

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of)	
)	Docket No. 50-608-CP
SHINE MEDICAL TECHNOLOGIES, INC.)	
(Medical Radioisotope Production Facility))	December 22, 2015
)	

**SHINE MEDICAL TECHNOLOGIES, INC.'S RESPONSE
TO COMMISSION'S POST-HEARING QUESTIONS**

SHINE Medical Technologies, Inc. (SHINE) provides the following response to the questions in the Commission's December 21, 2015 Order (Transmitting Post-Hearing Questions) regarding the mandatory hearing for the Construction Permit Application for SHINE's medical radioisotope production facility. SHINE's response is limited to the question directed to SHINE.

Response to Commission Questions

Question 2: In its response to pre-hearing Question 41, SHINE described the bulk effects of a dilution event caused by a breach between the target solution vessel and the primary closed-loop cooling system. Has SHINE considered what would happen locally at the leak location? How would this affect the local reactivity until the solution is well mixed? Will the SHINE leak detection systems identify a slow leak in a reasonable time?

SHINE RESPONSE:

A breach between the target solution vessel (TSV) and the primary closed-loop cooling system (PCLS) would normally result in water from the PCLS entering the TSV at the breach location due to the PCLS pressure being higher than the pressure in the TSV. The system would inherently have some degree of non-uniformities due to the gradient of uranium concentrations near the leak (i.e., low concentration areas mixing with the bulk target solution concentration). SHINE expects the system overall will be well mixed during the irradiation process due to natural convection and bubble generation.

SHINE has not yet performed detailed analyses of the effects of local concentration variations near the leak. SHINE plans on performing in-depth accident analyses during final design, which will include the limiting TSV geometries that could arise as transient conditions during accidents (e.g., leakage of PCLS water at different potential locations). The results of the final analyses will be provided in the Operating License Application.

Introduction of PCLS water into the TSV without mixing essentially results in a change in reflection of the target solution, and depending on location, a change in the geometry of the solution. Due to the small size of the TSV, the system is highly neutronically coupled and less susceptible to spatial power oscillations and variations than a larger nuclear system (such as a power reactor core). Based on preliminary design and the reactivity effects of changes in the TSV reflection (e.g., cooling channel density variations) and small changes to the target solution geometry, SHINE does not expect that the local changes of the solution at the leak location will have a significant effect on reactivity.

As discussed in the SHINE Response to Non-Public Pre-Hearing Question 3, the detection time of a slow leak would be dependent on the leak rate since the detection methods are sensitive to cumulative volume. The methods of detection are expected to be sensitive to a few liters of leaked PCLS water.

The leak detection systems will identify a slow leak of PCLS water into the TSV in a reasonable time. The time is considered reasonable as the only significant expected impacts are those described in the SHINE Response to Non-Public Pre-Hearing Question 3 (i.e., reactivity decrease, PCLS level decrease, and TSV level increase). These impacts will alert the operators via indication and/or alarm. The operators will then be able to shut down the irradiation unit and initiate corrective actions.

Respectfully submitted,

Executed in Accord with 10 CFR § 2.304(d)

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Counsel for SHINE Medical Technologies, Inc.

Dated in Washington, D.C.
this 22nd day of December 2015

CERTIFICATION AND DECLARATION OF WITNESS

I certify that SHINE's response to the Commission's questions was prepared by me or under my direction; that the response is true and correct to the best of my information, knowledge and belief; and that I adopt this response as part of my sworn testimony in this proceeding.

I declare under penalty of perjury that the foregoing written testimony is true and correct to the best of my information, knowledge, and belief.

Executed on December 22, 2015.

Executed in Accord with 10 CFR § 2.304(d)

/s/ James Costedio

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CERTIFICATE OF SERVICE

I hereby certify that on this date a copy of the “SHINE Medical Technologies, Inc.’s Response to Commission’s Post-Hearing Questions” was submitted through the NRC’s E-filing system.

Signed (electronically) by Stephen J. Burdick
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