October 17, 2011

MEMORANDUM TO: Stewart N. Bailey, Chief
Safety Issues Resolution Branch
Division of Safety Systems
Office of Nuclear Reactor Regulation

FROM: Blake A. Purnell, Project Manager ***/RA/***
Generic Communications and Power Uprate Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF SEPTEMBER 21, 2011, PUBLIC MEETING ON POTENTIAL ALTERNATIVE FOR RESOLVING GENERIC SAFETY ISSUE 191

On September 21, 2011, U.S. Nuclear Regulatory Commission (NRC) staff held a public meeting with the Nuclear Energy Institute (NEI) and representatives from the nuclear industry to discuss potential alternatives for resolving Generic Safety Issue 191 (GSI-191). GSI-191 is concerned with the impact of debris on the performance of the emergency core cooling system and containment spray system during the recirculation phase following a loss-of-coolant accident (LOCA) in a pressurized-water reactor (PWR). The notice and agenda for this meeting can be obtained from the NRC Agencywide Documents Access and Management System (ADAMS) at Accession Number ML112630128.

At the beginning of the meeting, the NRC staff noted that it needs to provide the Commission with a proposed path forward to resolve GSI-191 by next June. The NRC staff emphasized that it needs the industry to provide input and that time is running short. The staff slides can be obtained from ADAMS Accession Number ML112710188.

**Testing Status and Plans**

A representative of the PWR Owners Group (PWROG) gave a presentation (ADAMS Accession No. ML112710195) on the status of the in-vessel effects testing referred to as the Long-Term Cooling Considerations (LTCC) program. The LTCC program defined a conservative test protocol that was intended to bound all plants and resolve this issue in a generic manner. The testing has been completed and the PWROG is revising its topical report on the subject. The testing showed that for all plants long-term core cooling can be maintained if the amount of fibrous debris that reaches the core does not exceed 15 grams per fuel assembly. This limit is very restrictive so the PWROG expects most licensees to conduct plant-specific in-vessel effects testing.

The PWROG is developing guidance that plants can use to conduct in-vessel effects testing. Within the next six weeks, the PWROG plans to develop a checklist for plant-specific tools and

options and a flowchart to guide the use of the tools. The PWROG and NRC staff discussed the tools proposed by the PWROG. Group testing (i.e., testing applicable to plants of a similar design) is expected to begin in October and be completed by the end of the year.

The PWROG also gave a presentation (ADAMS Accession No. ML112710184) on its testing and analysis to reduce debris generation zones of influence. The PWROG expects to complete target testing soon and complete this testing program, including submitting a report to the NRC, by the end of the year. Specific target materials were tested for specific licensees, but other licensees could buy into the program. PWROG analysis of the testing indicates that the zones of influence for several materials can be significantly smaller than the values that NRC staff has previously accepted.

**NEI Proposed GSI-191 Resolution Paths**

NEI presented (ADAMS Accession No. ML112710200) a number of options for resolving specific issues related to GSI-191. Some of these options are discussed further below.

The NRC staff asked the industry if they had considered the impact of small-break LOCAs on in-vessel effects. Small-break LOCAs are more benign than large-break LOCAs in terms of the physical effects, but they are also more likely. The PWROG stated it had not considered small-break LOCAs in its testing. South Texas Project stated that it is including the risk of small-break LOCAs in its risk-informing project.

NEI proposed that the locations for pipe breaks be limited to the terminal ends and locations of high stress as defined by NRC Branch Technical Position 3-4. NEI also proposed limiting the break size based upon fracture mechanics. NEI stated that acceptance of these proposals should be done in light of an overall conservative approach for addressing GSI-191, and that this was not intended for applicability outside of this issue. NRC staff stated that it had previously considered these ideas and determined them to be inconsistent with the rule. However, the NRC staff stated it would reconsider as a possible policy change.

