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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Submission of X Energy, LLC (X-energy) Responses to Preliminary Questions for Topical Report, "Control Room Staffing Methodology"

References: (1) Letter from T. Chapman to Nuclear Regulatory Commission dated January 4, 2022, "Submission of Revision 2 to X Energy, LLC (X-energy) Xe-100 Licensing Topical Report: Control Room Staffing Analysis Methodology and Associated Implementation Plans" (ML22004A333)

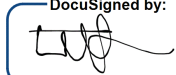
(2) Email to X Energy, LLC dated August 1, 2022, "Preliminary Questions in support of NRC review of the Xe-100 Licensing Topical Report: Control Room Staffing Methodology (XE00-R-R1ZZ-RDZZ-X-000714)"

On January 4, 2022, X Energy, LLC (X-energy), submitted the Topical Report, "Control Room Staffing Analysis Methodology" and associated Implementation Plans (Reference 1) to the Nuclear Regulatory Commission (NRC) for review. This topical report presents the methodology that X-energy is implementing to develop the technical basis for exemption from 10 CFR 50.54(m) licensed operator staffing requirements in accordance with NUREG-1791 through the Xe-100 Human Factors Engineering (HFE) Program. The NRC completed their acceptance review in March 2022 and found the material in the topical report was sufficient to begin the detailed review.

On August 1, 2022, the NRC staff issued Preliminary Questions via email (Reference 2), and X-energy discussed the questions with NRC staff on August 2, 2022, in a public meeting. X-energy's responses to these Preliminary Questions are provided in the Enclosure to this letter.

If you have any questions or require additional information, please contact Ingrid Nordby at inordby@x-energy.com.

Sincerely,

DocuSigned by:

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Travis Chapman
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Enclosure:

Responses to U.S. Nuclear Regulatory Commission Preliminary Questions regarding X Energy, LLC Xe-100
Licensing Topical Report: Control Room Staffing Methodology, Revision 2 (XE00-R-R1ZZ-RDZZ-X-000714)



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Enclosure

**Responses to U.S. Nuclear Regulatory Commission Preliminary Questions regarding
X Energy, LLC Xe-100 Licensing Topical Report: Control Room Staffing Methodology, Revision 2
(XE00-R-R1ZZ-RDZZ-X-000714)**



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NRC Review of: Control Room Staffing Analysis Methodology, Revision 2

NRC Preliminary Question Number: 1

NRC Question

NUREG-1791, "Guidance for Assessing Exemption Requests from the Nuclear Power Plant Licensed Operator Staffing Requirements Specified in 10 CFR 50.54(m)," published July 2005, provides the criteria for NRC staff to use when reviewing a control room staffing analysis provided by an applicant. (These review criteria are included throughout the body of NUREG-1791, and they are also listed/summarized in Appendix A to NUREG-1791.)

Meeting certain criteria in NUREG-1791 will rely on results from an eventual completed control room staffing analysis. (For example, an NRC determination regarding the criteria for a task analysis, discussed in Section 6.3 of NUREG-1791, relies on NRC staff review of information contained in a completed analysis.) However, discussion of a proposed methodology submitted for NRC review and approval should clearly demonstrate how the information necessary to satisfy those criteria will be obtained. Alternatively, if the discussion of specific details associated with a given NUREG-1791 criterion is limited, the discussion should include (as a minimum) explicit indication that the applicant intends for the criterion to be satisfied using a process that will be specified within (and thereby will be specific to) an eventually completed control room staffing analysis.

As enclosures to the letter submitting the topical report, X-energy includes implementation plans for the Human Factors Engineering (HFE) program review elements discussed in NUREG-0711, "Human Factors Engineering Program Review Model," Revision 3. Each of the implementation plans provided includes a "NUREG-0711 compliance list" as an appendix, demonstrating which section(s) of each implementation plan provides the information intended to address each of the criteria for the associated HFE program element. Such lists for the NUREG-1791 criteria, however, are not included in X-energy's submittal.

Please indicate which sections of the provided topical report and/or implementation plans are intended to address each of the criteria listed in NUREG-1791. Alternatively, for any NUREG-1791 criteria that are not directly addressed within the provided topical report or implementation plans, please confirm whether X-energy intends for those criteria to be addressed by processes detailed within an eventual staffing analysis that would be completed using the proposed methodology (to the extent it has been detailed).

