “[l]arge transformers are very expensive to replace and few spares are available. Manufacturing lead times for new equipment range from 12 months to more than 2 years.” See NRC, “Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools: Proposed Rules,” p. 74794.

³⁴ *Id.*, pp. 74788-74798.

intensity similar to that of the Carrington event—in interplanetary space, which passed through Earth’s orbit; the solar storm missed hitting Earth by nine days.³⁵)

Additionally, either devices designed specifically to disrupt (or destroy) electronic equipment or the detonation of a nuclear device high above the earth’s atmosphere could also produce an electromagnetic pulse with a magnitude that could cause large-scale, long-term power outages.³⁶ A June 2010 North American Electric Reliability Corporation and U.S. Department of Energy report states that such power outages could also be caused by pandemics, “coordinated cyber, physical, and blended attacks”³⁷ and that “[d]eliberate attacks (including acts of war, terrorism, and coordinated criminal activity) pose especially unique scenarios due to their inherent unpredictability and significant national security implications.”³⁸

(On April 16, 2013, snipers attacked San Jose, California’s Metcalf Transmission Substation, rendering it out of service. 17 large transformers were shot at; they overheated after leaking 52,000 gallons of oil.³⁹ A Federal Energy Regulatory Commission analysis indicates that if saboteurs disabled as few as nine electric-transmission substations on a hot summer day, the U.S. could incur a nationwide blackout that lasted for months (this applies to different sets of nine).⁴⁰)

If large-scale power outages were to last months or longer, multiple nuclear power plants (“NPP”) would lose their supply of offsite alternating current (“AC”) power, which is necessary for daily operation and preventing severe accidents. Multiple loss-of-offsite power (“LOOP”) events—especially in the event of prolonged electrical grid failures—could lead to a number of station-blackouts (“SBO”); a SBO is a complete

³⁵ Ying D. Liu, “Observations of an Extreme Storm in Interplanetary Space Caused by Successive Coronal Mass Ejections,” *Nature Communications*, March 18, 2014; and Robert Sanders, “Fierce Solar Magnetic Storm Barely Missed Earth in 2012,” *University of California, Berkeley News Center*, March 18, 2014.

³⁶ Metatech Corporation, “Electromagnetic Pulse: Effects on the U.S. Power Grid,” *Executive Summary*, January 2010.

³⁷ North American Electric Reliability Corporation, U.S. Department of Energy, “The High-Impact, Low-Frequency (HILF) Event Risk Effort,” June 2010, pp. 3, 8.

³⁸ *Id.*

³⁹ Rebecca Smith, “Assault on California Power Station Raises Alarm on Potential for Terrorism,” *The Wall Street Journal*, February 5, 2014.

⁴⁰ Rebecca Smith, “U.S. Risks National Blackout From Small-Scale Attack,” *The Wall Street Journal*, March 12, 2014.

loss of both grid-supplied and backup onsite AC power. The Fukushima Dai-ichi accident was a SBO accident that caused three reactor core meltdowns.

Many of the safety systems that are required for cooling the reactor core and SFP in a SBO—removing decay heat: the heat generated by the radioactive decay of the nuclear fuel's fission products—need AC power to operate.

In a LOOP event, a NPP's emergency diesel generators ("EDG") are intended to "supply power [promptly and] continuously to the equipment needed to maintain the plant in a safe condition" for an extended time period, "with refueling every 7 days."⁴¹ The NRC has stated that, in a LOOP event, EDGs should be able to maintain a NPP in a safe condition for a *mission time* of "typically around 30 days."⁴² Most U.S. NPPs are required to have a 7-day capacity of fuel oil for EDGs onsite; many NPPs have additional fuel oil onsite and arrangements to receive prompt deliveries of fuel oil.⁴³ However, there could be problems with transporting and maintaining a fuel supply, amidst varying degrees of social disruption, in the event of large-scale, long-term power outages.

In the event of prolonged electrical grid failures, neither the NRC nor any other government agency has a strategy for implementing measures that would effectively prevent multiple concurrent reactor core meltdowns and SFP fires, which would cause catastrophic releases of radioactive material.

I think the fact the NRC staff is considering PRM-50-96, which argued that SFP accidents could be initiated by relatively high-probability events, in its rulemaking process is yet another reason the Commissioners should revoke their approval of the NRC staff COMSECY-13-0030 recommendation. I agree with you that additional studies and regulatory analyses on the need to expedite the transfer of spent fuel assemblies from SFPs to dry cask storage are needed.

⁴¹ NRC, "Application and Testing of Safety-Related Diesel Generators in Nuclear Power Plants," Regulatory Guide 1.9, March 2007, Revision 4, p. 2.

⁴² NRC Inspection Manual, "Emergency Diesel Generator Technical Specification Surveillance Requirements Regarding Endurance and Margin Testing," May 2008, (ADAMS Accession No. ML080420064), p. 3.

⁴³ NRC, "Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools: Proposed Rules," p. 74796.

Sincerely,

/s/

Mark Leyse
P.O. Box 1314
New York, NY 10025
markleyse@gmail.com

From: Inverso, Tara
Sent: 22 Aug 2014 12:54:03 -0400
To: Borges, Jennifer
Cc: Mohseni, Aby; Doyle, Daniel; Bladey, Cindy
Subject: FW: Please Provide NRR Concurrence: Request for Review and Concurrence on Notice of Docketing for PRM-50-108
Attachments: PRM-50-108 - FRN - dd.docx, PRM-50-108 - congressional letters - dd.docx, PRM-50-108 - letter to petitioner - dd.docx

Jennifer,

NRR concurs on the PRM-50-108 NOR documents, subject to the attached documents. Please contact Dan Doyle if you have any questions.

Thanks!
Tara

-----Original Message-----

From: Mohseni, Aby
Sent: Friday, August 22, 2014 12:51 PM
To: Inverso, Tara
Subject: RE: Please Provide NRR Concurrence: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Thank you. I concur.

Aby

-----Original Message-----

From: Inverso, Tara
Sent: Friday, August 22, 2014 10:55 AM
To: Mohseni, Aby
Subject: Re: Please Provide NRR Concurrence: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

We are not required to seek public comment on PRMs. OGC (brad jones and geary) are beginning to enforce that we should only seek comment when we need more information to make our determination. In those cases, we should ask specific questions on what we would like comment on.

Stewarts PRM-50-106 didn't seek public comment for the same reason.

Sent from my NRC Blackberry

----- Original Message -----

From: Mohseni, Aby
Sent: Friday, August 22, 2014 10:51 AM
To: Inverso, Tara
Subject: Fw: Please Provide NRR Concurrence: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

----- Original Message -----

From: Mohseni, Aby
Sent: Friday, August 22, 2014 10:51 AM
To: Mohseni, Aby
Subject: Re: Please Provide NRR Concurrence: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Tara
Plse remind me again why we are not seeking public comment?
Aby

----- Original Message -----

From: Mohseni, Aby
Sent: Friday, August 22, 2014 07:09 AM
To: Mohseni, Aby
Subject: FW: Please Provide NRR Concurrence: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

From: Inverso, Tara
Sent: Thursday, August 21, 2014 5:15 PM
To: Mohseni, Aby
Cc: Doyle, Daniel
Subject: Please Provide NRR Concurrence: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Good evening, Aby,

Please review and provide NRR concurrence on the attached notice of receipt documents for PRM-50-108. Dan has several edits that conform with the working group's views, including removing the public comment opportunity (which has OGC backing).

Please let us know if you have any questions or concerns. Our concurrence is due to ADM by August 25th.

Thanks!
Tara

From: Doyle, Daniel
Sent: Wednesday, August 20, 2014 5:19 PM
To: Inverso, Tara
Subject: RE: ACTION by August 20: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Tara,

I recommend concurrence with the attached comments. Please let me know if you would like to discuss.

Dan

From: Inverso, Tara
Sent: Monday, August 11, 2014 4:04 PM
To: Doyle, Daniel
Cc: Mohseni, Aby
Subject: ACTION by August 20: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Hi Dan,

Please review the notice of receipt documents for PRM-50-108 by COB August 20, and provide a recommendation for concurrence or otherwise to me.

Thank you!

Tara

From: Borges, Jennifer
Sent: Monday, August 11, 2014 4:03 PM
To: RidsNrrMailCenter Resource; RidsNroMailCenter Resource; RidsOgcMailCenter Resource
Cc: Shepherd, Jill; Mizuno, Geary; Doyle, Daniel; Jones, Bradley; Baum, Robin; Inverso, Tara; Colaccino, Joseph; Bladey, Cindy
Subject: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Hello,

Below is a link to the notice of docketing package for a petition for rulemaking prepared for PRM-50-108 filed with the Commission by Mr. Mark Edward Leyse. Also, for your information, I have provided the link to the incoming petition. Please review and provide me with your concurrence by August 25, 2014.

If you have any questions concerning this matter, please let me know or contact Jill Shepherd at 301-287-0950 (Jill.Shepherd@nrc.gov<mailto:Shepherd@nrc.gov>).

PACKAGE:

(Federal Register Notice, Congressional Letters, & Letter to Petitioner)

View ADAMS P8 Properties

ML14223B127<https://adamsxt.nrc.gov/WorkplaceXT/integrationWebBasedCommand?_commandId=3010&objectStoreName=Main.____.Library&id=current&vsId=%7b2A164C6A-CB65-4168-BB59-169AC3745DCE%7d&objectType=document>

Open ADAMS P8 Package (PRM-50-108 Notice of Docketing RE: Fuel-Cladding Issues in Postulated SFP Accidents)<https://adamsxt.nrc.gov/WorkplaceXT/getContent?objectStoreName=Main.____.Library&id=current&vsId=%7b2A164C6A-CB65-4168-BB59-169AC3745DCE%7d&objectType=document>

INCOMING:

View ADAMS P8 Properties

ML14008A427<https://adamsxt.nrc.gov/WorkplaceXT/integrationWebBasedCommand?_commandId=3010&objectStoreName=Main.____.Library&id=current&vsId=%7bB9EF01EE-48F8-4736-A804-03116FF403BC%7d&objectType=document>

Open ADAMS P8 Document (Spent Fuel Pool (Fuel Cladding) Rulemaking Petition submitted by Atomic Safety

Organization)<https://adamsxt.nrc.gov/WorkplaceXT/getContent?objectStoreName=Main.____.Library&id=current&vsId=%7bB9EF01EE-48F8-4736-A804-03116FF403BC%7d&objectType=document>

INCOMING:

(Additional Information)

View ADAMS P8 Properties

ML14195A388<https://adamsxt.nrc.gov/WorkplaceXT/integrationWebBasedCommand?_commandId=3010&objectStoreName=Main.____.Library&id=current&vsId=%7b89D76C94-E4A2-4976-8094-B0CA9C1CBC3C%7d&objectType=document>

Open ADAMS P8 Document (PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and
Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool
Accidents.)<https://adamsxt.nrc.gov/WorkplaceXT/getContent?objectStoreName=Main.____Library&id=current&vsId=%7b89D76C94-E4A2-4976-8094-B0CA9C1CBC3C%7d&objectType=document>

Thank you,

Jennifer Borges
Regulations Specialist
Rules Team
ADM/DAS/RADB
301-287-0999

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket No. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; notice of docketing and request for comments.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) has received a petition for rulemaking (PRM) from Mr. Mark Edward Leyse (the petitioner), dated June 19, 2014. The petition was docketed by the NRC on July 14, 2014, and has been assigned Docket No. PRM-50-108. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The NRC is not instituting a requesting public comment period for this PRM at this time on the petition for rulemaking.

DATES: ~~Submit comments by [INSERT DATE THAT IS 75 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER].~~ Comments received after this date will be considered if it is practical to do so, but the NRC is able to assure consideration only for comments received on or before this date.

ADDRESSES: ~~You may submit comments by any of the following methods (unless this document describes a different method for submitting comments on a specific subject):~~

~~**Federal rulemaking Web site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2014-0171**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-287-3422; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.~~

~~**E-mail comments to:** Rulemaking-Comments@nrc.gov. If you do not receive an automatic e-mail reply confirming receipt, then contact us at 301-415-1677.~~

~~**Fax comments to:** Secretary, U.S. Nuclear Regulatory Commission at 301-415-1101.~~

~~**Mail comments to:** Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, ATTN: Rulemakings and Adjudications Staff.~~

~~**Hand deliver comments to:** 11555 Rockville Pike, Rockville, Maryland 20852, between 7:30 a.m. and 4:15 p.m. (Eastern Time) Federal workdays; telephone: 301-415-1677.~~

~~For additional direction on accessing information and submitting comments, see "Obtaining Information and Submitting Comments" in the SUPPLEMENTARY INFORMATION section of this document.~~

Please refer to Docket ID **NRC-2014-0171** when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this petition by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2014-0171**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-287-3422; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **NRC's Agencywide Documents Access and Management System (ADAMS):** You may obtain publicly available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "ADAMS Public Documents" and then select "Begin Web-based ADAMS Search." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209.

301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced in this document (if that document is available in ADAMS) is provided the first time that a document is referenced. The petition, PRM-50-108, is available in ADAMS under Accession Number ML14195A388.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Project Manager, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748, e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

~~I. Obtaining Information and Submitting Comments.~~

~~A. Obtaining Information~~

Please refer to Docket ID ~~NRC-2014-0171~~ when contacting the NRC about the availability of information for this petition. You may obtain publicly available information related to this petition by any of the following methods:

~~**Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID ~~NRC-2014-0171~~.~~

~~**NRC's Agencywide Documents Access and Management System (ADAMS):** You may obtain publicly available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "ADAMS Public Documents" and then select "Begin Web-based ADAMS Search." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced in this document (if that document is available in ADAMS) is provided the first time that a document is referenced.~~

~~**NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.~~

~~B. Submitting Comments~~

Please include Docket ID ~~NRC-2014-0171~~ in the subject line of your comment submission, in order to ensure that the NRC is able to make your comment submission available to the public in this docket.

The NRC cautions you not to include identifying or contact information that you do not

want to be publicly disclosed in your comment submission. The NRC will post all comment submissions at <http://www.regulations.gov> as well as enter the comment submissions into ADAMS. The NRC does not routinely edit comment submissions to remove identifying or contact information.

If you are requesting or aggregating comments from other persons for submission to the NRC, then you should inform those persons not to include identifying or contact information that they do not want to be publicly disclosed in their comment submission. Your request should state that the NRC does not routinely edit comment submissions to remove such information before making the comment submissions available to the public or entering the comment submissions into ADAMS.

II. The Petitioner.

Mr. Mark Edward Leyse (the petitioner) submitted this petition for rulemaking (PRM) as an individual. In Section II of the petition, "Statement of Petitioner's Interest," the petitioner explains that he disagrees with the conclusions of is aware of recent NRC post-Fukushima MELCOR simulations of boiling water reactor (BWR) Mark I spent fuel pool (SFP) accident scenarios.

and disagree with the resulting conclusions of it. On December 23, 2013, Mr. Leyse submitted a PRM (ADAMS Accession No. ML14008A427) with similar requests. requesting that the NRC make new regulations stipulating (1) that the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction be calculated by SFP accident evaluation models using data from multi-rod bundle (assembly) severe accident experiments; (2) that the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction be calculated by SFP accident evaluation models using data from multi-rod bundle

Comment [A]: This part is confusing how it walks through the requests in the last petition. I don't think we need to do that. Just mention that there was a previous petition that was not docketed. He revised it and resubmitted it as a new PRM that stands on its own. This notice should only focus on THIS PRM. Briefly: what regulations is he requesting and why.

~~(assembly) severe accident experiments conducted with pre-oxidized fuel cladding; (3) that SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior, which causes the protective zirconium dioxide layer on fuel cladding to degrade and oxidation rates to accelerate; and (4) that licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete loss of coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.~~

On March 21, 2014 (ADAMS Accession No. ML14023A743), the NRC requested supplemental information to further clarify the petitioner's request (ADAMS Accession No. ML14023A743). On June 19, 2014 (ADAMS Accession No. ML14195A388), the petitioner responded to the request and resubmitted the petition with additional information. ~~supplemental information.~~ After evaluating the resubmitted petition, as ~~supplemented~~, the NRC has determined that the petition meets the threshold sufficiency requirements for a petition for rulemaking under § 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," and the petition has been docketed as PRM-50-108. The NRC is not instituting a requesting public comment period for this PRM at this time ~~on the petition for rulemaking.~~

III. The Petition.

The petition requests that the NRC develop new regulations stipulating that (1) the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction be calculated by spent fuel pool (SFP) accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments; (2) the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction be calculated by SFP accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments, conducted

with pre-oxidized fuel cladding; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petition references recent NRC post-Fukushima MELCOR simulations of BWR Mark I SFP accident/fire scenarios. The petition states that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petition states that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium fires than MELCOR indicates. The petition states that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petition claims that the petitioner proposes the development of four new regulations that he believes would help improve public and plant-worker safety. The petitioner asserts that the first three of the proposed regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios.

The petition states that the fourth proposed regulation proposed in the petition would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: (1) postulated complete LOCA scenarios, (2) postulated partial LOCA scenarios, and (3) postulated boil-off accident scenarios. The petition states that the purpose of these evaluations would be to ~~er notes that such evaluations would keep the NRC informed of~~

the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs.

