



September 20, 2022

2022-SMT-0098
10 CFR 50.30

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

- References:
- (1) SHINE Medical Technologies, LLC letter to the NRC, "SHINE Medical Technologies, LLC Application for an Operating License," dated July 17, 2019 (ML19211C143)
 - (2) SHINE Technologies, LLC letter to the NRC, "SHINE Technologies, LLC Application for an Operating License Supplement No. 15, Submittal of the Phased Startup Operations Application Supplement," dated January 27, 2022 (ML22027A353)
 - (3) NRC letter to SHINE Technologies, LLC, "SHINE Medical Technologies, LLC – Request for Additional Information Related to the Office of General Counsel Review of the Phased Startup Operations Application Supplement (EPID No. L-2022-NEW-0004)," dated August 25, 2022 (ML22105A110)

SHINE Technologies, LLC Application for an Operating License
Response to Request for Additional Information

Pursuant to 10 CFR Part 50.30, SHINE Technologies, LLC (SHINE) submitted an application for an operating license for a medical isotope production facility to be located in Janesville, Wisconsin (Reference 1). On January 27, 2022, SHINE submitted Supplement No. 15 to the application for an operating license describing the SHINE approach to initial facility startup and operations (Reference 2). The NRC staff determined that additional information was required to enable the staff's continued review of the SHINE application supplement (Reference 3).

Enclosure 1 provides the SHINE responses to the NRC staff's request for additional information.

If you have any questions, please contact Mr. Jeff Bartelme, Director of Licensing, at 608/210-1735.

I declare under the penalty of perjury that the foregoing is true and correct.
Executed on September 20, 2022.

Very truly yours,

DocuSigned by:

F52DB96989224FF...

James Costedio
Vice President of Regulatory Affairs and Quality
SHINE Technologies, LLC
Docket No. 50-608

Enclosure

cc: Project Manager, USNRC
SHINE General Counsel
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ENCLOSURE 1

SHINE TECHNOLOGIES, LLC

SHINE TECHNOLOGIES, LLC APPLICATION FOR AN OPERATING LICENSE RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

The U.S. Nuclear Regulatory Commission (NRC) staff determined that additional information was required (Reference 1) to enable the continued review of the SHINE Technologies, LLC (SHINE) phased startup operations application supplement (Reference 2). The following information is provided by SHINE in response to the NRC staff's request.

RAI Phased-1

Pursuant to 10 CFR 50.57(a), unless the NRC finds that the construction of a "facility" has been "substantially completed," it may not issue an operating license for the facility. Pursuant to 10 CFR 50.57(b), each operating license will include such conditions as are required to assure that operation during the period of the completion of uncompleted items of construction will not endanger public health and safety. Based on these regulations, SHINE needs to address (1) how it interprets the term "facility" in 10 CFR 50.57(a) with respect to its operating license application, (2) how it interprets the term "substantially completed," in 10 CFR 50.57(a) with respect to this "facility" and, thus, when it believes that an operating license could be issued for the facility, and (3) what conditions it believes would need to be included in this license to satisfy 10 CFR 50.57(b).

- a Identify where in the operating license application, as amended, SHINE addresses, under its proposed phased approach to initial operations, (1) how the "substantially completed" criterion of 10 CFR 50.57(a) applies to the construction of the SHINE facility and (2) the license conditions that would be included, pursuant to 10 CFR 50.57(b), in any operating license to be issued pertaining to the installation of each grouping of IUs and their associated auxiliary and support systems and TPS train (i.e., IUs 1 and 2 and TPS train A (Phase 1); IUs 3, 4, and 5 and TPS train B (Phase 2); and IUs 6, 7, and 8 and TPS train C (Phase 3)) and the installations of RLWI selective removal components and the MATB (Phase 3) and iodine and xenon purification and packaging components (Phase 4). Otherwise, provide this information in response to this RAI.
- b Explain how SHINE interprets the term "facility" in 10 CFR 50.57(a) in light of SHINE's proposed phased approach to initial operations and SHINE's previous descriptions of the SHINE facility in its construction permit and operating license applications. Does "facility" refer to the entire SHINE facility, to each phase of the SHINE facility, or to something else?
- c If SHINE interprets the term "facility" in 10 CFR 50.57(a) to refer to the entire SHINE facility, explain when the construction of the entire SHINE facility will be "substantially complete," as that term is used in 10 CFR 50.57(a) and discussed in IP 69022. For example, will the construction of the entire SHINE facility be substantially completed upon the completion of Phase 1, upon the completion of Phase 2, at some other defined point in time prior to the completion of Phase 4, etc.? Reflect in this response such

