UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

September 26, 2022

MEMORANDUM TO: Ronald G. Ballinger, Lead
SHINE License Application Review Subcommittee
Advisory Committee on Reactor Safeguards

FROM: Ronald G. Ballinger, Member *Ronald Ballinger*
Advisory Committee on Reactor Safeguards

SUBJECT: INPUT FOR ACRS REVIEW OF SHINE OPERATING LICENSE APPLICATION - SAFETY EVALUATION REPORT FOR CHAPTER 3, "DESIGN OF STRUCTURES, SYSTEMS, AND COMPONENTS"

In response to the Subcommittee's request, I have reviewed the Nuclear Regulatory Commission (NRC) staff's safety evaluation report (SER) with no open items, and the associated section of the applicant's Final Safety Analysis Report (FSAR), for Chapter 3, "Design of Structures, Systems, and Components." In addition, representatives from SHINE Medical Technologies, LLC (SHINE), met with the SHINE Subcommittee on May 6, 2022, and July 19-20, 2022, to discuss Chapter 3, "Design of Structures, Systems, and Components." The following is my recommended course of action concerning further review of this chapter and the staff's associated SER.

Background

Chapter 3 of the FSAR describes the design bases of structures, systems, and components for the Irradiation Facility and Radioisotope Production Facility. Key sections of the FSAR (and key areas in the SER) included:

- Meteorological Damage
- Water Damage
- Seismic Damage
- Other Structural Damage
- External Hazards Damage

SER Summary

The SER documents the staff's evaluation of the applicant's design for compliance with applicable regulations and standards. The NRC staff evaluated the descriptions and discussions with SHINE. Based on the above evaluations, the NRC staff found that the

descriptions and discussions are sufficient and meet the applicable regulatory requirements and guidance, and acceptance criteria, for the issuance of an operating license.

Concerns

I did not identify any specific deficiencies in my review that would warrant additional discussions. I would observe that the application was well documented, and the staff's evaluation report thorough. Areas where discussions with the staff provided additional information included: (1) the potential for an aircraft impact causing additional fire related damage and (2) discussions related to the adequacy of the seismic gab between Category I and Category II (or lower) structures and the possibility that during a design basis event that there would be interaction between these structures that would result in unacceptable damage. SHINE indicated that there will be a 25% margin. We requested that SHINE provide us with the basis for the 25% margin. Our estimate was that there would be an approximately 16% probability that a seismic event would exceed the design basis and we questioned if the 25% margin would be sufficient. Subsequent discussions with the applicant and the staff have satisfied the author that there would be adequate margin.

Regarding the question of aircraft impact-induced fire damage, SHINE indicated that the design included the installation of missile shield barriers that would mitigate against this possibility.

The initial review did not include Section 3.1, "Design Criteria." However, the author notes that the SHINE design criteria are mentioned in previous presentations by the staff and SHINE. The author pressed the staff in this regard and was informed that the staff had reviewed Section 3.1 and had found no deficiencies. The SER for Section 3.1 was presented during the July 19-20, 2022, Subcommittee meeting. The author concurs with the staff's conclusion that Section 3.1 adequately describes the design criteria. However, the author suggests that a "lessons learned" item should be noted that review of Section 3.1 should be performed early during any future application to ensure that the potential for unresolved issues does not occur.

Recommendation

I did not identify any specific deficiencies in my review that would warrant additional discussions. I would observe that the application was well documented, and the staff's evaluation thorough.

A "lessons learned" item should be noted that review of Section 3.1 should be performed early during any future applications to ensure that the potential for unresolved issues does not occur. Defining the system design criteria is critical to the overall review and should be presented early in the review. Delaying Section 3.1 review has the potential to require additional review of previous chapters.

References

1. U. S. Nuclear Regulatory Commission, “Design of Structures, Systems, and Components,” Chapter 3, Staff Safety Evaluation Report, April 28, 2022 (ML22118B119).

2. U. S. Nuclear Regulatory Commission, “Design of Structures, Systems, and Components - Design Criteria” Chapter 3, Section 3.1, Staff Safety Evaluation Report, July 12, 2022 (ML22193A278).

3. SHINE Technologies, LLC, Application for Operating License Supplement 14, Revision to Final Safety Analysis Report, Chapter 3, Design of Structure, Systems and Components, January 26, 2022 (ML22034A638).

R. Ballinger

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