DOCKETED
USNRC

(7)

April 29, 2002 (4:11PM)

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

DOCKET NUMBER
PETITION RULE PRM 50-73A
(67FR 04214)

NEI
NUCLEAR ENERGY INSTITUTE

**Alexander Marion**
DIRECTOR
ENGINEERING DEPARTMENT
NUCLEAR GENERATION

April 15, 2002

Secretary of the Commission
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

**ATTENTION:** Rulemakings and Adjudications Staff

**SUBJECT:** NEI Comments on Supplemental Petition for Rulemaking, PRM-50-73A (*Federal Register* of January 29, 2002, 67 FR 4214)

**PROJECT NUMBER:** 689

The NRC has published a notice of receipt and requested public comments on a supplement to a petition filed by Mr. Robert H. Leyse (PRM-50-73A). The Nuclear Energy Institute[1] offers the following comments regarding the petition.

The petitioner requests that the NRC amend regulations on the acceptance criteria for emergency core cooling systems for light-water nuclear power reactors to address the impact of severe crud deposits on fuel bundle coolability during normal operation of a light-water-reactor (LWR). In support of this request, the petitioner describes a speculative series of events where an undetected buildup of crud leads to a catastrophic core meltdown. While not providing a sound scientific basis for his claims, we believe the petitioner is acting out of concern that the effects of fuel crud on design basis accidents (PRM 50-73) and normal operation (PRM 50-73A) are not adequately addressed by regulation. Our comments point to the regulatory requirements currently in place to address the impact of fuel crud. These requirements and associated guidance provide adequate assurance of safe fuel operation. The revisions to regulations proposed by the petitioner are not needed.

NEI comments on the original petition requesting that NRC amend regulations to address the impact of crud on cooling capability during a loss of coolant accident

[1]NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including regulatory aspects of generic operational and technical issues. NEI members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

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Template = SECY-067

SECY-02

(PRM 50-73) were provided in a letter dated December 18, 2001. A copy of this letter is attached.

With respect to the effect of fuel crud on normal reactor operation, 10 CFR Part 50, Appendix A, *General Design Criteria for Nuclear Power Plants*, Criterion 10, *Reactor Design*, requires that the reactor core and associated coolant, control, and protection systems, be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences.

Every reactor core design must undergo a thorough safety review to provide assurance that GDC-10 and all other applicable regulations are met. These reviews are performed in accordance with the USNRC Standard Review Plan (SRP) documented in NUREG-0800. The SRP outlines a comprehensive set of acceptance criteria that serve to demonstrate compliance with regulatory requirements. Two examples of acceptance criteria that specifically address the impact of fuel crud deposits are provided below:

<u>SRP 4.2, Fuel System Design, Acceptance Criterion II.A.1 (d):</u>
Oxidation, hydriding, and the buildup of corrosion products (crud) should be limited. Allowable oxidation, hydriding, and crud levels should be discussed in the Safety Analysis Report and shown to be acceptable. These levels should be presumed to exist in paragraphs (a) and (b) above [paragraphs (a) and (b) deal with stress, strain, loading limits and fatigue cycles of fuel components].

<u>SRP4.4, Thermal and Hydraulic Design, Acceptance Criterion II.8:</u>
The effects of crud should be accounted for in the thermal-hydraulic design by including it in the CHF calculations in the core or in the pressure drop throughout the RCS. Process monitoring provisions should assure capability for detection of a three percent pressure drop in the reactor coolant flow. The flow should be monitored every 24 hours.

These and other requirements adequately address the impacts of fuel crud on normal reactor operation.

In addition, it is important to note that evaluation models used by licensees are updated, as warranted, to address unanticipated operational occurrences. Licensees routinely monitor fuel performance during normal operation. Poolside examinations are commonly performed by licensees and by fuel vendors as part of ongoing fuel monitoring processes designed to ensure that fuel models are accurate and that the results of approved evaluation models provide defensibly conservative results. Unusual fuel performance or unexpected operational characteristics are

thoroughly evaluated as a normal part of this process. Evaluation models are updated, as necessary, to address the results of these evaluations.

In summary, the impacts of fuel crud deposits on normal reactor operation are adequately addressed by current regulations that require operation within specified fuel design limits. These fuel design limits include the effects of fuel crud on normal operation as well as accident conditions. Fuel performance monitoring processes and ongoing evaluations of impacts on NRC approved evaluation models provide a mechanism for ensuring that unexpected fuel behaviors are thoroughly evaluated and that regulatory requirements continue to be met. The revisions to 10 CFR 50.46 and Appendix K proposed by the petitioner are not needed.