factors as the percentage of the SHINE facility that would be completed, as well as the extent and location of the remaining construction activities as compared to those that have already been completed (e.g., whether throughout the facility or at discrete locations in the facility). Finally, explain when the facility would be functionally complete with respect to its purpose, stated in the construction permit as “the production of medical radioisotopes, as described in the [construction permit] application,” and whether this impacts the determination of when the construction of the entire SHINE facility has been substantially completed.

- d** If significant construction activities would remain to be completed after the point in time at which SHINE considers the construction of the entire SHINE facility to be substantially completed then, consistent with 10 CFR 50.57(b), provide the license conditions that would be required to be included in any operating license that may be issued to ensure that operation during the remainder of construction (e.g., during Phases 2, 3, and 4 if construction is considered to be substantially completed at the completion of Phase 1) will not endanger public health and safety. For example, in order to ensure that the related uncompleted items of construction are completed before SHINE operates any uncompleted phases, provide a license condition that would ensure that SHINE may proceed to operate subsequent phases only upon notifying the NRC (e.g., by written submission) of the completion of all uncompleted items of construction related to those phases. Similarly, in order to support the NRC oversight of the uncompleted items of construction, provide a license condition that would ensure that, prior to the operation of Phase 4, SHINE will provide to the NRC (e.g., through periodic reports) information on the status of uncompleted items of construction and the current schedule for the completion of significant milestones regarding the uncompleted items of construction.
- e** If SHINE interprets the term “facility” in 10 CFR 50.57(a) to refer to each phase of the SHINE facility (as opposed to the entire SHINE facility), explain how the application supports the issuance of an operating license upon the substantial completion of construction of Phase 1 that would authorize the operation of just Phase 1 and how the licensing Phases 2–4 would be accomplished. For example, would SHINE plan to request amendments to this operating license for each of the three remaining phases (i.e., submit a Phase 2 license amendment request (LAR), a Phase 3 LAR, and a Phase 4 LAR)? If so, would these LARs have new information or refer to the information in the NRC staff’s SER on the operating license application? Explain when SHINE would submit each LAR in relation to the timing of the substantial completion of construction of each phase and what SHINE would request as the effectiveness date and implementation date for each LAR.
- f** If SHINE interprets the term “facility” in 10 CFR 50.57(a) to refer to something other than the entire SHINE facility or to each phase of the SHINE facility, then explain this interpretation and how it would affect (1) the timing of the “substantially completed” finding/operating license issuance under 10 CFR 50.57(a) and (2) the conditions that would have to be included in the license under 10 CFR 50.57(b).
- g** However SHINE may interpret the term “facility” in 10 CFR 50.57(a), does SHINE plan to operate this facility before its construction is substantially completed? If so, how would this approach be consistent with the NRC’s regulations? Would SHINE request an exemption from 10 CFR 50.57(a)? If so, how would SHINE ensure that operation during the period of the completion of construction will not endanger public health and safety? For example, would the operating license include license conditions that prohibit the

operation of each uncompleted phase? Upon the completion of each of these phases, would SHINE then remove these prohibitions from the operating license through license amendments?

SHINE Response

- a The SHINE operating license application (Reference 3), as amended, does not explicitly address how the “substantially completed” criterion of 10 CFR 50.57(a) applies to the construction of the SHINE facility, nor does it address or propose license conditions that would be included, pursuant to 10 CFR 50.57(b), in any operating license to be issued pertaining to the phased approach to construction and operation of the SHINE facility. This information is provided in the SHINE Response to Parts -b through -g of this request.
- b SHINE considers the “facility” as used in 10 CFR 50.57(a) regarding the NRC’s finding of substantial completion to be that described in the SHINE operating license application (Reference 3), as amended, to include the structures, systems, and components (SSCs) of the entire facility described in Chapter 1 of the FSAR. In the SHINE phased startup operations application supplement (Reference 2), as amended, SHINE describes a phased approach to operation of the SHINE facility which does not affect the definition of the facility.
- c Construction of the SHINE facility will be substantially complete prior to the commencement of Phase 1 operations. SHINE considers the facility to be substantially complete upon the installation and functional testing of the safety-related SSCs required for initial startup (i.e., Phase 1 operations), the safe handling and storage of special nuclear material, safe shutdown of operational irradiation units (as defined in technical specifications), and the prevention of accidents or the mitigation of consequences of accidents involving installed equipment. Substantial completion of the SHINE facility represents the point in time in which the facility can safely produce medical isotopes (i.e., the facility is functionally complete, as defined in Construction Permit No. CPMIF-001 [Reference 4]).

