



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

July 8, 2022

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

FROM: David A. Petti, Member *David Petti*
Advisory Committee on Reactor Safeguards

SUBJECT: INPUT FOR ACRS REVIEW OF SHINE OPERATING LICENSE
SAFETY EVALUATION FOR CHAPTER 12, CONDUCT OF
OPERATION, SECTION 12.13 "MATERIAL CONTROL AND
ACCOUNTABILITY"

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 for Chapter 12.13, "Material Control and Accounting (MC&A)." The following is my recommended course of action concerning further review of this chapter and the staff's associated safety evaluation.

Background

Chapter 12, Section 12.13 of the SER documents the staff's review of the material control and accounting section of the Final Safety Analysis Report (FSAR). It summarizes the staff's safety review of the SHINE operating license application in accordance with the requirements contained in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities."

The NRC staff evaluated the sufficiency of the SHINE MC&A plans as described in the SHINE FSAR Section 12.13. The SHINE plan discussed general performance objectives including; management structure; measurements; measurement control systems; statistics; physical inventory program; item control program; receiving and shipping program; assessment and review of the MC&A program; tamper-safing; designation of material balance areas; item control areas and custodians; resolving indications of loss; theft; diversion or misuse of special nuclear material (SNM); aiding investigation and recovery of missing SNM; and record keeping.

The MC&A organization will be independent of the operations organization to assure there are no conflicts between other major functions such as production and to ensure independence of action and objectiveness of decision.

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Significant attention was paid to the need for process sampling tests to ensure homogeneity and representativeness, duplicate or replicate measurements to ensure source of uncertainties are identified and remain low, proper statistical evaluation of the results, and the establishment of a measurement control program that monitors all measurements to ensure that the standard error of inventory differences remains below 0.125% of the active inventory.

There was discussion during our subcommittee meeting about the ability of SHINE to meet this strict level considering the difficulty in making accurate liquid level measurements in tanks where the majority of the facility's uranium inventory resides. Furthermore, the 0.125% requirement traditionally is applied to fuel facilities that handle much larger inventories of uranium in solid form and is imposed to preclude an International Atomic Energy Agency significant quantity of uranium from being diverted. The inventory of uranium at SHINE is much smaller than fuel facilities and most of it will be in liquid form. Furthermore, NUREG-1065, Revision 2, "Acceptable Standard Format and Content for the Fundamental Nuclear Material Control Plan Required for Low-Enriched Uranium Facilities," states that the limit should be 0.125% or 4.5 kg of U-235, whichever is larger. If SHINE qualifies, it could consider using the 4.5 kg value.

SER Summary

The staff concluded that the MC&A plan satisfies the applicable requirements of 10 CFR Part 74 and is consistent with applicable guidance. The plan is acceptable and contains appropriate and necessary commitments to meet applicable MC&A requirements thereby providing reasonable assurance that the licensee will adequately control and account for SNM during the term of the license. The applicant plans to combine its Part 70 license with its operating license, which is allowable under 10 CFR Part 50.31.

Concerns

None

Recommendation

As lead reviewer for SHINE Chapter 12, Section 12.13, I recommend that no additional input is needed from the staff or applicant.

References

1. U. S. Nuclear Regulatory Commission, "Conduct of Operations," Chapter 12, Section 12.13, Materials Control and Accountability, Staff Safety Evaluation Report, May 11, 2022 (ML22131A269).
2. SHINE Technologies, LLC, Application for Operating License Supplement 14, Revision to Final Safety Analysis Report, Chapter 12, Conduct of Operations, June 26, 2022 (ML22034A626).
3. NUREG-1065, "Acceptable Standard Format and Content for the Fundamental Nuclear Material Control Plan Required for Low-Enriched Uranium Facilities," Revision 2, December 1995 (ML031340288).

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