NEI proposed that plants should receive increased credit for improved insulation jacketing and banding. The NRC stated that this was an acceptable approach, but could not discuss it much further because the ongoing testing is proprietary. NEI agreed to gather public information on tests to support this credit.

NEI proposed that plants could use a more realistic fibrous debris size distribution in their testing. NRC staff noted that the criterion is that plants include debris that is easily suspended, and that there is not much data for debris generation close to the break. Changing debris characteristics could require plants to redo head loss testing. NEI agreed to provide a white paper on debris preparation and gather data on fines.

NEI proposed that plants could receive credit for debris interceptors and traps when assessing debris transport. The staff noted that this approach is acceptable, but previous attempts to credit debris interceptors and traps ran into problems with testing.

NEI proposed modifying the strainer head loss testing to use a homogenous debris mixture and avoid assuming that all particulate debris is present at the start of recirculation. The staff notes

that this is consistent with current guidance provided that the most transportable debris comes first. The staff stated that the addition of some particulates can come later if justified.

NEI proposed that impact of chemical effects would be reduced if the pH could be reduced. NEI stated that French experimental data suggested that a high pH may not be needed for iodine retention. However, the French data is preliminary and the testing program is not expected to be completed until 2014. The staff does not think that reliance upon the French data is a viable near term solution for GSI-191, further, removal of pH buffers would put plants in an unknown environment with regard to chemical effects. The staff notes that license amendments have been approved to lower the pH for some plants using current NRC guidance.

NEI proposed that plants could control the sump pool temperature using non-safety-related equipment to reduce chemical effects. NRC staff stated that it was willing to consider this proposal, but it needs to better understand what NEI is proposing and this is likely a change in policy. NEI also proposed using integrated chemical effects testing. NRC staff is willing to consider this method, but is not enthusiastic about this proposal if NEI is proposing iterative 30-day tests performed on a plant-specific basis.

**Future Actions**

NEI agreed to provide a list of follow-up actions by September 24, 2011. The NRC proposed that NEI provide a white paper listing all options. Based upon the discussion during this meeting, the NRC staff recommended that the white paper leave out options that are not likely to move forward. It was also proposed that a meeting on chemical effects be held in the near future. NRC staff stated we are working on a review of a clean plant that will be provided to industry.

Enclosure: List of Attendees

cc: John Butler, NEI

that this is consistent with current guidance provided that the most transportable debris comes first. The staff stated that the addition of some particulates can come later if justified.

NEI proposed that impact of chemical effects would be reduced if the pH could be reduced. NEI stated that French experimental data suggested that a high pH may not be needed for iodine retention. However, the French data is preliminary and the testing program is not expected to be completed until 2014. The staff does not think that reliance upon the French data is a viable near term solution for GSI-191, further, removal of pH buffers would put plants in an unknown environment with regard to chemical effects. The staff notes that license amendments have been approved to lower the pH for some plants using current NRC guidance.

NEI proposed that plants could control the sump pool temperature using non-safety-related equipment to reduce chemical effects. NRC staff stated that it was willing to consider this proposal, but it needs to better understand what NEI is proposing and this is likely a change in policy. NEI also proposed using integrated chemical effects testing. NRC staff is willing to consider this method, but is not enthusiastic about this proposal if NEI is proposing iterative 30-day tests performed on a plant-specific basis.

**Future Actions**

NEI agreed to provide a list of follow-up actions by September 24, 2011. The NRC proposed that NEI provide a white paper listing all options. Based upon the discussion during this meeting, the NRC staff recommended that the white paper leave out options that are not likely to move forward. It was also proposed that a meeting on chemical effects be held in the near future. NRC staff stated we are working on a review of a clean plant that will be provided to industry.

