

August 21, 2012

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

FROM: Russell E. Chazell, Project Manager */RA/*
Policy Branch
Division of Advanced Reactors and Rulemaking
Office of New Reactors

SUBJECT: SUMMARY OF JULY 24, 2012, PUBLIC MEETING ON NEXT
GENERATION NUCLEAR PLANT FUEL QUALIFICATION AND
SOURCE TERM DISCUSSION

On July 24, 2012, U.S. Nuclear Regulatory Commission (NRC) staff held a public meeting as part of its ongoing pre-application interactions with the U.S. Department of Energy (DOE) and its Idaho National Laboratory (INL) for DOE's Next Generation Nuclear Plant (NGNP) Project. The meeting was held at the NRC Headquarters One White Flint North office in Rockville, MD. The purpose of the meeting was to discuss technical and policy issues associated with NGNP Fuel Qualification (FQ) and Mechanistic Source Term (MST) discussions. 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 ML12193A518. 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.

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The meeting addressed the following topics.

1. Technical discussions on issues from the assessment of NGNP FQ and MST, to include:
 - a. FQ/MST-11 – Adequacy of Accelerated Irradiation Testing
 - b. FQ/MST-18 – Irradiation and Accident Proof Testing of Production Fuel
 - c. FQ/MST-24 – Models and Data for Fuel Particle Performance during Normal Operation and Heat-Up Accidents
 - d. FQ/MST-26 – Models and Data for Accidents with Attack by Oxidants
 - e. FQ/MST-27 – Effects of Air on Particle Coating Layers
 - f. FQ/MST-29 – Long Term Modeling of Radionuclide Transport within the Core and the Reactor Coolant System
 - g. FQ/MST-32 – Impact of Dust on the Behavior of Fission Products, and
 - h. FQ/MST-37 – Effects of Dust on Fission Product Transport
2. Follow-Up Discussions of Topics from Previous Meetings
3. Next Steps

The objectives of the meeting were to continue the technical discussion of specific issues of NGNP FQ and MST. These issues were summarized in spreadsheet to facilitate the interaction. The spreadsheet can be found in ADAMS under accession number ML12233A527.

Discussion of Specific FQ and MST Issues

INL discussed with the NRC staff FQ and MST issues as follows. These discussions resulted in a number of action items for both INL and NRC staff that will inform future meetings and revisions to NGNP project documents.

FQ/MST-11 – Adequacy of Accelerated Irradiation Testing and FQ/MST-18 – Irradiation and Accident Proof Testing of Production Fuel

INL stated that there is less variability of results due to improved measurement technologies since the 1970s. There will be an opportunity to compare Advanced Gas Reactor (AGR) 5-6 fuel with production runs. There was also discussion of the usefulness of an AGR-9 test. NRC staff stated that such a test would produce data on production fuel performance more quickly than data could be obtained from fuel removed from the reactor. INL believes that end-of-cycle data simulating accident conditions absent an AGR-9 is coming together and that testing of fuel from the reactor would still be needed to assure performance in a prototypical environment. INL stated that it has not made any commitments regarding an AGR-9 test or other production fuel tests.

NRC posed two other questions one being whether scaling problems were anticipated and INL responded that previous results were overly conservative and grossly over-predicted releases. Secondly, the NRC staff inquired whether fuel testing could be done in the High Temperature Test Reactor. INL did not think this was feasible due to transportation challenges, ship-back for heat up challenges, low volume, and reactor power density concerns.

FQ/MST-24 – Models and Data for Fuel Particle Performance during Normal Operation and Heat-Up Accidents

INL stated that the Goodin-Nabielek model may not be used in design considerations. This will remain an open item pending receipt of an application. It should be addressed as a generic issue focused on fuel performance models generally rather than the Goodin-Nabielek model specifically.

FQ/MST-26 – Models and Data for Accidents with Attack by Oxidants and FQ/MST-27 – Effects of Air on Particle Coating Layers

Discussion ensued around the need to perform tests on irradiated and un-irradiated materials in order to validate measurements. There were other questions about the testing regime such as bounding analyses and whether Sr diffuses from the kernel. INL stated that they had sent NRC a letter, dated July 19, 2012, (CCN227952) that provides a research plan for moisture and air ingress experiments.