X-energy Response

The methodology proposed in the topical report follows the guidance contained in NUREG-1791 as described in Section 4 of the report. Appendix A of NUREG-1791 provides a list/summary of the criteria used by the NRC staff when reviewing a control room staffing analysis. The topical report and attached implementation plans address all criteria listed in NUREG-1791, as applicable to the Xe-100 technology. The tables below in this enclosure provide the location in the topical report and/or the applicable



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implementation plan that addresses all review criteria listed in NUREG-1791, as applicable to the Xe-100 technology.

The columns labeled "Reference" uses the following document abbreviations:

Table 1: Document Abbreviations

Abbreviation	Document
LTR	2022-XE-NRC-002, Control Room Staffing LTR, Submission of Revision 2 to X Energy, LLC (X-energy) Xe-100 Licensing Topical Report: Control Room Staffing Analysis Methodology and Associated Implementation Plans
TR	XE00-R-R1ZZ-ZZZ-X-000697, Xe-100 Licensing Topical Report Control Room Staffing Analysis Methodology, Revision 2
COO	XE00-Z-ZZZ-ZZZ-Y-004342, Human Factors Concept of Operations Description, Revision 1
PMP	XE00-B-G1ZZ-GLZZ-E-001247, Human Factors Engineering Program Management Plan, Revision 2
OER	XE00-R-R1ZZ-RDZZ-X-000982, Operating Experience Review Implementation Plan, Revision 2
TIHA	XE00-R-R1ZZ-RDZZ-X-000984, Treatment of Important Human Actions Implementation Plan, Revision 2
FRA	XE00-R-R1ZZ-RDZZ-X-000985, Functional Requirements Analysis and Function Allocation Implementation Plan, Revision 2
TA	XE00-R-R1ZZ-RDZZ-X-000986, Task Analysis Implementation Plan, Revision 2
S&Q	XE00-R-R1ZZ-RDZZ-X-000987, Staffing and Qualifications Implementation Plan, Revision 2
HSI	XE00-R-R1ZZ-RDZZ-X-000988, Human-System Interface Design Implementation Plan, Revision 2
V&V	XE00-R-R1ZZ-RDZZ-X-000989, Human Factors Verification and Validation Implementation Plan, Revision 2
DI	XE00-R-R1ZZ-RDZZ-X-000990, Design Implementation Implementation Plan, Revision 2



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Table 2.1 Review the Exemption Request

Review Criteria	Reference
Confirm that one or more exemptions to 10 CFR 50.54(m) is required.	TR: Section 3
Confirm that exemptions from other, related regulations are either unnecessary or have been appropriately identified and described by the applicant. If additional exemptions are required that have not been identified by the applicant, the applicant should be informed and the review should be stopped until a complete request for exemptions is submitted.	Additional exemption requests are not required at this time
Confirm that the terms used in the submittal are fully defined.	TR: "Definitions"
Confirm that adequate data and information have been submitted to meet the data requirements for the remainder of the review.	(1)

(1) At current stage of the HFE Program, only Implementation Plans for the HFE Program have been submitted. As the HFE Program progresses, additional data and information will be submitted

Table 2.2 Review of the Concept of Operations

Review Criteria	Reference
The reviewer should confirm that the applicant's description of the concept of operations for the plant or system is complete and that the applicant has addressed each of the aspects of operations and roles of the control personnel.	COO

Table 2.3 Review of the Operational Conditions

This table collects review criteria from section 3.3.1, Operational Conditions Sampling for an Advanced Reactor Design, of NUREG-1791. Section 3.3.2, Special Considerations for Plant Modification Programs, is not applicable for Xe-100 reactor design.

Review Criteria	Reference
The reviewer should confirm that the following operational conditions were analyzed or that an adequate rationale for not analyzing the conditions was provided: <ul style="list-style-type: none"> Normal operational events, including plant start-up, shutdown, or refueling, and significant changes in operating power 	FRA: 3.2.2 TIHA: 3.2.2 TA: 3.2.1 V&V: 3.2.1



