

August 17, 2017

MEMORANDUM TO: John P. Segala, Chief  
Advanced Reactor and Policy Branch  
Division of Safety Systems, Risk Assessment and Advanced  
Reactors  
Office of New Reactors

FROM: William D. Reckley, Senior Project Manager */RA/*  
Advanced Reactor and Policy Branch  
Division of Safety Systems, Risk Assessment and Advanced  
Reactors  
Office of New Reactors

SUBJECT: SUMMARY OF AUGUST 3, 2017 PUBLIC MEETING  
TO DISCUSS REGULATORY IMPROVEMENTS FOR  
ADVANCED REACTORS

On August 3, 2017, the U.S. Nuclear Regulatory Commission (NRC) held a Category 2 public meeting with stakeholders, Department of Energy (DOE), national laboratories, and Nuclear Energy Institute (NEI), to discuss ongoing initiatives within the industry and NRC related to the development and licensing of non-light water reactors (Agencywide Documents Access and Management System [ADAMS] Accession No. ML17213A032). Enclosure 1 contains a list of meeting attendees and participants who joined via webinar. The slides and meeting handouts are available in ADAMS Accession No. ML17220A315.

The staff led a discussion of the NRC's implementation action plans (ADAMS Accession Nos. ML17165A069 and ML17164A173). The implementation action plans describe the various activities underway or planned to improve the NRC's readiness to interact with developers of non-light water reactors (non-LWRs) and to put in place the necessary infrastructure to license and regulate new technologies. The staff emphasized during the presentation that all of the NRC's activities require coordination with DOE, technology working groups, individual reactor developers, and other stakeholders.

The staff described a draft white paper on the possible use of prototype testing to support licensing of advanced reactors (ADAMS Accession No. ML17025A353). The paper explains how a first-of-a-kind or prototype reactor is an option to supplement experience, analyses, and test programs to support certification or approval of a standard reactor design. The paper also clarifies terminology currently used to distinguish between various research, test, and power reactors that might be included in the development and deployment of advanced reactor

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technologies. Much of the discussion was on the overall testing needed to demonstrate the performance of safety features, which was discussed in SECY-91-074, "Prototype Decisions for Advanced Reactor Designs," provided as an appendix to the white paper. Mr. Edward Burns of X-energy Corporation and representing NEI's Advanced Reactor Regulatory Task Force (ARRTF) provided initial industry feedback on the staff's draft white paper. The staff will consider the feedback provided during the meeting along with any other comments or suggestions provided by stakeholders as they revise the paper and decide on how it will be issued or incorporated into other guidance documents.

Mr. Peter Hastings led a discussion on regulatory engagement plans on behalf of NEI's ARRTF. Regulatory engagement plans serve as a blueprint for advanced reactor developers, technology working groups, or other stakeholders to propose and reach agreement with the NRC staff on expected outcomes from submittals or other interactions. The staff agreed that regulatory engagement plans would replace licensing program or project plans as the standard terminology. The staff agreed that regulatory engagement plans are optional products but encouraged their use to support planning, budgeting, and communications between stakeholders and the NRC. NEI's ARRTF is developing an outline to help advanced reactor developers or working groups prepare regulatory engagement plans. The outline provides flexibility in content and format because of the wide variations in technologies and expected interactions with the NRC staff. Mr. Hastings stated that the staff will be given an opportunity to provide feedback on the regulatory engagement plan outline after it is completed and reviewed by the ARRTF.

Several miscellaneous topics were discussed during the meeting. The topics included:

- The website for the Gateway for Accelerated Innovation in Nuclear (<https://gain.inl.gov>) includes a tab for regulatory issues. Stakeholders may make inquiries related to regulatory matters through the website and responses have been posted there under Regulatory FAQs [frequently asked questions].
- The staff plans to prepare a draft white paper to support discussions at future stakeholder meetings on relationships between population distributions and siting of advanced reactors. Current guidance on this topic is provided in Regulatory Guide 4.7, "General Site Suitability Criteria for Nuclear Power Stations" (ADAMS Accession No. ML12188A053).
- Mr. Jim Kinsey of Idaho National Laboratory (INL) discussed how consideration and prioritization of key issues for non-LWRs could be supported by analyses of licensing basis events. The example provided identified how design basis accidents might define some design requirements and future performance standards for a functional containment.

The afternoon sessions were devoted primarily to the topic of qualification of various fuel forms to support non-light water reactor technologies. The staff provided an overview and representatives from national laboratories and technology working groups discussed qualification programs and plans for specific fuel forms.

The qualification of tristructural isotropic (TRISO) fuel was discussed by Jim Kinsey, Dr. Farshid Shahroki of Areva representing the HTGR [high temperature gas-cooled reactor] Technology Working Group (TWG) and Dr. Paul Demkowicz of INL. Dr. Shahroki described the HTGR TWG and the role of TRISO particle within the safety case for HTGRs. Dr. Demkowicz provided information on the ongoing development and qualification program for TRISO fuel.

Mr. Kinsey described plans to develop and submit a limited scope topical report on the manufacturing of TRISO fuel for NRC review and approval. The limited scope topical report would address matters generic to HTGRs and certain molten salt reactors (MSRs) and thereby reduce regulatory uncertainties facing these designs. Technology-specific activities would follow to address issues such as the relevancy of INL's irradiation and post-irradiation testing of TRISO fuel to a particular technology or design. The timeline and content of the limited-scope topical report will be discussed in future meetings between the staff and the HTGR TWG.