FQ/MST-29 – Long Term Modeling of Radionuclide Transport within the Core and the Reactor Coolant System

Following up on a previously issued Request for Additional Information, the NRC staff indicated that more information of AGR fuel plan updates was desired. Specifically, information regarding which radionuclides are expected be the predominate contributors to offsite doses for various High-Temperature Gas Reactor (HTGR) accident scenarios. The NRC staff believes that long-lived radionuclides are more challenging because of plate-out and remobilization in primary systems in the event of an accident. NRC requested a table at end-of-life inventory of typical radionuclides on an order-of-magnitude basis. NGNP stated such information is available for the General Atomics Modular High Temperature Gas Reactor (MHTGR) and agreed to provide NRC with a summary of that information.

FQ/MST-32 – Impact of Dust on the Behavior of Fission Products and FQ/MST-37 – Effects of Dust on Fission Product Transport

INL stated that the issue of dust is a bi-modal issue – namely that it is a big issue for the pebble bed design and not an issue at all for the prismatic design. INL queried the NRC staff about whether further consideration of this issue is necessary given that the industry alliance has selected the prismatic design, thereby effectively mooting this concern. The NRC initial response was that since DOE has not decided whether the pebble bed or the prismatic design has been selected, this issue of dust should be further considered. INL requested that the NRC assessment report on this issue be revised to address the distinction between pebble bed and prismatic designs and the NRC staff agreed to do so. Further, the NRC staff stated that INL analyses of prismatic designs should include analyses supporting the argument that dust effects in that design are negligible.

Other Follow-Up Discussions

Following the specific issue discussions summarized above, there were several other brief discussions of ancillary issues. These included the test method for moisture/air ingress experiments; post-irradiation evaluations (PIE); Europium release from fuel kernels; Plutonium ratios in test data; Particle Fuel Model (PARFUME) calculations; and PIE diffusion coefficient data results.

Next Steps

Future discussions of FQ and MST issues will include:

- FQ/MST-12 – Prototypical Irradiation Testing Neutron Spectrum
- FQ/MST-15 – Access to Detailed ATR Information, and
- FQ/MST-29 – Long Term Modeling of Radionuclide Transport within the Core and the Reactor Coolant System

Action Items

The NRC staff noted the following action items:

- Update of the assessment report to clarify the distinction between pebble bed and prismatic designs with regard to dust issues.
- Update of the assessment report to generalize rather than focus on the Goodin-Nabielek model for fuel particle performance during normal operation and heat-up accidents.

INL noted the following action items:

- Provide a review of Modular High-Temperature Gas Reactor bounding event sequences.
- Postulate deterministic events used for siting analyses such as cross vessel break, steam generator tube breaks, etc.

Conclusion

The meeting concluded with discussions about future meeting scheduling and topics as well as an opportunity for public comment.

There was one member of the public present at the beginning of the meeting. That person departed before the meeting ended and there were no public comments made.

Enclosure:
Attendance List

cc w/encl: See next page

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cc w/encl: See next page

ADAMS Accession Number: ML12234A678

***via e-mail**

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SUBJECT: SUMMARY OF JULY 24, 2012, PUBLIC MEETING ON NEXT
GENERATION NUCLEAR PLANT FUEL QUALIFICATION AND
SOURCE TERM DISCUSSION

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**NEXT GENERATION NUCLEAR PLANT
RISK-INFORMED PERFORMANCE BASED LICENSING APPROACH MEETING
July 24, 2012**

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Jim Kinsey	DOE/INL/NGNP	David Petti	DOE/INL/NGNP
John McKirgan	NRC/NRO/DSRA	Madeline Feltus	DOE/NE-74
A.J. Nosek	NRC/RES/DSA	Russell Chazell	NRC/NRO/DARR
Michelle Hart	NRC/NRO/DSEA	David Hanson	TechSource/INL
Elaine Hirud	Platts	Fred Forsaty	NRO/DSRA
Maitri Banerjee	NRC/ACRS	Mike Kania*	BNL Consultant
George Thomas	NRC/NRO/DSEA	John Valente*	BNL (for NRO)
Jason Schaperow	NRC/NRO/DSRA	Chris VanWert*	NRO/DSRA
Nan Chien	NRC/NRO		
Jason Tokey	DOE/NE		
Kimberly Gambone	NRC/NSIR/DPR		
Carl Sink	DOE/NE-74		

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