

August 6, 2012

MEMORANDUM TO: Amy E. Cabbage, Chief
Policy Branch
Division of Advanced Reactors and Rulemaking
Office of New Reactors

FROM: Jonathan DeGange, Project Manager */RA/*
Policy Branch
Division of Advanced Reactors and Rulemaking
Office of New Reactors

SUBJECT: SUMMARY OF JULY 10-11, 2012, PUBLIC MEETING ON NEXT
GENERATION NUCLEAR PLANT RISK-INFORMED PERFORMANCE
BASED LICENSING AND FUNCTIONAL CONTAINMENT
PERFORMANCE

On July 10-11, 2012, U.S. Nuclear Regulatory Commission (NRC) staff held public meetings as part of its ongoing pre-application interactions with staff from U.S. Department of Energy (DOE) and Idaho National Laboratory (INL) for DOE's Next Generation Nuclear Plant (NGNP) Project. The meetings were held at the NRC Headquarter's One White Flint office building in Rockville, MD. The meetings consisted of discussions of technical and policy issues associated with INL's Risk-Informed, Performance Based Licensing Approach, as well as INL's proposed approach to addressing functional containment performance. The meeting was a continuation of a proposed series of working meetings to be held over the coming months.

The associated meeting notice is available at NRC's Agencywide Documents Access and Management System (ADAMS) under accession number ML12174A228. The following provides a brief summary of the meetings.

Summary

Dr. Donald Carlson, Policy Branch, Division of Advanced Reactors and Rulemaking (DARR), Office of New Reactors (NRO), opened the meeting with an introduction and brief summary of the meeting agenda. Then, those in attendance also provided brief introductions as to their role in the NGNP effort.

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INL staff then provided an overview of their high level objectives for the NGNP project. Specifically, INL staff stated that they sought NRC staff positions and feedback from the Advisory Committee on Reactor Safeguards on four main issues: 1) containment functional performance, 2) licensing basis event (LBE) selection, 3) radiological source terms and 4) emergency planning. A more in-depth discussion of the topics covered in the meetings follows.

Discussion of Specific LBE Issues

INL staff proceeded with a presentation providing follow-on discussion to issues raised during a May 16, 2012, public meeting on the NGNP Licensing Basis Event Selection. The presentations started with a comparison of the frequency-consequence (F-C) curve developed by INL staff to the comparable curve included in NUREG-1860, "Feasibility Study for a Risk-Informed and Performance-Based Regulatory Structure for Future Plant Licensing." Next, the group had a discussion regarding NRC Request for Additional Information LBE-37 from the NRC's February 2012 Staff Assessment Report (see ADAMS ML120170084).

A discussion of the events considered in the late 1980s in the proposed licensing basis for Modular High Temperature Gas-cooled Reactor (MHTGR) design followed. Other notable topics included a discussion on terminology related to anticipated operational occurrences (AOOs)", and a short discussion on cutoff frequencies for the design basis event (DBE) and beyond design basis event (BDBE) categories on INL's proposed NGNP F-C curve.

Discussion of Probabilistic Risk Assessment (PRA) White Paper

INL staff presented a high level overview of the contents of their PRA white paper including an explanation of the step-by-step procedure for development of event sequences. This included methodologies for defining functional initiating event categories, event sequence end states, addressing pertinent safety functions, systems, and operator actions, developing dependency matrices and event sequence models, as well as establishing success criteria for each "event tree" top event.

NRC staff suggested that the white paper provide an expanded discussion on industry activities related to development of High Temperature Gas-cooled Reactor (HTGR) codes and standards. NRC staff also recommended improving the descriptions of assumptions and major sources of uncertainty. There was also a discussion regarding the lack of inclusion of "bounding events" in the analysis, and how this may affect the scope of the PRA.

Discussion of Structures, Systems, and Components (SSCs) Issues

NRC and INL then proceeded into a discussion regarding issues from INL's proposed SSC classification White Paper submitted to NRC for review on September 21, 2010. INL staff first presented a high level overview of their SSC classification methodology. Next, the group discussed a question from NRC staff addressing the possibility of exemption requests by the NGNP applicant. INL staff explained that the purpose of the white paper is to present its proposed classification methodology and is not intended to propose regulatory implementation options.

Next, the group discussed the proposed NGNP safety category classification and its relationship to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.2. There was much discussion regarding prevention and mitigation of AOOs, and their associated SSC safety classification. Emphasis was placed on clarifying issues with INL's proposed non-safety related with special treatment (NSRST) category. Fission product barriers including the helium pressure boundary and reactor building and their associated SSCs' classifications were also discussed. Lastly, a short discussion about the application of American Society of Mechanical Engineers code requirements to HTGR design concluded this portion of the meeting.

