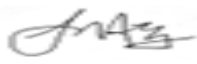




UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 23, 2024

MEMORANDUM TO: Michael Wentzel, Chief
Advanced Reactor Licensing Branch 2
Division of Advanced Reactors and Non-power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation  Signed by Hernandez Munoz, Jorge
on 05/23/24

FROM: Jorge Hernandez, Project Manager
Advanced Reactor Licensing Branch 2
Division of Advanced Reactors and Non-power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF THE JANUARY 17, 2024, PUBLIC MEETING WITH X
ENERGY, LLC. (X-ENERGY), "APPROACH FOR GRAPHITE
QUALIFICATION FOR THE XE-100 HIGH TEMPERATURE GAS
REACTOR" (EPID NO. L-2018-LRM-0076)

Meeting Information:

Applicant: X ENERGY, LLC. (X-energy)

Docket/Project No.(s): 99902071

Public Meeting Notice Agencywide Documents Access and Management System (ADAMS)
Accession No.: ML24017A127

Applicant Presentation Slides ADAMS Accession No.: ML24002B166

Meeting Attendees: See the enclosure for a list of meeting attendees.

CONTACT: Jorge Hernandez, NRR/DANU
(301) 287-9096

Background:

By letter dated July 31, 2023 (ML23212B211), X-energy transmitted a regulatory engagement plan focused on material qualification of graphite and other graphite-related matters, along with the proposed schedule for the meetings.

Prior to this meeting, the following meetings have been held, in accordance with the aforementioned regulatory engagement plan:

- August 24, 2023 (ML23271A128): partially closed meeting to discuss scope of graphite qualification and methodologies that will be included in the Preliminary Safety Analysis Report (construction permit) for the Xe-100 reactor at the Dow Chemical Company facility in Long Mott, TX and referenced technical reports and the information that is planned to be provided in the Final Safety Analysis Report at the operating license application stage.
- October 5, 2023 (ML23319A239): partially closed meeting to discuss X-energy's modelling approach for the stress analysis of irradiated graphite components.
- October 12, 2023 (ML23319A359): partially closed meeting to discuss development of X-energy's proprietary computer model, named Irradiated Graphite Numerical Iterative Solver (IGNIS).
- November 9, 2023 (ML23355A076): partially closed meeting to discuss the design loadings and service level definitions for the graphite core assembly.

The meeting summaries are collected in ADAMS Package No. ML23271A128, "Meeting Summary - X-energy Graphite Qualification Engagement Meetings Series (2023/2024)."

Meeting Summary:

The U.S. Nuclear Regulatory Commission (NRC) staff conducted the meeting in accordance with NRC Management Directive 3.5, "Attendance at NRC Staff-Sponsored Meetings" ([ML21180A271](#)).

This meeting was the fifth meeting included in X-energy's regulatory engagement plan for graphite components.

The X-energy's staff presentation discussed the following topics:

- The methodologies that X-energy intends to use for the consideration of transient and seismic events that will impact the graphite core assembly.
- An introduction to the Price model, the fatigue analysis method that will be used, and homologous stress as used in the model.
- A description of the effects of temperature, volume, and irradiation on graphite fatigue life.
- The seismic qualification framework and reasoning behind the use of the intended approach.
- A description of how X-energy will validate and verify the seismic model through software commercial grade dedication and testing.

The NRC staff made the following questions/observations (including X-energy's responses):

- The NRC staff asked X-energy what quality assurance programs they will be committing to for data quality and software. X-energy indicated that this will be addressed in future technical report submittals.
- The NRC staff asked about the use of test data to model fatigue of graphite components. X-energy responded that it does not expect fatigue to be a significant degradation mechanism; however, it acknowledged the question to address in future licensing submittals.
- The NRC staff discussed the topic of low-frequency and high-consequence seismic event sequences to be analyzed as part of the probabilistic risk assessment as the design matures when implementing the Licensing Modernization Project process in RG 1.233, "Guidance for Technology-Inclusive, Risk-Informed, and Performance-Based Approach to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors" (ML20091L698). X-energy stated that it understands the issue, which is an industry's generic challenge, and will work with the NRC staff in the future as necessary.
- The NRC staff questioned if Miner's Rule can be applied to graphite. X-energy responded in the affirmative.