~~The petitioner references recent NRC post Fukushima MELCOR simulations of BWR Mark I SFP accident/fire scenarios. The petitioner notes that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading, because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.~~

~~The petitioner is concerned that in actual SFP fires, there would be quicker fuelcladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium fires than MELCOR indicates. Furthermore, the petitioner states that in accordance with the NRC's philosophy of defense in depth, which requires the application of conservative models, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.~~

~~The petitioner believes that, if implemented, the regulations proposed in the petition would improve public and plant worker safety. Therefore, the petitioner requests that the NRC develop new regulations regarding SFP accident evaluation models because the probability of the type of events that could lead to SFP accidents is relatively high and recent SFP accident simulation scenarios have only considered accidents with very slight probabilities of occurring.~~

Dated at Rockville, Maryland, this XX day of XXXX, 2014.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

The Honorable Barbara Boxer
Chairman, Committee on Environment
and Public Works
United States Senate
Washington, DC 20510

Dear Madam Chairman:

Enclosed is a copy of a notice of receipt and request for public on a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edward Leyse ~~(the petitioner)~~, on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP)-accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Eugene Dacus, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Senator David Vitter

The Honorable Sheldon Whitehouse
Chairman, Subcommittee on Clean Air
and Nuclear Safety
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public on a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edward Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Eugene Dacus, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Senator Jeff Sessions

The Honorable Fred Upton
Chairman, Committee on Energy
and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public on a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edward Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Eugene Dacus, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Henry A. Waxman

The Honorable Ed Whitfield
Chairman, Subcommittee on Energy
and Power
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public on a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edward Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Eugene Dacus, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Bobby L. Rush

The Honorable John Shimkus
Chairman, Subcommittee on Environment
and the Economy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public on a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edward Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Eugene Dacus, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Paul Tonko

The Honorable John Shimkus
Chairman, Subcommittee on Environment
and the Economy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public on a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edward Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Eugene Dacus, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Paul Tonko

IDENTICAL LETTERS SENT TO:

The Honorable Barbara Boxer with cc: to Senator David Vitter

The Honorable Sheldon Whitehouse with cc: to Senator Jeff Sessions

The Honorable Fred Upton with cc: to Representative Henry A. Waxman

The Honorable Ed Whitfield with cc: to Representative Bobby L. Rush

ADAMS Accession No: MLXXXXXXXXXX

*via e-mail

| OFFICE | ADM/DAS/RADB/ RT | ADM/DAS/RADB /TL | ADM/DAS/RADB /BC | | OGC | OCA/D |
|--------|---------------------|---------------------|---------------------|--|-----|--------|
| NAME | JBorges | LTerry | CBladey | | | EDacus |
| DATE | | | | | | |

OFFICIAL AGENCY RECORD



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

This letter is in reference to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) on June 19, 2014 (NRC's Agencywide Documents Access and Management System Accession No. ML14195A388). In your petition, you request that the NRC develop new regulations stipulating that (1) the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction be calculated by spent fuel pool (SFP) accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments; (2) the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction be calculated by SFP accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments, conducted with pre-oxidized fuel cladding; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior, which causes the protective zirconium dioxide layer on fuel cladding to degrade and oxidation rates to accelerate; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

Your petition has been docketed under § 2.802 of Title 10 of the *Code of Federal Regulations*, "Petition for rulemaking," to acknowledge your request and has been assigned Docket No. PRM-50-108. Please reference this docket number on any correspondence you may have concerning the petition. The enclosed notice acknowledging receipt of the petition will be published in the *Federal Register*. The NRC is not requesting public comment on your petition for rulemaking at this time. The NRC appreciates your offer to send copies of the references cited in your petition and would like to take you up on this offer. This would greatly assist the staff in its review. Please provide the references to the staff contacts listed below. As the staff reviews your petition, it may be necessary to request additional information.

You can monitor the docket for your petition on the Federal rulemaking Web site, <http://www.regulations.gov>, by searching on Docket ID NRC-2014-01714. In addition, the Federal rulemaking Web site allows you to receive alerts when changes or additions occur in a docket folder. To subscribe: (1) navigate to the docket folder NRC-2014-01714; (2) click the "E-mail Alert" link; and (3) enter your e-mail address and select how frequently you would like to receive e-mails (daily, weekly, or monthly). The NRC also tracks all petition actions on its Web site at <http://www.nrc.gov/reading-rm/doc-collections/rulemaking-ruleforum/petitions-by-year.html>.

Comment [A]: We don't need to include this part. This is a claim/explanation that he is making embedded in his request and the way this is written, it sounds like we are saying this. The request is to model the behavior, so I think we should just say that and leave this part out.

Comment [A]: On page 7 of ML14195A388, he wrote: "Upon request, I would be happy to send NRC any references to the supporting documentation for the C.F.R. § 2.802 rulemaking petition."

Comment [A]: NRC-2014-0171

M. Leyse

- 2 -

You may direct any questions you have concerning the petition process or the status of your petition to Cindy Bladey at 301-287-0949 (e-mail: Cindy.Bladey@nrc.gov) or to Daniel Doyle at 301-415-3748 (e-mail: Daniel.Doyle@nrc.gov).

Sincerely,

Annette L. Vietti-Cook,
Secretary of the Commission.

Enclosure
Notice of docketing of petition
for rulemaking

M. Leyse

- 2 -

You may direct any questions you have concerning the petition process or the status of your petition to Cindy Bladey at 301-287-0949 (e-mail: Cindy.Bladey@nrc.gov) or to Daniel Doyle at 301-415-3748 (e-mail: Daniel.Doyle@nrc.gov).

Sincerely,

Annette L. Vietti-Cook,
Secretary of the Commission.

Enclosure
Notice of docketing of petition
for rulemaking

DISTRIBUTION:

RADB R/F CBladey, ADM JBorges, ADM LTerry, ADM

ADAMS Accession No.:

| OFFICE | ADM/DAS/RADB/RT | ADM/DAS/RADB/RT | ADM/DAS/RADB/BC |
|--------|-----------------|------------------------|-----------------|
| NAME | JBorges | LTerry (JShepherd for) | CBladey |
| DATE | / /14 | / /14 | / /14 |

OFFICIAL RECORD COPY

From: Doyle, Daniel
Sent: 20 May 2015 15:25:06 -0400
To: Mohseni, Aby;Kokajko, Lawrence;McGinty, Tim;Davis, Jack;Monninger, John;Case, Michael;Bladey, Cindy;Spencer, Mary;Hernandez, Raul;Esmaili, Hossein;Greenleaf, Michael;Witt, Kevin;Mizuno, Geary;Borges, Jennifer;Inverso, Tara;Casto, Greg
Cc: Terry, Leslie;Taylor, Robert;Cohen, Shari;Anderson, Shaun;Davidson, Evan;Bowman, Gregory;Armstrong, Kenneth;Coffin, Stephanie
Subject: Material for PRM-50-108 PRB (5/27/15): Draft FRN

Good afternoon,

On Wednesday, May 27, 2015, a petition review board (PRB) will be conducted to achieve alignment on the recommended resolution of petition for rulemaking PRM-50-108. A draft *Federal Register* notice supporting the staff's recommendation to deny the petition is available at the following link:

[View ADAMS P8 Properties ML14307A630](#)

[Open ADAMS P8 Document \(Federal Register Notice: Petition for Rulemaking: Denial on Spent Fuel Pool Evaluations \(PRM-50-108\)\)](#)

This email does not request your formal concurrence. That step will be after the PRB. This email is for information only as you prepare for the PRB. The working group members listed below participated in the development of the documents in the denial package and will be available to answer questions you may have.

Dan

-----Original Appointment-----

From: Doyle, Daniel
Sent: Monday, May 04, 2015 3:51 PM
To: Doyle, Daniel; Mohseni, Aby; Kokajko, Lawrence; McGinty, Tim; Davis, Jack; Monninger, John; Case, Michael; Bladey, Cindy; Spencer, Mary; Hernandez, Raul; Esmaili, Hossein; Greenleaf, Michael; Witt, Kevin; Mizuno, Geary; Borges, Jennifer; Inverso, Tara; Casto, Greg; NRR_DPR_PRMB Resource
Cc: rhfigueroa77@gmail.com; Terry, Leslie; Taylor, Robert; Cohen, Shari; Anderson, Shaun; Davidson, Evan; Bowman, Gregory; DSSCAL Resource; Armstrong, Kenneth; Coffin, Stephanie
Subject: Petition Review Board Meeting for PRM-50-108
When: Wednesday, May 27, 2015 10:00 AM-11:00 AM (UTC-05:00) Eastern Time (US & Canada).
Where: HQ-OWFN-09B04-25p

Please attend a petition review board (PRB) meeting for petition for rulemaking (PRM) 50-108. During this meeting, PRB voting members will be briefed on the working group's recommendation to deny PRM-50-108. Voting members will consist of the DPR Division Director (Chairman), OGC, ADM, and all involved technical division directors. **If you are unable to attend, please arrange to have your deputy division director or someone else you delegate to vote in your absence attend.**

I will attach a POP and slides prior to the meeting. In addition, the PRB members will receive the draft denial package at least one week prior to the PRB. In the meantime, please see below for some additional background information.

Dan Doyle

Background:

Mr. Mark Leyse submitted PRM-50-108 in June 2014. The petition requests that the NRC amend its regulations to require power reactor licensees to perform annual evaluations to determine the potential consequences of various postulated spent fuel pool accident scenarios. The working group evaluated the PRM and recommends that the NRC deny the PRM.

Draft Denial package:

The DRAFT denial package will consist of the following documents:

- SECY Paper
- *Federal Register* notice
- Letter to the Petitioner
- Congressional Letters
- Daily Note

Working Group Assistance:

An interoffice working group was formed to evaluate the PRM and to develop the draft denial package.

The working group consists of the following staff members:

| Name | Office/Division |
|-------------------|-----------------|
| Jennifer Borges | ADM/RADB |
| Dan Doyle | NRR/DPR |
| Hossein Esmaili | RES/DSA |
| Michael Greenleaf | NRR/DSS |
| Raul Hernandez | NRO/DSRA |
| Geary Mizuno | OGC |
| Kevin Witt | NRR/JLD |

From: Baum, Robin
Sent: 11 Aug 2014 16:50:22 -0400
To: Mizuno, Geary;Safford, Carrie
Cc: Shepherd, Jill;Doyle, Daniel;Jones, Bradley;Inverso, Tara;Colaccino, Joseph;Bladey, Cindy;Borges, Jennifer
Subject: Notice of Docketing for PRM-50-108

Hello All – especially in Rules Team/ADM :

Please note that my management rotation concluded on July 25. Going forward, please substitute Carrie Safford in lieu of me, as Carrie is now the Acting AGC for HLW/Fuel Cycle/Nuclear Security. I have returned to my home office - it was a pleasure working with you !

Robin A. Baum
Deputy Assistant General Counsel for Administration/
Special Counsel for Acquisition
Office of the General Counsel
U.S. Nuclear Regulatory Commission
Office: O15H03
(301) 415-2202
robin.baum@nrc.gov

From: Mizuno, Geary
Sent: Monday, August 11, 2014 4:47 PM
To: Borges, Jennifer; RidsNrrMailCenter Resource; RidsNroMailCenter Resource; RidsOgcMailCenter Resource
Cc: Shepherd, Jill; Doyle, Daniel; Jones, Bradley; Baum, Robin; Inverso, Tara; Colaccino, Joseph; Bladey, Cindy
Subject: RE: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Jennifer and Dan:

Why are we requesting comments on this PRM? I see nothing in this that suggests we should provide an opportunity for the public to submit comments. If there are specific issues for which public comment would be useful, or information that we think would help our deliberations, then we should ask specific questions seeking to elicit this information. Otherwise, we should NOT be providing a general comment opportunity.

In any event, the organization and content of the FRN needs work. The discussions under Sections II and III are not well organized. I have a hard time trying to figure out why the information on docketing is under II. The Petitioner, and why this section contains no real information describing the petitioner and why he has satisfied our requirement to describe his interest in this rulemaking subject. In addition, there is no information in the FRN that justifies why the NRC determined that Mr. Leyse had met our requirements in 2.802(c)(2) as reported on p.5.

The wording of the FRN is also problematic, because at times it is impossible to distinguish whether the FRN is describing assertions made by the petitioner, or actually represents NRC's position/description. For example, on p. 4, under **II. The Petitioner**, the first sentence: "*Mr. Leyse is aware of recent NRC post-Fukushima MELCOR simulations of boiling water reactor (BWR) Mark I SFP accident scenarios and disagree with the resulting conclusions of it.*" Is this

our statement and why do we need to make this statement in order to describe the petitioner for purposes of this PRM?

Why are we using the word "stipulating" in the same paragraph? That is not correct in this context; just because the petitioner uses does not mean we have to accede to its use – especially since we are not putting it in the quotation. The correct word is "requiring". I also find that putting the description of each of the four regulations in **II. The Petitioner**, detracts from the emphasis of this section. It should be placed in **III. The Petition**, in the first paragraph.

This completes my review of the package.

Geary

From: Borges, Jennifer
Sent: Monday, August 11, 2014 4:03 PM
To: RidsNrrMailCenter Resource; RidsNroMailCenter Resource; RidsOgcMailCenter Resource
Cc: Shepherd, Jill; Mizuno, Geary; Doyle, Daniel; Jones, Bradley; Baum, Robin; Inverso, Tara; Colaccino, Joseph; Bladey, Cindy
Subject: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Hello,

Below is a link to the notice of docketing package for a petition for rulemaking prepared for PRM-50-108 filed with the Commission by Mr. Mark Edward Leyse. Also, for your information, I have provided the link to the incoming petition. Please review and provide me with your concurrence by **August 25, 2014**.

If you have any questions concerning this matter, please let me know or contact Jill Shepherd at 301-287-0950 (Jill.Shepherd@nrc.gov).

PACKAGE:

(*Federal Register* Notice, Congressional Letters, & Letter to Petitioner)

[View ADAMS P8 Properties ML14223B127](#)

[Open ADAMS P8 Package \(PRM-50-108 Notice of Docketing RE: Fuel-Cladding Issues in Postulated SFP Accidents\)](#)

INCOMING:

[View ADAMS P8 Properties ML14008A427](#)

[Open ADAMS P8 Document \(Spent Fuel Pool \(Fuel Cladding\) Rulemaking Petition submitted by Atomic Safety Organization\)](#)

INCOMING:

(Additional Information)

[View ADAMS P8 Properties ML14195A388](#)

[Open ADAMS P8 Document \(PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents.\)](#)

Thank you,

Jennifer Borges
Regulations Specialist
Rules Team
ADM/DAS/RADB
301-287-0999

[7590-01-P]

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket No. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; notice of docketing and request for comments.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) has received ~~is publishing for comment a notice of docketing of a petition for rulemaking (PRM) filed with the Commission by from~~ Mr. Mark Edwards Leyse (the petitioner), ~~on December 23, 2013, and supplemented on~~ dated June 19, 2014. The petition was docketed by the NRC on July 14, 2014, and has been assigned Docket No. PRM-50-108. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The NRC is requesting public comment on the petition for rulemaking.

DATES: Submit comments by **[INSERT DATE THAT IS 75 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]**. Comments received after this date will be considered if it is practical to do so, but the NRC is able to assure consideration only for comments received on or before this date.

ADDRESSES: You may submit comments by any of the following methods (unless this document describes a different method for submitting comments on a specific subject):

Comment [C]: The June document is the entire PRM.

Comment [JLB]: Is the staff requesting comments?

Comment [C]: Yes, as far as we know.

Comment [JLB]: Revise if not requesting comments.

- **Federal rulemaking Web site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2014-0171**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-287-3422; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **E-mail comments to:** Rulemaking.Comments@nrc.gov. If you do not receive an automatic e-mail reply confirming receipt, then contact us at 301-415-1677.

- **Fax comments to:** Secretary, U.S. Nuclear Regulatory Commission at 301-415-1101.

- **Mail comments to:** Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, ATTN: Rulemakings and Adjudications Staff.

- **Hand deliver comments to:** 11555 Rockville Pike, Rockville, Maryland 20852, between 7:30 a.m. and 4:15 p.m. (Eastern Time) Federal workdays; telephone: 301-415-1677.

For additional direction on accessing information and submitting comments, see "Obtaining Information and Submitting Comments" in the SUPPLEMENTARY INFORMATION section of this document.

FOR FURTHER INFORMATION CONTACT: Cindy Bladey, Chief, Rules, Announcements, and Directives Branch, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-287-0949, e-mail: Jennifer.Borges@nrc.gov.

SUPPLEMENTARY INFORMATION:

Comment [JLB]: Revise if not requesting comments.

I. Obtaining Information and Submitting Comments

A. Obtaining Information

Please refer to Docket ID **NRC-2014-0171** when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this petition by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2014-0171**.

- **NRC's Agencywide Documents Access and Management System (ADAMS):**

You may obtain publicly available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced in this document (if that document is available in ADAMS) is provided the first time that a document is referenced.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

B. Submitting Comments

Please include Docket ID **NRC-2014-0171** in the subject line of your comment submission, in order to ensure that the NRC is able to make your comment submission available to the public in this docket.