We appreciate the opportunity to comment on the petition for rulemaking. Please contact John Butler 202-739-8108, jcb@nei.org or me if you desire further information.

Sincerely,

Alex Marion

Alex Marion

JCB/maa

Enclosure

NUCLEAR ENERGY INSTITUTE

**Alexander Marion**
DIRECTOR
ENGINEERING DEPARTMENT
NUCLEAR GENERATION

December 18, 2001

Mr. Michael T. Lesar
Rules and Directives Branch
Office of Administration
Mail Stop T6-D59
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

**SUBJECT:** Industry Comments on Petition for Rulemaking, PRM-50-73 (*Federal Register* of October 12, 2001, 66 FR 52065)

**PROJECT NUMBER:** 689

Dear Mr. Lesar:

The NRC has published a notice of receipt of a petition for rulemaking that was filed by Mr. Robert H. Leyse. The petitioner requests that the NRC amend regulations on the acceptance criteria for emergency core cooling systems for light-water nuclear power reactors to address the impact of crud on cooling capability during a large-break, loss-of-coolant accident (LOCA). The Nuclear Energy Institute[1] offers the following comments regarding the proposed petition.

The petitioner states that § 50.46 and Appendix K to Part 50 do not address the impact of crud on coolability during a fast-moving (large-break) LOCA. This is an incorrect statement. 10 CFR 50.46 requires that the cooling performance of the ECCS, following postulated LOCAs, conform to criteria set forth in the regulation. These criteria include requirements that the calculated changes in core geometry be such that the core remains amenable to cooling and that the calculated core temperature be maintained at an acceptably low value for an extended period of time. These requirements adequately address any impacts that fuel crud may have on coolability during and following a large-break LOCA.

[1]NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including regulatory aspects of generic operational and technical issues. NEI members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

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These requirements do not attempt to identify and address all phenomena and events that can be postulated to occur during and following a large-break LOCA. Instead, the regulations establish performance requirements (e.g., maintaining core coolability) necessary to ensure public health and safety. Associated regulatory guidance and NRC approved evaluation models are relied on to address the specific phenomena that can potentially impact these performance requirements. 10 CFR 50.46 requires that ECCS cooling performance be calculated in accordance with acceptable evaluation models and requires that these models include sufficient supporting justification to show that the analytical technique realistically describes the behavior of the reactor system during a LOCA.

Numerous thermal-hydraulic phenomena, events and associated technical models play a role in evaluation models for a large-break LOCA. Because the regulations specify performance requirements and are not overly prescriptive in the phenomena to be addressed, advances in the knowledge base associated with the large-break LOCA event can be readily addressed without requiring a rule change.

The evaluation models used by licensees are updated, as warranted, to address advances in understanding of LOCA phenomena, events and models; resulting from experiments, tests, as well as operational data. Licensees routinely monitor fuel performance during normal operation. Poolside examinations are commonly performed by licensees and by fuel vendors as part of ongoing fuel monitoring processes designed to ensure that fuel models are accurate and that the results of approved evaluation models provide defensibly conservative results. Unusual fuel performance or unexpected operational characteristics are thoroughly evaluated as a normal part of this process. Evaluation models are updated, as necessary, to address the results of these evaluations.

The petitioner states that crud deposits on fuel can become dislodged during a large-break LOCA and postulates that the redistribution of crud would result in substantial blockage of flow. The petitioner does not provide supporting evidence for these suppositions. In contrast, data have been collected and analyzed by licensees and fuel vendors as part of the fuel performance monitoring process noted above. The data collected thus far on crud morphology and expected behavior during a large-break LOCA do not support the characteristics and behavior necessary to support a "substantial blockage of flow." Irrespective of results obtained to date, it is important to note that fuel performance monitoring processes continue and the impact of new data on evaluation models will be continually evaluated.

In summary, the impacts of fuel crud deposits on large-break LOCA behavior that are postulated by the petitioner are not supported by industry data. Fuel performance monitoring processes and ongoing evaluations of impacts on NRC

approved evaluation models provide a mechanism for ensuring that unexpected fuel behaviors are thoroughly evaluated and that the requirements of 10 CFR 50.46 continue to be met. Revisions to 10 CFR 50.46 and Appendix K proposed by the petitioner are not needed.

We appreciate the opportunity to comment on the petition for rulemaking. Please contact John Butler (202) 739-8108, jcb@nei.org if you desire further information.

Sincerely,

Alex Marion

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JCB/maa