No regulatory decisions were made as a result of this meeting.

Project No. 99902071

Enclosure: List of Meeting Attendees

cc: X-energy Xe-100 via GovDelivery

SUBJECT: SUMMARY OF THE NOVEMBER 9, 2023, PUBLIC MEETING WITH X ENERGY, LLC. (X-ENERGY), "APPROACH FOR GRAPHITE QUALIFICATION FOR THE XE-100 HIGH TEMPERATURE GAS REACTOR" (EPID NO. L-2018-LRM-0076) DATED: MAY 23, 2024

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ADAMS Accession No: ML24122A992

NRR-106

OFFICE	NRR/DANU/UAL2/PM	NRR/DANU/UTB1/BC	NRR/DANU/UAL2/BC
NAME	JHernandez	GOberson	MWentzel
DATE	05/01/2024	05/23/2024	05/23/2024
OFFICE	NRR/DANU/UAL2/PM		
NAME	JHernandez		
DATE	05/23/2024		

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List of Meeting Attendees
For the January 17, 2024 Public Meeting With X Energy, LLC. (X-Energy), “Approach for Graphite Qualification for the Xe-100 High Temperature Gas Reactor”

Open Meeting

Name	Organization
Christopher Welch	U.S. Nuclear Regulatory Commission (NRC)
Dan Beacon	NRC
Greg Oberson	NRC
Ian Jung	NRC
James Gaslevic	NRC
Jorge Hernandez Munoz	NRC
Jose Pires	NRC
Joseph Bass	NRC
Madhumita Sircar	NRC
Matthew Gordon	NRC
Vince Voltaggio	NRC
Doug Kalinousky	X-energy
Emna Sghaier	X-energy
FJ van Zanten	X-energy
Jaime A Cano	X-energy
James Roll	X-energy
Jasmine Wang	X-energy
Jim Fogarty	X-energy
Jon Facemire	X-energy
Maggie Staiger	X-energy
Sam Baylis	X-energy
Steve Vaughn	X-energy
Tim Lucas	X-energy
Alex Dean	X-energy (contractor)
Gwennael Beirnaert	X-energy (contractor)
Michael Saitta	X-energy (contractor)
Mark Feltner	Dow
William E. Windes	Idaho National Laboratory
Addison Hall	Dominion Energy
Chuck Marks	Dominion Energy
David Gross	Dominion Energy
James A. Brownell	Energy Northwest
Lisa L. Williams	Energy Northwest
Steven Pope	Information Systems Laboratory
Nicole Schlichting	Kairos Power
Ali	Member of Public
Chong Chen	Member of Public
Douglas J. Roll	Member of Public
Raja sekhar Tripuraneni	Member of Public
Tom Roberts	Member of Public
Nassia Tzelepi	National Nuclear Laboratory
Benjamin D. Kosbab	SGH
Jordan M. Seawright	SGH

Name	Organization
Michael Scott DeFilippis	Tennessee Valley Authority
Keith W. Means	Westinghouse
Zefeng Yu	Westinghouse

Closed Meeting

Name	Organization
Alexander Chereskin	NRC
Christopher Welch	NRC
Dan Beacon	NRC
Greg Oberson	NRC
Ian Jung	NRC
James Gaslevic	NRC
Jorge Hernandez Munoz	NRC
Joseph Bass	NRC
Jose Pires	NRC
Madhumita Sircar	NRC
Yamir Diaz-Castillo	NRC
Doug Kalinousky	X-energy
Emna Sghaier	X-energy
FJ van Zanten	X-energy
Jaime A Cano	X-energy
James Roll	X-energy
Jasmine Wang	X-energy
Jim Fogarty	X-energy
Jon Facemire	X-energy
Maggie Staiger	X-energy
Sam Baylis	X-energy
Steve Vaughn	X-energy
Tim Lucas	X-energy
Alex Dean	X-energy (contractor)
Benjamin D. Kosbab	X-energy (contractor)
Gwennael Beirnaert	X-energy (contractor)
Jordan M. Seawright	X-energy (contractor)
Michael Saitta	X-energy (contractor)