



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

October 17, 2024

MEMORANDUM TO: Gerond George, Chief
Licensing Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

FROM: James Delosreyes, Project Manager /RA/
Licensing Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

SUBJECT: MEETING SUMMARY OF THE SEPTEMBER 3, 2024, HIGHER
BURNUP WORKSHOP V

On September 3, 2024, the U.S. Nuclear Regulatory Commission (NRC) staff held the Higher Burnup (HBU) Workshop V, an observation public meeting, with nuclear industry and other stakeholders. This workshop included presentations by the NRC staff and representatives from the Nuclear Energy Institute (NEI), the Electric Power Research Institute (EPRI), the U.S. Department of Energy's (DOE) Oak Ridge National Laboratory (ORNL). The meeting had two purposes: (1) to exchange information between the NRC and industry on HBU, increased enrichment (IE), and accident tolerant fuel (ATF) activities; and (2) to provide an opportunity for members of the public to ask questions of the NRC staff. The meeting notice is available in the Agencywide Documents Access and Management System (ADAMS) at Accession No. ML24243A162. The meeting slides are available at ADAMS Accession No. ML24243A161.

Opening and closing remarks were given by Andrea Kock, Deputy Office Director for Engineering in the Office of Nuclear Reactor Regulation. The topics discussed during the meeting are summarized below.

Accident Tolerant Fuel and Increased Enrichment Rulemaking Update

The NRC staff delivered a presentation on various ATF-related activities such as updates to the "Roadmap to Readiness" which was revised most recently to version 1.2 on August 2, 2024 (ADAMS Accession No. ML24199A170), a discussion on the newly signed ADVANCE Act and its implications for the ATF project team, and a brief overview of the status of the IE rulemaking since the previous workshop. This was followed by a more detailed presentation on Fuel Fragmentation, Relocation, and Dispersal (FFRD) and the regulations at Title 10 of the *Code of Federal Regulations* (10 CFR) 50.46, two topics closely tied to the IE rulemaking and of high public interest.

Industry Motivation for Use of Higher Burnup

EPRI representatives delivered a presentation on key factors driving industry interest in HBU, such as favorable financial outcomes resulting from recent legislation and demand forecasts. Power uprates and cycle length extensions are two feasible methods of increasing the efficiency of existing commercial nuclear power, some of which are planned to leverage IE and HBU.

Industry Perspectives on a Modernized and Combined Risk-Informed Loss-of-Coolant Accident Rule

NEI representatives delivered a presentation on their perspective on 10 CFR 50.46. This began with an overview of the historical rule and its shortcomings. Various improvements are suggested, such as making it technology-neutral, performance-based, and risk-informed, as well as considerations for its implementation.

NRC's Phenomena Identification and Ranking Tables for High Burnup Fuel Fragmentation, Relocation, Dispersal, and Its Consequences for Design-Basis Accidents

The NRC staff delivered a presentation on the Phenomena Identification and Ranking Tables (PIRT) exercise for FFRD which was documented in NUREG/CR-7307 (ADAMS Accession No. ML24155A058) and published on May 31, 2024. This exercise was a scientific study involving a number of academic and industry members to evaluate the impacts of extending burnup limits under various accident scenarios, the results of which will be used to support the IE rulemaking.

Proposed Fragmentation, Relocation, Dispersal Dose Consequence Guidance in DG-1425 (Draft Rev 2 of RG 1.183)

The NRC staff delivered a presentation on the next revision of Regulatory Guide (RG) 1.183, another supporting document for the IE rulemaking which is currently being drafted. Among other changes, this revision updates the guidance and analysis regarding radiological consequences for certain accidents.

High Burnup Summary

Representatives from ORNL delivered a presentation on their continued research in support of HBU. Data and analyses regarding studies on fuel sieving, cladding strain, fission gas release, and FFRD were shared as well as a summary of future planned work.

Environmental Evaluation of Accident Tolerant Fuel with Increased Enrichment and Higher Burnup Levels

The NRC staff delivered a presentation on NUREG-2266 (ADAMS Accession No. ML24207A210) which evaluates the environmental impact of the deployment and use of IE and HBU in support of licensing reviews and was published on July 31, 2024. Addressed in the document are the impacts of the uranium fuel cycle, transportation of fuel and waste, and decommissioning.

Spent Fuel Pool 2024 A Regulatory Perspective

The NRC staff delivered a presentation relating HBU to spent fuel pool licensing and regulation. General considerations and guidance were provided which would allow for a more efficient license amendment request review process within this domain.

Public Comments

Two public comments were received during this meeting. For the first, a member of the public made a comment regarding regulations being made into guidance and then asked whether damaged fuel was being placed into spent fuel pools and what would be the effect of the storage of the canisters for this case, which were asked in relation to NUREG-2266 and FFRD. The NRC staff responded that due consideration is made for what is written into regulations versus guidance based on the available data to ensure adequate protection. For the second, a member of the public addressed a concern with provisions regarding fuel retrievability, in the context of 10 CFR Part 72. The NRC staff responded that it continues to holistically assess the impact on waste disposal and storage with the available information and reassess as further information becomes available.

No regulatory decisions were made during this meeting.

Please direct any inquiries to James Delosreyes at James.Delosreyes@nrc.gov.