Enclosure: List of Attendees

cc: John Butler, NEI

DISTRIBUTION: See last page

**ADAMS ACCESSION NUMBER:** ML112710227 NRC-001

| OFFICE | LA:DPR:PGCB | PM:DPR:PGCB | BC:DSS:SSIB | PM:DPR:PGCB |
|---|---|---|---|---|
| NAME | CHawes CMH | BPurnell | SBailey | BPurnell |
| DATE | 10/04/11 | 10/4/11 | 10/6/11 | 10/17/11 |

**OFFICIAL RECORD COPY**

**List of Participants for September 21, 2011, Public Meeting**

| Name | AFFILIATION |
|---|---|
| Sher Bahadur | NRC |
| Stewart Bailey | NRC |
| Vic Cusumano | NRC |
| James Beall | NRC |
| Steve Smith | NRC |
| Blake Purnell | NRC |
| Brian Holian | NRC |
| Bill Ruland* | NRC |
| Ervin Geiger | NRC |
| John Tsao | NRC |
| Paul Klein | NRC |
| Mathew Yoder | NRC |
| Waqas Abbasi | Enercon Services |
| Brian Adkison | Arkansas Nuclear One |
| Tim Andreychek | Westinghouse Electric Co., LLC |
| Mel Arey | Duke Energy/PWROG |
| Jana Bargman | Scientech, CWFC |
| Jim Bleigh | Performance Contracting, Inc. |
| John Butler | NEI |
| Nancy Chapman* | Bechtel Power Corp. |
| John W. Crenshaw | STPEGS |
| William A. Cross | NextEra/FPL |
| Tim Croyle | Westinghouse Electric Company, LLC |
| Mo Dingler | WCNOC/PWROG |
| Andre Drake | Constellation Nuclear |
| Charles Feist | Luminant Power/Comanche Peak |
| Joseph K. Gasper | OPPD |
| Phil Grissom | Southern Nuclear Company |
| Ludwig Haber | Alden Lab |
| Mark A. Harris | Arkansas Nuclear One |
| Ron Hollaway | WCNOC |
| Masaya Hoshi | Mitsubishi Nuclear Energy Systems |
| Ernie Kee | STPNOC |
| Dana Knee* | Dominion |
| Paul Leonard | Industry Consultant |

Enclosure

| | |
|---|---|
| Wes McGoun* | Progress Energy |
| Kevin McNambe | Westinghouse Electric Co. |
| Craig Miller* | Progress Energy (Crystal River) |
| Valerie Myers | Entergy, Indian Point |
| Tony Nowinowski | Westinghouse/PWROG |
| Ken Petersen | STARS |
| Bob Peterson | Sargent & Lundy |
| Greg Quitoriano* | Diablo Canyon |
| P. J. Reyes | Performance Contracting, Inc. |
| Timothy Sande* | Alion Science and Technology |
| Craig D. Sellers | Alion Science & Technology |
| Aaron Smith | Enercon Services |
| Carl Stafford | Arizona Public Services Co. |
| Matt Swartz | Westinghouse |
| Ari Tuckman | Duke Energy/Catawba |

*Participated via phone

Memorandum to Stewart Bailey from Blake Purnell

SUBJECT: SUMMARY OF SEPTEMBER 21, 2011, PUBLIC MEETING ON POTENTIAL ALTERNATIVE FOR RESOLVING GENERIC SAFETY ISSUE 191

DISTRIBUTION:

**E-Mail**:

RidsNrrOd
RidsNrrDss
RidsNrrDci
RidsNrrDpr
RidsNrrDprPgcb
RidsEdoMailCenter
RidsAcrsAcnwMailCenter
RidsOgcMailCenter
---
Blake Purnell
Stacey Rosenberg
Paul Klein
Stewart Bailey
Stephen Smith
Sher Bahadur
Victor Cusumano
Eric Miller
Clint Ashley
Jason Carneal
John Burke
Tim Collins
James Beall
Mike Franovich
Bill Ruland
John Lubinski
Steven Laur
Andrew Howe
Stephen Dinsmore
Samson Lee
Mathew Yoder
Chris Jackson
Brian Holian