

12.11 Startup Plan

SHINE FSAR Section 12.11, "Startup Plan," describes at a high-level the tests necessary to verify key system parameters required for safe handling of nuclear material and operation of the facility.

SHINE FSAR Section 12.11.1, "Administration of the Startup Testing Program," describes testing that will occur in accordance with a startup test schedule to ensure that all required systems are tested to confirm operability prior to facility startup. SHINE FSAR Section 12.11.1 states that SHINE will use approved test procedures that will describe the personnel qualifications, conduct of testing, documenting of deficiencies, and corrective actions. Test results will be documented, including comparison of test data with acceptance criteria and disposition of any discrepancies. Along with test procedures, SHINE states in FSAR Section 12.11.1 that it will use approved test plans to conduct pre-operational testing. The test plans will describe testing methods and objectives, acceptance criteria, hazard control and procedures for accomplishing the test. Subsequent to the completion of testing, SHINE will submit a startup report to the NRC in accordance with the timeframe established in TS 5.8.4, "Startup Report." The startup test report will contain the information described in SHINE FSAR Section 12.11.1.2, "Startup Test Report."

SHINE FSAR Sections 12.11.2.1, "Facility Startup Tests," and 12.11.2.2, "Irradiation Unit Startup Tests," provide an overview of the facility and irradiation unit startup tests, which include tests in the following areas:

- Facility startup tests
 - Preparation for uranium handling
 - Receipt, unpacking and internal transfer of uranium
 - Preparation of uranyl sulfate
 - Process vessel vent system
 - Transfer of target solution
 - Packaging at end of solution life
 - Radiation measurements
 - Ventilation systems
 - Electrical systems
 - Instrumentation and controls
 - Tritium purification system
- Irradiation unit startup tests
 - Irradiation unit fill and drain systems
 - Subcritical assembly system nuclear physics parameters
 - Uranium concentration
 - Critical height
 - Calculational bias
 - Temperature coefficients
 - Void coefficients
 - Flux distribution
 - Neutron driver assembly system
 - Target solution vessel off-gas system
 - Primary closed loop cooling system

The NRC staff determined that although the SHINE FSAR does not provide detailed information on the testing methods and acceptance criteria, it does state that SHINE will develop acceptance criteria using the applicable design specifications, design documents, drawings, TSs, manufacturer instructions, etc. SHINE states that it will describe these acceptance criteria in test plans for the tests listed in FSAR Sections 12.11.2.1 and 12.11.2.2. For the startup tests described in FSAR Sections 12.11.2.1 and 12.11.2.2, SHINE referenced design details in the following FSAR Sections to support the development of the startup test acceptance criteria:

- Section 4a2.3, "Neutron Driver Assembly System,"
- Section 4a2.6, "Nuclear Design,"
- Section 4a2.8; "Gas Management System,"
- Section 4b.2, "Radioisotope Production Facility Biological Shield,"
- Section 4b.4, "Special Nuclear Material Processing and Storage,"
- Section 5a2.2, "Primary Closed Loop Cooling System,"
- Section 7.2.1, "System Design,"
- Section 7.4.5, "Highly Integrated Protection System Design,"
- Section 9a2.1, "Heating, Ventilation, and Air conditioning Systems,"
- Section 9a2.7, "Other Auxiliary Systems,"
- Section 9b.2, "Handling and Storage of Target Solution,"
- Section 9b.6, "Cover Gas Control in the Radioisotope Production Facility," and
- Section 9b.7, " Other Auxiliary Systems."

The NRC staff determined the licensee provided references to applicable sections of the SHINE FSAR that describe the design details to support development of startup acceptance criteria. Additionally, the NRC staff finds that SHINE has identified startup tests to measure operational nuclear physics parameters, perform radiation surveys to compared with expected values, plans for handling uranium and target solution, and calibrate detectors based on manufacturer instructions.

Therefore, the NRC staff finds that implementation of the proposed startup plan will provide reasonable assurance that the facility can operate as described and analyzed in the FSAR provided the licensee develops appropriate acceptance criteria based on the approved applicable design specifications as described in the FSAR, design documents, drawing, TSs, and manufacturer instructions as stated in SHINE FSAR Section 12.11.