Discussion of Functional Containment Performance

The meeting proceeded with a discussion regarding reactor containment. INL presented to the NRC staff positions they seek with respect to the functional containment, namely to 1) confirm that plans being implemented by the fuel development and qualification program are generally acceptable and provide reasonable assurance of the capability of coated fuel particles to retain fission products in a controlled and predictable manner, 2) establish options regarding functional containment performance standards, and 3) establish a staff position regarding how LBEs will be considered for the purpose of plant siting and functional containment design decisions.

INL staff then discussed the safety design approach including information on passive safety features and the inherent materials properties of the helium coolant, the ceramic coated fuel, and the graphite moderator. Detailed discussions followed about certain aspects of the containment approach, including free volume considerations in the reactor building, as well as the potential for alternative reactor building designs. Examples of the expected performance of the functional containment during off-normal events, based on MHTGR accident analyses from the late 1980s and early 1990s, were also presented.

Subsequently, a discussion about the applicability of general design criteria (GDCs) in Appendix A to 10 CFR Part 50 to non-light-water-reactors (LWRs) ensued. INL staff emphasized that GDCs are intended to provide guidance in establishing the principal design criteria for non-LWRs. INL staff revealed that they have developed a preliminary set of principal design criteria (PDC) modeled after the GDCs and noted that the derivation and implementation of their PDCs is consistent with the provisions of the GDCs, and would not require rulemaking.

NRC staff questioned the form that the regulatory implementation the PDCs would take, and discussed potential issues regarding possible rulemaking and Commission policy. NRC staff also expressed concern with the enforcement implications that may be involved with implementing the PDCs, such as technical specifications, license conditions, or potential rulemaking. INL staff then reiterated that the derivation and implementation of the PDCs is consistent with the provisions of Appendix A to 10 CFR Part 50 and would not require rulemaking. INL staff agreed that a framework for enforcement would need to be developed.

Conclusion

The meeting concluded with discussions about future meeting topics and scheduling, as well as an opportunity for discussion with members of the public. There were no comments or

A. Cabbage

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questions from the public in either of the meetings. Future meetings will include additional discussion of LBE issues, fuel qualification issues, mechanistic source term issues, and functional containment issues.

Enclosure:
Attendance List

cc w/encl: See next page

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Attendance List

cc w/encl: See next page

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**NEXT GENERATION NUCLEAR PLANT
RISK-INFORMED PERFORMANCE BASED LICENSING APPROACH MEETING
July 10, 2012**

Attendance List

| Name | Organization | Name | Organization |
|-------------------|---------------------|------------------|---------------------|
| Donald E. Carlson | NRC/NRO/DARR | Lou Lanese | NuScale Power |
| Russell Chazell | NRC/NRO/DARR | John Bolin | General Atomics |
| Maitri Banerjee | NRC/ACRS | Janelle Zamore | DOE/NE |
| George Thomas | NRC/NRO/DSRA | David Alberstein | INL/NGNP |
| Danny Chien | NRC/NRO/DSRA | Bill Reckley | NRC/NRR/JLD |
| Sardar Ahmed | NRC/NRO/EMB | Yiu Law | NRC/NRO/DE |
| Jim Kinsey | INL/NGNP | Carl Sink | DOE/NE |
| Pete Jordan | INL/NGNP | Mary Drouin | NRC/RES/DRA |
| Mark Holbrook | INL/NGNP | Madeline Feltus | DOE/NE |
| Fred A. Silady | INL/ Tech Insights | Mark Caruso | NRC/NRO/DSRA |
| Pete Lowry | INL/NGNP | Jonathan DeGange | NRC/NRO/DARR |
| Karl Fleming | INL/NGNP | Sud Basu | NRC/RES |
| Thomas Hicks | INL/NGNP | Bill Corwin | DOE/NE |
| Richard McNally* | NRO/DE/EMB | | |

*On teleconference bridge line

**NEXT GENERATION NUCLEAR PLANT
HTGR FUNCTIONAL CONTAINMENT MEETING
July 11, 2012**

Attendance List

| Name | Organization | Name | Organization |
|-------------------|---------------------|------------------|---------------------|
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| Maitri Banerjee | NRC/ACRS | David Alberstein | INL/NGNP |
| George Thomas | NRC/NRO/DSRA | Shie-Jeng Peng | NRC/NRO/DSRA |
| Danny Chien | NRC/NRO/DSRA | John McKirgan | NRC/NRO/DSRA |
| Jim Kinsey | INL/NGNP | Carl Sink | DOE/NE |
| Pete Jordan | INL/NGNP | Mary Drouin | NRC/RES/DRA |
| Mark Holbrook | INL/NGNP | Jonathan DeGange | NRC/NRO/DARR |
| Fred A. Silady | INL/ Tech Insights | | |
| Pete Lowry | INL/NGNP | | |
| Karl Fleming | INL/NGNP | | |
| Tom O'Connor | DOE/NE | | |
| Neil Ray | NRO/DE/CIB | | |
| Lou Lanese | NuScale Power | | |