The NRC cautions you not to include identifying or contact information that you do not want to be publicly disclosed in your comment submission. The NRC will post all comment submissions at <http://www.regulations.gov> as well as enter the comment submissions into ADAMS. The NRC does not routinely edit comment submissions to remove identifying or contact information.

If you are requesting or aggregating comments from other persons for submission to the NRC, then you should inform those persons not to include identifying or contact information that they do not want to be publicly disclosed in their comment submission. Your request should state that the NRC does not routinely edit comment submissions to remove such information before making the comment submissions available to the public or entering the comment submissions into ADAMS.

II. The Petitioner.

Mr. Mark Edward Leyse is [insert brief description.], submitted a PRM ~~On~~ December 23, 2013, Mr. Leyse submitted a PRM (ADAMS Accession No. ML14008A427), requesting that the NRC make new regulations stipulating (1) that the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium2-steam reaction be calculated by spent fuel pool (SFP) accident evaluation models using data from multi-rod bundle (assembly) severe accident experiments; (2) that the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction be calculated by SFP accident evaluation models using data from multi-

rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding; (3) that SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior, which causes the protective zirconium dioxide layer on fuel cladding to degrade and oxidation rates to accelerate; and (4) that licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

On March 21, 2014 (ADAMS Accession No. ML14023A743), the NRC requested supplemental information to further clarify the request. On June 19, 2014 (ADAMS Accession No. ML14195A388), the petitioner responded to the request and submitted supplemental information. After evaluating the petition, as supplemented, the NRC has determined that the petition meets the threshold sufficiency requirements for a petition for rulemaking under § 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," and the petition has been docketed as PRM-50-108. The NRC is requesting public comment on the petition for rulemaking.

Comment (JLB): Delete if this is not true.

III. Discussion of ~~t~~The Petition.

The petitioner proposes the development of four new regulations that he believes would help improve public and plant-worker safety. The petitioner asserts that three of the proposed regulations, regarding to zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios.

The fourth regulation proposed in the petition is ~~intended to~~would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: (1) postulated complete LOCA scenarios, (2) postulated partial LOCA scenarios, and

(3) postulated boil-off accident scenarios. The petitioner notes that such evaluations would keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs.

The petitioner references recent NRC Post-Fukushima MELCOR simulations of boiling water reactor (BWR) Mark I SFP accident/fire scenarios. The petitioner notes that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading, because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner is concerned that in actual SFP fires, there would be quicker fuelcladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium fires than MELCOR indicates. Furthermore, the petitioner states that in accordance with NRC's philosophy of defense-in-depth, which requires the application of conservative models, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner believes that, if implemented, the regulations proposed in the petition would improve public and plant-worker safety. Therefore, the petitioner requests that the NRC develop new regulations regarding SFP accident evaluation models because the probability of the type of events that could lead to SFP accidents is relatively high and recent SFP accident simulation scenarios have only considered accidents with very slight probabilities of occurring.

Dated at Rockville, Maryland, this XX day of XXXX, 2014.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

From: Mizuno, Geary
Sent: 9 Sep 2014 15:27:55 -0400
To: Barczy, Theresa;Bladey, Cindy;Doyle, Daniel
Cc: Jones, Bradley;Biggins, James;Benowitz, Howard
Subject: OGC Comments on PRM 50-108 docketing package (OGC Ticket 2014-3672)

Theresa and Dan:

In the attached files, please find my comments on the FRN announcing notice of docketing of PRM-50-108 and the letter to Mark Leyse, the petitioner. I had no comments on the Congressional letters. Given the relatively small number of comments, I will keep the folder open until next Monday, in order to allow you make changes and advise me that the changes have been made in the ADAMS documents. If I don't hear back, I will close the ticket; the package will then have to be re-submitted to OGC through the OGC Mailroom.

One matter which I feel I need to draw to your attention. The letter to the petitioner, informing the petitioner of the NRC's decision to docket the PRM, has an legally-objectionable description of the docketing action and notice. The language appears to be either an unauthorized departure from the template for this type of letter, or a change to the template made without full OGC review. The problematic words are highlighted below:

Your petition has been docketed under § 2.802 of Title 10 of the Code of Federal Regulations, "Petition for rulemaking," to acknowledge your request and has been assigned Docket No. PRM-XX-XXX.

The highlighted words should be struck-out so that the sentence reads:

Your petition has been docketed under § 2.802 of Title 10 of the Code of Federal Regulations, "Petition for rulemaking," and has been assigned Docket No. PRM-XX-XXX.

If it is part of the current RADB template, then the template should be changed to revert back to the accepted language (NOTE: OGC should have been consulted on the template change, IMO). If the language at issue in the letter represents a departure from the template, then we do not understand the reasons for the departure.

Geary

From: Doyle, Daniel
Sent: 27 May 2015 09:45:26 -0400
To: Mohseni, Aby;Kokajko, Lawrence;McGinty, Tim;Davis, Jack;Monninger, John;Case, Michael;Bladey, Cindy;Spencer, Mary;Hernandez, Raul;Esmaili, Hossein;Greenleaf, Michael;Witt, Kevin;Mizuno, Geary;Borges, Jennifer;Inverso, Tara;Casto, Greg;NRR_DPR_PRMB Resource
Cc: rhfigueroa77@gmail.com;Terry, Leslie;Taylor, Robert;Cohen, Shari;Anderson, Shaun;Davidson, Evan;Bowman, Gregory;DSSCAL Resource;Armstrong, Kenneth;Coffin, Stephanie
Subject: Petition Review Board Meeting for PRM-50-108
Attachments: PRM-50-108 - PRB POP.docx, PRM-50-108 PRB slides.pptx, Material for PRM-50-108 PRB (5/27/15): Draft FRN

Bridgeline: 888-324-7813
Passcode: 26167#

A POP, slides, and bridgeline information are attached:



E-mail transmitting draft Federal Register notice to PRB members is attached:



Please attend a petition review board (PRB) meeting for petition for rulemaking (PRM) 50-108. During this meeting, PRB voting members will be briefed on the working group's recommendation to deny PRM-50-108. Voting members will consist of the DPR Division Director (Chairman), OGC, ADM, and all involved technical division directors. **If you are unable to attend, please arrange to have your deputy division director or someone else you delegate to vote in your absence attend.**

I will attach a POP and slides prior to the meeting. In addition, the PRB members will receive the draft denial package at least one week prior to the PRB. In the meantime, please see below for some additional background information.

Dan Doyle

Background:

Mr. Mark Leyse submitted PRM-50-108 in June 2014. The petition requests that the NRC amend its regulations to require power reactor licensees to perform annual evaluations to determine the potential consequences of various postulated spent fuel pool accident scenarios. The working group evaluated the PRM and recommends that the NRC deny the PRM.

Draft Denial package:

The DRAFT denial package will consist of the following documents:

- SECY Paper
- *Federal Register* notice
- Letter to the Petitioner
- Congressional Letters
- Daily Note

Working Group Assistance:

An interoffice working group was formed to evaluate the PRM and to develop the draft denial package. The working group consists of the following staff members:

| Name | Office/Division |
|-------------------|-----------------|
| Jennifer Borges | ADM/RADB |
| Dan Doyle | NRR/DPR |
| Hossein Esmaili | RES/DSA |
| Michael Greenleaf | NRR/DSS |
| Raul Hernandez | NRO/DSRA |
| Geary Mizuno | OGC |
| Kevin Witt | NRR/JLD |

PRM-50-108 Petition Review Board
May 27, 2015

PURPOSE:

- To obtain Petition Review Board (PRB) direction on the working group recommended resolution of PRM-50-108.

EXPECTED OUTCOME:

- PRB understands issues raised by the petitioner and supports the recommendation of the NRC working group to deny the PRM.

PROCESS:

- See attached presentation.

Next Steps:

- PRB decision will be documented by the project manager in a non-public meeting summary within 30 days.
- Finalize SECY paper and draft FRN and provide to the Commission within 4.5 months of today's date. A Commission vote is needed to deny the PRM.



Petition for Rulemaking PRM-50-108

Petition Review Board Meeting

May 27, 2015

OWFN-09B04

10:00 am – 11:00 am

Bridge Line: 888-324-7813 Passcode: 26167#



Working Group Members

- Dan Doyle – Project Manager, NRR/DPR
- Jennifer Borges – ADM
- Hossein Esmaili – RES/DSA
- Michael Greenleaf – NRR/DSS
- Raul Hernandez – NRO/DSRA
- Geary Mizuno – OGC
- Kevin Witt – NRR/JLD



Purpose

- **Purpose:** Obtain Petition Review Board (PRB) direction on the working group (WG) recommended resolution of PRM-50-108.
- **Outcome:** PRB understands issues raised by the petitioner and supports the WG recommendation to deny the PRM.
- **Process:** Discuss PRM-50-108 and WG recommendations.



Agenda

- Petition Background
- Summary of Petitioner's Requests
- NRC's Interpretation of PRM Argument
- Issues for Evaluation by the NRC
- Staff Technical Evaluation
- Working Group Recommendation
- Next Steps



Petition Background

**Jun. 19,
2014**

**Mr. Leyse submitted
petition request**

(ADAMS Accession No. ML14195A388)

**Oct. 7,
2014**

**Notice of docketing
review w/o opportunity
for comment published
in the *Federal Register***

(79 FR 60383)

**To
Present**

**WG analyzing petition to
offer a recommendation**



Summary of Petitioner's Requests

- The NRC should require licensees to perform annual spent fuel pool (SFP) severe accident safety evaluations (request #4). The evaluation models should:
 - Use data from multi-rod bundle severe accident experiments to calculate fuel cladding oxidation (request #1)
 - Use data from multi-rod bundle severe accident experiments conducted with pre-oxidized fuel cladding (request #2)
 - Conservatively model nitrogen-induced breakaway oxidation behavior (request #3)



NRC's Interpretation of PRM Argument

The working group reviewed the petition and identified three issues for evaluation by the NRC:

Since the risk of a SFP accident is relatively high (issue #1), the NRC should require licensees to perform annual SFP safety evaluations (issue #2). The safety evaluations should use conservative computer models, and MELCOR is not currently sufficient (issue #3).



Issues for Evaluation by the NRC

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
 - Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in SFPs.
 - Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.
-



Staff Technical Evaluation Issue 1

The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

Background: The petition states that a long-term station blackout can happen in multiple ways, and a loss of SFP cooling and a SFP fire is a likely outcome. The petition argues that this is a sufficient basis for the requested regulations.

Working Group: Disagree. Numerous evaluations have shown that the risk of a SFP fire is low. There are multiple layers of protection to prevent uncovering of spent fuel and the potentially resulting fire.



Staff Technical Evaluation Issue 2

Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in SFPs.

Background: The petition states that the purpose of the evaluations would be to keep the NRC informed of potential consequences.

Working Group: Disagree. SFP safety is provided by: conservative design of SFP; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's approach for providing SFP safety.



Staff Technical Evaluation Issue 3

MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

Background: The petition states that there are serious flaws with MELCOR, and, therefore, MELCOR is not currently sufficient for use in the requested annual SFP evaluations.

Working Group: Disagree. Updated computer modeling of SFP accidents is not needed for SFP accident evaluations or for mitigative response by the licensee. Normal, off-normal, and mitigative response uses appropriately conservative assumptions.



Working Group Recommendation

The WG recommends that the NRC deny the petition.

- Staff disagrees with the arguments raised by the petitioner.
- The information that would be reported to the NRC as requested by the petition is not necessary for effective NRC regulatory decisionmaking with respect to spent fuel pools.
- The current design and licensing requirements for spent fuel provide adequate protection of public health and safety.

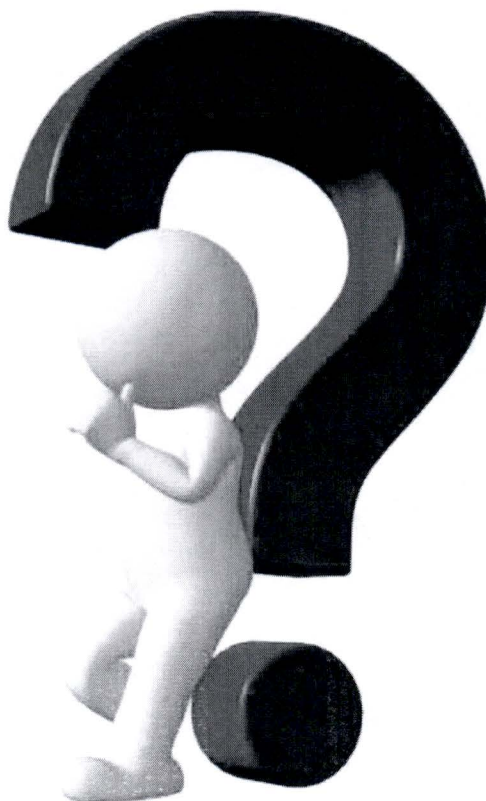


Next Steps

- PRB decision will be documented by the project manager in a non-public meeting summary within 30 days.
 - Finalize SECY paper and draft FRN within 4.5 months and provide to the Commission.
 - Commission vote is needed to deny the PRM
 - Publish FRN documenting PRM disposition.
-



Questions?



From: Doyle, Daniel
Sent: 20 May 2015 19:25:06 +0000
To: Mohseni, Aby;Kokajko, Lawrence;McGinty, Tim;Davis, Jack;Monninger, John;Case, Michael;Bladey, Cindy;Spencer, Mary;Hernandez, Raul;Esmaili, Hossein;Greenleaf, Michael;Witt, Kevin;Mizuno, Geary;Borges, Jennifer;Inverso, Tara;Casto, Greg
Cc: Terry, Leslie;Taylor, Robert;Cohen, Shari;Anderson, Shaun;Davidson, Evan;Bowman, Gregory;Armstrong, Kenneth;Coffin, Stephanie
Subject: Material for PRM-50-108 PRB (5/27/15): Draft FRN

Good afternoon,

On Wednesday, May 27, 2015, a petition review board (PRB) will be conducted to achieve alignment on the recommended resolution of petition for rulemaking PRM-50-108. A draft *Federal Register* notice supporting the staff's recommendation to deny the petition is available at the following link:

[View ADAMS P8 Properties ML14307A630](#)

[Open ADAMS P8 Document \(Federal Register Notice: Petition for Rulemaking: Denial on Spent Fuel Pool Evaluations \(PRM-50-108\)\)](#)

This email does not request your formal concurrence. That step will be after the PRB. This email is for information only as you prepare for the PRB. The working group members listed below participated in the development of the documents in the denial package and will be available to answer questions you may have.

Dan

-----Original Appointment-----

From: Doyle, Daniel
Sent: Monday, May 04, 2015 3:51 PM
To: Doyle, Daniel; Mohseni, Aby; Kokajko, Lawrence; McGinty, Tim; Davis, Jack; Monninger, John; Case, Michael; Bladey, Cindy; Spencer, Mary; Hernandez, Raul; Esmaili, Hossein; Greenleaf, Michael; Witt, Kevin; Mizuno, Geary; Borges, Jennifer; Inverso, Tara; Casto, Greg; NRR DPR PRMB Resource
Cc: rhfigueroa77@gmail.com; Terry, Leslie; Taylor, Robert; Cohen, Shari; Anderson, Shaun; Davidson, Evan; Bowman, Gregory; DSSCAL Resource; Armstrong, Kenneth; Coffin, Stephanie
Subject: Petition Review Board Meeting for PRM-50-108
When: Wednesday, May 27, 2015 10:00 AM-11:00 AM (UTC-05:00) Eastern Time (US & Canada).
Where: HQ-OWFN-09B04-25p

Please attend a petition review board (PRB) meeting for petition for rulemaking (PRM) 50-108. During this meeting, PRB voting members will be briefed on the working group's recommendation to deny PRM-50-108. Voting members will consist of the DPR Division Director (Chairman), OGC, ADM, and all involved technical division directors. **If you are unable to attend, please arrange to have your deputy division director or someone else you delegate to vote in your absence attend.**

I will attach a POP and slides prior to the meeting. In addition, the PRB members will receive the draft denial package at least one week prior to the PRB. In the meantime, please see below for some additional background information.

Dan Doyle

Background:

Mr. Mark Leyse submitted PRM-50-108 in June 2014. The petition requests that the NRC amend its regulations to require power reactor licensees to perform annual evaluations to determine the potential consequences of various postulated spent fuel pool accident scenarios. The working group evaluated the PRM and recommends that the NRC deny the PRM.

Draft Denial package:

The DRAFT denial package will consist of the following documents:

- SECY Paper
- *Federal Register* notice
- Letter to the Petitioner
- Congressional Letters
- Daily Note

Working Group Assistance:

An interoffice working group was formed to evaluate the PRM and to develop the draft denial package. The working group consists of the following staff members:

| Name | Office/Division |
|-------------------|-----------------|
| Jennifer Borges | ADM/RADB |
| Dan Doyle | NRR/DPR |
| Hossein Esmaili | RES/DSA |
| Michael Greenleaf | NRR/DSS |
| Raul Hernandez | NRO/DSRA |
| Geary Mizuno | OGC |
| Kevin Witt | NRR/JLD |

From: Shepherd, Jill
Sent: 27 Aug 2014 09:23:43 -0400
To: Bladey, Cindy
Subject: PRM status

The Leyse petition is 50-108 (Jennifer) and concurrence was due 8/25. I will get a status update on it from Jennifer at tomorrow's RT meeting.

