



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

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July 8, 2023

MEMORANDUM TO: William Jessup, Chief
Advanced Reactor Licensing Branch 1
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

FROM: Michael Orenak, Project Manager */RA/*
Advanced Reactor Licensing Branch 1
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF THE APRIL 24, 2023, PARTIALLY CLOSED
MEETING BETWEEN THE U.S. NUCLEAR REGULATORY
COMMISSION STAFF AND X ENERGY, LLC REGARDING THE
GRAPHITE MATERIAL QUALIFICATION METHODOLOGY
WHITE PAPER

Meeting Information:

Applicant: X Energy LLC

Docket/Project No. 99902071

EPID: L-2018-LRM-0076

Meeting Title: Meeting with X Energy LLC regarding the Xe-100 Licensing White Paper:
Graphite Material Qualification Methodology

Meeting Date: April 24, 2023

Meeting Type: Partially Closed

Public Meeting Notice Agencywide Documents Access and Management System (ADAMS):
ML23108A166

Public Portion Meeting Slides: ML23104A435

Closed Portion Meeting Slides: ML23104A434 (non-public)

Meeting Attendees: See Enclosure for list of meeting attendees.

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Meeting Summary:

The U.S. Nuclear Regulatory Commission (NRC) staff held a virtual partially closed meeting with representatives from X-Energy, LLC (X-energy). The meeting was conducted in accordance with NRC Management Directive 3.5, "Attendance at NRC Staff-Sponsored Meetings" (ADAMS Accession No. ML21180A271).

During the public portion of the meeting, X-energy presented their public slides. There was no discussion with the NRC staff during or after the presentation. There were no public comments during the public comment period.

During the closed portion of the meeting, X-energy presented a proprietary set of slides to the NRC staff. The main points of discussion in the closed session included:

For the slide with the reactor diagram and temperatures graph, the NRC staff asked several questions:

- The NRC staff asked if this analysis is for abnormal events, or just for normal events. X-energy responded that this graph was for normal 100% power operation and no abnormal events are represented. This data set is for the best estimate at this moment in time and will likely change as the design is refined.
- The NRC staff also asked [[]].
- The NRC asked what the top reflector material is. X-energy responded that the top reflector is made of [[]].

The NRC staff asked how X-energy will know when the best fit curves go beyond the crossover fluence. X-energy responded the graphite is [[]]. The current analysis does not account for uncertainty or material property variability.

X-energy staff stated during their presentation that [[]].

]].

The NRC staff asked X-energy to comment on data from the [[]].

]].

The NRC staff asked if X-energy viewed high temperature creep data at high fluences as relevant. X-energy stated that the [[]].

The NRC staff discussed the use of "limited extrapolation" allowed by the ASME Code. "Limited extrapolation" is not defined in the ASME Code and the NRC staff asked of X-energy is extrapolating temperature, fluence, or both, and asked if X-energy has limits or guidance for extrapolation of this type. X-energy stated that [[]].

]].

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The NRC staff asked if graphite [[]]. X-energy responded that they don't expect to see [[]] could be changed if justified. The NRC staff noted that in the area of a graph where [[]]. The NRC staff asked what are X-energy's plans, or what actions are being taken, if the data [[]]. X-energy responded that they are doing testing at [[]]. X-energy stated that the testing should meet the ASME non-stressed data requirements.

The NRC staff asked about credited historical graphite data, specifically if the graphite in the data can't be guaranteed to be the same as analyzed/used by X-energy to meet the requirements in Article HHA-5000, "Historical Data," of Section III Division 5. X-energy responded that they will work with the manufacturer to assure the graphite used by X-energy is consistent with the tested material.

At the end of the meeting, the X-energy reviewed several questions that they wanted the NRC staff to answer in the NRC's white paper feedback. The NRC staff said to directly ask those questions within the white paper and the NRC will respond.

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DATED: JULY 7, 2023

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ADAMS Accession Number: ML23207A187

NRR-052

OFFICE	NRR/DANU/UAL1/PM	NRR/DANU/UAL1/BC	NRR/DANU/UAL1/PM
NAME	MOrenak	WJessup	MOrenak
DATE	6/7/2023	6/8/2023	6/8/2023

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List of Attendees

Partially Closed Meeting Between the U.S. Nuclear Regulatory Commission Staff and X Energy, LLC Regarding the Graphite Material Qualification Methodology White Paper

Monday, April 24, 2023

Name	Organization
Mike Orenak	U.S. Nuclear Regulatory Commission (NRC)
Matt Gordon	NRC
Stephanie Devlin-Gill	NRC
Margret Audrain	NRC
Andrew Proffitt	NRC
Alex Chereskin	NRC
Ryann Bass	NRC
Ingrid Nordby	X-Energy LLC (X-energy)
Travis Chapman	X-energy
Jon Facemire	X-energy
Chris Cruz	X-energy
Charlotte Geiger	X-energy
James Roll	X-energy
Tim Lucas	X-energy
Paul Loza	X-energy
Sam Baylis	X-energy
FJ van Zenten	X-energy
Ryan Buck	X-energy
Mark Natale	US Department of Energy
Carl Friesen	US Department of Energy
Matthew Hahn	US Department of Energy
Gwennaël Beirnaert	Contractor for X-energy
Don Behnke	Contractor for X-energy
Jamie Cano	
Leigh Lloveras	Breakthrough Institute
Zefeng Yu	
Derek Watkins	