UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 9, 2024

Mr. Corey Hines, Director
Washington State University
Nuclear Radiation Center
50 Roundtop Drive
Pullman, WA 99164 1300

SUBJECT: WASHINGTON STATE UNIVERSITY - ISSUANCE OF AMENDMENT NO. 22 TO FACILITY OPERATING LICENSE NO. R-76 TO MODIFY THE TECHNICAL SPECIFICATIONS FOR THE WASHINGTON STATE UNIVERSITY MODIFIED TRIGA NUCLEAR REACTOR (EPID L-2023-NFA-0007)

Dear Mr. Hines:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 22 to Facility Operating License No. R-76 for the Washington State University (WSU) Modified TRIGA (Training, Research, Isotopes, General Atomics) Nuclear Reactor. The amendment consists of changes to technical specifications (TSs) section 3, “Limiting Conditions of Operation,” section 4, “Surveillance Requirements,” section 5, “Design Features,” and section 6, “Administrative Control,” to clarify the use of certain descriptive language when referring to certain parts or a whole of either the WSU nuclear reactor, a licensed area, or the research reactor facility as defined in TS section 1, “Definitions,” in response to the application dated August 8, 2023 (Agencywide Documents Access and Management System Accession No. ML23220A385), as supplemented by letters dated January 11, 2024 (ML24011A169), February 23, 2024 (ML24054A196), and March 11, 2024 (ML24071A186).

A copy of the related safety evaluation is also enclosed. If you have any questions, please contact me at (301) 415-5656, or by e-mail at Paulette.Torres@nrc.gov.

Sincerely,

Signed by Torres, Paulette on 04/09/24

Paulette A. Torres, Project Manager
Non-Power Production and Utilization Facility Licensing Branch
Division of Advanced Reactors and Non-Power Production and Utilization Facilities
Office of Nuclear Reactor Regulation

Docket No. 50-027
License No. R-76

Enclosures:
1. Amendment No. 22 to Facility Operating License No. R-76
2. Safety Evaluation

cc w/enclosures: GovDelivery Subscribers

SUBJECT: WASHINGTON STATE UNIVERSITY - ISSUANCE OF AMENDMENT NO. 22 TO FACILITY OPERATING LICENSE NO. R-76 TO MODIFY THE TECHNICAL SPECIFICATIONS FOR THE WASHINGTON STATE UNIVERSITY MODIFIED TRIGA NUCLEAR REACTOR (EPID L-2023-NFA-0007) DATED: APRIL 9, 2024

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WASHINGTON STATE UNIVERSITY

DOCKET NO. 50-027

WASHINGTON STATE UNIVERSITY MODIFIED TRIGA NUCLEAR REACTOR

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 22
License No. R-76

1. The U.S. Nuclear Regulatory Commission ("the Commission") has found that:

   A. The application for amendment to Facility Operating License No. R-76, filed by the Washington State University ("the licensee") on August 8, 2023, as supplemented by letters dated January 11, February 23, and March 11, 2024, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended ("the Act"), and the Commission's rules and regulations set forth in Title 10 of the *Code of Federal Regulations* (10 CFR) Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance that (i) the activities authorized by this amendment can be conducted at the designated location without endangering the health and safety of the public, and (ii) such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public;

   E. The issuance of this amendment is in accordance with 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," of the Commission's regulations and all applicable requirements have been satisfied; and

   F. Prior notice of this amendment was not required by 10 CFR 2.105, "Notice of proposed action," and publication of a notice of issuance for this amendment is not required by 10 CFR 2.106, "Notice of issuance."

2. Accordingly, the license is amended as described in Attachment 1 to this amendment and by changes to the Technical Specifications as described in Attachment 2. Paragraph 2.C.(2) of Facility Operating License No. R-76 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 22, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 90 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Holly D. Cruz Digitally signed by Holly D. Cruz

Holly D. Cruz, Acting Chief
Non-Power Production and Utilization Facility
Licensing Branch
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

Attachments:
1. Changes to Facility Operating License No. R-76
2. Changes to Appendix A, “Technical Specifications”

Date of Issuance: April 9, 2024

ATTACHMENT 1 TO LICENSE AMENDMENT NO. 22

FACILITY OPERATING LICENSE NO. R-76

DOCKET NO. 50-027

Replace the following page of Facility Operating License No. R-76 with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Facility Operating License No. R-76

Remove	Insert
3	3

d. to receive, possess, use, but not separate, in connection with operation of the facility, such byproduct material as may be produced by operation of the facility.

