

December 5, 2012

MEMORANDUM TO: Anna Bradford, Chief
SMR Licensing Branch 2
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 NOVEMBER 14, 2012, PUBLIC MEETING ON NEXT
GENERATION NUCLEAR PLANT RISK-INFORMED PERFORMANCE
BASED LICENSING AND EMERGENCY PLANNING

On November 14, 2012, U.S. Nuclear Regulatory Commission (NRC) staff held a public meeting 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 meeting was a continuation of a series of working meetings held throughout the 2012 calendar year.

The associated meeting notice is available at NRC's Agencywide Documents Access and Management System (ADAMS) under accession number ML12305A224. The following provides a brief summary of the meeting.

Summary

Dr. Donald Carlson, SMR Licensing Branch 2, 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. DOE/INL staff then provided an overview of topics to be discussed during the meeting. The meeting focused on three different issues: 1) substantiation for a frequency lower boundary value of 10^{-4} for the Design Basis Event (DBE) region of the NGNP frequency-consequence (F-C) curve, 2) determining siting source terms (SSTs) and bounding event sequences in view of guidance provided in the Staff Requirements Memorandum (SRM) to SECY 93-0092, and 3) a discussion of the proposed NGNP Emergency Planning (EP) event selection process. Meeting presentations and discussion materials are available in ADAMS under accession numbers ML12338A592, ML12338A598, ML12338A622, and ML12338A646. A more in-depth discussion of the topics covered in the meeting follows.

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DBE Region Frequency Boundary

DOE/INL staff proceeded with a presentation intended to provide substantiation for using 10^{-4} per plant-year as a lower boundary frequency value for the DBE region used in the proposed NGNP Risk-informed Performance Based framework. Event sequences with mean frequencies below 10^{-4} per plant-year would thus be classified as beyond design basis events (BDBEs). The presentation argued that events with frequencies of 10^{-4} per plant-year would have <1% chance of occurring in a plant's lifetime, and that a lower frequency would not be required to meet the NRC Quantitative Health Objectives.

Additionally, DOE/INL staff pointed out that the Commission established a core damage frequency goal of 10^{-4} per reactor-year for advanced reactors in the SRM to SECY-90-0016, and that accidents involving core damage in light-water reactors (LWRs) are regarded as BDBEs, implying that the lowest event frequency for design should be set no lower than 10^{-4} per plant-year. DOE/INL further argued that their proposed approach of evaluating event frequencies and consequences on a per-plant basis (versus a per-reactor basis) duly covers integral risk from events that affect more than one reactor module within a multiple-module plant. Dose consequences from a plant-wide or multiple-module event are calculated on a per-plant basis by summing the dose consequences from each reactor module affected by the event and the total is then evaluated based on event frequency per plant-year.

Conservative evaluations for event sequences less frequent than 10^{-4} per plant-year were noted to be provided through the analysis of Design Basis Accidents (DBAs). DBAs are made less frequent than the DBEs on which they are based by deterministically imposing the conservative assumption that only safety-related structure, system or components perform their safety functions. Per the proposed NGNP F-C curve, DBAs are nevertheless conservatively evaluated against the more stringent dose consequence criteria associated with the higher-frequency parent DBEs. DOE/INL staff also pointed out that the proposed value of 10^{-4} per plant-year was consistent with the event selection approaches proposed previously in the modular high temperature gas-cooled reactor (HTGR) pre-licensing activities for the modular high temperature gas-cooled reactor (MHTGR) and pebble bed modular reactor.

Addressing the SRM to SECY-93-0092 and Siting Source Terms

In the SRM to SECY-93-0092, the Commission stated that in considering MHTGR functional containment, the staff should address an event in which there is a loss of primary coolant pressure boundary integrity whereby air ingress could occur, known as the "chimney effect." Note that this was a direction to the staff and not to the MHTGR applicant. In recent discussions with DOE/INL, some NRC staff inquired about the nature of such extreme postulated events, including the timeframes over which graphite oxidation would progress and the very low frequencies of such events in relation to the proposed NGNP F-C curve.

DOE/INL gave a quick presentation regarding siting source terms (SST) and their proposed mechanistic approach for siting analysis. Part of the proposed analysis would incorporate examinations to see if any "cliff-edge" events were present directly below the BDBE region cutoff frequency of 5×10^{-7} per plant-year, and events would be examined to 10^{-8} per plant-year. DOE/INL staff stated that because the event described in SECY-93-0092 has a frequency so far below the licensing-basis event (LBE)-spectrum of events, the event would be considered

incredible and thus not likely considered by the NGNP applicant in their application. However, DOE/INL did mention that physically plausible bounding event sequences that maximize the potential for graphite oxidation would be considered in the bounding event sequence process and its analysis.

EP Event Selection

DOE/INL staff then gave a brief presentation on EP event selection. The presentation focused on providing clarification to NRC staff on the difference between event selection for the siting source terms and for emergency planning zone (EPZ) size determination. DOE/INL clarified both the proposed event selection process and proposed evaluation methodology to NRC staff. DOE/INL referenced an INL White Paper on EP (NGNP White Paper INL/MIS-10-19799). INL explained that the selection of LBEs for EP would be the same as for the SST with the exception of events evaluated for "cliff edge" effects (which DOE/INL staff does not expect to be used for EPZ determination). The evaluation of LBEs for EP is proposed by INL to be the same as that used for the SSTs, with the following exceptions:

- 1) For EPZ determination, the mean dose values are proposed to be used whereas conservative dose values are used for the SSTs.
- 2) The criteria proposed for EPZ selection are the EPA Protective Action Guidelines values whereas Title 10 of the *Code of Federal Regulations* (10 CFR) 50.34 criteria are used for the SST.

The staff had many questions regarding the use of mean values for determining the EPZ. Some NRC staff were concerned that the proposed approach was not conservative enough, and that conservative values should be used rather than mean values. It was agreed that this would be a topic for future discussion.

Conclusion

The meeting concluded with a brief discussion about potential needs to schedule further meetings as well as an opportunity for public comment. No public comments were provided.

Enclosure:
Attendance List

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ADAMS Accession Number: ML12338A474-pkg

NRO-001

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SUBJECT: SUMMARY OF NOVEMBER 14, 2012, PUBLIC MEETING ON NEXT
GENERATION NUCLEAR PLANT RISK-INFORMED PERFORMANCE BASED
LICENSING AND EMERGENCY PLANNING

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**NEXT GENERATION NUCLEAR PLANT (NGNP)
RISK-INFORMED PERFORMANCE BASED LICENSING APPROACH MEETING**

November 14, 2012
10:00 a.m. – 12:00 p.m.
NRC Headquarters
Room OWFN-14B08

Telephone Bridge Line:
1-888-566-5788, pass code 60029

Attendance List

Name	Organization
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Jonathan DeGange	NRC/NRO/DARR
Thomas Boyle	NRC/NRO/DARR
Patricia Milligan	NRC/NSIR/DPR
Anna Bradford	NRC/NRO/DARR
Jim Kinsey	INL/NGNP
Pete Jordan*	INL/NGNP
Thomas Hicks	INL/NGNP
Fred A. Silady*	INL/ Tech Insights
David Alberstein*	INL/NGNP
Wayne Moe*	INL/NGNP
Carl Sink	DOE/NE
Madeline Feltus*	DOE/NE
Lew Lommers*	Areva
George Zinke*	Entergy

*On teleconference bridge line