Figure 1.1-1 of the SHINE phased startup operations application supplement (Reference 2) depicts the extent and location of the remaining construction activities (i.e., the remaining Phase 2, Phase 3, and Phase 4 construction activities) at the time in which construction of the SHINE facility is substantially complete.
- d While construction of the facility will be substantially complete prior to the commencement of Phase 1 operations, SHINE anticipates limited ongoing construction activities associated with the installation of SSCs to support operation of subsequent phases. A SHINE-proposed license condition associated with these uncompleted items of construction to support operation of Phase 2, Phase 3, and Phase 4 is provided as Attachment 1. A phase-specific listing of installation and functional testing activities required to support operation of Phase 2, Phase 3, and Phase 4 (i.e., uncompleted items of construction, as used in 10 CFR 50.57(b)) is provided as Attachment 2.
- e See the SHINE Response to Part -b of this request.
- f See the SHINE Response to Part -b of this request.

- g SHINE will not operate the facility prior to issuance of the operating license (i.e., prior to the NRC's determination that construction of the facility is substantially complete). As such, SHINE does not intend to seek exemption from the requirements of 10 CFR 50.57(a). As described in the SHINE Response to Part -d of this request, SHINE has proposed license conditions which prohibit the operation of subsequent phases prior to satisfaction of the notification related to the completion of all uncompleted items of construction for each subsequent phase. These prohibitions, as proposed, would not need to be removed from the operating license upon the completion of each subsequent phase.

RAI Phased-2

The FSAR states that RLWI solidification equipment is available in Phase 1, but that the RLWI selective removal process is not available until Phase 3. Therefore, waste solidified during Phases 1 and 2 may have higher dose rates and higher waste classifications than wastes solidified during Phases 3 and 4. The FSAR further states that the MATB is not available until Phase 3. Therefore, solidified waste generated during Phases 1 and 2 would be stored in the subgrade bore holes in the RPF with additional radioactive storage areas available within the radiologically controlled area of the main production facility.

- a Given the above information, is there a point in time, prior to the installation of RLWI selective removal components and the MATB, at which the waste generated by the continuous operation of Phases 1 and 2 could exceed the SHINE facility's waste storage capabilities (if waste disposal shipments are discounted)? If so, provide a conservative estimate for this point in time.
- b Propose a license condition that would ensure sufficient waste storage capabilities at the SHINE facility during the proposed phased approach to initial operations of the SHINE facility. For example, such a condition could state that if the installation of RLWI selective removal components and the MATB is not completed prior to the point in time at which the SHINE facility's waste storage capabilities could be exceeded, SHINE will either cease activities that could lead to the generation of additional waste or calculate, based on current circumstances, a new point in time at which the SHINE facility's waste storage capabilities could be exceeded.

SHINE Response

- a As discussed with the NRC Staff at a May 24, 2022 regulatory audit interaction related to waste storage capabilities during the phased approach to operations of the SHINE facility (Reference 5), SHINE will conduct routine shipments to waste disposal facilities to mitigate on-site waste accumulation during Phase 1 and Phase 2 operations, as needed. As such, the SHINE facility's waste storage capability will not be exceeded prior to the installation of radioactive liquid waste immobilization (RLWI) selective removal components and the material staging building (MATB).

As stated in Section 11.2 of the FSAR, radioactive wastes are prepared for shipment in approved shipping containers and shipped off-site using common or contract carriers in compliance with U.S. Department of Transportation (DOT) regulations (49 CFR) and 10 CFR 20, 10 CFR 61 and 10 CFR 71, as applicable.

Because SHINE will conduct routine waste shipments to waste disposal facilities to mitigate on-site waste accumulation during Phase 1 and Phase 2 operations, and such shipments will be made in compliance with applicable regulations, public health and safety remains protected.

- b As the SHINE facility provides sufficient waste storage capabilities to support the operation of Phase 1 and Phase 2, as described in the SHINE Response to Part -a of this request, a license condition to ensure sufficient waste storage capabilities is not necessary.