The two NEI petitions are 37-1 (Christian) – concurrence was due on that one yesterday and 73-18 (Tremaine, now Dawn). Concurrence was due on this one 8/21. I imagine Dawn is preparing it for publication. I've asked her for an update and will let you know once I get a response.

Thanks,

Jill

*Jill Shepherd-Vladimir
Regulations Specialist
U.S. Nuclear Regulatory Commission
ADM/DAS/RADB/RT
Room: 06-A58
Mail Stop: 3WFN 06-A44MP
Email: Jill.Shepherd@NRC.gov
Phone: 301-287-0950*

From: RulemakingComments Resource
Sent: 14 Jul 2014 15:15:54 -0400
To: Bladey, Cindy
Cc: Giitter, Rebecca;Julian, Emile;Newell, Brian;RulemakingComments Resource
Subject: PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents

Cindy,

The following Petition has been docketed and a folder for PRM-50-108 has been created in the "ELECTRONIC RULEMAKING COMMENTS" folder in ADAMS.

[ML14195A388 - PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents.](#)

Thanks.

Herald

Herald M. Speiser
Rulemakings and Adjudications Staff
Office of the Secretary
Nuclear Regulatory Commission
(301) 415-1675

From: Shepherd, Jill
Sent: 24 Jul 2014 15:23:17 -0400
To: Borges, Jennifer
Cc: Bladey, Cindy
Subject: RE: ACTION: PRM-50-108 Docketing Package; Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents
Attachments: Congressional letters PRM-50-108 - JSV edits.docx, Letter to petitioner NoR PRM-50-108 - JSV edits.docx, Notice of docketing PRM-50-108 - JSV edits.docx

Jennifer,

My edits are attached. Thanks,

Jill

Jill Shepherd-Vladimir
Regulations Specialist
U.S. Nuclear Regulatory Commission
ADM/DAS/RADB/RT
Room: 06-A58
Mail Stop: 3WFN 06-A44MP
Email: Jill.Shepherd@NRC.gov
Phone: 301-287-0950

-----Original Message-----

From: Borges, Jennifer
Sent: Thursday, July 24, 2014 3:04 PM
To: Shepherd, Jill
Cc: Bladey, Cindy
Subject: ACTION: PRM-50-108 Docketing Package; Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents

Hello,

Please find attached the documents pertaining to PRM-50-108. Please review and provide me with comments. I will add the documents into ADAMS before submitting the package to the group for concurrence.

The incoming petition is available in ADAMS under accession No. ML14195A388.

<https://adamsxt.nrc.gov/WorkplaceXT/getContent?id=current&vsId=%7B89D76C94-E4A2-4976-8094-B0CA9C1CBC3C%7D&objectStoreName=Main...Library&objectType=document>

Your message is ready to be sent with the following file or link attachments:

Notice of docketing PRM-50-108.docx
Congressional letters PRM-50-104.docx
Letter to petitioner NoR PRM-50-108.docx

Note: To protect against computer viruses, e-mail programs may prevent sending or receiving certain types of file attachments. Check your e-mail security settings to determine how attachments are handled.

Thank you,

Jennifer Borges
Regulations Specialist
Rules Team
ADM/DAS/RADB

Location: 3WFN 6-A38
301-287-0999

Comment [P]: Make corresponding changes to all letters.

[The Honorable Barbara Boxer]
Chairman, Committee on Environment
and Public Works
United States Senate
Washington, DC 20510

Dear Madam Chairman:

Enclosed is a copy of a notice of receipt and request for public comments for a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edwards Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Please feel free to contact me at (301) 415-1776, if you have questions or need more information.

Sincerely,

Amy Powell, Acting Director
Office of Congressional Affairs

Enclosure: *Federal-Register* Notice

cc: Senator David Vitter

The Honorable Sheldon Whitehouse
Chairman, Subcommittee on Clean Air
and Nuclear Safety
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public comments for a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edwards Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Amy Powell, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Senator Jeff Sessions

The Honorable Fred Upton
Chairman, Committee on Energy
and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public comments for a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edwards Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Amy Powell, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Henry A. Waxman

The Honorable Ed Whitfield
Chairman, Subcommittee on Energy
and Power
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public comments for a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edwards Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Amy Powell, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Bobby L. Rush

The Honorable John Shimkus
Chairman, Subcommittee on Environment
and the Economy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public comments for a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edwards Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Amy Powell, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Paul Tonko

The Honorable John Shimkus
Chairman, Subcommittee on Environment
and the Economy
Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is a copy of a notice of receipt and request for public comments for a petition for rulemaking (PRM), PRM-50-108, filed by Mr. Mark Edwards Leyse (the petitioner), on June 19, 2014. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The notice will be published in the *Federal Register* shortly.

Sincerely,

Amy Powell, Acting Director
Office of Congressional Affairs

Enclosure: *Federal Register* Notice

cc: Representative Paul Tonko

IDENTICAL LETTERS SENT TO:

The Honorable Barbara Boxer with cc: to Senator David Vitter

The Honorable Sheldon Whitehouse with cc: to Senator Jeff Sessions

The Honorable Fred Upton with cc: to Representative Henry A. Waxman

The Honorable Ed Whitfield with cc: to Representative Bobby L. Rush

ADAMS Accession No: MLXXXXXXXXXX

*via e-mail

| OFFICE | ADM/DAS/RADB/ RT | ADM/DAS/RADB /TL | ADM/DAS/RADB /BC | | OGC | OCA/D |
|--------|---------------------|---------------------|---------------------|--|-----|---------|
| NAME | JBorges | LTerry | CBladey | | | APowell |
| DATE | | | | | | |

OFFICIAL AGENCY RECORD



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

This letter is in reference to your petition for rulemaking (PRM) that you submitted to the U.S. Nuclear Regulatory Commission (NRC) on June 19, 2014 (NRC's Agencywide Documents Access and Management System Accession No. ML14195A388). In your petition, you request that the NRC develop new regulations stipulating that (1) the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction be calculated by spent fuel pool (SFP) accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments; (2) the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction be calculated by SFP accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments, conducted with pre-oxidized fuel cladding; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior, which causes the protective zirconium dioxide layer on fuel cladding to degrade and oxidation rates to accelerate; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

Your petition has been docketed under § 2.802 of Title 10 of the *Code of Federal Regulations*, "Petition for rulemaking," to acknowledge your request and has been assigned Docket No. PRM-50-108. Please reference this docket number on any correspondence you may have concerning the petition. The enclosed notice acknowledging receipt of the petition will be published in the *Federal Register*. [The NRC is requesting public comment on your petition for rulemaking.] As the staff reviews your petition, it may be necessary to request additional information.

You can monitor the docket for your petition on the Federal rulemaking Web site, <http://www.regulations.gov>, by searching on Docket ID NRC-2014-0174. In addition, the Federal rulemaking Web site allows you to receive alerts when changes or additions occur in a docket folder. To subscribe: (1) navigate to the docket folder NRC-2014-0174; (2) click the "E-mail Alert" link; and (3) enter your e-mail address and select how frequently you would like to receive e-mails (daily, weekly, or monthly). The NRC also tracks all petition actions on its Web site at <http://www.nrc.gov/reading-rm/doc-collections/rulemaking-ruleforum/petitions-by-year.html>.

Comment [P]: Should the 2 be a superscript?

Comment [BJ]: Delete if not true.

M. Leyse

- 2 -

You may direct any questions you have concerning the petition process or the status of your petition to Cindy Bladey at 301-287-0949 (e-mail: Cindy.Bladey@nrc.gov) or to Jennifer Borges at 301-287-0999 (e-mail: Jennifer.Borges@nrc.gov).

Sincerely,

Annette L. Vietti-Cook,
Secretary of the Commission.

Enclosure
Notice of docketing of petition
for rulemaking

M. Leyse

- 2 -

You may direct any questions you have concerning the petition process or the status of your petition to Cindy Bladey at 301-287-0949 (e-mail: Cindy.Bladey@nrc.gov) or to Jennifer Borges at 301-287-0999 (e-mail: Jennifer.Borges@nrc.gov).

Sincerely,

Annette L. Vietti-Cook,
Secretary of the Commission.

Enclosure
Notice of docketing of petition
for rulemaking

DISTRIBUTION:

RADB R/F CBladey, ADM JBorges, ADM LTerry, ADM

ADAMS Accession No.:

| OFFICE | ADM/DAS/RADB/RT | ADM/DAS/RADB/RT | ADM/DAS/RADB/BC |
|--------|-----------------|------------------------|-----------------|
| NAME | JBorges | LTerry (JShepherd for) | CBladey |
| DATE | / /14 | 07/24/14 | / /14 |

OFFICIAL RECORD COPY

[7590-01-P]

Comment [JLB]: Is the staff requesting comments?

Comment [JLB]: Revise if not requesting comments.

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket No. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; notice of docketing and request for comments.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is publishing for comment a notice of docketing of a petition for rulemaking (PRM) filed with the Commission by Mr. Mark Edwards Leyse (the petitioner) on December 23, 2013, and supplemented on June 19, 2014. The petition was docketed by the NRC on July 14, 2014, and has been assigned Docket No. PRM-50-108. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models.

DATES: Submit comments by **[INSERT DATE THAT IS 75 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]**. Comments received after this date will be considered if it is practical to do so, but the NRC is able to assure consideration only for comments received on or before this date.

ADDRESSES: You may submit comments by any of the following methods (unless this document describes a different method for submitting comments on a specific subject):

• **Federal rulemaking Web site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2014-0171**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-287-3422; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

• **E-mail comments to:** Rulemaking.Comments@nrc.gov. If you do not receive an automatic e-mail reply confirming receipt, then contact us at 301-415-1677.

• **Fax comments to:** Secretary, U.S. Nuclear Regulatory Commission at 301-415-1101.

• **Mail comments to:** Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, ATTN: Rulemakings and Adjudications Staff.

• **Hand deliver comments to:** 11555 Rockville Pike, Rockville, Maryland 20852, between 7:30 a.m. and 4:15 p.m. (Eastern Time) Federal workdays; telephone: 301-415-1677.

For additional direction on accessing information and submitting comments, see "Obtaining Information and Submitting Comments" in the SUPPLEMENTARY INFORMATION section of this document.

FOR FURTHER INFORMATION CONTACT: Cindy Bladey, Chief, Rules, Announcements, and Directives Branch, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-287-0949, e-mail: Jennifer.Borges@nrc.gov.

Comment [P]: This should be the PM for the PRM, not Cindy. Please revise before sending out for concurrence.

SUPPLEMENTARY INFORMATION:

Comment (JLB): Revise if not requesting comments.

I. Obtaining Information and Submitting Comments

A. Obtaining Information

Please refer to Docket ID **NRC-2014-0171** when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this petition by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2014-0171**.

- **NRC's Agencywide Documents Access and Management System (ADAMS):**

You may obtain publicly available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "ADAMS Public Documents" and then select "Begin Web-based ADAMS Search." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced in this document (if that document is available in ADAMS) is provided the first time that a document is referenced.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

B. Submitting Comments

Please include Docket ID **NRC-2014-0171** in the subject line of your comment submission, in order to ensure that the NRC is able to make your comment submission available to the public in this docket.

The NRC cautions you not to include identifying or contact information that you do not want to be publicly disclosed in your comment submission. The NRC will post all comment submissions at <http://www.regulations.gov> as well as enter the comment submissions into ADAMS. The NRC does not routinely edit comment submissions to remove identifying or contact information.

If you are requesting or aggregating comments from other persons for submission to the NRC, then you should inform those persons not to include identifying or contact information that they do not want to be publicly disclosed in their comment submission. Your request should state that the NRC does not routinely edit comment submissions to remove such information before making the comment submissions available to the public or entering the comment submissions into ADAMS.

II. The Petition.

Mr. Mark Edward Leyse, submitted a PRM on December 23, 2013 (ADAMS Accession No. ML14008A427), requesting that the NRC make new regulations stipulating (1) that the rates of energy release, hydrogen generation, and fuel cladding oxidation from the ~~zirconium2-steam~~ reaction be calculated by ~~spent fuel pool (SFP)~~ accident evaluation models using data from multi-rod bundle (assembly) severe accident experiments; (2) that the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction be calculated by SFP accident evaluation models using data from multi-rod bundle (assembly) severe accident experiments conducted

Comment [P]: Should this be Zirconium-to-steam?? Or just Zirconium-steam?

with pre-oxidized fuel cladding; (3) that SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior, which causes the protective zirconium dioxide layer on fuel cladding to degrade and oxidation rates to accelerate; and (4) that licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

On March 21, 2014 (ADAMS Accession No. ML14023A743), the NRC requested supplemental information to further clarify the petitioner's request. On June 19, 2014 (ADAMS Accession No. ML14195A388), the petitioner responded to the request and submitted supplemental information. After evaluating the petition, as supplemented, the NRC has determined that the petition meets the threshold sufficiency requirements for a petition for rulemaking under § 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," and the petition has been docketed as PRM-50-108. The NRC is requesting public comment on the petition for rulemaking.

Comment [JLB]: Delete if this is not true.

III. Discussion of the Petition.

The petitioner proposes the development of four new regulations that he believes would help improve public and plant-worker safety. The petitioner asserts that three of the proposed regulations, regarding ~~te~~-zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios.

The fourth regulation proposed in the petition is intended to require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of:

- (1) postulated complete LOCA scenarios, (2) postulated partial LOCA scenarios, and
- (3) postulated boil-off accident scenarios. The petitioner notes that such evaluations would

keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs.

The petitioner references recent NRC Post-Fukushima MELCOR simulations of boiling water reactor (BWR) Mark I SFP accident/fire scenarios. The petitioner notes that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading, because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner is concerned that in actual SFP fires, there would be quicker fuel cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium fires than MELCOR indicates. Furthermore, the petitioner states that in accordance with the NRC's philosophy of defense-in-depth, which requires the application of conservative models, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner believes that, if implemented, the regulations proposed in the petition would improve public and plant-worker safety. Therefore, the petitioner requests that the NRC develop new regulations regarding SFP accident evaluation models because the probability of the type of events that could lead to SFP accidents is relatively high and recent SFP accident simulation scenarios have only considered accidents with very slight probabilities of occurring.

Dated at Rockville, Maryland, this XX day of XXXX, 2014.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

From: Mizuno, Geary
Sent: 11 Aug 2014 16:47:07 -0400
To: Borges, Jennifer; RidsNrrMailCenter Resource; RidsNroMailCenter Resource; RidsOgcMailCenter Resource
Cc: Shepherd, Jill; Doyle, Daniel; Jones, Bradley; Baum, Robin; Inverso, Tara; Colaccino, Joseph; Bladey, Cindy
Subject: RE: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Jennifer and Dan:

Why are we requesting comments on this PRM? I see nothing in this that suggests we should provide an opportunity for the public to submit comments. If there are specific issues for which public comment would be useful, or information that we think would help our deliberations, then we should ask specific questions seeking to elicit this information. Otherwise, we should NOT be providing a general comment opportunity.

In any event, the organization and content of the FRN needs work. The discussions under Sections II and III are not well organized. I have a hard time trying to figure out why the information on docketing is under II. The Petitioner, and why this section contains no real information describing the petitioner and why he has satisfied our requirement to describe his interest in this rulemaking subject. In addition, there is no information in the FRN that justifies why the NRC determined that Mr. Leyse had met our requirements in 2.802(c)(2) as reported on p.5.

The wording of the FRN is also problematic, because at times it is impossible to distinguish whether the FRN is describing assertions made by the petitioner, or actually represents NRC's position/description. For example, on p. 4, under **II. The Petitioner**, the first sentence: "*Mr. Leyse is aware of recent NRC post-Fukushima MELCOR simulations of boiling water reactor (BWR) Mark I SFP accident scenarios and disagree with the resulting conclusions of it.*" Is this our statement and why do we need to make this statement in order to describe the petitioner for purposes of this PRM?

Why are we using the word "stipulating" in the same paragraph? That is not correct in this context; just because the petitioner uses does not mean we have to accede to its use – especially since we are not putting it in the quotation. The correct word is "requiring". I also find that putting the description of each of the four regulations in **II. The Petitioner**, detracts from the emphasis of this section. It should be placed in **III. The Petition**, in the first paragraph.

This completes my review of the package.

Geary

From: Borges, Jennifer
Sent: Monday, August 11, 2014 4:03 PM
To: RidsNrrMailCenter Resource; RidsNroMailCenter Resource; RidsOgcMailCenter Resource
Cc: Shepherd, Jill; Mizuno, Geary; Doyle, Daniel; Jones, Bradley; Baum, Robin; Inverso, Tara; Colaccino, Joseph; Bladey, Cindy
Subject: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Hello,

Below is a link to the notice of docketing package for a petition for rulemaking prepared for PRM-50-108 filed with the Commission by Mr. Mark Edward Leyse. Also, for your information, I have provided the link to the incoming petition. Please review and provide me with your concurrence by **August 25, 2014**.

If you have any questions concerning this matter, please let me know or contact Jill Shepherd at 301-287-0950 (Jill.Shepherd@nrc.gov).