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Review Criteria	Reference
<ul style="list-style-type: none"> • Failure events, including instrument failures and HSI failures • Transients and accidents • Reasonable, risk-significant, and beyond-design-basis events, derived from the plant-specific PRA • Conditions that challenge plant safety functions as a result of interconnections and interactions among systems 	
<p>The reviewer should confirm that the following types of personnel tasks were included in the analysis:</p> <ul style="list-style-type: none"> • Risk-significant human actions • Difficult tasks identified through the operating experience review • A range of procedure-guided tasks that are well defined by normal, abnormal, emergency, alarm response, and test procedures • A range of knowledge-based tasks that require greater reasoning about safety and operating goals and the various means of achieving them • A range of human cognitive activities, including decision making • A range of human interactions, including tasks performed by individual control personnel and any tasks performed by personnel acting as a crew • Tasks that are performed with high frequency • Tasks that are important or difficult but infrequently performed 	<p>TIHA: 3.2.1 TA: 3.2.1 V&V: 3.2.1</p>
<p>The reviewer should confirm that the analysis included the following situational factors that are known to challenge human performance:</p> <ul style="list-style-type: none"> • Operationally difficult tasks • Error-forcing contexts • High-workload conditions • Varying-workload situations • Fatigue and circadian factors • Environmental factors 	<p>S&Q: 3.2.2.3 V&V: 3.2.1 and 3.2.3</p>
<p>The range and combination of operational conditions considered by the applicant are appropriate and adequate.</p>	<p>(1)</p>

(1) This criterion is understood to be met as long as all previous criteria in Table 2.3 are met



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Table 2.4 Review Operating Experience

Review Criteria	Reference
Predecessor or similar plants and systems included in the analysis are identified and their similarities and differences from the exemption under consideration are described.	OER: 3.1.2 and 3.2.1
Any recognized industry issues with the plant or system design are identified.	OER: 3.1.2, 3.2.1 and 3.2.2
Any recognized industry issues with staffing for similar plants, systems, or technologies are identified.	OER: 3.1.2, 3.2.1 and 3.2.2
Other sources of operating experience data are identified, along with any limitations of their use in performing the review for the exemption requested.	OER: 3.1.2, 3.2.1 and 3.2.2
For each of the related plants or systems selected, the applicant has reviewed the staffing goals and numbers of control personnel.	OER: 3.1.2
The process used by the applicant for identifying issues during the operating experience review includes a description of the assumptions, criteria, and constraints used in selecting issues and developing interviews of control personnel.	OER: 3.1.2.3
The applicant has identified the risk-important actions associated with existing plants, systems, or relevant technologies that could potentially be a problem if the requested exemption is granted.	OER: 3.2.2
The operating experience review was of sufficient scope to identify the most important relevant information and the applicant's rationale for excluding some experience that could have been analyzed is reasonable.	OER: 3.1
Examples of effective implementations of technologies, practices, or concepts of operation included as support for the exemption are fully substantiated and documented.	OER: 3.2.3

Table 2.5 Review the Functional Requirements Analysis and Function Allocation

Review Criteria	Reference
The set of functions identified as applicable to the analysis is complete and appropriately characterized.	FRA: 3.2, 3.2.1, 3.2.2, 3.2.3, 3.2.4 and 3.2.5



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Review Criteria	Reference
All functions have been allocated to control personnel, automated systems, or a combination of the two, and that the strategies and criteria for the allocations are clear and met.	FRA: 3.2.6, 3.2.7
The function allocations support integrated control staff roles across functions, systems, and other plant personnel.	FRA: 3.2.7
Any new or modified licensed control personnel positions resulting from the function requirements analysis and function allocation have been identified and characterized.	FRA: 3.2.7 S&Q: 3.2.2
The data analyses were performed using appropriate parameters and methods.	FRA: 3.2
The assumptions and estimates used in conducting the analyses were documented and appropriate.	PMP: 6 and 7

Table 2.6 Review the Task Analysis

Review Criteria	Reference
The set of tasks identified as applicable to the analysis is complete and appropriately characterized.	TA: 3.1
The task performance requirements for each task were comprehensively identified.	TA: 3.2.2 and 3.2.3
The tasks for any new or modified licensed control personnel positions (as specified in 10 CFR Part 55) have been identified and characterized.	TA: 3.3
The data analyses were performed using appropriate parameters and methods.	TA: 1.1 and 3.3
The assumptions and estimates used in conducting the analyses were documented and appropriate.	PMP: 6 and 7

Table 2.7 Review the Job Definitions

Review Criteria	Reference
The scope and impact of the exemption request is adequately addressed for control personnel jobs.	COO: 7 S&Q: 3.2.2



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Review Criteria	Reference
Applicable data from the concept of operations, operational conditions, operating experience, functional requirements analysis and function allocation, and task analysis support the roles and responsibilities assigned to each impacted job in the exemption request.	S&Q: 3.2.2.1
The KSA analysis is complete and that the KSAs are consistent with the qualifications required for each impacted job identified in the exemption request.	S&Q: 3.2.2.2 (1)
Coherent job descriptions are maintained for licensed control room personnel (under the current requirements), or are defined for any new jobs included as a part of the exemption request	COO: 7 S&Q: 3.2.2.2
The job definitions for control personnel who will work in crews are coordinated.	LTR: 4.10 S&Q: 3.2.3