(3) Pursuant to the Act and 10 CFR Part 30, to receive, possess, and use, in connection with operation of the facility, such byproduct material as may be produced by operation of the reactor, which cannot be separated except for byproduct material produced in non-fueled experiments.

C. This license shall be deemed to contain and is subject to the conditions specified in 10 CFR Parts 20, 30, 50, 51, 55, 70 and 73 of the Commission's regulations; is subject to all applicable provisions of the Act, and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The licensee is authorized to operate the facility at a steady-state power levels not in excess of 1.0 megawatt (thermal) and to pulse the reactor in accordance with the limitations in the Technical Specifications.

(2) Technical Specification

The Technical Specifications contained in Appendix A, as revised through Amendment No. 22, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

(3) Physical Security Plan

The licensee shall fully implement and maintain in effect all provisions of the physical security plan approved by the Commission and all amendments and changes made pursuant to the authority of 10 CFR 50.90 and 10 CFR 50.54(p), respectively. The approved plan, which is exempt from public disclosure pursuant to the provisions of 10 CFR 73.21, is entitled, "The Physical Security Plan for the Washington State University," dated November 11, 1983, as amended by letter dated July 18, 1984.

ATTACHMENT 2 TO LICENSE AMENDMENT NO. 22

FACILITY OPERATING LICENSE NO. R-76

DOCKET NO. 50-027

Replace the following pages of Appendix A, “Technical Specifications,” with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Technical Specifications

Remove	Insert
22 of 73	22 of 73
23 of 73	23 of 73
24 of 73	24 of 73
25 of 73	25 of 73
26 of 73	26 of 73
27 of 73	27 of 73
28 of 73	28 of 73
29 of 73	29 of 73
31 of 73	31 of 73
32 of 73	32 of 73
33 of 73	33 of 73
35 of 73	35 of 73
43 of 73	43 of 73
44 of 73	44 of 73
46 of 73	46 of 73
48 of 73	48 of 73
52 of 73	52 of 73
56 of 73	56 of 73
57 of 73	57 of 73
58 of 73	58 of 73
60 of 73	60 of 73
62 of 73	62 of 73
65 of 73	65 of 73
70 of 73	70 of 73

Specification (2) limits the primary coolant temperature to 50 °C because safety analysis for conversion of the WSU reactor from HEU to LEU fuel was carried out for a maximum pool water temperature of 50 °C and found to provide an acceptable level of cooling for the reactor.

Specification (3) stipulates that the radioactive content of the reactor pool water shall remain below 10 CFR 20 release limits, which ensures that a pool water leak cannot under any condition exceed 10 CFR 20 effluent release limits. At this limit the entire pool could be emptied into the WSU sewage system without taking advantage of the dilution factor associated with the discharge volume of the WSU sewage system.

Specification (4) ensures that the appropriate pressure exists for the reactor coolant.

3.4 Ventilation System

Applicability: This specification applies to the operation of the pool room ventilation system.

Objective: The objective is to ensure that the pool room ventilation system is operable to mitigate the consequences of the possible release of radioactive materials resulting from reactor operation.

Specifications:

(1) The reactor shall not be operated unless the pool room ventilation system is operable and operating, except for periods of time not to exceed 48 hours to permit repair or testing of the pool room ventilation system. The pool room ventilation system is operable when flow rates, dampers and fans are functioning normally. The normal, dilute and isolation modes shall be operable for the pool room ventilation system to be considered operable.

   (a) The exhaust flow rate of the pool room ventilation system in the normal mode, from the reactor pool room, shall be not less than 4000 cfm.

   (b) The exhaust flow rate of the pool room ventilation system in the dilute mode, from the reactor pool room, shall be 300 cfm.

(2) The reactor pool room atmospheric pressure shall be maintained negative with respect to the areas outside the pool room when the pool room ventilation system is in the normal or dilute mode.