RAI Phased-3

The January 27, 2022, supplement to the operating license application states that normal operation of the SHINE facility within the limits of the proposed technical specifications (TSs) during the proposed phased approach to initial operations of the SHINE facility will not result in offsite radiation exposure in excess of 10 CFR Part 20, "Standards for Protection against Radiation," guidelines. However, this does not address whether the language of the proposed TSs needs to be modified to reflect that a SHINE facility operating license could be issued before the completion of Phases 2, 3, or 4. Therefore, identify any language in the proposed TSs that would be affected by SHINE's proposed phased approach and propose changes to this language that would account for the phased approach.

SHINE Response

SHINE has revised the technical specifications (Reference 6) to incorporate the additional safety-related controls required to support the phased approach to operations of the SHINE facility and to ensure the applicability of limiting conditions for operation (LCOs) address the multiple phases of the phased approach to operations of the SHINE facility. SHINE previously discussed these revised technical specifications with the NRC Staff during regulatory audit interactions in June, July, and August 2022 (Reference 7).

References

1. NRC letter to SHINE Technologies, LLC, "SHINE Medical Technologies, LLC – Request for Additional Information Related to the Office of General Counsel Review of the Phased Startup Operations Application Supplement (EPID No. L-2022-NEW-0004)," dated August 25, 2022 (ML22105A110)
2. SHINE Technologies, LLC letter to the NRC, "SHINE Technologies, LLC Application for an Operating License Supplement No. 15, Submittal of the Phased Startup Operations Application Supplement," dated January 27, 2022 (ML22027A353)
3. SHINE Medical Technologies, LLC letter to the NRC, "SHINE Medical Technologies, LLC Application for an Operating License," dated July 17, 2019 (ML19211C143)
4. NRC letter to SHINE Technologies, LLC, "SHINE Medical Technologies, LLC – Issuance of Amendment No. 2 to Construction Permit No. CPMIF-001 for the SHINE Medical Isotope Production Facility Related to the Receipt and Possession of Certain Radioactive Materials (EPID No. L-2021-LLA-0104)," dated December 2, 2021 (ML21320A225)

5. NRC letter to SHINE Technologies, LLC, "SHINE Medical Technologies, LLC Regulatory Audit Related to Phased Startup Operations Application Supplement, Session 2 (EPID No. L-2019-NEW-0004)," dated May 23, 2022 (ML22094A114)
6. SHINE Technologies, LLC letter to the NRC, "SHINE Technologies, LLC Application for an Operating License Supplement No. 30," dated August 31, 2022
7. NRC letter to SHINE Technologies, LLC, "SHINE Medical Technologies, LLC – Regulatory Audit of Technical Specifications Described in Operating License Application, (EPID No. L-2019-NEW-0004)," dated June 2, 2022 (ML22152A108)

**ENCLOSURE 1
ATTACHMENT 1**

SHINE TECHNOLOGIES, LLC

**SHINE TECHNOLOGIES, LLC APPLICATION FOR AN OPERATING LICENSE
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

**PROPOSED LICENSE CONDITION TO SUPPORT THE PHASED APPROACH TO
SHINE FACILITY OPERATIONS**

The Licensee shall conduct activities for startup of facility operations in Phases, as described in SHINE Technologies, LLC Application for an Operations License Supplement No. 15, Enclosure 1, SHINE Phased Startup Operations Application Supplement, dated January 27, 2022 (ADAMS Accession No. ML22027A353), as amended. Operation of Phase 2 or of any subsequent Phase shall not commence prior to satisfaction of conditions (a) and (b) below:

- (a) No later than 14 days before the planned commencement of operation of Phase 2, and thereafter no later than 14 days before the planned commencement of operation of each subsequent phase, the Licensee shall notify the NRC in writing that all uncompleted items of construction related to that Phase have been completed.
- (b) Prior to the operation of Phase 4, the Licensee shall provide to the NRC in writing, six months after the issuance of this operating license and every six months thereafter, information on the status and schedule for completion of uncompleted items of construction.

