



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

July 19, 2023

MEMORANDUM TO: Joseph A. Proffitt, Acting Chief  
Advanced Reactor Licensing Branch 1  
Division of Advanced Reactors and Non-Power  
Production and Utilization Facilities  
Office of Nuclear Reactor Regulation

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

*Michael Orenak*

Signed by Orenak, Michael  
on 07/19/23

SUBJECT: SUMMARY OF THE APRIL 24, 2023, OBSERVATION MEETING  
BETWEEN THE U.S. NUCLEAR REGULATORY COMMISSION  
STAFF AND X ENERGY, LLC REGARDING THE ATMOSPHERIC  
DISPERSION AND DOSE CALCULATION METHODOLOGY  
TOPICAL REPORT

**Meeting Information:**

Applicant: X Energy LLC

Docket/Project No. 99902071

EPID: L-2022-TOP-0051

Meeting Title: Pre-submittal Discussion of X-energy Topical Report, "Atmospheric Dispersion and Dose Consequences Methods"

Meeting Date: April 27, 2023

Meeting Type: Observation

Public Meeting Notice Agencywide Documents Access and Management System (ADAMS):  
ML23108A164

Public Meeting Slides: ML23107A143

Meeting Attendees: See Enclosure for list of meeting attendees.

CONTACT: Michael D. Orenak, NRR/DANU  
(301) 415-3229

**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" (ML21180A271).

During the public meeting, X-energy presented their slides detailing the approaches being taken for atmospheric dispersion and dose approach for the Xe-100 reactor.

The NRC asked that given the Xe-100 is planned to be built with four units on site, has there been any consideration for a multi-unit event and any impacts on cross-units control rooms. X-energy responded that the current analysis is to look at the limiting unit. X-energy stated they will evaluate multi-units in the future, but that is out of the scope for this topical report.

The NRC staff noted that the proposed TR dispersion methodology describes use of a generic method to make calculations without local meteorological conditions, but for a license application, site-specific atmospheric dispersion analysis must be made. X-energy responded that the methodology is intended to be bounding to result in a set of enveloping atmospheric dispersion factors ( $\chi/Qs$ , pronounced "chi over Qs"). The NRC staff also noted that the topical report should describe the technical basis for the use of reduction factors, as taken from referenced documents, including application of the Ramsdell-Fosmire correlation.

The NRC staff also confirmed that X-energy intended to use equations from NRC Regulatory Guide (RG) 1.194, "Atmospheric Relative Concentrations for Control Room Radiological Habitability Assessments at Nuclear Power Plants" (ML031530505), and RG 1.145, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants" (ML003740205), with conservative generic values to develop the dispersion analysis. Then, once the specific site is known, X-energy will perform an ARCON analysis with site-specific meteorological information. The two analyses would be compared, and the most conservative atmospheric dispersion factors will be used as input to the dose analysis to support the license application (i.e., construction permit application).

The NRC staff noted that X-energy referenced NRC Draft Guide (DG) 4030. Because DG-4030 has yet to be approved, any topical report or application must have a full description of the methodology until the resulting Regulatory Guide is issued.

The NRC staff noted that for all  $\chi/Q$  equations in the topical report, a value for each variable should be provided to support the NRC staff's review.

The NRC staff noted that the topical report should describe all reduction factors, how and why they are used (e.g., evaluation of design basis accident (DBA) consequences vs. use in the NEI 18-04, Revision 1, "Risk-Informed Performance-Based Guidance for Non-Light Water Reactor Licensing Basis Development" (ML19241A336), approach (non-DBAs)), and why they are appropriate to use in the methodology.

The NRC staff asked whether a point source is being used instead of a diffuse source for control room dose. X-energy clarified that it was a diffuse source consistent with guidance in RG 1.194.

The NRC staff noted the topical report methodology for non-DBAs would result in a “best-estimate” dose offsite. The NRC staff asked how the methodology would estimate consequence uncertainty as needed for the NEI 18-04 approach. X-energy indicated that uncertainty analysis is still under consideration.

The NRC staff asked for clarification if the control room  $\chi$ /Qs were best-estimate or 95<sup>th</sup> percentile (conservative) considering the slide indicating that the event for control room dose was for non-DBAs only. X-energy responded that the control room  $\chi$ /Qs will be conservative and will not use a reduction factor. X-energy clarified that the evaluated events for the control room dose analysis would be non-DBAs, consistent with the discussion in the X-energy topical report on principal design criteria (PDC), specifically that PDC-19 for the control room does not consider it to be required for defense-in-depth. The NRC staff stated that there was no precedent for not including evaluation of DBAs in the control room habitability evaluation, and the NRC staff would have to take additional time to consider this approach. X-energy stated the discussion of source terms and radiological releases are out of scope for this topical report and noted that it is a topic for future discussion.

There were no public comments at the end of the meeting. X-energy stated they would provide the topical report by the end of the following week (May 5<sup>th</sup>).

SUBJECT: SUMMARY OF THE APRIL 27, 2023, OBSERVATION MEETING BETWEEN THE U.S. NUCLEAR REGULATORY COMMISSION STAFF AND X ENERGY, LLC REGARDING THE ATMOSPHERIC DISPERSION AND DOSE CALCULATION METHODOLOGY TOPICAL REPORT DATED: JULY 19, 2023

**DISTRIBUTION:**

Public  
RidsOgcMailCenter  
RidsOpaMail Resource  
RidsNrrDanu Resource  
RidsNrrDanuUarl Resource  
JProffitt, NRR  
MOrenak, NRR  
SDevlinGill, NRR  
MHart, NRR  
JWhite, NRR  
JSchaperow, NRR

**ADAMS Accession Number: ML23159A096**

**NRR-052**

<b>OFFICE</b>	<b>NRR/DANU/UAL1/PM</b>	<b>NRR/DANU/UAL1/BC (A)</b>	<b>NRR/DANU/UAL1/PM</b>
<b>NAME</b>	MOrenak	JProffitt	MOrenak
<b>DATE</b>	7/05/2023	7/19/2023	7/19/2023

**OFFICIAL RECORD COPY**

## 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

<u>Name</u>	<u>Organization</u>
Mike Orenak	U.S. Nuclear Regulatory Commission (NRC)
Andrew Proffitt	NRC
Stephanie Devlin-Gill	NRC
Michelle Hart	NRC
Jason Schaperow	NRC
Jason White	NRC
Ingrid Nordby	X-Energy LLC (X-energy)
Travis Chapman	X-energy
Jon Facemire	X-energy
Brian Froese	X-energy
Daniel Strohmeyer	X-energy
Jessica Maddocks	X-energy
Julia Sharma	X-energy
Stephanie Yazzie	X-energy
Yvonne Mirowski	X-energy
Wesley Steh	X-energy
Milton Gordon	X-energy
Martin van Staden	X-energy
Carl Friesen	US Department of Energy
Dominik Muszyn	
Lisa Momkus	Oklo
Lisa Matis	
Jodine Vehec	
Jana Bergman	Curtiss Wright
Matt Denman	Kairos

Enclosure