(1) KSA analysis is being performed by the Training group in the context of the Training Program development. KSAs are fed into the HFE Program for validation

Table 2.8 Review the Staffing Plan

Review Criteria	Reference
The set of operational conditions identified as applicable to the staffing plan is complete and representative of the exemption request.	S&Q: 3.1.2
The staffing plan will provide adequate numbers of qualified personnel to operate the plant safely under the operational conditions considered.	S&Q: 3.2.1, 3.2.2 and 3.3
Roles/responsibilities are integrated across shifts and among personnel.	S&Q: 3.2.2.1 and 3.2.2.1.3
Travel and response times are adequate and do not trigger adverse conditions for the safety of the plant.	TA: 3.2.3 S&Q: 3.2.2.1.4
The staffing plan uses data from previous sections in a logical/rational manner.	S&Q: 3.2.2.1, 3.2.2.2



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Table 2.9 Review of Additional Data and Analyses

Section 9 of NUREG-1791 does not contain review criteria. However, it states, “Additional review may include the following areas:”

Review Criteria	Reference
Human reliability analysis used to demonstrate the impacts of risk-important human actions.	TIHA: 3.2.3 S&Q: 3.2.2 V&V: 3.2.1
Human-system integration data used to demonstrate that the design of the HSIs supports the concept of operations, functional requirements analysis and function allocation, task analysis, staffing plan, and operating experience.	S&Q: 1.1 V&V: 3.1
KSA analysis used in support of new or changing job definitions.	S&Q: 3.2.2.2
KSA analysis used to support modified tasks or human-system interfaces.	S&Q: 3.2.2
Procedures and training documentation used to demonstrate the implementation of components of the concept of operations, functional requirements analysis and function allocation, or task analysis.	S&Q: 3.2.2

Table 2.10.1 Operational Conditions Sampling

Tables 2.10.1 through 2.10.4 are associated with the review of the staffing plan validation.

Review Criteria	Reference
The scenarios fully incorporate the operational conditions relevant to the exemption request.	V&V: 3.2.1 and 3.2.3.1
Relevant criteria for evaluation of successful performance were used.	V&V: 3.2.3.1.6
Scenarios relevant to the exemption request were used.	LTR: 4.10 COO: 8
Scenarios that challenge the personnel, plant, and system were used.	V&V: 3.2.3.1.2



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Table 2.10.2 Human Performance Measures and Criteria

Review Criteria	Reference
The human performance measures and criteria are relevant to the plant/system concept of operations.	V&V: 1.2, 3.2.3.1.2, 3.2.3.1.4 and 3.2.3.1.6
At a minimum, the selected human performance measures represent the most important outcome behaviors.	V&V: 3.2.3.1.6
The rationale for excluding some potential human performance measures is reasonable.	V&V: 3.2.3.1.6
The selected measures assess both individual and crew performance, where appropriate.	V&V: 3.2.3.1.6
Measures specific to data collection methods or constructs have been used appropriately.	V&V: 3.2.3.1.2 and 3.2.3.1.3
The criteria defined for acceptable human performance on each measure is reasonable.	V&V: 3.2.3.1.6 and 3.2.3.1.8 (1)
Any identified environmental conditions, external conditions, or staffing practices that could potentially degrade individual or crew performance, are effectively addressed by the staffing plan.	V&V: 3.2.2, 3.2.3.1.3, 3.2.3.1.4 and 3.2.3.1.8
Valid methods and criteria have been identified.	V&V: 3.2.3.1.6
The data analyses were performed using appropriate parameters and methods.	V&V: 3.2.3.1.8
The assumptions and estimates used in conducting the analyses are documented and appropriate.	V&V: 3.2.3.1.9, 3.2.3.2 and 3.2.4

(1) Acceptable criteria are not explicitly addressed in the V&V IP. These will be defined in a validation procedure, which is developed before scenario execution

Table 2.10.3 Data Sources or Demonstration Methods

Review Criteria	IP Reference
The selected design of the staffing plan validation, the data sources, and the demonstration methods comprehensively address the dynamic aspects of the staffing plan and support the requested exemption.	LTR: 4.10 S&Q: 3.2.2.3 and 3.2.3