**ENCLOSURE 1
ATTACHMENT 2**

SHINE TECHNOLOGIES, LLC

**SHINE TECHNOLOGIES, LLC APPLICATION FOR AN OPERATING LICENSE
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

UNCOMPLETED ITEMS OF CONSTRUCTION BY PHASE

Phase 2

Installation Activities

Irradiation Unit (IU) 3 and its supporting structures, systems, and components (SSCs), consisting of:

- Subcritical assembly system (SCAS)
- Target solution vessel (TSV) off-gas system (TOGS)
- Primary closed loop cooling system (PCLS)
- Light water pool system (LWPS)
- Safety-related isolation valves
- Radioisotope process facility cooling system (RPCS) equipment located in the associated IU cell and cooling room
- Radiological ventilation zone 1 exhaust (RVZ1e) equipment located in the associated IU cell and cooling room
- Safety-related RVZ1e IU cell exhaust radiation monitoring instruments
- Compressed oxygen subsystem of the facility chemical reagent system (FCRS) equipment located in the associated IU cell and cooling room
- Process integrated control system (PICS) cabling from remote panels to end devices for the IU
- TSV reactivity protection system (TRPS) cabling from remote panels to end devices for the IU
- Neutron flux detection system (NFDS) equipment located in the associated IU cell and cabling from remote panels to end devices for the IU
- IU cell shield plugs
- TOGS cell shield plugs

IU 4 and its supporting SSCs, consisting of:

- SCAS
- TOGS
- PCLS
- LWPS

- Safety-related isolation valves
- RPCS equipment located in the associated IU cell and cooling room
- RVZ1e equipment located in the associated IU cell and cooling room
- Safety-related RVZ1e IU cell exhaust radiation monitoring instruments
- Compressed oxygen subsystem of the FCRS equipment located in the associated IU cell and cooling room
- PICS cabling from remote panels to end devices for the IU
- TRPS cabling from remote panels to end devices for the IU
- NFDS equipment located in the associated IU cell and cabling from remote panels to end devices for the IU
- IU cell shield plugs
- TOGS cell shield plugs

IU 5 and its supporting SSCs, consisting of:

- SCAS
- TOGS
- PCLS
- LWPS
- Safety-related isolation valves
- RPCS equipment located in the associated IU cell and cooling room
- RVZ1e equipment located in the associated IU cell and cooling room
- Safety-related RVZ1e IU cell exhaust radiation monitoring instruments
- Compressed oxygen subsystem of the FCRS equipment located in the associated IU cell and cooling room
- PICS cabling from remote panels to end devices for the IU
- TRPS cabling from remote panels to end devices for the IU
- NFDS equipment located in the associated IU cell and cabling from remote panels to end devices for the IU
- IU cell shield plugs
- TOGS cell shield plugs

Tritium purification system (TPS) train B and its supporting SSCs, consisting of:

- TPS train gloveboxes
- Isotope separation subsystem
- Secondary enclosure cleanup subsystem
- Vacuum/impurity treatment subsystem
- PICS cabling from remote panels to end devices for the TPS train
- Engineered safety features actuation system (ESFAS) cabling from remote panels to end devices for the TPS train

Functional Testing Activities

IU 3 testing, consisting of:

- SCAS, TOGS, and PCLS leak testing complete
- Light water pool water level verified to be ≥ 14 feet (SR 3.3.1.1)
- TOGS blowers verified to provide sweep gas at acceptable flowrates (SR 3.1.1.1)
- TOGS recombiner heaters verified to provide heat to acceptable temperatures (SR 3.1.1.1)
- PCLS and IU-specific RPCS equipment verified to provide cooling water at acceptable temperatures and pressures
- RVZ1 IU-specific equipment verified to provide ventilation at acceptable temperatures and flowrates
- TRPS automatic actuation functions are verified to go to completion upon actuation (SR 3.2.1.2)
- Safety-related valves verified to stroke on demand from TRPS (SR 3.4.1.1)
- Safety-related RVZ1e IU cell exhaust radiation monitoring instruments calibrated and functionally tested (SR 3.7.1.2, Item f.)
- IU cell and TOGS cell confinement leak testing complete (SR 3.4.5.1 and 3.4.5.2)

IU 4 testing, consisting of:

