

## U.S. Nuclear Regulatory Commission Public Meeting Summary

**Title:** NRC Hybrid Workshop (1 of 3) - Update to RG 1.183, Revision 1, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors"

**Meeting Identifier:** [20231392](#)

**Date of Meeting:** January 9, 2024

**Location:** Hybrid (NRC Headquarters, Rockville, MD and via Microsoft Teams)

**Type of Meeting:** Comment Gathering Public Meeting

**Purpose of Meeting:** This was the first of 3 workshops the U.S. Nuclear Regulatory Commission (NRC) is hosting in early 2024 to discuss a revision to RG 1.183, Revision 1 (<https://www.nrc.gov/docs/ML2308/ML23082A305.pdf>). These workshops will provide opportunities for NRC staff and stakeholders to discuss updates to extend the applicability of the guidance to higher burnup and increased enrichment fuel applications, in support of the NRC's Increased Enrichment Rulemaking (<https://www.regulations.gov/document/NRC-2020-0034-0005>), and to consider other feedback that is relevant to the guidance. The workshops allow for the NRC's external stakeholders to participate in the regulatory process through a comment gathering format as described in the NRC's policy statement on public meetings at 86 FR 14964. The staff will collect comments and input through note-taking and will consider this information while drafting updates to guidance.

### Related Documents:

- [ML23346A110](#) - High Burnup Fuel Source Term Accident Analysis Boiling-Water Reactor Follow-On Calculations, November 16, 2023 (Presentation by NRC Staff to ACRS Subcommittee on Radiation Protection and Nuclear Materials)
- [ML23346A111](#) - High Burnup Fuel Accident Source Terms, November 16, 2023 (Presentation by Sandia National Laboratories to ACRS Subcommittee on Radiation Protection and Nuclear Materials)
- [ML24005A107](#) - RG 1-183 Public Workshop (1 of 3) NRC & SNL Presentation Material
- [ML23082A305](#) - Regulatory Guide (RG) 1.183, Revision 1, Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors
- [ML23352A393](#) - Transcript of Advisory Committee on Reactor Safeguards - Radiation Protection and Nuclear Materials Subcommittee Meeting, November 16, 2023, Pages 1-259 (Open)
- [ML24008A044](#) - NEI - Slides for NRC Workshop 1 on Revision to RG 1.183 R1 - Final - ML24008A044
- [ML24008A156](#) - 01/09/2024 NRC Hybrid Workshop (1 of 3) - Update to RG 1.183, Revision 1, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors"

## Summary:

On January 9, 2024, the NRC staff held a workshop, formally known as a comment gathering public meeting, to discuss the revision of Regulatory Guide (RG) 1.183, Revision 1, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," Agencywide Documents Access and Management System (ADAMS) at Accession No. ML23082A305. This workshop included presentations by the NRC staff and representatives from Sandia National Laboratories (SNL), the Nuclear Energy Institute (NEI) and the Electric Power Research Institute (EPRI). The meeting provided an opportunity for NRC staff to discuss updates to extend the applicability of RG 1.183 to higher burnup and increased enrichment fuel applications, in support of the NRC's Increased Enrichment Rulemaking (<https://regulations.gov> under docket "NRC-2020-0034"), and to consider other feedback that is relevant to the guidance contained in the RG. The meeting notice is available at ADAMS Accession No. ML24008A156. The NRC, SNL and industry meeting slides are available at ADAMS Accession Nos. ML24005A107 and ML24008A044, respectively.

Michael X. Franovich, Director of the Division of Risk Assessment in the Office of Nuclear Reactor Regulation (NRR), made opening remarks. Following the opening remarks, as required by the Commission's Policy Statement on Public Meetings (86 FR 14964), the staff described methods that stakeholders can use to provide input and feedback to the NRC and the staff clarified that comments regarding the NRC's Increased Enrichment Rulemaking should be submitted through the <https://regulations.gov> website under docket ID "NRC-2020-0034."