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Review Criteria	IP Reference
The data sources and demonstration methods were used appropriately.	V&V: 3.2.3.1.8
The appropriate quantitative, objective measures and criteria were defined and captured. See Section 5.2, "Validating Staffing Plans," of NUREG/CR-6838 for further information.	V&V: 3.2.3.1.5 and 3.2.3.1.6
The data collection and analysis were conducted appropriately.	V&V: 3.2.3.1.8
The scope and data quality were adequate.	V&V: 3.2.3.1.8
The outcomes were reasonable/valid.	V&V: 3.2.3.1.9

Table 2.10.4 Staffing Plan Validation Outcomes

Review Criteria	IP Reference
The results of analyses demonstrate that control personnel, individually and working in crews, if applicable, can accomplish their tasks within performance criteria.	V&V: 3.2.3.1.9
The results of analyses demonstrate that the staffing plan does not result in either excessively high or minimal workload demands on control personnel for the operational conditions considered.	V&V: 3.2.3.1.9 and 3.3.3.2
The results of the analyses demonstrate that the staffing plan does not compromise control personnel situational awareness.	V&V: 3.2.3.1.2, 3.2.3.1.6 and 3.2.3.1.9
The staffing plan effectively addressed any identified environmental conditions or staffing practices that could potentially degrade individual or crew performance.	V&V: 3.2.3.1.9



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NRC Review of: Control Room Staffing Analysis Methodology, Revision 2

NRC Preliminary Question Number: 2

NRC Question

NUREG-1791, Section 3.3.1, "Operational Conditions Sampling for an Advanced Reactor Design," states, in part, that the reviewer should confirm that the analysis included the following situation factors that are known to challenge human performance: fatigue and circadian factors, and environmental factors."

X-Energy submission, "Xe-100 Licensing Topical Report Control Room Staffing Analysis Methodology," Revision 2, does not mention fatigue and circadian factors, or environmental factors, as part of the development or review of operational conditions.

Please confirm that X-Energy intends for the eventual staffing analysis, conducted using the proposed methodology, to include situation factors known to challenge human performance, specifically fatigue and circadian factors and environmental factors in the operational conditions.

X-energy Response

X-energy intends for the eventual staffing analysis conducted using the proposed methodology in the topical report, "Control Room Staffing Analysis Methodology" to adhere to the guidance of NUREG-1791, Section 3.3.1, "Operational Conditions Sampling for an Advanced Reactor Design." X-energy will perform partial validation testing, as discussed in the Xe-100 Human Factors Verification and Validation Implementation Plan, to evaluate operator performance during operational conditions. The partial validations will be performed once the human-system interface (HSI) is implemented, a set of operating procedures is developed, and a volunteer crew knowledgeable of the plant design and operation is available, prior to the Integrated System Validation (ISV).

X-energy will include fatigue, circadian factors, and environmental factors in the operational conditions during these partial validations. Factors that X-energy plans to utilize during this evaluation include keeping the crew awake the night before the partial validation, running the partial validation during nighttime hours, adjusting the ventilation in the control room simulator for changing environmental conditions such as elevated temperature, introducing high noise to simulate steam leaks or lifting relief valves, and providing poor or no lighting in the control room simulator.



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NRC Review of: Control Room Staffing Analysis Methodology, Revision 2

NRC Preliminary Question Number: 3

NRC Question

NUREG-1791, Section 6 “Review the Task Analysis,” Subsection 6.2, “Applicant Submittals,” states, in part, that “task analysis data submitted in support of the exemption request should include the following, as applicable: minimum task performance requirements in terms of time, timing, accuracy, or other relevant criteria, as identified in Table 2.” Table 2 provides a list of performance requirements that should be considered for various data points to support the task analysis.

- a. X-Energy submission, “Xe-100 Licensing Topical Report Control Room Staffing Analysis Methodology,” Revision 2, does not state explicitly that each of the task performance requirements discussed in Table 2 will be determined.

Please confirm that X-Energy intends for the eventual staffing analysis, conducted using the proposed methodology, to determine each of the task performance requirements listed in Table 2 of NUREG-1791 as part of the task analysis conducted to support the control room staffing analysis for the Xe-100.

- b. X-Energy submission, “Xe-100 Licensing Topical Report Control Room Staffing Analysis Methodology,” Revision 2, does it provide details regarding how each of the task performance requirements discussed in Table 2 will be determined.

