

U.S. NUCLEAR REGULATORY COMMISSION STAFF FEEDBACK REGARDING XE-100 LICENSING WHITE PAPER: TRAINING PROGRAMS, CONTROL ROOM OPERATOR QUALIFICATION, AND CONTROL ROOM OPERATOR ELIGIBILITY (EPID L-2022-LRO-0025)

SPONSOR AND SUBMITTAL INFORMATION

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Brief Description of the White Paper: This white paper presents the X Energy LLC (X-energy) approach to developing training programs for Xe-100 plant staff, qualifying control room operators, and establishing their eligibility requirements. X-energy requested the U.S. Nuclear Regulatory Commission (NRC) staff to review this white paper and provide feedback.

The NRC staff are making no regulatory findings on this white paper, and nothing herein should be interpreted as an official agency position. The NRC staff's comments provided in the attachment are specific to the white paper as submitted. The NRC staff encourages further pre-application engagement, especially for novel design features or planned approaches that differ from currently operating reactors. These early discussions help to facilitate the NRC staff understanding of the unique aspects of the Xe-100 reactor design. This will be helpful when considering other related topics such as control room staffing and other subsequent submittals.

TECHNICAL ASSESSMENT

The Xe-100 white paper titled, "Training Programs, Control Room Operator Qualification, and Control Room Operator Eligibility," (white paper) provides a useful perspective about how X-energy plans to train and qualify control room operators. Specific NRC staff feedback is provided in the following comments. The comments are organized by their applicable section of the white paper.

Section 3. Overview of Regulatory Requirements

This section outlines applicable regulatory requirements and exemptions for development of the Xe-100 training programs, the Qualified Control Room Operator (QCRO) position, and eligibility criteria. X-energy states that the outlined exemptions will be presented in future submittals.

1. In section 3.2.1 of the white paper, X-energy states that it intends to use certified (non-licensed) operators in a manner consistent with an approach proposed as part of an

early iteration of the preliminary proposed rule language for Title 10 of the *Code of Federal Regulations* (10 CFR) Part 53. However, the NRC staff has since determined that such a certified operator approach would be inconsistent with the Atomic Energy Act of 1954, as amended (AEA), because it would allow the manipulation of the controls of a utilization facility by an individual who had not been issued a license by the NRC, in contravention of AEA § 107. Therefore, the NRC staff removed the certified operator approach from the preliminary proposed rule language for 10 CFR Part 53.

The requirement of AEA § 107 that the NRC issue licenses to operators for the manipulation of the controls of a utilization facility cannot be delegated to a facility licensee through an operator certification program. Instead, 10 CFR Part 55 enacts this requirement by establishing a process by which an individual may apply to the NRC for an operator license and, if that process is satisfied, the NRC will issue the individual a license. Although 10 CFR Part 55 includes a provision, 10 CFR 55.11, allowing for exemptions from the requirements in 10 CFR Part 55, such exemptions must still be authorized by law. Accordingly, an exemption from 10 CFR Part 55 could not be inconsistent with the AEA, including its requirement that the NRC issue operator licenses.

Based on the above, the NRC staff recommends that X-energy revisit their intent to use 10 CFR Part 55 exemptions for certified operators. It may be possible for X-energy to obtain other exemptions from the 10 CFR Part 55 process by which the NRC issues operator licenses. Additionally, X-energy could request as part of an application that any license issued to it for the operation of a facility contain conditions regarding the operator licensing process that tailor the 10 CFR Part 55 process, as exempted, to the specific circumstances of the facility. Such requests for exemptions and license conditions would have to demonstrate that the facility-specific operator licensing process is authorized by law and will not endanger life or property and is otherwise in the public interest.

2. In section 3.2.7, X-energy states their intention to request an exemption from 10 CFR 55.46 requirements for Commission-approval of their simulation facility. The requirements in 10 CFR 55.46 apply to operating license (OL) holders. An exemption may not be necessary if a Xe-100 OL applicant or licensee has a simulation facility that meets the requirements to be a plant-referenced simulator.
3. The NRC staff encourages further discussions between the NRC staff and X-energy about the exemption process moving forward.

Section 4. Xe-100 Training Programs Approach

This section describes X-energy's approach to training development and utilization of the Systems Approach to Training (SAT) methodology as required by 10 CFR 50.120 and defined in 10 CFR 55.4. NUREG-0711, "Human Factors Engineering Program Review Model," will be used to integrate a Human Factors Engineering (HFE) Task Analysis (the Analysis) as input to the SAT program development.

Subsection 4.1.1 Analysis

1. The job/task analysis activities emphasize use of existing station/industry job data and procedures instead of the Xe-100 plant. The training program job and task list should originate from the Xe-100 plant design, safety analysis, and operating practices and procedures. Reference to existing generic task lists for LWR designs as the point of origination for task list development could reduce the efficacy of the Analysis process.
2. The Analysis methods described utilize a Job Analysis process to create a task list and filters the task list using a systematic screening algorithm (Difficulty, Importance, Frequency (DIF)) for determining which tasks require training. The NRC staff observed that the analysis phase does not address identifying requisite knowledge, skills, and abilities (KSA) for each task, only conditions and standards.