PACKAGE:

(*Federal Register* Notice, Congressional Letters, & Letter to Petitioner)

[View ADAMS P8 Properties ML14223B127](#)

[Open ADAMS P8 Package \(PRM-50-108 Notice of Docketing RE: Fuel-Cladding Issues in Postulated SFP Accidents\)](#)

INCOMING:

[View ADAMS P8 Properties ML14008A427](#)

[Open ADAMS P8 Document \(Spent Fuel Pool \(Fuel Cladding\) Rulemaking Petition submitted by Atomic Safety Organization\)](#)

INCOMING:

(Additional Information)

[View ADAMS P8 Properties ML14195A388](#)

[Open ADAMS P8 Document \(PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents.\)](#)

Thank you,

Jennifer Borges
Regulations Specialist
Rules Team
ADM/DAS/RADB
301-287-0999

From: Borges, Jennifer
Sent: 8 Sep 2014 14:39:56 -0400
To: RidsOgcMailCenter Resource
Cc: Barczy, Theresa; Jones, Bradley; Bladey, Cindy; Mizuno, Geary; Lewman, Shelby; Safford, Carrie
Subject: RE: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Hello,

Below is a link to the notice of docketing package for a petition for rulemaking prepared for PRM-50-108 filed with the Commission by Mr. Mark Edward Leyse. These documents incorporate comments received from NRR and NRO. For your information, I have provided the link to the incoming petition. Please review and provide me with your concurrence by **September 19, 2014**.

If you have any questions concerning this matter, please let me know or contact Theresa Barczy at 301-287-3418 (Theresa.Barczy@nrc.gov).

PACKAGE:

(Federal Register Notice, Congressional Letters, & Letter to Petitioner)

[View ADAMS P8 Properties ML14223B127](#)

[Open ADAMS P8 Package \(PRM-50-108 Notice of Docketing RE: Fuel-Cladding Issues in Postulated SFP Accidents\)](#)

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[Open ADAMS P8 Document \(PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents.\)](#)

Thank you,

Jennifer Borges
Regulations Specialist
Rules Team
ADM/DAS/RADB
301-287-0999

From: Mizuno, Geary
Sent: Monday, August 11, 2014 4:47 PM
To: Borges, Jennifer; RidsNrrMailCenter Resource; RidsNroMailCenter Resource; RidsOgcMailCenter Resource
Cc: Shepherd, Jill; Doyle, Daniel; Jones, Bradley; Baum, Robin; Inverso, Tara; Colaccino, Joseph; Bladey, Cindy
Subject: RE: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Jennifer and Dan:

Why are we requesting comments on this PRM? I see nothing in this that suggests we should provide an opportunity for the public to submit comments. If there are specific issues for which public comment would be useful, or information that we think would help our deliberations, then we should ask specific questions seeking to elicit this information. Otherwise, we should NOT be providing a general comment opportunity.

In any event, the organization and content of the FRN needs work. The discussions under Sections II and III are not well organized. I have a hard time trying to figure out why the information on docketing is under II. The Petitioner, and why this section contains no real information describing the petitioner and why he has satisfied our requirement to describe his interest in this rulemaking subject. In addition, there is no information in the FRN that justifies why the NRC determined that Mr. Leyse had met our requirements in 2.802(c)(2) as reported on p.5.

The wording of the FRN is also problematic, because at times it is impossible to distinguish whether the FRN is describing assertions made by the petitioner, or actually represents NRC's position/description. For example, on p. 4, under **II. The Petitioner**, the first sentence: "*Mr. Leyse is aware of recent NRC post-Fukushima MELCOR simulations of boiling water reactor (BWR) Mark I SFP accident scenarios and disagree with the resulting conclusions of it.*" Is this our statement and why do we need to make this statement in order to describe the petitioner for purposes of this PRM?

Why are we using the word "stipulating" in the same paragraph? That is not correct in this context; just because the petitioner uses does not mean we have to accede to its use – especially since we are not putting it in the quotation. The correct word is "requiring". I also find that putting the description of each of the four regulations in **II. The Petitioner**, detracts from the emphasis of this section. It should be placed in **III. The Petition**, in the first paragraph.

This completes my review of the package.

Geary

From: Borges, Jennifer
Sent: Monday, August 11, 2014 4:03 PM
To: RidsNrrMailCenter Resource; RidsNroMailCenter Resource; RidsOgcMailCenter Resource
Cc: Shepherd, Jill; Mizuno, Geary; Doyle, Daniel; Jones, Bradley; Baum, Robin; Inverso, Tara; Colaccino, Joseph; Bladey, Cindy
Subject: ACTION: Request for Review and Concurrence on Notice of Docketing for PRM-50-108

Hello,

Below is a link to the notice of docketing package for a petition for rulemaking prepared for PRM-50-108 filed with the Commission by Mr. Mark Edward Leyse. Also, for your information, I have provided the link to the incoming petition. Please review and provide me with your concurrence by **August 25, 2014**.

If you have any questions concerning this matter, please let me know or contact Jill Shepherd at 301-287-0950 (Jill.Shepherd@nrc.gov).

PACKAGE:

(*Federal Register* Notice, Congressional Letters, & Letter to Petitioner)

[View ADAMS P8 Properties ML14223B127](#)

[Open ADAMS P8 Package \(PRM-50-108 Notice of Docketing RE: Fuel-Cladding Issues in Postulated SFP Accidents\)](#)

INCOMING:

[View ADAMS P8 Properties ML14008A427](#)

[Open ADAMS P8 Document \(Spent Fuel Pool \(Fuel Cladding\) Rulemaking Petition submitted by Atomic Safety Organization\)](#)

INCOMING:

(Additional Information)

[View ADAMS P8 Properties ML14195A388](#)

[Open ADAMS P8 Document \(PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents.\)](#)

Thank you,

Jennifer Borges
Regulations Specialist
Rules Team
ADM/DAS/RADB
301-287-0999

From: Doyle, Daniel
Sent: 21 May 2015 13:42:47 -0400
To: Mohseni, Aby;Kokajko, Lawrence;McGinty, Tim;Davis, Jack;Monninger, John;Case, Michael;Bladey, Cindy;Spencer, Mary;Hernandez, Raul;Esmaili, Hossein;Greenleaf, Michael;Witt, Kevin;Mizuno, Geary;Borges, Jennifer;Inverso, Tara;Casto, Greg
Cc: Terry, Leslie;Taylor, Robert;Cohen, Shari;Anderson, Shaun;Davidson, Evan;Bowman, Gregory;Armstrong, Kenneth;Coffin, Stephanie
Subject: RE: Material for PRM-50-108 PRB (5/27/15): Draft FRN

For your convenience, here is a link to the actual incoming petition that is the subject of the PRB next Wednesday. This is referenced in the background discussion in the draft FRN that I sent out.

[View ADAMS P8 Properties ML14195A388](#)
[Open ADAMS P8 Document \(PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents.\)](#)

I will attach a POP and the slides to the appointment in Outlook before the meeting.

Dan

From: Doyle, Daniel
Sent: Wednesday, May 20, 2015 3:25 PM
To: Mohseni, Aby; Kokajko, Lawrence; McGinty, Tim; Davis, Jack; Monninger, John; Case, Michael; Bladey, Cindy; Spencer, Mary; Hernandez, Raul; Esmaili, Hossein; Greenleaf, Michael; Witt, Kevin; Mizuno, Geary; Borges, Jennifer; Inverso, Tara; Casto, Greg
Cc: Terry, Leslie; Taylor, Robert; Cohen, Shari; Anderson, Shaun; Davidson, Evan; Bowman, Gregory; Armstrong, Kenneth; Coffin, Stephanie
Subject: Material for PRM-50-108 PRB (5/27/15): Draft FRN

Good afternoon,

On Wednesday, May 27, 2015, a petition review board (PRB) will be conducted to achieve alignment on the recommended resolution of petition for rulemaking PRM-50-108. A draft *Federal Register* notice supporting the staff's recommendation to deny the petition is available at the following link:

[View ADAMS P8 Properties ML14307A630](#)
[Open ADAMS P8 Document \(Federal Register Notice: Petition for Rulemaking: Denial on Spent Fuel Pool Evaluations \(PRM-50-108\)\)](#)

This email does not request your formal concurrence. That step will be after the PRB. This email is for information only as you prepare for the PRB. The working group members listed below participated in the development of the documents in the denial package and will be available to answer questions you may have.

Dan

-----Original Appointment-----

From: Doyle, Daniel
Sent: Monday, May 04, 2015 3:51 PM
To: Doyle, Daniel; Mohseni, Aby; Kokajko, Lawrence; McGinty, Tim; Davis, Jack; Monninger, John; Case, Michael; Bladey, Cindy; Spencer, Mary; Hernandez, Raul; Esmaili, Hossein; Greenleaf, Michael; Witt, Kevin; Mizuno, Geary; Borges, Jennifer; Inverso, Tara; Casto, Greg; NRR DPR PRMB Resource
Cc: rhfigueroa77@gmail.com; Terry, Leslie; Taylor, Robert; Cohen, Shari; Anderson, Shaun; Davidson,

Evan; Bowman, Gregory; DSSCAL Resource; Armstrong, Kenneth; Coffin, Stephanie

Subject: Petition Review Board Meeting for PRM-50-108

When: Wednesday, May 27, 2015 10:00 AM-11:00 AM (UTC-05:00) Eastern Time (US & Canada).

Where: HQ-OWFN-09B04-25p

Please attend a petition review board (PRB) meeting for petition for rulemaking (PRM) 50-108. During this meeting, PRB voting members will be briefed on the working group's recommendation to deny PRM-50-108. Voting members will consist of the DPR Division Director (Chairman), OGC, ADM, and all involved technical division directors. **If you are unable to attend, please arrange to have your deputy division director or someone else you delegate to vote in your absence attend.**

I will attach a POP and slides prior to the meeting. In addition, the PRB members will receive the draft denial package at least one week prior to the PRB. In the meantime, please see below for some additional background information.

Dan Doyle

Background:

Mr. Mark Leyse submitted PRM-50-108 in June 2014. The petition requests that the NRC amend its regulations to require power reactor licensees to perform annual evaluations to determine the potential consequences of various postulated spent fuel pool accident scenarios. The working group evaluated the PRM and recommends that the NRC deny the PRM.

Draft Denial package:

The DRAFT denial package will consist of the following documents:

- SECY Paper
- *Federal Register* notice
- Letter to the Petitioner
- Congressional Letters
- Daily Note

Working Group Assistance:

An interoffice working group was formed to evaluate the PRM and to develop the draft denial package. The working group consists of the following staff members:

| Name | Office/Division |
|-------------------|-----------------|
| Jennifer Borges | ADM/RADB |
| Dan Doyle | NRR/DPR |
| Hossein Esmaili | RES/DSA |
| Michael Greenleaf | NRR/DSS |
| Raul Hernandez | NRO/DSRA |
| Geary Mizuno | OGC |
| Kevin Witt | NRR/JLD |

From: Barczy, Theresa
Sent: 10 Sep 2014 11:09:07 -0400
To: Bladey, Cindy
Cc: Terry, Leslie
Subject: RE: OGC Comments on PRM 50-108 docketing package (OGC Ticket 2014-3672)

Cindy,

Our templates are okay, but one of the *examples* on SharePoint contains the error that Geary referenced.

The PRM docketing letter template says the following:

The NRC docketed your petition pursuant to § 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," on [Date], and assigned it Docket Number [PRM-XX-XX].

This language should be okay. It's similar to the language that Geary provided, but it's written in active voice. I think that the problem arose because of one of the example letters on SharePoint used the incorrect phrase "to acknowledge your request..."

So...if we point this out at the RT meeting, all should be well. In the meantime, Jennifer is going to start reviewing the PRM templates.

-Theresa

From: Bladey, Cindy
Sent: Wednesday, September 10, 2014 11:04 AM
To: Barczy, Theresa
Cc: Terry, Leslie
Subject: FW: OGC Comments on PRM 50-108 docketing package (OGC Ticket 2014-3672)

Are you ok with his changes? I'd love to get some of these PRMs out of here.

From: Mizuno, Geary
Sent: Tuesday, September 09, 2014 3:28 PM
To: Barczy, Theresa; Bladey, Cindy; Doyle, Daniel
Cc: Jones, Bradley; Biggins, James; Benowitz, Howard
Subject: OGC Comments on PRM 50-108 docketing package (OGC Ticket 2014-3672)

Theresa and Dan:

In the attached files, please find my comments on the FRN announcing notice of docketing of PRM-50-108 and the letter to Mark Leye, the petitioner. I had no comments on the Congressional letters. Given the relatively small number of comments, I will keep the folder open until next Monday, in order to allow you make changes and advise me that the changes have been made in the ADAMS documents. If I don't hear back, I will close the ticket; the package will then have to be re-submitted to OGC through the OGC Mailroom.

One matter which I feel I need to draw to your attention. The letter to the petitioner, informing the petitioner of the NRC's decision to docket the PRM, has an legally-objectionable description of the docketing action and notice. The language appears to be either an unauthorized departure from the template for this type of letter, or a change to the template made without full OGC review. The problematic words are highlighted below:

Your petition has been docketed under § 2.802 of Title 10 of the Code of Federal Regulations, "Petition for rulemaking," **to acknowledge your request** and has been assigned Docket No. PRM-XX-XXX.

The highlighted words should be struck-out so that the sentence reads:

Your petition has been docketed under § 2.802 of Title 10 of the Code of Federal Regulations, "Petition for rulemaking," and has been assigned Docket No. PRM-XX-XXX.

If it is part of the current RADB template, then the template should be changed to revert back to the accepted language (NOTE: OGC should have been consulted on the template change, IMO). If the language at issue in the letter represents a departure from the template, then we do not understand the reasons for the departure.

Geary

From: Mizuno, Geary
Sent: 9 Sep 2014 15:32:07 -0400
To: Barczy, Theresa; Bladey, Cindy; Doyle, Daniel
Cc: Jones, Bradley; Biggins, James; Benowitz, Howard
Subject: RE: OGC Comments on PRM 50-108 docketing package (OGC Ticket 2014-3672)
Attachments: FRN docketing PRM 50-108 GSM1.docx, Leyse PRM50-108 docketing letter GSM1.docx

Resent with attachments. Just realized I did not attach them.

Geary

From: Mizuno, Geary
Sent: Tuesday, September 09, 2014 3:28 PM
To: Barczy, Theresa; Bladey, Cindy; Doyle, Daniel
Cc: Jones, Bradley; Biggins, James; Benowitz, Howard
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In the attached files, please find my comments on the FRN announcing notice of docketing of PRM-50-108 and the letter to Mark Leyse, the petitioner. I had no comments on the Congressional letters. Given the relatively small number of comments, I will keep the folder open until next Monday, in order to allow you make changes and advise me that the changes have been made in the ADAMS documents. If I don't hear back, I will close the ticket; the package will then have to be re-submitted to OGC through the OGC Mailroom.

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Your petition has been docketed under § 2.802 of Title 10 of the Code of Federal Regulations, "Petition for rulemaking," and has been assigned Docket No. PRM-XX-XXX.

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Geary

[7590-01-P]

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket No. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; notice of docketing.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) has received a petition for rulemaking (PRM) from Mr. Mark Edward Leyse (the petitioner), dated June 19, 2014. The petition was docketed by the NRC on July 14, 2014, and has been assigned Docket No. PRM-50-108. The petitioner requests that the NRC make new regulations concerning the use of spent fuel pool (SFP) accident evaluation models. The NRC is not instituting a public comment period for this PRM at this time.

ADDRESSES: Please refer to Docket ID **NRC-2014-0171** when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this petition by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2014-0171**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-287-3422; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

Comment [gsm]: Can we please use plain language?

Also, note that we describe this differently in the letter to Mr. Leyse – we say:

The NRC is not requesting public comment on your petition for rulemaking at this time.

This is actually the best way of putting it, and I strongly suggest that we use this sentence in the RFN as well – here and in the discussion below, with a change from “your petition” to “PRM-50-108.”

- **NRC's Agencywide Documents Access and Management System (ADAMS):**

You may obtain publicly available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced in this document (if that document is available in ADAMS) is provided the first time that a document is referenced. The petition, PRM-50-108, is available in ADAMS under Accession Number ML14195A388.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Project Manager, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748, e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

I. The Petitioner.

Mr. Mark Edward Leyse (the petitioner) submitted this petition for rulemaking (PRM) as an individual. In Section II of the petition, "Statement of Petitioner's Interest," the petitioner explains that he disagrees with the conclusions of recent MELCOR simulations of boiling water reactor (BWR) Mark I spent fuel pool (SFP) accident scenarios.

On December 23, 2013, Mr. Leyse submitted a PRM (ADAMS Accession No. ML14008A427) with similar requests. On March 21, 2014, the NRC requested ~~supplement~~ additional information to further clarify the petitioner's request (ADAMS Accession No. ML14023A743). On June 19, 2014 (ADAMS Accession No. ML14195A388), the petitioner responded to the request and resubmitted the petition with additional information. After evaluating the resubmitted petition, the NRC has determined that the petition meets the threshold sufficiency requirements for a petition for rulemaking under § 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," and the petition has been docketed as PRM-50-108. ~~The NRC is not institut~~ providing a public comment period for this PRM at this time.

Comment [gsm]: It is more accurate to say "additional." The petitioner decides whether the information is going to be in the form of a "supplement" or in the form of a new/resubmitted/amended petition.

Comment [gsm]: See earlier comment on this sentence.