(3) The pool room ventilation system shall automatically switch to dilute mode upon a high activity alarm from the Continuous Air Monitor.

(4) The pool room ventilation system shall be switched to the isolate mode upon initiation of a reactor scram.

(5) The dilute mode air filter shall be changed whenever the pressure drop across the filter increases by 1 in. of water above the initial level.

Basis: The ^{41}Ar gaseous radioactive effluent release under normal operations of the research reactor facility is limited to 20 Ci of ^{41}Ar per year. The environmental monitoring program, as reported in annual reports to the U.S. NRC shows that there are no measurable exposures in the environment arising from operation of the reactor. Therefore, operating the reactor with the pool room ventilation system in the dilute or isolate mode presents no increased risk to the public or the environment since, when in the dilute or isolate mode, the amount of effluent air released from the reactor pool room is less than when the pool room ventilation system is operating normally. Operation of the reactor with the pool room ventilation system shut down or in isolate mode for short periods of time to make system repairs or tests does not compromise the control over the release of airborne radioactive materials. Moreover, radiation monitors within the research reactor facility, independent of the pool room ventilation system, can give warning of high levels of radiation when the pool room ventilation system is shut down or in isolate mode.

A high activity alarm from the Continuous Air Monitor would be the first indication of a loss of cladding integrity of a fuel rod. The high activity alarm from the Continuous Air Monitor causes the pool room ventilation system to automatically switch into the dilute mode.

All reactor scrams trigger the pool room ventilation system controls to shift the pool room ventilation system into the isolate mode, irrespective of the cause of the reactor scram.

3.5 Radiation Monitoring System and Effluents

3.5.1 Radiation Monitoring Systems

Applicability: This specification applies to the radiation monitoring information which shall be available to the reactor operator during reactor operation.

Objective: The objective is to ensure that sufficient radiation monitoring information is available to the reactor operator to ensure safe operation of the reactor.

Specifications: The reactor shall not be operated unless the radiation monitoring channels listed in Table 3.4 are operable. Each channel shall have a readout in the reactor control room and be capable of sounding an audible alarm that can be heard in the reactor control room.

Basis: The radiation monitors inform the reactor operator about danger from radiation so that there will be sufficient time to evacuate the research reactor facility and take the necessary steps to prevent the spread of radioactivity to the surroundings.

Table 3.4 Minimum Radiation Monitoring Channels

Channel*	Number
Reactor bridge radiation monitor	1
Beam room radiation monitor	1
Continuous air monitor	1
Exhaust gas monitor	1

*During maintenance to the radiation monitoring channels, the intent of this specification will be satisfied if they are replaced with portable gamma radiation sensitive instruments with alarms or that shall be kept under visual observation.

3.5.2 Effluents

Applicability: This specification applies to the concentration of ^{41}Ar in air effluent and to liquid effluents that may be discharged from the research reactor facility.

Objective: The objective of this specification is to protect the health and safety of the public by limiting discharge of ^{41}Ar from the research reactor facility and to limit the annual population radiation exposure due to operation of the research reactor facility.

Specifications:

(1) The concentration of ^{41}Ar in the effluent gas discharged from the research reactor facility into the unrestricted area, after environmental dilution shall not exceed 1×10^{-8} μCi/mL averaged over one year.

(2) An environmental radiation monitoring program shall be conducted to measure the integrated radiation exposure in and around the research reactor facility.

(3) The annual radiation exposure due to reactor operation, at the closest off-site point of extended occupancy, shall not, on an annual basis, exceed the average local off-site background radiation by more than 20%.

(4) The total annual discharge of ^{41}Ar into the environment shall not exceed 20 Ci per year.

(5) The reactor shall be shut down if a fission product leak from a fuel rod or an airborne radioactive release from an irradiated sample is detected by the continuous air monitor, and the reactor shall remain shut down until the source of the leak is located and eliminated. However, the reactor may continue to be operated on a short-term basis as needed to assist with identification of the source of the leak provided that occupational values listed in Table 1 of 10 CFR 20 Appendix B are not exceeded and effluent concentrations listed in Table 2 of 10 CFR 20 are not exceeded.