Dr. A. M. Yacout of Argonne National Laboratory (ANL) described the existing metallic fuel database and efforts underway to evaluate the data and make it available to industry and other stakeholders. The DOE's Advanced Reactor Technology (ART) Program supports the development of the database from experiments conducted at facilities such as the Experimental Breeder Reactor II and Fast Flux Test Facility. The ART Program also includes ongoing work to establish the qualification of the legacy data from metallic fuel irradiation experiments. The Fast Reactor Technology Working Group is considering what type of interactions with the NRC might be appropriate to take advantage of the data qualification efforts being done under the ART Program.

Dr. George Flanagan of Oak Ridge National Laboratory discussed issues and possible approaches for fuel qualification for MSRs. The characteristics of MSR fuels, with fuel in liquid form moving within a fuel salt loop, are different from the mechanical fuel assemblies or other solid fuel forms in other reactor designs. Dr. Flanagan noted that many questions related to the properties of MSR fuels in fluoride salts might be addressed through chemical testing programs. Irradiation data for chloride salts is sparse and so additional irradiation programs may be needed to confirm their stability in reactor environments. Dr. Flanagan suggested that the NRC, DOE, and industry develop a process for MSR fuel qualification so that appropriate research and development activities could be identified. The staff plans to continue these discussions on MSR fuel qualification in future public meetings.

The remaining working-group public meetings on regulatory improvements for advanced reactors for 2017 are scheduled for September 28, November 2, and December 14. Other upcoming meetings of interest include a discussion of the advanced reactor design criteria on August 24<sup>th</sup> and the NRC standards forum on September 26<sup>th</sup>. The staff asked for feedback from stakeholders on the following tentative dates for meetings in 2018:

February 1	March 22	May 3	June 14
July 26	September 13	October 25	December 13

Enclosure:  
List of attendees

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<b>NAME</b>	WReckley	ARedden
<b>DATE</b>	08 / 17 / 2017	08 / 17 / 2017

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Public Meeting to Discuss Regulatory Improvements for Advanced Reactors  
 August 3, 2017  
 Attendance List

<b>Attendance List – Attended at least part of meeting in person</b>		
<b>Name</b>		<b>Organization</b>
Jim	Hammelman	NRC/NMSS
Christina	Leggett	NRC/NMSS
Arlon	Costa	NRC/NRO
Amy	Cubbage	NRC/NRO
Nishka	Devaser	NRC/NRO
Tim	Drzewiecki	NRC/NRO
Nicholas	McMurray	NRC/NRO
John	Monninger	NRC/NRO
Bill	Reckley	NRC/NRO
Martin	Stutzke	NRC/NRO
Seshagiri	Tammara	NRC/NRO
George	Tartal	NRC/NRO
Chris	Van Wert	NRC/NRO
Lucieann	Vechioli	NRC/NRO
Joe	Williams	NRC/NRO
Andrew	Yeshnik	NRC/NRO
Steven	Lynch	NRC/NRR
Shawn	Lichvar	NRC/NSIR
Nanette	Valliere	NRC/OCMSB
Marcia	Carpentier	NRC/OGC
Steve	Bajorek	NRC/RES
Michelle	Bales	NRC/RES
Amy	Hull	NRC/RES
Shah	Malik	NRC/RES
Carol	Moyer	NRC/RES
Ian	Porter	NRC/RES
Iouri	Prokofiev	NRC/RES
Mike	Salay	NRC/RES

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Trevor	Cook	DOE
Craig	Welling	DOE
AM	Yacout	ANL
Farshid	Shahrokhi	Areva
N.P.	Kadambi	Consultant
Christian	Marciulescu	EPRI
Charles	Hess	High Bridge
Philip	Moor	High Bridge
Jim	Kinsey	INL
Rita	Baranwal	INL/GAIN
Jon	Johnson	LightBridge
Kati	Austgen	NEI
George	Flanagan	ORNL
Lou	Qualls	ORNL
Tara	O'Neil	PNNL
Amir	Afzali	Southern
Jeff	Sharkey	Southern
Peter	Hastings	THG
Levi	Lorenzo	USNIC
Edward	Burns	X-energy
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**Attendance List – Webinar Attendees**

Name	Organization
Darrell Adams	NRC
Alisa Beyninson	US Senate
Donald Carlson	
Timothy Crook	Transatomic
Paul Demkowicz	INL
Suzanne Dennis	NRC
Matt Dennis	Sandia

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Janelle	Eddins	DOE
Madeline	Feltus	DOE
Ken	Geelhood	PNNL
Raymond	Gibson	NRC
Frank	Goldner	DOE
aaron	goldner	US Senate
Dave	Grabaskas	ANL
Kathy	Halvey Gibson	NRC
James	Hammelman	NRC
Michelle	Hart	NRC
Mark	Holbrook	INL
David	Holcomb	ORNL
Ryan	Hon	General Atomics
Amy	Hull	NRC
Palaia	Jim	ANI
christina	leggett	NRC
Marvin	Lewis	
Diana	Li	DOE
Jun	Liao	Westinghouse
Edwin	Lyman	UCS
Lisa	Matis	Tetrattech
Gary	Mays	ORNL
Bruce	McDowell	PNNL
W	Moe	INL
Per	Peterson	Kairos Power
Andrew	Pinkowski	ANI
Mike	Poore	ORNL
Alex	Popova	Oklo
Everett	Redmond	NEI
Robin	Rickman	Terrestrial USA

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Stuart	Rubin	Numark Associates
Nicholas	Smith	Southern Co.
Tanju	Sofu	ANL
Tom	Sowinski	DOE
Amanda	Spalding	Westinghouse
Courtney	St. Peters	NRC
Edward	Wallace	GNBC Associates
William	Wallace	EPM
Otto	Walter	ANI
Staci	Wheeler	Alpha Tech Research Corp.