II. The Petition.

The petition requests that the NRC develop new regulations ~~requiring~~ that (1) the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction be calculated by spent fuel pool (SFP) accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments; (2) the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction be calculated by SFP accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments, conducted with pre-oxidized fuel cladding; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petition references recent NRC post-Fukushima MELCOR simulations of BWR Mark I SFP accident/fire scenarios. The petition states that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petition states that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium fires than MELCOR indicates. The petition states that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petition claims that the new regulations would help improve public and plant-worker safety. The petitioner asserts that the first three proposed regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petition states that the fourth proposed regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petition states that the purpose of these evaluations would be to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs.

Dated at Rockville, Maryland, this XX day of XXXX, 2014.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.



OGC-GSM 9-9-2014
UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. Mark Edward Leyse
PO Box 1314
New York, NY 10025

Dear Mr. Leyse:

This letter is in reference to your petition for rulemaking that you submitted to the U.S. Nuclear Regulatory Commission (NRC) on June 19, 2014 (NRC's Agencywide Documents Access and Management System Accession No. ML14195A388). In your petition, you request that the NRC develop new regulations requiring stipulating that (1) the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction be calculated by spent fuel pool (SFP) accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments; (2) the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction be calculated by SFP accident evaluation models, using data from multi-rod bundle (assembly) severe accident experiments, conducted with pre-oxidized fuel cladding; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

Your petition has been docketed under § 2.802 of Title 10 of the *Code of Federal Regulations*, "Petition for rulemaking," (to acknowledge your request) and has been assigned Docket No. PRM-50-108. Please reference this docket number on any correspondence you may have concerning the petition. The enclosed notice acknowledging receipt of the petition will be published in the *Federal Register*. The NRC is not requesting public comment on your petition for rulemaking at this time. The NRC appreciates your offer to send copies of the references cited in your petition and would like to take you up on this offer. This would greatly assist the staff in its review. Please provide the references to the staff contacts listed below. As the staff reviews your petition, it may be necessary to request additional information.

You can monitor the docket for your petition on the Federal rulemaking Web site, <http://www.regulations.gov>, by searching on Docket ID NRC-2014-0171. In addition, the Federal rulemaking Web site allows you to receive alerts when changes or additions occur in a docket folder. To subscribe: (1) navigate to the docket folder NRC-2014-0171; (2) click the "E-mail Alert" link; and (3) enter your e-mail address and select how frequently you would like to receive e-mails (daily, weekly, or monthly). The NRC also tracks all petition actions on its Web site at <http://www.nrc.gov/reading-rm/doc-collections/rulemaking-ruleforum/petitions-by-year.html>.

Comment [gsm]: This is not a correct use of the term, "stipulating."

Comment [gsm]: Who added this? This should be stricken from any template. The last letter I have, a September 6, 2013 letter to Mr. Mark Leyse on PRN-501-5, correctly does not contain this language. It is incorrect and legally objectionable.

You may direct any questions you have concerning the petition process or the status of your petition to Cindy Bladey at 301-287-0949 (e-mail: -Cindy.Bladey@nrc.gov) or to Daniel Doyle at 301-415-3748 (e-mail: -Daniel.Doyle@nrc.gov).

Sincerely,

Annette L. Vietti-Cook,
Secretary of the Commission.

Enclosure:
Notice of docketing of petition
for rulemaking

Comment [gsm]: Either add the colon or indent. If the way this letter is drafted follows the NRC style guide, then this guidance is poorly thought out on this point and should be changed. Please advise us as to whether this is in the current style guide.

You may direct any questions you have concerning the petition process or the status of your petition to Cindy Bladey at 301-287-0949 (e-mail: Cindy.Bladey@nrc.gov) or to Daniel Doyle at 301-415-3748 (e-mail: Daniel.Doyle@nrc.gov).

Sincerely,

Annette L. Vietti-Cook,
Secretary of the Commission.

Enclosure
Notice of docketing of petition
for rulemaking

DISTRIBUTION:

RADB R/F CBladey, ADM JBorges, ADM LTerry, ADM

ADAMS Accession No.:

| | | | |
|---------------|-----------------|------------------------|-----------------|
| OFFICE | ADM/DAS/RADB/RT | ADM/DAS/RADB/RT | ADM/DAS/RADB/BC |
| NAME | JBorges | LTerry (JShepherd for) | CBladey |
| DATE | / /14 | / /14 | / /14 |

OFFICIAL RECORD COPY

From: Barczy, Theresa
Sent: 11 Sep 2014 09:33:30 -0400
To: Bladey, Cindy
Subject: RE: OGC Comments on PRM 50-108 docketing package (OGC Ticket 2014-3672)

I spoke with Geary. He wants to know if we should change our template language a bit more, given the new commenting features that will be rolled out soon.

From: Bladey, Cindy
Sent: Wednesday, September 10, 2014 5:34 PM
To: Barczy, Theresa
Cc: Terry, Leslie
Subject: RE: OGC Comments on PRM 50-108 docketing package (OGC Ticket 2014-3672)

Awesome, thank you.

From: Barczy, Theresa
Sent: Wednesday, September 10, 2014 11:09 AM
To: Bladey, Cindy
Cc: Terry, Leslie
Subject: RE: OGC Comments on PRM 50-108 docketing package (OGC Ticket 2014-3672)

Cindy,

Our templates are okay, but one of the *examples* on SharePoint contains the error that Geary referenced.

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So...if we point this out at the RT meeting, all should be well. In the meantime, Jennifer is going to start reviewing the PRM templates.

-Theresa

From: Bladey, Cindy
Sent: Wednesday, September 10, 2014 11:04 AM
To: Barczy, Theresa
Cc: Terry, Leslie
Subject: FW: OGC Comments on PRM 50-108 docketing package (OGC Ticket 2014-3672)

Are you ok with his changes? I'd love to get some of these PRMs out of here.

From: Mizuno, Geary

Sent: Tuesday, September 09, 2014 3:28 PM

To: Barczy, Theresa; Bladey, Cindy; Doyle, Daniel

Cc: Jones, Bradley; Biggins, James; Benowitz, Howard

Subject: OGC Comments on PRM 50-108 docketing package (OGC Ticket 2014-3672)

Theresa and Dan:

In the attached files, please find my comments on the FRN announcing notice of docketing of PRM-50-108 and the letter to Mark Leyse, the petitioner. I had no comments on the Congressional letters. Given the relatively small number of comments, I will keep the folder open until next Monday, in order to allow you make changes and advise me that the changes have been made in the ADAMS documents. If I don't hear back, I will close the ticket; the package will then have to be re-submitted to OGC through the OGC Mailroom.

One matter which I feel I need to draw to your attention. The letter to the petitioner, informing the petitioner of the NRC's decision to docket the PRM, has an legally-objectionable description of the docketing action and notice. The language appears to be either an unauthorized departure from the template for this type of letter, or a change to the template made without full OGC review. The problematic words are highlighted below:

Your petition has been docketed under § 2.802 of Title 10 of the Code of Federal Regulations, "Petition for rulemaking," to acknowledge your request and has been assigned Docket No. PRM-XX-XXX.

The highlighted words should be struck-out so that the sentence reads:

Your petition has been docketed under § 2.802 of Title 10 of the Code of Federal Regulations, "Petition for rulemaking," and has been assigned Docket No. PRM-XX-XXX.

If it is part of the current RADB template, then the template should be changed to revert back to the accepted language (NOTE: OGC should have been consulted on the template change, IMO). If the language at issue in the letter represents a departure from the template, then we do not understand the reasons for the departure.

Geary

From: Shepherd, Jill
Sent: 1 Aug 2014 14:21:07 -0400
To: Bladey, Cindy; Barczy, Theresa
Subject: RE: PRM Report

Theresa,

Please make Cindy's changes and only make the changes to the chart that I sent to you earlier (I added the Leyse PRM and put them in docket date order). I should have copied Cindy on it when I sent it, my apologies. Also, please make her changes to the report as well.. Wse can discuss on Monday when you are back in the office.

Thanks,

Jill

From: Bladey, Cindy
Sent: Friday, August 01, 2014 2:12 PM
To: Shepherd, Jill; Barczy, Theresa
Subject: RE: PRM Report

See if these edits look ok. I hate to change these memos, but this one seemed awkward and repetitive – probably we are retaining an older format that doesn't work well with the current data.

I forgot to turn on the track change function until I was almost done (sorry).

I had a few comments on the PRM report, as well.

I look at this report and always wonder – when is a PRM not considered to be “on schedule”?

From: Shepherd, Jill
Sent: Friday, August 01, 2014 11:14 AM
To: Bladey, Cindy
Subject: FW: PRM Report

Here you go.

From: Barczy, Theresa
Sent: Friday, August 01, 2014 8:09 AM
To: Shepherd, Jill
Subject: PRM Report

Jill,

Thanks for the feedback. We are ready to send this to Cindy!

[View ADAMS P8 Properties ML14212A760](#)
[Open ADAMS P8.Package \(August 2014 PRM Report\)](#)

-Theresa

From: Borges, Jennifer
Sent: 17 Jul 2014 09:50:45 -0400
To: Bladey, Cindy
Subject: RE: PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents

Hi Cindy,

Did you send an acknowledging letter to the petitioner back in June? If not, I can combine both acknowledging and docketing letters.

Thank you,

Jennifer Borges

Regulations Specialist
Rules Team
ADM/DAS/RADB

Location: 3WFN 6-A38



301-287-0999



jennifer.borges@nrc.gov

From: Bladey, Cindy
Sent: Monday, July 14, 2014 3:21 PM
To: Borges, Jennifer
Subject: FW: PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents

fyi

From: RulemakingComments Resource
Sent: Monday, July 14, 2014 3:16 PM
To: Bladey, Cindy
Cc: Giitter, Rebecca; Julian, Emile; Newell, Brian; RulemakingComments Resource
Subject: PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents

Cindy,

The following Petition has been docketed and a folder for PRM-50-108 has been created in the "ELECTRONIC RULEMAKING COMMENTS" folder in ADAMS.

ML14195A388 - PRM-50-108 - Petition for Rulemaking Submitted by Mark Leyse and Pertaining to Fuel-cladding Issues in Postulated Spent Fuel Pool Accidents.

Thanks.

Herald

Herald M. Speiser
Rulemakings and Adjudications Staff
Office of the Secretary
Nuclear Regulatory Commission
(301) 415-1675

From: Mizuno, Geary
Sent: 23 Sep 2015 13:36:31 -0400
To: Doyle, Daniel;Inverso, Tara
Cc: Spencer, Mary;Biggins, James;England, Christina;Irvin, Ian;Bladey, Cindy;Terry, Leslie;DeJesus, Anthony
Subject: RE: PRM-50-108 Denial package (OGC Ticket 2015-3943)
Attachments: FRN PRM-50-108 deny GSM 9-23-2008.docx, SECY PRM-50-108 deny GSM 9-23-2015.docx

Dan and Tara:

By this e-mail, OGC/RMR is providing a NLO on the package proposing to deny PRM-50-108, subject to the changes in the attached files for the SECY paper and the FRN. This PRM addresses spent fuel pool modeling, and was submitted by Mark Leyse. The other parts of the package are acceptable.

We urge the staff to voluntarily prepare, for an FRN denying a PRM, the table of documents available (in the FRN under the heading "Availability of Documents") with the following subdivisions (listed in order):

- ① PRM documents and FRN notices
- ② documents referenced in the PRM which the NRC is making available
- ③ other documents referenced in the FRN which the NRC relies upon and is making available

Please note, that OGC's NLO does not apply if there are any changes to the package (other than typographic and grammar corrections) which are made after OGC provides its NLO. Such changes should be brought to the attention of OGC to ensure that the changes themselves do not raise new legal issues not present in the version forming the basis for OGC's NLO, or that the changes upset OGC's previous bases for providing the NLO. This e-mail serves as the official record of OGC's NLO on this package.

Geary

From: Doyle, Daniel

Sent: Tuesday, September 22, 2015 2:12 PM

To: OGCMailCenter Resource

Cc: Mizuno, Geary

Subject: RE: PRM-50-108 - please provide NLO

I am resubmitting for NLO the draft denial package for PRM-50-108 (links below). I have reviewed Geary's comments and updated the package. To facilitate OGC's review, I responded to the comments in the attached files.

[View ADAMS P8 Properties ML14307A691](#)

[Open ADAMS P8 Package \(SECY-xx-xxxx Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations \(PRM-50-108\).\)](#)

[View ADAMS P8 Properties ML14307A891](#)

[Open ADAMS P8 Document \(Daily Note Regarding PRM-50-108: Annual Spent Fuel Pool Evaluations\)](#)

[View ADAMS P8 Properties ML14307A845](#)

[Open ADAMS P8 Document \(PRM-50-108 Annual Spent Fuel Pool Evaluations Congressional Letters\)](#)

Dan

415-3748

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-108; NRC-2014-0171]

Fuel-Cladding Issues in Postulated Spent Fuel Pool Accidents

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), PRM-50-108, submitted by Mr. Mark Edward Leyse (the petitioner). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC is denying the petition because the NRC does not believe the information is needed for effective NRC regulatory decisionmaking or for public safety, environmental protection, or common defense and security.

DATES: The docket for the petition for rulemaking, PRM-50-108, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2014-0171 when contacting the NRC about the availability of information for this petition. You may obtain publicly-available information related to this action by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2014-0171. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **The NRC's Agencywide Documents Access and Management System (ADAMS):** You may obtain publicly-available documents online in the ADAMS Public Document collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-Based ADAMS Search.](#)" For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced (if it is available in ADAMS) is provided the first time that it is mentioned in the SUPPLEMENTARY INFORMATION section. For the convenience of the reader, instructions about obtaining materials referenced in this document are provided in Section IV, "Availability of Documents," of this document.

- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

TABLE OF CONTENTS:

- I. The Petition.
- II. Reasons for Denial.
- III. Conclusion.
- IV. Availability of Documents.

I. The Petition.

Section 2.802 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Petition for rulemaking," provides an opportunity for any interested person to petition the Commission to issue, amend, or rescind any regulation. The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The NRC published a notice of docketing in the *Federal Register* (FR) on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air

reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The petitioner referenced recent NRC post-Fukushima MELCOR simulations of boiling-water reactor Mark I SFP accident/fire scenarios. The petitioner stated that the conclusions from the NRC's MELCOR simulations are non-conservative and misleading because their conclusions underestimate the probabilities of large radiological releases from SFP accidents.

The petitioner asserted that in actual SFP fires, there would be quicker fuel-cladding temperature escalations, releasing more heat, and quicker axial and radial propagation of zirconium (Zr) fires than MELCOR indicates. The petitioner stated that the NRC's philosophy of defense-in-depth requires the application of conservative models, and, therefore, it is necessary to improve the performance of MELCOR and any other computer safety models that are intended to accurately simulate SFP accident/fire scenarios.

The petitioner claimed that the new regulations would help improve public and plant-worker safety. The petitioner asserted that the first three requested regulations, regarding zirconium fuel cladding oxidation and nitriding, as well as nitrogen-induced breakaway oxidation behavior, are intended to improve the performance of computer safety models that simulate postulated SFP accident/fire scenarios. The petitioner stated that the fourth requested regulation would require that licensees use conservative SFP accident evaluation models to perform annual SFP safety evaluations of postulated complete LOCA scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios. The petitioner stated that the purpose of these evaluations would be to keep the NRC informed of the potential

consequences of postulated SFP accident/fire scenarios as fuel assemblies were added, removed, or reconfigured in licensees' SFPs. The petitioner stated that the requested regulations are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios for use in the PRM-proposed annual SFP evaluations.

Detailed NRC responses to the three issues are provided in Section II, "Reasons for Denial," of this document.

II. Reasons for Denial.

The NRC is denying the petition because the petitioner failed to present any significant information or arguments that would warrant the requested regulations. The first three requested regulations would establish requirements for how the detailed annual evaluations in the fourth requested regulation should be performed. It is not necessary to require detailed annual evaluations of the progression of SFP severe accidents because the risk of a SFP

severe accident is low. The NRC defines risk as the product of the probability and the consequences of an accident. The requested annual evaluations are not needed for regulatory decisionmaking, and the evaluations would not prevent or mitigate a SFP accident. The petitioner described multiple ways that an extended loss of offsite electrical power could occur and how this could lead to a SFP fire. In order for a SFP fire to occur, all SFP systems, backup systems, and operator actions would have to fail to prevent the spent fuel in the pool from being uncovered. The NRC does not agree that more detailed accident evaluation models need to be developed for this purpose as requested by the petitioner because the requested annual evaluations are not needed for regulatory decisionmaking. The NRC recognizes that the consequences of a SFP fire could be large and that is why there are numerous requirements in place to prevent a situation where the spent fuel is uncovered.

This section provides detailed NRC responses to the three issues identified in the petition.

Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.

The petitioner claimed that the requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high. The petitioner stated that a SFP accident could happen as a result of a leak (rapid drain down) or boil-off scenario. Furthermore, the petitioner notes that in the event of a long-term station blackout, emergency diesel generators could run out of fuel and SFP cooling would be lost, resulting in a boil-off of SFP water inventory and a subsequent release of radioactive materials from the spent fuel. The petitioner also provided several examples of events that could lead to a long-term station blackout and ultimately a SFP

accident, such as a strong geomagnetic disturbance, a nuclear device detonated in the earth's atmosphere, a pandemic, or a cyber or physical attack.