Enclosure:
List of Attendees

LIST OF ATTENDEES
HIGHER BURNUP WORKSHOP V
September 3, 2024
9:00 am – 12:30 pm

U.S. Nuclear Regulatory Commission (NRC)	
First Name	Last Name
Zena	Abdullahi
Philip	Benavides
Andrew	Bielen
Kristy	Bucholtz
Jesse	Carlson
Theresa	Clark
Alex	Collier
James	Corson
Vic	Cusumano
James	Delosreyes
Elijah	Dickson
Dan	Doyle
Darrell	Dunn
Denise	Edwards
Hossein	Esmaili
David	Garmon
Gerond	George
Victor	Hall
Kevin	Heller
Kevin	Hsueh
Jason	Huang
Daniel	King
Andrea	Kock
Scott	Krepel
Lucas	Kyriazidis
Michael	Mahoney
Sean	Meighan
Joseph	Messina
Donald	Palmrose
Scott	Palmtag
Aida	Rivera-Varona
Cinthya	Roman
David	Rudland
Ashley	Smith
James	Smith
Ted	Smith
Rao	Tammara
Robert	Tregoning
Zach	Turner
Gokul	Vasudevamurthy

Brian	Wagner
Kimberly	Webber
Sunil	Weerakkody
Brandon	Wise
Antonios	Zoulis

Non-NRC		
First Name	Last Name	Organization (if provided)
Darius B	Ahrar	Excel Energy
Victoria	Anderson	NEI
James	Andrachek	Westinghouse
Samuel J	Baker	Dominion Energy
Kevin J	Barber	Westinghouse
Ernest F	Bates	Southern Nuclear
Philippe	Bellanger	Framatome
Jana	Bergman	Curtiss-Wright
Samson Vincent	Berklite	Duke Energy
Zach	Bevans	Public
Michael A	Blom	Duke Energy
Walter	Boatwright	Vistra Corp
Michael L	Boone	Westinghouse
David E	Bortz	Duke Energy
Jan	Boudart	Public
Damon V	Bryson	Dominion Energy
Donald J	Buth	Duke Energy
Jared A	Cantrell	Public
Nathan	Capps	ORNL
Christopher	Clemens	Dominion Energy
Paul	Clifford	Framatome
Joe	Coletta	Duke Energy
Ben	Collins	Public
Jonathan	Cordz	Ameren
Aladar	Csontos	NEI
Cecile	Dame	MPR Associates
Earp Jr.	Dennis	Duke Energy
Peter	Diller	General Electric
Bradley	Dolan	Southern Nuclear
Zach	Duncan	Public
Chris	Eastus	Energy
Joseph	Faldowski	EPRI
Rodolfo	Ferrer	Studsvik
John D	Fisher	Energy Northwes
William P	Gassmann	Constellation
Lisa	Gerken	Framatome
Mario E	Gomez Fernandez	NuScale Power
Kent E	Halac	Global Nuclear Fuel – Americas
Robert	Hall	Duke Energy

Mark Conrad	Handrick	Duke Energy
Stanley	Hayes	Duke Energy
Tao	He	Constellation
Kimberly	Hobbs	Constellation
Jerald	Holm	Framatome
Zeses	Karoutas	Westinghouse
Storm	Kauffman	MPR Associates
Kasey L	Kennett	Dominion Energy
Behrooz	Khorsandi	Constellation
Jeffrey R	Kobelak	Westinghouse
Aylin	Kucuk	EPRI
Samuel	Lafountain	Southern Nuclear
Svetlana	Lawrence	Idaho National Laboratory
Guangjun	Li	General Electric
Kurt P	Linsenbardt	Ameren
James M	Lynde	Constellation
Alex J	Markivich	Dominion Energy
John R	Massari	Constellation
Tara Elizabeth	Matheny	Duke Energy
Brian	Merritt	Public
Bruce	Montgomery	NEI
Brian L	Mount	Dominion Energy
Kurshad	Muftuoglu	EPRI
Carole	Naugle	Framatome
Matthew	Nudi	EPRI
Stephen P	O'hearn	Public
David S	Orr	Duke Energy
Geoff	Pihl	Duke Energy
Frances	Pimentel	NEI
Steven	Pope	Information Systems Laboratories
Ian	Porter	General Electric
Thomas	Remick	Public
Donald E	Rickard	Ameren
Baris	Sarikaya	Constellation
Phil	Sharpe	Studsvik
Emily R	Shemon	Argonne National Laboratory
Fred	Smith	EPRI
Scott	Stanchfield	Entergy
Charles	Stroupe	Duke Energy
Ryan T	Sweet	ORNL
Dallas	Swihart	Public
Scott B	Thomas	Duke Energy
Chris L	Thornell	Public
Emily J	Tomlinson	Dominion Energy

Duane	Twining	Dominion Energy
Kalene	Walker	Public
Ryan	Yeung	Public
Dustin	Zavada	General Electric

SUBJECT: MEETING SUMMARY OF THE SEPTEMBER 3, 2024 HIGHER BURNUP WORKSHOP V DATED OCTOBER 17, 2024

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TClark, NRR	DKing, NRR	BWagner, NMSS
ACollier, NRR	AKock, NRR	KWebber, RES
	SKrepel, NRR	SWeerakkody, NRR
	LKyriazidis, RES	BWise, NRR
	MMahoney, NRR	AZoulis, NRR

ADAMS Accession Nos.:

Package: ML24277A161

Meeting Summary: ML24277A154

Meeting Notice: ML24243A162

Meeting Slides: ML24243A161

OFFICE	DORL/LLPB/PM	DORL/LLPB/LA	DORL/LLPB/BC	DORL/PLPB/PM
NAME	JDelosreyes	DHarrison	GGeorge	JDelosreyes
DATE	10/03/2024	10/16/2024	10/17/2024	10/17/2024

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