Please indicate whether X-energy is, at this time, seeking approval regarding the specific methodologies that will be used to determine the task performance requirements listed in Table 2 of NUREG-1791 as part of the task analysis conducted to support the control room staffing analysis for the Xe-100. If X-energy is seeking such approval, please provide additional details regarding how those requirements will be determined.

X-energy Response

- a. X-energy intends for the eventual staffing analysis, conducted using the proposed methodology described in the topical report, to determine each of the task performance requirements listed in Table 2 of NUREG-1971. This will be to the extent that the task performance requirements are applicable to the Xe-100 Main Control Room design.

For the items in Table 2 of NUREG-1791 that are not applicable to the Xe-100 Main Control Room design or are only applicable in a general way and not task-by-task, the completed staffing analysis will provide the justification for why it’s not applicable to the Xe-100 100 Main Control Room design and/or how the requirement is met in a general way. Currently, examples of this are requirements applicable to the digital software-based Xe-100 Main Control Room, such as Physical Position and Biomechanics. Items related to workload, stress, and fatigue will be evaluated directly during partial



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validations, and the outputs of the validations will inform the HFE analysis and HSI design, as appropriate.

Specific details relating to meeting the Categories, Data Items, and Requirements of Table 2 of NUREG-1791 will be identified during the Task Analysis phase and included in the test scenarios that will be developed for the Human Factors Verification and Validation process.

- b. X-energy is not currently seeking approval regarding the methodologies identified in the Task Analysis and the Human Factors Verification and Validation Implementation Plans that will be used to determine the task performance requirements. Once the tasks analysis is completed, the scenario development process will identify the specific methodology (procedure for validation) to be used to verify the ability of the control room operators to complete each required task.



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NRC Review of: Control Room Staffing Analysis Methodology, Revision 2

NRC Preliminary Question Number: 4

NRC Question

NUREG-1791, Section 8, "Review the Staffing Plan," Subsection 8.2, "Applicant Submittals," states, in part, that the "staffing plan submitted in support of the exemption request should include the following elements: expected travel times or response times for control personnel who need to move to new locations (e.g., home to the plant or office) or provide other support (e.g., to log in to system control computers from home), when applicable." NUREG-1791, Subsection 8.3, "Review Criteria," states, in part, that the "reviewer should be able to ensure that each of the following criteria has been met: Travel and response times are adequate and do not trigger adverse conditions for the safety of the plant."

X-Energy submission, "Xe-100 Licensing Topical Report Control Room Staffing Analysis Methodology," Revision 2, Section 4.7. "Staffing Plan," states, in part, that "In the case of operations that take place outside the main control room, the location and personnel will be specified."

Please confirm that X-energy intends for the eventual staffing analysis, conducted using the proposed methodology, to address travel and response times for actions of control room operators outside the main control room, in addition to the location and personnel who will perform the actions. Please also confirm that X-energy intends for the eventual completed staffing analysis to provide information that the travel times, response times, locations, and personnel will be sufficient to not trigger adverse conditions for the safety of the plant.

X-energy Response

The document "Xe-100 Task Analysis Implementation Plan," Revision 2 states in part that the Task Analysis methodology covers the identification of tasks for the full range of plant operating modes, including startup, normal operations, abnormal operations, transient conditions, shutdown conditions, and main control room habitability. Additionally, the Task Analysis will identify tasks that the control room operators will need to be performed outside of the control room to support the full range of plant operating modes. The Task Analysis specifies if any action needs to be performed in the field, the action will be performed by a field technician. As described in the topical report, X-energy will add the specific location of tasks required to be performed in the field (e.g., where manual valves are located) once this information becomes available in the system design information.

The current Xe-100 design does not require the control room operators to operate any equipment in the plant, including the need to relocate to a place where they would continue the shutdown of the plant in case of unavailability of MCR. The only remote location in the plant design is the Reserve Shutdown Room which contains a local trip button that is a backup to the MCR, and this trip button would be operated by the field technician upon order from the control room operators.



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As the Xe-100 design becomes finalized, if the Task Analysis identifies the control room operators are required to perform actions in the field, the eventual staffing analysis using the proposed methodology in the topical report will address travel and response times for the actions of the control room operators outside of the control room in accordance with the guidance in NUREG-1791. It will identify the location and personnel required to perform that action. The completed staffing analysis will also provide information to confirm that if control room operators are required to perform any action outside of the control room that the travel and response times, locations, and personnel required to perform the action will be sufficient and not trigger adverse conditions for the safety of the Xe-100 plant.