- SCAS, TOGS, and PCLS leak testing complete
- Light water pool water level verified to be ≥ 14 feet (SR 3.3.1.1)
- TOGS blowers verified to provide sweep gas at acceptable flowrates (SR 3.1.1.1)
- TOGS recombiner heaters verified to provide heat to acceptable temperatures (SR 3.1.1.1)
- PCLS and IU-specific RPCS equipment verified to provide cooling water at acceptable temperatures and pressures
- RVZ1 IU-specific equipment verified to provide ventilation at acceptable temperatures and flowrates
- TRPS automatic actuation functions are verified to go to completion upon actuation (SR 3.2.1.2)
- Safety-related valves verified to stroke on demand from TRPS (SR 3.4.1.1)
- Safety-related RVZ1e IU cell exhaust radiation monitoring instruments calibrated and functionally tested (SR 3.7.1.2, Item f.)
- IU cell and TOGS cell confinement leak testing complete (SR 3.4.5.1 and 3.4.5.2)

IU 5 testing, consisting of:

- SCAS, TOGS, and PCLS leak testing complete
- Light water pool water level verified to be ≥ 14 feet (SR 3.3.1.1)
- TOGS blowers verified to provide sweep gas at acceptable flowrates (SR 3.1.1.1)
- TOGS recombiner heaters verified to provide heat to acceptable temperatures (SR 3.1.1.1)
- PCLS and IU-specific RPCS equipment verified to provide cooling water at acceptable temperatures and pressures

- RVZ1 IU-specific equipment verified to provide ventilation at acceptable temperatures and flowrates
- TRPS automatic actuation functions are verified to go to completion upon actuation (SR 3.2.1.2)
- Safety-related valves verified to stroke on demand from TRPS (SR 3.4.1.1)
- Safety-related RVZ1e IU cell exhaust radiation monitoring instruments calibrated and functionally tested (SR 3.7.1.2, Item f.)
- IU cell and TOGS cell confinement leak testing complete (SR 3.4.5.1 and 3.4.5.2)

TPS train B testing, consisting of

- Tritium confinement boundary leak testing complete
- Tritium confinement boundary valves verified to stroke on demand from ESFAS (SR 3.4.3.1)
- Safety-related tritium monitoring instruments calibrated and functionally tested (SR 3.7.1.2, Item g. and Item h.)

Phase 3

Installation Activities

IU 6 and its supporting SSCs, consisting of:

- SCAS
- TOGS
- PCLS
- LWPS
- Safety-related isolation valves
- RPCS equipment located in the associated IU cell and cooling room
- RVZ1e equipment located in the associated IU cell and cooling room
- Safety-related RVZ1e IU cell exhaust radiation monitoring instruments
- Compressed oxygen subsystem of the FCRS equipment located in the associated IU cell and cooling room
- PICS cabling from remote panels to end devices for the IU
- TRPS cabling from remote panels to end devices for the IU
- NFDS equipment located in the associated IU cell and cabling from remote panels to end devices for the IU
- IU cell shield plugs
- TOGS cell shield plugs

IU 7 and its supporting SSCs, consisting of:

- SCAS
- TOGS
- PCLS
- LWPS
- Safety-related isolation valves

- RPCS equipment located in the associated IU cell and cooling room
- RVZ1e equipment located in the associated IU cell and cooling room
- Safety-related RVZ1e IU cell exhaust radiation monitoring instruments
- Compressed oxygen subsystem of the FCRS equipment located in the associated IU cell and cooling room
- PICS cabling from remote panels to end devices for the IU
- TRPS cabling from remote panels to end devices for the IU
- NFDS equipment located in the associated IU cell and cabling from remote panels to end devices for the IU
- IU cell shield plugs
- TOGS cell shield plugs

IU 8 and its supporting SSCs, consisting of:

- SCAS
- TOGS
- PCLS
- LWPS
- Safety-related isolation valves
- RPCS equipment located in the associated IU cell and cooling room
- RVZ1e equipment located in the associated IU cell and cooling room
- Safety-related RVZ1e IU cell exhaust radiation monitoring instruments
- Compressed oxygen subsystem of the FCRS equipment located in the associated IU cell and cooling room
- PICS cabling from remote panels to end devices for the IU
- TRPS cabling from remote panels to end devices for the IU
- NFDS equipment located in the associated IU cell and cabling from remote panels to end devices for the IU
- IU cell shield plugs
- TOGS cell shield plugs

TPS train C and its supporting SSCs, consisting of:

- TPS train gloveboxes
- Isotope separation subsystem
- Secondary enclosure cleanup subsystem
- Vacuum/impurity treatment subsystem
- PICS cabling from remote panels to end devices for the TPS train
- ESFAS cabling from remote panels to end devices for the TPS train

Radioactive liquid waste immobilization (RLWI) system selective removal components
 Material Staging Building (MATB) complete