The first presentation given by NRC staff provided an overview of the plan to update RG 1.183 and a review of the purposes of RGs, how they are maintained and the process the staff follows for updating RGs. In discussing the background of RGs, the staff stated that RGs are used to assist stakeholders in understanding and complying with NRC rules and regulations and that they conserve licensee and NRC resources by simplifying the licensing process by describing methods the staff has predetermined to be acceptable to meeting regulations. Thus, RGs relieve applicants and licensees of the burden of demonstrating that approved methods satisfy applicable NRC requirements. The process to update RGs is described in Management Directive 6.6, "Regulatory Guides," ADAMS Accession No. ML22010A233, and includes significant internal staff effort in developing new guidance and attendant technical bases; external interactions, including public comment periods; and, if necessary, briefings to the Advisory Committee on Reactor Safeguards (ACRS). During this presentation, the staff reviewed the process to withdraw a RG in cases when the guidance in a RG has been relocated to another document, or if the staff concludes that the guidance in a RG is no longer an acceptable means of complying with applicable requirements.

The staff then listed three main reasons for updating RG 1.183, Revision 1: (1) to provide guidance that is applicable for fuel burnups greater than 68 GWd/MTU; (2) to develop guidance to implement certain Increased Enrichment Rulemaking decisions, as necessary; and (3) to consider other improvements to the guidance, in particular ones that optimize conservatism in methods approved by the staff. The staff completed the first presentation by reviewing the current project schedule, which includes a total of five public meetings from January 2024 through April 2024, and a briefing to the ACRS in the fall of 2024. The project plan aims toward submitting the Draft Guide (DG) to the Commission in December 2024, in conjunction with the Increased Enrichment Rulemaking SECY forwarding the proposed rule for Commission vote.

The second presentation was provided by SNL. This presentation reviewed the content in Sandia Report No. 2023-01313, "High Burnup Fuel Source Term Accident Sequence Analysis."

In summary, SNL found that increased burnup or extended enrichment does not significantly impact the source term, but that the most significant change in the source term comes from improvement in the modeling of best practices (e.g., from the SOARCA, post-Fukushima studies) and supported by experimental observations (e.g., PHEBUS). These studies suggest a greater prevalence of low-pressure scenarios that can lead to higher radiological releases to containment during the in-vessel phase. Lastly, SNL highlighted that for boiling water reactors, retention in the suppression pool can have a significant effect on the containment source term. This presentation was abridged from a more detailed presentation that was provided to the ACRS on November 16, 2023. The ACRS meeting transcript is available at ADAMS Accession No. ML23352A393.

The third presentation was provided by the NRC staff. This presentation reviewed follow-on calculations that the staff has been considering with regards to a pathway-specific source term in boiling water reactors. The staff described how modeling of the main steam lines was refined in these calculations to provide better estimation of the distribution of fission products. The staff presented preliminary source term inventory fractions for the early in-vessel accident phase at a boiling water reactor, broken down by radionuclide chemical grouping (e.g., noble gases, halogens, alkali metals) and release pathway (i.e., suppression pool, containment and steam line). These results indicate that a pathway specific source term may be a reasonable approach to account for the impact of the suppression pool both in containment and the main steam line. Meeting participants expressed a significant amount of interest in these calculations and several questions on this topic were fielded by NRC staff. NRC staff mentioned that this methodology will be described in a report that will be published in Summer 2024.

The last presentation provided the nuclear industry's initial perspective on the effort to update RG 1.183, Revision 1 and was organized by NEI; however, remarks were delivered by industry representatives, including members of utilities, EPRI and a consultant. Presenters emphasized that open and transparent dialog is critical to identify and resolve key technical issues that pertain to the RG. Industry representatives recognized that many power reactor licensees will be challenged to implement high burnup and increased enrichment fuels because of source term modeling used in Sandia Report No. 2023-01313. Presenters observed that the SNL report shows that increased burnup and enrichment does not strongly impact in-containment source term and that suppression pool scrubbing is prevalent during boiling water reactor accident progression—significantly reducing the non-noble gas activity component of the in-containment source term. Therefore, presenters requested that staff consider establishing methods for crediting suppression pool scrubbing in design basis accident analyses.

Additionally, industry representatives requested that the staff consider how additional safety equipment, such as Station Blackout and Advanced Accident Mitigation (B.5.b) and Flex equipment, as well as updated risk insights can be applied to design basis accident analyses; how other changes (e.g., particulate deposition in main steam lines, statistical approaches to dose calculations and cases where the guidance drives users to assume airborne and water releases that are more than core inventory) can improve realism and facilitate implementation of the guidance in the RG; and if the staff can provide assurance of the continued acceptance of earlier revisions of the RG. Finally, industry representatives provided some insights into research that EPRI may be conducting on behalf of the industry to inform applications of severe accident scenarios.