NRC Response.

Spent nuclear fuel offloaded from a reactor is initially stored in a SFP. The SFPs at all nuclear plants in the United States are extremely robust structures constructed with thick, reinforced, concrete walls and welded stainless-steel liners. They are designed to safely contain the spent fuel discharged from a nuclear reactor under a variety of normal, off-normal, and hypothetical accident conditions (e.g., loss of electrical power, loss of cooling, fuel or cask drop incidents, floods, earthquakes, or extreme weather events). Racks fitted in the SFPs store the fuel assemblies in a controlled configuration so that the fuel is maintained in a sub-critical and coolable geometry. Redundant monitoring, cooling, and water makeup systems are provided. The spent fuel assemblies are typically covered by at least 25-feet of water, which provides passive cooling as well as radiation shielding as a result of the significant volume of water above the spent fuel. Penetrations to pools are limited to prevent inadvertent drainage, and the penetrations are generally located well above spent fuel storage elevations to prevent uncovering of fuel from drainage. As spent fuel cools, older fuel is sometimes removed from a plant's SFP for on-site dry cask storage, depending on the space available in the SFP. Fuel removal is performed using specially designed transfer and storage casks that are licensed by the NRC. These dry storage casks are shielded to limit radiation exposure. They are monitored and routinely inspected for integrity, and they are protected by security measures.

Studies conducted over the last four decades have consistently shown that the probability of an accident causing a zirconium fire in a SFP to be lower than that for severe reactor accidents. The risk of a SFP accident was examined in the 1980s as Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools", in light of increased use of high-density

storage racks and laboratory studies that indicated the possibility of zirconium fire propagation between assemblies in an air-cooled environment (Section 3 of NUREG-0933, "Resolution of Generic Safety Issues," <http://nureg.nrc.gov/sr0933/>). The risk assessment and cost-benefit analyses developed through this effort, Section 6.2 of NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools" (ADAMS Accession No. ML082330232), concluded that the risk of a severe accident in the SFP was low and appeared to meet the objectives of the Commission's Safety Goal Policy Statement public health objectives (August 21, 1986; 51 FR 30028) and that no new regulatory requirements were warranted.

The risk of a SFP accident was re-assessed in the late 1990s to support a risk-informed rulemaking for permanently shutdown, or decommissioned, nuclear power plants in the United States. The study, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), conservatively assumed that if the water level in the SFP dropped below the top of the spent fuel, a SFP zirconium fire involving all of the spent fuel would occur, and thereby bounded those conditions associated with air cooling of the fuel (including partial-drain down scenarios) and fire propagation. Even when all events leading to the spent fuel assemblies becoming partially or completely uncovered were assumed to result in a SFP zirconium fire, the study found the risk of a SFP fire to be low and well within the Commission's Safety Goals.

In light of the changes in storage configuration of the SFP (increased to high density racks), inadvertent partial draindown events, as well as monumental events such as the September 11, 2001, terrorist attacks and the 2011 accident at the Fukushima Dai-ichi nuclear power plant, the NRC continues to examine the issue of SFP safety. Recently, the NRC conducted a regulatory analysis in COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS

Accession No. ML13329A918), which considered a broad history of the NRC's oversight of spent fuel storage, SFP operating experience (domestic and international), as well as information compiled in NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365). The COMSECY-13-0030 concluded that SFPs are very robust structures with large safety margins and proposed regulatory actions to further enhance safety were not warranted. The Commission subsequently concluded that no regulatory action needed to be pursued in the Staff Requirements Memorandum to COMSECY-13-0030 (ADAMS Accession No. ML14143A360).

Additional mechanisms to mitigate the potential loss of SFP water inventory were implemented following the terrorist attacks of September 11, 2001, which have enhanced spent fuel coolability and the potential to recover SFP water level and cooling prior to a potential SFP zirconium fire (73 FR 76204; August 8, 2008). Based on the implementation of these additional strategies, the probability of and, accordingly, the risk of a SFP zirconium fire initiation has decreased and is expected to be less than previously analyzed in NUREG-1738 and previous studies.

Following the 2011 accident at Fukushima Dai-ichi, the NRC has taken extensive actions to ensure that portable equipment is available to mitigate a loss of cooling water in the SFP. On March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). This order required licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. The NRC endorsed the Nuclear Energy Institute (NEI) guidance to meet the requirements of this order.¹ That guidance

¹ See NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated August 2012

establishes additional mechanisms for mitigating a loss of SFP cooling water beyond the requirements in 10 CFR 50.54(hh)(2), such as installing a remote connection for SFP makeup water that can be accessed away from the SFP refueling floor.

As supported by numerous evaluations referenced in this notice, the NRC has determined that the risk of a SFP severe accident is low. While the risk of a severe accident in a SFP is not negligible, the NRC believes that the risk is low because of the conservative design of SFPs; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of NRC's approach for ensuring SFP safety. The NRC notes that the issue of long-term cooling of SFPs is the subject of PRM-50-96, which has been accepted for consideration in the rulemaking process (December 18, 2012; 77 FR 74788).

Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

The petitioner stated that the purpose of the proposed requirement is to keep the NRC informed of the potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.

(ADAMS Accession No. ML12242A378), and JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated August 2012 (ADAMS Accession No. ML12229A174).

NRC Response.

The NRC does not agree that this is necessary because the NRC already evaluates SFP systems and structures during initial licensing and for license amendment requests and provides ongoing oversight to ensure adequate protection. There are not sufficient benefits that would justify the new requirement proposed in the petition for SFP accident evaluations. The proposed new requirement for licensees to perform SFP evaluations would not prevent or mitigate a SFP accident or provide information that is necessary for regulatory decisionmaking. The annual licensee SFP safety evaluations and its results proposed to be provided to the NRC is not needed for the effectiveness of the NRC's approach for ensuring SFP safety.

The NRC issues licenses after reviewing and approving the design and licensing bases contained in the plant's final safety analysis report. Licensees are required to operate the plant, including performing operations and surveillances related to spent fuel, in accordance with technical specifications and established practices and procedures for that plant. Any licensee changes to design, operational or surveillance practices, or approved spent fuel inventory limits or configuration changes must be evaluated using the criteria in 10 CFR 50.59, documented and retained for the duration of the operating license, and, if warranted, submitted to the NRC for prior approval.

The NRC provides oversight of the licensee's overall plant operations and the SFP in several ways. The NRC inspectors ensure that spent fuel is stored safely by regularly inspecting reactor and equipment vendors; inspecting the design, construction, and use of equipment; and observing "dry runs" of procedures. The NRC resident inspectors are permanently stationed on-site to provide monitoring and inspection of routine and special activities. They are aware of and routinely observe SFP activities involving fuel manipulation. The NRC inspectors use inspection procedures to guide periodic inspection activities, and the results are published in publicly-available inspection reports. Special inspections may be

conducted, as necessary, to evaluate root causes and licensee corrective actions if site-specific events occur. Special inspections may also evaluate generic actions taken by some or all licensees to an NRC order or change in regulations.

In accordance with 10 CFR part 21, the NRC is informed of defects in and failures to conform to the NRC requirements with respect to basic components, which includes SFPs and associated drain pipes and safety-related systems, structures, and components for makeup water. This information allows the NRC to take additional regulatory action as necessary with respect to defects and failures to conform. The NRC is also informed of the events and conditions at nuclear power plants, as set forth in §§ 50.72 and 50.73. Depending upon the nature of the event or condition, the nuclear power plant licensee must inform the NRC within a specified period of time of the licensee's corrective action taken or planned to be taken. These reports also facilitate effective and timely NRC regulatory oversight. Finally, information identified by a nuclear power plant applicant and licensee as having a significant implication for public health and safety or common defense and security, must be reported to the NRC within 2 days of the applicant's or licensee's identification of the information.

The general design criteria (GDC) in appendix A to 10 CFR part 50 establish general expectations that licensees must meet through compliance with their plant-specific licensing basis. Several GDC apply to SFPs:

- Protecting against natural phenomena and equipment failures (GDC 2 and GDC 4);
- Preventing a substantial loss-of-coolant inventory under accident conditions (e.g., equipment failure or loss of decay and residual heat removal) (GDC 61);
- Preventing criticality of the spent fuel (GDC 62); and
- Adequately monitoring the SFP conditions for loss of decay heat removal and radiation (GDC 63).

Additionally, emergency procedures and mitigating strategies are in place to address unexpected challenges to spent fuel safety. Multiple requirements in 10 CFR part 50, as well as recent NRC orders following the Fukushima Dai-ichi accident require redundant equipment and strategies to address loss of cooling to SFPs as well as protective actions for plant personnel and the public to limit exposure to radioactive materials.

It is unclear how the annual evaluations requested in the petition would provide information that is necessary for regulatory decisionmaking. The evaluations requested in the petition would postulate scenarios in which the normal cooling systems, the backup cooling methods, and the mitigation strategies have all failed to cool the stored fuel and would require the calculation of the time it would take for the stored fuel to ignite and how much of it would ignite. Due to the robustness of this equipment, the NRC views this sequence of events as extremely unlikely to occur. Since the current regulations require that the pool be designed to prevent the loss-of-coolant and subsequent fuel uncover, the information that would be obtained from the proposed requirement in the petition does not impact the current design basis. Moreover, as discussed previously, the NRC's current regulatory infrastructure relevant to SFPs at nuclear power plants in the United States already contains information collection and reporting requirements that support effective NRC regulatory oversight of SFPs.

The NRC does not agree that it is necessary to impose a new requirement for licensees to perform annual evaluations of their SFPs because existing requirements and oversight are sufficient to ensure adequate protection of public health and safety.

Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

The petitioner requested that the NRC establish requirements for SFP accident evaluation computer models to be used in the annual SFP evaluations requested in Issue 2.

The petitioner claimed that there are serious flaws with MELCOR which has been used by the NRC to model severe accident progression in SFPs, and, therefore, MELCOR is not sufficient.

NRC Response.

The NRC does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how the evaluation should be conducted. Furthermore, the NRC disagrees with the petitioner's claims that MELCOR is flawed. The following discussion is provided in to address the petitioner's claims about the adequacy of MELCOR, even though this discussion does not form the basis for denial of this petition for rulemaking.

The NRC recognizes that the phenomena discussed in the petition are important to realistically evaluate the initiation and progression of SFP fires in the unlikely event of a beyond design basis accident. However, in the context of this petition, the NRC notes that the requests in the petition related to SFP severe accident evaluation models are secondary to the request for a new requirement for licensees to perform annual evaluations of SFPs. The petitioner's request to address perceived deficiencies in current severe accident models go hand-in-hand with the petitioner's request to establish a new requirement for an annual SFP evaluation because that would set the requirements for how to do the evaluation. Since the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking, the assertions in the petition related to SFP severe accident evaluation models do not need to be addressed in detail. However, the NRC is providing the following information about how MELCOR is used and the NRC's views on some of the phenomena discussed in the petition.

The petitioner claimed that MELCOR does not simulate the generation of heat from the chemical reaction of zirconium and nitrogen, nor does it simulate how nitrogen affects the oxidation of zirconium in air. The petitioner also claimed that MELCOR under-predicts the zirconium-steam reaction rates. These phenomena would affect the progression and severity of a SFP accident, and therefore, the petitioner claimed, MELCOR simulations underestimate the probabilities of large releases from SFP accidents because actual fires would be more severe. The petitioner pointed to a number of references published over the last few years to assert that the MELCOR computer code is inadequate.

The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. The MELCOR computer code has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. Any new application of MELCOR requires targeted assessment of the code. The models in MELCOR have been developed over the past few decades, and are supported by experimental validation as discussed later in this section.

The MELCOR computer code is used to perform "best estimate" analysis with "uncertainty analysis" to better understand and bound phenomenological uncertainties. Best estimate in this context means that MELCOR has been validated against separate effects and integral effects experiments, so it reasonably captures the physics of the phenomena. There are inherent uncertainties in the progression of severe accidents and there are many interrelated phenomena. Therefore, it is neither desirable nor very practical to develop a "conservative" computer safety model for severe accidents. There are many interrelated phenomena that need to be properly understood as, otherwise, conservatism in one area may lead to some overall non-conservative results. Conservatism can be meaningfully introduced

into the relevant analysis after the best estimate analysis is done and uncertainties are properly taken into account.

Contrary to the assertions in the petition, there is not a specific temperature peculiar to zirconium alloy cladding at which self-sustaining oxidation (i.e., "zirconium fire") occurs. A self-sustaining zirconium fire will develop if the heat-generation rate from reaction with oxidant exceeds the heat-loss rate (heat losses include both convective and radiative losses) from the reaction zone. Because both heat generation and heat losses increase with temperature, no specific temperature defines whether a zirconium fire will occur.

Nitriding refers to the formation of zirconium nitride (ZrN) when zirconium cladding oxidizes at high temperatures in an air environment. As an additional heat source, nitriding is only important in oxygen-starved situations (e.g., in cases where the reactor building is intact during the zirconium fire). However, in such cases the releases are likely to be limited by the decontamination afforded by the intact reactor building, due to processes such as deposition and settling within the building before the radioactive aerosols are released into the environment. At higher temperatures, the presence of any measurable amount of oxygen in the gas (steam or air) attacking the cladding is sufficient to prevent the formation of surface ZrN . Further, if ZrN does form it can be converted readily to zirconium oxide (ZrO_2) when exposed to oxygen. The heat generation from the reaction of cladding to form ZrN followed by oxidation of the ZrN to form ZrO_2 is essentially the same as the direct reaction of Zr to form ZrO_2 . This last reaction is taken into account in accident analysis codes. Detailed modeling of the current understanding of the microscopic effects of nitriding is not needed because simple empirical kinetics are sufficient to account for the effects and there is a sufficient data base of these empirical kinetics. The empirical modeling data base includes a substantial body of information on the breakaway phenomenon mentioned in the petition. The effect of nitrogen is taken into account in MELCOR in the formulation of air oxidation kinetics including the transition from pre-

to post-breakaway necessary for the prediction of zirconium fire. Nitriding is most relevant when nuclear fuel is undergoing a severe accident in an air environment and oxygen-starved conditions develop because of rapid consumption of oxygen from the air. The incremental increase in clad reaction will be insignificant compared to the extensive and rapid reaction of oxygen that takes place before nitriding. Effects of localized nitriding are well within uncertainties in the high temperature air oxidation rates.

With respect to the findings in various tests cited in the petition (i.e., CORA-16 or PHEBUS B9R), these phenomena are well understood and recognized in the formulations of models. With respect to zirconium fire propagation, the axial and radial heat transfer within fuel assemblies and between groups of fuel assemblies is modeled in severe accident codes (e.g., MELCOR) needed for accident progression analysis in a SFP. The code assessment against zirconium fire experiments conducted at Sandia National Laboratory (SNL) and code-to-code comparison documented in NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident" (ADAMS Accession No. ML13072A056), address fire propagation phenomena.

The air oxidation kinetics models in MELCOR for zirconium-based alloys (including Zirlo and M5) are based on the research sponsored by NRC and documented in NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys" (ADAMS Accession No. ML041900069). The MELCOR computer code was used in the zirconium fire experiments (see NUREG/CR-7143) and the predictions showed good agreement with data for the initiation and propagation of zirconium fire. The publication of experimental results in NUREG/CR-7143 (including code-to-code comparisons) as well as the SFP study (NUREG-2161) and the review by the Advisory Committee on Reactor Safeguards (ACRS) supports the adequacy of MELCOR's use for this purpose.

The recent Sandia Fuel Project by the Organisation for Economic Co-operation and Development Nuclear Energy Agency provided experimental data relevant for hydraulic and ignition phenomena of prototypic pressurized water reactor fuel assemblies and supplemented earlier results (NUREG/CR-7143) obtained for boiling water reactor assemblies. Overall, results from the code validations demonstrate that MELCOR is capable of simulating the experiments. The petitioner asserted that the SNL SFP accident experiments are unrealistic because they were conducted with clean, non-oxidized cladding, and the data from the experiments is inadequate for benchmarking MELCOR. The NRC disagrees. The SNL experimental results were appropriately applied to MELCOR. The buildup of an oxide layer happens very early prior to ignition even when there is no oxide layer present, such as with new fuel cladding. This buildup of oxide is modeled in MELCOR. The fuel assemblies in the SNL experiments went through a buildup of an oxide layer prior to ignition. The cracking of the oxide layer is responsible for the change in the oxidation kinetics and the zirconium fire. This was clear from the experiments. Had there been an existing oxide layer of more than 100 micron, it may have changed the timing of ignition somewhat but there are uncertainties in the timing because of the complex nature of breakaway phenomenon. This has a minor effect on the overall accident progression and is well within the uncertainties.

