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)

X Energy LLC (X-energy) submitted XE00-R-R1ZZ-RDZZ-X-000714, "Xe-100 Licensing Topical Report: Control Room Staffing Methodology," Revision 2 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML22004A333) in January 2022. The U.S. Nuclear Regulatory Commission (NRC) staff performed an acceptance review of the subject topical report and found, in March 2022, that the material presented was sufficient to begin the detailed review (ADAMS Accession No. ML22068A223).

During the detailed review of the topical report, the NRC staff identified a set of preliminary questions and observations to improve its understanding of the information presented in the subject report. The questions are intended to:

- Obtain clarification regarding the material in the topical report.

- Promptly identify areas where additional information may be needed.

- Facilitate discussions and continue an effective communication between the NRC staff and X-energy.

The NRC staff plan to meet with X-energy on August 2, 2022, to discuss the preliminary questions below in a public meeting. Based on the outcome of its discussions with X-energy, the NRC staff may develop formal requests for additional information or continue with the development of the safety evaluation report.

Preliminary Questions:

1. 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).

2. 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.

3. 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.

4. 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.