Michael Franovich, Director of the Division of Risk Assessment in NRR provided closing remarks.

No regulatory decisions were made during the meeting.

List of Attendees

January 9, 2024, Public Meeting NRC Hybrid Workshop (1 of 3) - Update to RG 1.183, Revision 1, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors"

<b>Name</b>	<b>Affiliation</b>	<b>Name</b>	<b>Affiliation</b>
C A	Self	David Kortge	Constellation
Birol Aktas	Southern Nuclear Company	Sam Lafountain	SNC
Jill Anderson	APS	Leigh Lloveras	Breakthrough Institute
Dever Atwood	BWROG Chair	Rick Loeffler	Xcel Energy
Uriel Bachrach	Westinghouse	Peter Lowry	PNNL
Steve Baker	Baker Consulting Services	David Luxat	Sandia National Laboratories
Philip Benavides	NRC	Edwin Lyman	UCS
Jana Bergman	CurtissWright/Scientech	Kevin Lynn	NuScale
Andrew Bielen	NRC	Alex Markivich	Dominion Energy
Dwayne Blaylock	Enercon Services Inc.	Don Marksberry	NRC
Mark Blumberg	NRC	Richard McCarty	Nuclear Utility Group on Equipment Qualification (NUGEQ)
Francis Bolger	EPRI	Dave McIntyre	NRC
Butch Bornt	Southern Nuclear	Sean Meighan	NRC
Jan Bostelman	Self	Joseph Messina	NRC
Andrew Bowman	Westinghouse Electric Company	Brian Mount	Dominion Energy
Eric Bowman	NRC	Carole Naugle	Framatome
Greg Broadbent	Consultant	Matthew Nudi	EPRI
Kristy Bucholtz	NRC	Donald Palmrose	NRC
Scott Burnell	NRC	John Palsmeier	NuScale Power
Justin Byard	Dominion Energy	John Parillo	NRC
Shawn Campbell	NRC	Frances Pimentel	NEI
Johnathan Chavers	Southern Company	Doug Pollock	TVA
Rob Choromokos	EPRI	Steven Pope	ISL, Inc.
Paul Clifford	Framatome	Blake Purnell	NRC
Price Collins	Duke Energy	William Rautzen	NRC
Phil Couture	Entergy	MJ Ross-Lee	NRC
Aladar Csontos	NEI	Michael Salay	NRC
Kristopher Cummings	NuScale Power	Baris Sarikaya	Constellation
Steven Dolley	S&P Global Platts	Raymond Schneider	Westinghouse
Hossein Esmaili	NRC	Harold Scott	Self

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<b>Name</b>	<b>Affiliation</b>	<b>Name</b>	<b>Affiliation</b>
Mike Eudy	NRC	Melissa Shahzadeh	Council of State Governments - Midwest
Fernando Ferrante	EPRI	Carlos Sisco	Winston & Strawn
John Fisher	Energy Northwest	Scott Stanchfield	Entergy
Michael Franovich	NRC	Christopher Staum	Constellation
Shane Gardner	GE Hitachi Nuclear	James Stavely	PSEG Nuclear
Steven Garry	NRC	Charles Stroupe	Duke Energy
William Gassmann	Constellation	Christie Taylor	Duke Energy
Lisa Gerken	Framatome	Brian Timm	Duke Energy
Alex Gilbreath	SNC	Nadejda Todorova	Constellation
Zachary Gran	NRC	Christopher Van Wert	NRC
Paul Guinn	NuScale Power	Storm Veunephachan	NRC
Nathaniel Hall	STPNOC	Kim Webber	NRC
Michelle Hart	NRC	Sunil Weerakkody	NRC
David Hinder	GE Hitachi	Lewis Wells	Constellation
Kevin Hsueh	NRC	Albert Widmer	Energy Harbor
Harley Hutchins	Self	Zhe Yuan	NRC
Caryl Ingram	Duke Energy Corp	Andrew Zach	Senate
Randy Jacobs	GEH		
Steve Jones	NRC		
Meena Khanna	NRC		
Tom Kindred	SNC		
Daniel King	NRC		
Audrey Klett	NRC		
Jeffrey Kobelak	Westinghouse		