The important question for an analysis is if the uncertainties are appropriately considered in the analysis results. For example, Section 9 of the SFP study (NUREG-2161) is devoted to discussion of the major uncertainties that can affect the radiological releases (e.g., hydrogen combustion, core concrete interaction, multiunit or concurrent accident, fuel loading). In addition, the regulatory analysis in COMSECY-13-0030 only relied on SFP study insights for the boiling-water reactors with Mark I and II containments, and even then, the results were conservatively biased towards higher radiological releases. For other designs, the release fractions were based on previous studies (i.e., NUREG-1738) that used bounding or

conservative estimates. The NRC continues to believe that the use of the quantitative results from NUREG-1738 in the recent continued storage generic environmental impact statement (NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volumes 1 and 2 (ADAMS Accession Nos. ML14196A105 and ML14196A107)) are justified because they are based on analyses that assume that a large radiological release will occur if the water drops to 3 feet above the top of the fuel in the pool, therefore encompassing the effects of some of the phenomena mentioned by the petition. The NRC has considered the most important phenomena, and continues to improve the models to further reduce the uncertainties. However, the NRC wishes to emphasize that these improvement efforts are not being pursued because the models are unacceptable.

In summary, it is not necessary to establish requirements for SFP accident evaluation models as requested in this petition because the NRC has concluded that the annual SFP evaluations requested in Issue 2 are not necessary for regulatory decisionmaking. The NRC has considered the most important phenomena, and continues to improve the models to further reduce the uncertainties.

III. Conclusion.

For the reasons described in Section II, "Reasons for Denial," of this document, the NRC is denying the petition under 10 CFR 2.803. The petitioner failed to present any information or arguments that would warrant the requested amendments. The NRC does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC continues to conclude that the current design and licensing requirements for SFPs provide adequate protection of public health and safety.

IV. Availability of Documents.

The documents identified in the following table are available to interested persons as indicated. For more information on accessing ADAMS, see the ADDRESSES section of this document.

| Date | Document | ADAMS Accession Number/<i>Federal Register</i> Citation |
|-------------------|---|--|
| August 21, 1986 | Safety Goals for the Operations of Nuclear Power Plants; Policy Statement; Republication. | 51 FR 30028 |
| April 1989 | NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools." | ML082330232 |
| February 2001 | NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants." | ML010430066 |
| June 2004 | NUREG/CR-6846, "Air Oxidation Kinetics for Zr-Based Alloys." | ML041900069 |
| March 12, 2012 | EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12054A735 |
| August 2012 | NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide." | ML12242A378 |
| August 2012 | JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." | ML12229A174 |
| December 18, 2012 | Long-Term Cooling and Unattended Water Makeup of Spent Fuel Pools. | 77 FR 74788 |

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|-------------------|---|-------------|
| March 2013 | NUREG/CR-7143, "Characterization of Thermal-Hydraulic and Ignition Phenomena in Prototypic, Full-Length Boiling Water Reactor Spent Fuel Pool Assemblies After a Postulated Complete Loss-of-Coolant Accident." | ML13072A056 |
| November 12, 2013 | COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML13329A918 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 1. | ML14196A105 |
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 2015.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

| | | |
|-----------------|---|-------------|
| September 2014 | NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," Volume 2. | ML14196A107 |
| September 2014 | NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling-Water Reactor." | ML14255A365 |
| May 23, 2014 | SRM-COMSECY-13-0030, "Staff Requirements – COMSECY-13-0030 – Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel." | ML14143A360 |
| June 19, 2014 | Incoming Petition (PRM-50-108) from Mr. Mark Edward Leyse. | ML14195A388 |
| October 7, 2014 | Notice of Docketing for PRM-50-108. | 79 FR 60383 |

Dated at Rockville, Maryland, this day of , 2015.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

ADAMS Accession Nos: PKG: ML14307A691; FRN: ML14307A630

*via email

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|--------|-----------------|---------------------|-----------------------|----------------------------|----------------------------------|
| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D |
| NAME | DDoyle | GLappert | TInverso | AMohseni | LKokajko (AMohseni for) |
| DATE | 7/14/2015 | 7/16/2015 | 7/17/2015 | 7/27/2015 | 7/31/2015 |
| OFFICE | NRR/DSS:D* | NRR/JLD:D* | RES:D* | NRO:D* | ADM/DAS/RADB:BC Tech Editing* |
| NAME | TMcGinty | JDavis (JBowen for) | BSheron (SCoffin for) | GTracy (JMonninger for) | CBladey (LTerry for) |
| DATE | 8/24/2015 | 8/25/2015 | 8/27/2015 | 8/28/2015 | 8/24/2015 |
| OFFICE | OGC/GCLR/RMR | NRR:D | EDO | | |
| NAME | MSpencer | WDean | MSatorius | | |
| DATE | | | | | |

OFFICIAL RECORD COPY

OGC/GSM changes on p.3.

Comment [MG]: This is the same text as in the FRN, under I. The Petition.

FOR: The Commissioners

FROM: Mark A. Satorius
Executive Director for Operations

SUBJECT: DENIAL OF PETITION FOR RULEMAKING REQUESTING AMENDMENTS
REGARDING SPENT FUEL POOL SEVERE ACCIDENT EVALUATIONS
(PRM-50-108; NRC-2014-0171)

PURPOSE:

To obtain Commission approval to deny a petition for rulemaking (PRM) submitted by Mr. Mark Edward Leyse (the petitioner). This paper does not address any new commitments or resource implications.

BACKGROUND:

[The NRC received a petition for rulemaking dated June 19, 2014, from Mr. Mark Edward Leyse and assigned it Docket No. PRM-50-108 (ADAMS Accession No. ML14195A388). The petitioner filed its petition, PRM-50-108, with the Commission on June 19, 2014 (Accession No. ML14195A388 in the U.S. Nuclear Regulatory Commission's (NRC) Agencywide Documents Access and Management System (ADAMS)). The petitioner requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool (SFP) accident scenarios. The evaluations would be required to be submitted to the NRC for informational purposes. The NRC published a notice of docketing in the *Federal Register* on October 7, 2014 (79 FR 60383). The NRC did not request public comment on the petition because sufficient information was available for the NRC staff to form a technical opinion regarding the merits of the petition.

CONTACT: Daniel I. Doyle, NRR/DPR
301-415-3748

DISCUSSION:

The Petition

The petitioner requested that the NRC develop new regulations requiring that: (1) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The NRC staff reviewed the petition and, based on its understanding of the overall argument in the petition, identified and evaluated the following three issues:

- Issue 1: The requested regulations pertaining to SFP accident evaluation models are needed because the probability of the type of events that could lead to SFP accidents is relatively high.
- Issue 2: Annual licensee SFP safety evaluations and submission of results to the NRC is necessary so that the NRC is aware of potential consequences of postulated SFP accident/fire scenarios as fuel assemblies are added, removed, or reconfigured in licensees' SFPs.
- Issue 3: MELCOR is not currently sufficient to provide a conservative evaluation of postulated SFP accident/fire scenarios.

Section II, "Reasons for Denial," of the enclosed *Federal Register* notice provides detailed NRC responses to the three issues identified in the petition.

NRC Evaluation of Issues Raised in the Petition

Issue 1: The petitioner stated that a long-term station blackout can happen in multiple ways, and a loss of SFP cooling and a SFP fire is a likely outcome. The petitioner argued that this is a sufficient basis for the requested regulations. The NRC staff disagrees. Numerous evaluations have shown that the risk of a SFP fire is low. There are multiple layers of protection to prevent uncovering of spent fuel and the potentially resulting fire.

Issue 2: The petitioner stated that the purpose of the evaluations would be to keep the NRC informed of potential consequences. The NRC staff disagrees. The SFP safety is provided by: conservative design of the SFP; operational criteria to control spent fuel movement, monitor pertinent parameters, and maintain cooling capability; mitigation measures if there is loss of cooling capability or water; and emergency preparedness measures to protect the public. The information proposed to be provided to the NRC is not needed for the effectiveness of the NRC's approach for providing SFP safety.

Issue 3: The petitioner stated that there are serious flaws with MELCOR, and, therefore, MELCOR is not currently sufficient for use in the requested annual SFP evaluations. The NRC NRC staff does not agree that it is necessary to establish requirements for SFP accident evaluation computer models because the requested annual SFP evaluations are not necessary for regulatory decisionmaking. Therefore, it is not necessary for the NRC to establish requirements for how the evaluation should be conducted. Furthermore, the NRC staff disagrees with the petitioner's claims that MELCOR is flawed. The MELCOR computer code is the NRC's best estimate tool for severe accident analysis. It has the capability to mechanistically model the important physical phenomena given inherent uncertainties in accident progression phenomenology. The MELCOR computer code has been benchmarked against many experiments including separate and integral effects tests for a wide range of phenomena. These additional points, which need not be addressed to resolve the petition, are nonetheless discussed in the Federal Register notice denying the petition or rulemaking in order to address the assertions in the petition.

RECOMMENDATION:

The NRC staff recommends that the Commission deny PRM-50-108 because the petitioner failed to present any significant new information or arguments that would warrant the requested amendments. The NRC staff does not believe that the information that would be reported to the NRC as requested by the petitioner is necessary for effective NRC regulatory decisionmaking with respect to SFPs. The NRC staff continues to believe that the current design and licensing requirements for SFPs provide adequate protection of public health and safety. The enclosed *Federal Register* notice provides a detailed response to the issues raised in the petition.

The NRC staff requests the Commission's approval to publish the *Federal Register* notice denying the petition (Enclosure 1).

The enclosed letter for signature by the Secretary of the Commission (Enclosure 2) informs the petitioner of the Commission's decision to deny the petition.

The NRC staff will inform the appropriate congressional committees.

RESOURCES:

Denial of this petition will not affect budgeted resource needs.

The Commissioners

- 4 -

COORDINATION:

The Office of the General Counsel has no legal objection to the denial of this petition and the documents in this package. The Office of Administration has reviewed and concurred on this paper.

Mark A. Satorius
Executive Director
for Operations

Enclosures:

1. *Federal Register* notice
2. Letter to the Petitioner

The Commissioners

- 4 -

COORDINATION:

The Office of the General Counsel has no legal objection to the denial of this petition. The Office of Administration has reviewed and concurred on this paper.

Mark A. Satorius
Executive Director
for Operations

Enclosures:

1. *Federal Register* notice
2. Letter to the Petitioner

ADAMS Accession Nos: PKG: ML14307A691, SECY: ML14307A134, FRN: ML14307A630, Petition: ML14195A388, LTR to Petitioner: ML14307A157, Daily Note: ML14307A891 *via email

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|--------|---------------------|-----------------------|----------------------------|----------------------|----------------------------|------------|
| OFFICE | NRR/DPR/PRMB:PM | NRR/DPR/PRMB:RS | NRR/DPR/PRMB:BC | NRR/DPR/PRMB:DD | NRR/DPR:D | NRR/DSS:D* |
| NAME | DDoyle | GLappert | TInverso | AMohseni | LKokajko (AMohseni for) | TMcGinty |
| DATE | 7/14/2015 | 7/16/2015 | 7/17/2015 | 7/27/2015 | 7/31/2015 | 8/24/2015 |
| OFFICE | NRR/JLD:D* | RES:D* | NRO:D* | ADM/DAS/RADB:BC* | OGC/GCLR/RMR | NRR:D |
| NAME | JDavis (JBowen for) | BSheron (SCoffin for) | GTracy (JMonninger for) | CBladey (LTerry for) | MSpencer | WDean |
| DATE | 8/25/2015 | 8/27/2015 | 8/28/2015 | 8/24/2015 | | |
| OFFICE | EDO | | | | | |
| NAME | MSatorius | | | | | |
| DATE | | | | | | |

OFFICIAL RECORD COPY

From: Doyle, Daniel
Sent: 7 Aug 2015 15:44:08 -0400
To: RidsNrrDss Resource;RidsNRRJLD Resource;RidsNroMailCenter
Resource;RidsResOd Resource;Bladey, Cindy
Cc: McGinty, Tim;Anderson, Shaun;Casto, Greg;Greenleaf, Michael;Davis,
Jack;Proffitt, Andrew;Bowman, Gregory;Witt, Kevin;Tracy, Glenn;Monninger, John;ODriscoll, James;Dias,
Antonio;Hernandez, Raul;Case, Michael;Armstrong, Kenneth;Lee, Richard;Esmaili, Hossein;Terry,
Leslie;Borges, Jennifer;Mizuno, Geary;Kokajko, Lawrence;Mohseni, Aby;Inverso, Tara;Tobin, Jennifer
Subject: Request for Review and Concurrence on PRM-50-108

Good afternoon,

I am requesting concurrence from NRR/DSS, NRR/JLD, NRO, RES, and ADM/RADB on the denial package for petition for rulemaking (PRM) 50-108. The package consists of a SECY paper, a *Federal Register* notice, the incoming petition, and a letter to the petitioner. A daily note and congressional letters are also included as background.

Requested action:

Please review and provide me with your concurrence by close of business on Friday, August 28. Links to the documents are provided below.

[View ADAMS P8 Properties ML14307A691](#)

[Open ADAMS P8 Package \(SECY-xx-xxxx Denial of Petition for Rulemaking Requesting Annual Spent Fuel Pool Evaluations \(PRM-50-108\).\)](#)

[View ADAMS P8 Properties ML14307A891](#)

[Open ADAMS P8 Document \(Daily Note Regarding PRM-50-108: Annual Spent Fuel Pool Evaluations\)](#)

[View ADAMS P8 Properties ML14307A845](#)

[Open ADAMS P8 Document \(PRM-50-108 Annual Spent Fuel Pool Evaluations Congressional Letters\)](#)

Background: PRM-50-108 requested that the NRC require power reactor licensees to perform evaluations to determine the potential consequences of various postulated spent fuel pool accident scenarios. A working group was formed to evaluate the PRM. A petition review board met on May 27, 2015, and unanimously approved the working group's recommendation to deny the petition.

DPR Project Manager: Dan Doyle, NRR/DPR/PRMB, 415-3748

TAC: MF4673

Cognizant individuals:

| Name | Organization |
|-------------------|--------------|
| Michael Greenleaf | NRR/DSS |
| Greg Casto | NRR/DSS |
| Kevin Witt | NRR/JLD |
| Raul Hernandez | NRO/DSRA |
| Hossein Esmaili | RES/DSA |
| Jennifer Borges | ADM/RADB |

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

From: Doyle, Daniel
Sent: 15 Jan 2016 13:08:43 -0500
To: 'markleyse@gmail.com' (markleyse@gmail.com)
Cc: Burnell, Scott;Bladey, Cindy;Inverso, Tara
Subject: Status of PRM-50-108

Mr. Leyse,

I am writing to provide an update on your letter dated June 19, 2014, in which you submitted a petition for rulemaking to the U.S. Nuclear Regulatory Commission (NRC). In your letter, you requested that the NRC develop new regulations requiring that (1) spent fuel pool (SFP) accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The NRC docketed your letter as petition for rulemaking (PRM) 50-108. A notice of docketing was published in the *Federal Register* on October 7, 2014 (79 FR 60383).

The NRC is evaluating the petition. Once the petition has been resolved, the NRC will publish a notice in the *Federal Register* explaining the NRC's finding. You will also receive a letter at that time notifying you of the action the NRC has taken.

Please contact me at Daniel.Doyle@nrc.gov or (301) 415-3748 if you have any questions.

Sincerely,

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

From: Doyle, Daniel
Sent: 16 Jul 2015 13:04:11 -0400
To: 'markleyse@gmail.com' (markleyse@gmail.com)
Cc: Burnell, Scott; Bladey, Cindy; Inverso, Tara
Subject: Status of PRM-50-108

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Please contact me at Daniel.Doyle@nrc.gov or (301) 415-3748 if you have any questions.

Sincerely,

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

From: Doyle, Daniel
Sent: 16 Jan 2015 13:31:05 -0500
To: Mark Leyse (markleyse@gmail.com)
Cc: Burnell, Scott; Bladey, Cindy; Inverso, Tara
Subject: Status of PRM-50-108

Mr. Leyse,

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Sincerely,

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

daniel.doyle@nrc.gov

(301) 415-3748

From: Doyle, Daniel
Sent: 15 Jan 2016 13:08:43 -0500
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I am writing to provide an update on your letter dated June 19, 2014, in which you submitted a petition for rulemaking to the U.S. Nuclear Regulatory Commission (NRC). In your letter, you requested that the NRC develop new regulations requiring that (1) spent fuel pool (SFP) accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments for calculating the rates of energy release, hydrogen generation, and fuel cladding oxidation from the zirconium-steam reaction; (2) SFP accident evaluation models use data from multi-rod bundle (assembly) severe accident experiments conducted with pre-oxidized fuel cladding for calculating the rates of energy release (from both fuel cladding oxidation and fuel cladding nitriding), fuel cladding oxidation, and fuel cladding nitriding from the zirconium-air reaction; (3) SFP accident evaluation models be required to conservatively model nitrogen-induced breakaway oxidation behavior; and (4) licensees be required to use conservative SFP accident evaluation models to perform annual SFP safety evaluations of: postulated complete loss-of-coolant accident (LOCA) scenarios, postulated partial LOCA scenarios, and postulated boil-off accident scenarios.

The NRC docketed your letter as petition for rulemaking (PRM) 50-108. A notice of docketing was published in the *Federal Register* on October 7, 2014 (79 FR 60383).

The NRC is evaluating the petition. Once the petition has been resolved, the NRC will publish a notice in the *Federal Register* explaining the NRC's finding. You will also receive a letter at that time notifying you of the action the NRC has taken.

Please contact me at Daniel.Doyle@nrc.gov or (301) 415-3748 if you have any questions.

Sincerely,

Dan Doyle

Project Manager

U.S. Nuclear Regulatory Commission

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