Functional Testing Activities

IU 6 testing, consisting of:

- SCAS, TOGS, and PCLS leak testing complete
- Light water pool water level verified to be ≥ 14 feet (SR 3.3.1.1)
- TOGS blowers verified to provide sweep gas at acceptable flowrates (SR 3.1.1.1)
- TOGS recombiner heaters verified to provide heat to acceptable temperatures (SR 3.1.1.1)
- PCLS and IU-specific RPCS equipment verified to provide cooling water at acceptable temperatures and pressures
- RVZ1 IU-specific equipment verified to provide ventilation at acceptable temperatures and flowrates
- TRPS automatic actuation functions are verified to go to completion upon actuation (SR 3.2.1.2)
- Safety-related valves verified to stroke on demand from TRPS (SR 3.4.1.1)
- Safety-related RVZ1e IU cell exhaust radiation monitoring instruments calibrated and functionally tested (SR 3.7.1.2, Item f.)
- IU cell and TOGS cell confinement leak testing complete (SR 3.4.5.1 and 3.4.5.2)

IU 7 testing, consisting of:

- SCAS, TOGS, and PCLS leak testing complete
- Light water pool water level verified to be ≥ 14 feet (SR 3.3.1.1)
- TOGS blowers verified to provide sweep gas at acceptable flowrates (SR 3.1.1.1)
- TOGS recombiner heaters verified to provide heat to acceptable temperatures (SR 3.1.1.1)
- PCLS and IU-specific RPCS equipment verified to provide cooling water at acceptable temperatures and pressures
- RVZ1 IU-specific equipment verified to provide ventilation at acceptable temperatures and flowrates
- TRPS automatic actuation functions are verified to go to completion upon actuation (SR 3.2.1.2)
- Safety-related valves verified to stroke on demand from TRPS (SR 3.4.1.1)
- Safety-related RVZ1e IU cell exhaust radiation monitoring instruments calibrated and functionally tested (SR 3.7.1.2, Item f.)
- IU cell and TOGS cell confinement leak testing complete (SR 3.4.5.1 and 3.4.5.2)

IU 8 testing, consisting of:

- SCAS, TOGS, and PCLS leak testing complete
- Light water pool water level verified to be ≥ 14 feet (SR 3.3.1.1)
- TOGS blowers verified to provide sweep gas at acceptable flowrates (SR 3.1.1.1)
- TOGS recombiner heaters verified to provide heat to acceptable temperatures (SR 3.1.1.1)
- PCLS and IU-specific RPCS equipment verified to provide cooling water at acceptable temperatures and pressures

- RVZ1 IU-specific equipment verified to provide ventilation at acceptable temperatures and flowrates
- TRPS automatic actuation functions are verified to go to completion upon actuation (SR 3.2.1.2)
- Safety-related valves verified to stroke on demand from TRPS (SR 3.4.1.1)
- Safety-related RVZ1e IU cell exhaust radiation monitoring instruments calibrated and functionally tested (SR 3.7.1.2, Item f.)
- IU cell and TOGS cell confinement leak testing complete (SR 3.4.5.1 and 3.4.5.2)

TPS train C testing, consisting of

- Tritium confinement boundary leak testing complete
- Tritium confinement boundary valves verified to stroke on demand from ESFAS (SR 3.4.3.1)
- Safety-related tritium monitoring instruments calibrated and functionally tested (SR 3.7.1.2, Item g. and Item h.)

RLWI selective removal system testing, consisting of:

- Equipment leak testing complete

MATB construction testing complete

Phase 4

Installation Activities

Isotope and Xenon purification (IXP) system installed, consisting of:

- IXP equipment within supercell area 10
- Safety-related RVZ1 supercell area 10 exhaust ventilation radiation monitoring instruments
- PICS cabling from remote panels to end devices for IXP
- ESFAS cabling from remote panels to end devices for IXP
- Hot cell fire detection and suppression system (HCFD) for IXP cell

Functional Testing Activities

IXP system testing, consisting of

- Safety-related RVZ1 supercell area 10 exhaust ventilation radiation monitoring instruments calibrated and functionally tested (SR 3.7.1.2, Item b.)
- Supercell area 10 confinement boundary leak testing complete
- HCFD functional testing
- Safety-related valves verified to stroke on demand from ESFAS (SR 3.8.10.1, Item n. and Items t. through y.)