

Addendum to *Clarifying “Major Portions” of a Reactor Design in Support of a Standard Design Approval*. Nuclear Innovation Alliance Observations of Terrestrial Energy USA Engagement with NRC Regarding Major Portions of a Reactor Design

Project Overview

In 2019 and 2020, NIA observed ongoing interactions between Terrestrial Energy USA (TEUSA) and the Nuclear Regulatory Commission for a project titled “TEUSA-USNRC Pre-Licensing Activities for the IMSR[®].” The overall purpose of the project was to define the scope of a Standard Design Approval (SDA) application under 10 CFR Part 52 for the TEUSA Integrated Molten Salt Reactor (IMSR[®]) Core-unit. NRC and TEUSA will consider the Core-unit for the SDA a “major portion” of the overall IMSR[®] plant design. The project required establishing interfaces between the major portion and the rest of the design. This will provide valuable information to inform TEUSA’s subsequent application. NIA’s role in the project was to observe the use of its 2017 guidance document “[Clarifying ‘Major Portions’ of a Reactor Design in Support of a Standard Design Approval](#).” The results of the overall project, including NIA’s observation, provide valuable process-related information for the NRC and future license applicants in industry. NIA personnel attended meetings between TEUSA personnel, an engineering consultant for the project, and the NRC staff and, when appropriate, recorded general observations about how the document and associated content influenced the progress and outcome of the regulatory interactions.

As described in more detail below, NIA’s document played a major role in guiding initial development of the regulatory interaction and proved to be a catalyst to speed up the overall progress. With limited NRC experience and guidance on licensing major portions, NIA’s report provided an important neutral starting point for TEUSA and NRC staff to begin identifying relevant issues. Ultimately, TEUSA was able to develop an approach for its pre-application activities beyond what is outlined in the NIA report. Nevertheless, observations of these interactions indicated NIA’s report, as well as a recent associated NIA technical report on interface requirements, can provide useful guidance to future applicants that wish to pursue licensing of a major portion of a reactor design. Accordingly, this project confirmed the value of the original report, and NIA will consider updating it to be even more helpful in the future.

Lessons Learned

- 1. The NIA report provided a helpful starting point.** NRC has limited or no experience in reviewing applications for a “major portion” of a reactor design for purposes of a Standard Design Approval. Accordingly, the primary purpose of NIA’s report was to provide an initial basis to begin a staged review of an advanced reactor in conjunction with existing NRC regulatory guidance (particularly [Reg. Guide 1.232](#)). NIA received direct feedback from TEUSA that the document made the process less difficult and helped provide an initial framework to pursue the overall regulatory interaction. TEUSA described the document as a catalyst for this process that has helped inform the company’s overall license approach. Over the course of the interaction between TEUSA

and NRC, the document became less important as technical questions emerged and TEUSA developed a more detailed approach to defining a major portion.

2. **Pre-application engagement is important.** TEUSA used NIA’s report to inform its initial NRC pre-application interactions. Based on feedback from TEUSA, NIA believes that the use of NIA’s document or similar guidance, as well as pursuing pre-application activities, are essential to the successful use of major portions in a SDA. The scope of the major portion that TEUSA was considering changed during the course of the engagement as technical questions and interface requirements became clearer. Pre-application can be the foundation to successful and timely licensing. When combined with major portions for a SDA, pre-application can contribute in a positive fashion to an efficient staged licensing review.
3. **NRC used the NIA document.** During two meetings between TEUSA and the NRC, multiple NRC staff members had their own copies of NIA’s document. Each staff member had written notes on most pages of their copy. During the interactions with TEUSA, staff members referred to NIA’s report, or to notes on the report, as they were discussing technical and other information. In NIA’s view, these observations indicate the value of the document to both the applicant and the regulatory staff for providing a starting point to develop a more comprehensive pre-application interaction relative to licensing a major portion of a complete power plant design. Going forward, the importance of the document to the NRC staff and industry may diminish as NRC gains more experience conducting reviews for major portion SDAs. Nevertheless, the experience from this project indicates value in similar licensing-specific input from third party entities on novel licensing questions for advanced reactors. Beyond the report itself, NIA observed that NRC staff were very responsive to the major portions approach and asked good questions that guided TEUSA in identifying potential regulatory concerns.
4. **Defining interface requirements is important for a successful major portion(s) licensing strategy.** Feedback from TEUSA indicated that it is difficult to determine principal design criteria for a major portion alone. Rather, it is likely that an applicant pursuing a major portions strategy will need to determine principal design criteria for the complete design. Determining these criteria and describing well-defined system boundaries are important to a successful major portions licensing approach. Well-defined boundaries can assist in the development of interface requirements. In fall 2019, NIA published a supplemental report, “[Establishing Interface Requirements for ‘Major Portions’ Standard Design Approvals.](#)” Feedback at the end of the project from TEUSA indicated that the addition of a template or structure to NIA’s initial major portions report would make it more helpful; NIA is evaluating whether the new report meets that recommendation or whether additional work can better guide future users of NIA materials.