Subsection 4.1.2 Design

No comments

Subsection 4.1.3 Development

1. In the first bullet of this subsection, X-energy discusses “identifying learning activities for each learning objective. This is accomplished by classifying the learning objectives as either knowledge or skill related and then developing or adapting existing learning activities to support the objective.” It is not clear to the NRC staff if the identification of learning activities as either knowledge or skill related is done in the Development stage or the Design phase, as stated section 4.1.2:
 - Develop learning objectives. These define exactly what, when, and how the trainee must perform during and after training.
 - Determine the setting in which training is conducted.
2. Development should include sequencing the training material into an organized curriculum for implementation. The NRC staff recommends that X-energy confirm their approach, as this was not stated in the white paper.

Subsection 4.1.4 Implementation

1. This subsection discusses the use of instructors and teaching methodologies for a first of a kind (FOAK) plant.

The white paper states that candidate eligibility requirements will be defined for the inaugural class and subsequent classes, with consideration given to the unique circumstances of a FOAK Xe-100 plant.

Candidate prerequisite knowledge should be defined in the analysis phase for KSA and subsequent training program development.

2. The activities in this subsection do not specifically address exam security processes.

3. The activities in this subsection do not specifically address remediation standards.

Subsection 4.1.5 Evaluation

No comments

Section 5 Qualified Control Room Operators In lieu of Licensed Operators and Engineering Expertise On-shift

This section describes the X-energy approach for developing the technical basis for the Xe-100 QCRO and the basis for requesting exemptions from 10 CFR Part 55 for licensed Senior Reactor Operators (SROs) and licensed Reactor Operators (ROs).

1. The white paper explains that there is only one level of operator for Xe-100 (i.e., not separate RO and SRO positions). A QCRO receives training equivalent to that of a traditional SRO and Shift Technical Advisor (STA). X-energy intends to combine the QCRO position with the STA role. There will not be a stand-alone STA training program or qualification. Shift supervisors are also trained as QCROs and receive additional training that addresses high-level management skills and behaviors and provides a broader perspective of plant operations. X-energy plans to submit a topical report for the QCRO approach that will address QCRO duties in more detail.

The NRC staff understand that the review of the topical report related to this topic is necessary to better understand X-energy's suggested roles and responsibilities among the various QCRO qualified positions on shift.

Section 6 Control Room Operator Eligibility

Background: This section describes the approach to establish the eligibility criteria (i.e., education, experience, and training minimum requirements) for staffing plant personnel.

1. X-energy intends to follow the guidance of Regulatory Guide 1.8, "Qualification and Training of Personnel for Nuclear Power Plants," Revision 4, which endorses ANSI/ANS 3.1-2014, "Selection, Qualification and Training of Personnel for Nuclear Power Plants." X-energy should note that the NRC staff did not endorse ANSI/ANS 3.1-2014 for the purposes of meeting 10 CFR Part 55. This is because the NRC review of applications for operator licenses is performed in accordance with 10 CFR Part 55, "Operators' Licenses," Subpart D, "Applications", and public comment on the draft Regulatory Guide 1.8, Revision 4, revealed conflicts between ANSI/ANS-3.1, Revision 11 of NUREG-1021, "Operator Licensing Examination Standards for Power Reactors", and National Academy for Nuclear Training (NANT) qualification standards. However, the NANT qualification standard is one way to meet 10 CFR Part 55 and the NRC staff may reconsider endorsement of ANSI/ANS 3.1-2014 in the future.
2. In Section 6.1 of the white paper, there is a note stating: "Eligibility criteria is not required to be complete prior to taking the qualification exam." The NRC staff would like to know more detail about X-energy's approach regarding which eligibility criteria are not necessary to be complete before taking the examination.

3. Given the combination of the STA with QCRO position and the minimum education requirement for QCROs as a high-school diploma, the staff would like to know if X-energy considered the Commission policy statement, "Education for Senior Reactor Operators and Shift Supervisors at Nuclear Power Plants," (published in the Federal Register (54 FR 33639) on August 15, 1989). In this policy statement, the Commission acknowledged the potential for situations to arise which are not covered through training or operating procedures. Therefore, there is a "need for some individuals on each nuclear power plant operating shift who have an innate understanding of the systems-level performance of a nuclear power plant" and "knowledge of scientific and engineering fundamentals and the basic scientific principles that govern the behavior of electrical, mechanical and other engineering systems." The NRC staff suggests considering that this kind of knowledge is acquired from an academic degree program in a technical discipline.

Section 7 Conclusions and Recommendations

1. Section 7.2 states that X-energy's qualification approach for QCROs does not include requiring engineering expertise (i.e., technical degree requirements for QCROs). This section also states that the STA function is integrated into QCRO qualifications. It is not clear to the NRC staff how functions are replaced by qualifications especially when the QCRO qualifications do not include a technical degree. The NRC staff may benefit from further explanations of the combined STA/QCRO position.