(6) The quantity of radioactivity in liquid effluents released to the sewer system shall not exceed the limits stipulated in 10 CFR 20 Appendix B, Table 3.

Basis:

The maximum allowable concentration of ^{41}Ar in air released to unrestricted areas as specified in Appendix B, Table II of 10 CFR 20 is 1×10^{-8} μCi/mL.

The environmental monitoring program requirement is intended to provide data to measure the impact of reactor operations on the surrounding environment.

The maximum allowable annual radiation exposure to the public as stipulated in 10 CFR 20, Subpart D, 20.1301 due to reactor operations is 0.1 rem in one year. An increase of 20% over background radiation levels is less than the 0.1 rem per year limit. The environmental radiation monitoring program is used to determine average background radiation by monitoring background radiation levels in locations distant from the WSU reactor. The monitoring program is also used to measure radiation levels in close proximity to the nearest occupied dwelling. The closest off-site point of extended occupancy is used as a conservative baseline because it would be the point of greatest exposure.

Section 6.5 of the safety analysis report for conversion of the WSU TRIGA reactor to FLIP fuel establishes a 3.4×10^{-3} atmospheric dilution factor for an average 4.4 mph wind speed. Given a pool room ventilation system exhaust discharge rate of 4000 cubic feet per minute, a dilution factor of 3.4×10^{-3} and a maximum discharge of 20 Ci/year, the maximum concentration of ^{41}Ar released into the unrestricted area would be 1.1×10^{-9} μCi/mL.

A fission product leak would first be detected by the continuous air monitor. The reactor may only be operated for purposes of finding the leak as long as 10 CFR 20 limits for occupational exposure and effluent concentrations are not exceeded.

Monthly average release limits for radioactive materials are provided in 10 CFR 20, Appendix B, Table 3. These values will be used for purposes of determining liquid effluent release limits.

3.6 Limitations on Experiments

Applicability: This specification applies to experiments installed in the research reactor and its experimental facilities (defined in Section 1).

Objective: The objective is to prevent damage to the reactor or excessive release of radioactive materials in the event of an experiment failure.

Specifications: The reactor shall not be operated unless the following conditions governing experiments exist:

(1) The reactivity worth of a moveable experiment shall be less than $1.00.

(2) The reactivity worth of a secured experiment shall not exceed \$2.00.

(3) The sum of the absolute values of all individual experiments shall not exceed \$5.00.

(4) Explosive materials, such as TNT, or its equivalent, shall be limited to 25 mg, for irradiation in the reactor or experimental facilities. Explosive materials in quantities less than 25 mg may be irradiated in the reactor or experimental facilities, provided prior testing of explosive material encapsulation is shown to ensure no reactor damage in the event of a detonation and that the pressure produced upon detonation of the explosive has been demonstrated to be less than half the design pressure of the container.

(5) Experimental materials, except fuel materials, which could off-gas, sublime, volatilize, or produce aerosols under:

(a) normal operating conditions of the experiment or reactor;

(b) credible accident conditions in the reactor;

(c) possible accident conditions in the experiment;

shall be limited in radioactivity so that if 100% of the gaseous radioactivity or radioactive aerosols produced escaped to the reactor pool room or the atmosphere of the unrestricted area outside the facility, the airborne concentration of radioactivity would not exceed the limits of 10 CFR 20, Appendix B, Table 1 or Table 2 averaged over one year. An atmospheric dilution factor of 3.4×10^{-3} for gaseous discharges from the research reactor facility shall be used in calculations of unrestricted area effluent discharges.

(6) Pursuant to specification (5) above, the following conditions shall be shown to exist:

(a) at least 90% of the particles will be retained if the effluent from an experiment is designed to exhaust through a filter installation designed for greater than 99% filtration efficiency for 0.3 micrometer particles;

(b) at least 90% of the vapors will be retained in the experiment or in the reactor pool for materials whose boiling point is above 60 °C and the materials are exposed to conditions in which the material can boil, and vapors formed by boiling this material can escape only through an undisturbed column of water above the core.

(7) Each fueled experiment shall be controlled so that the total radioactive inventory of iodine isotopes 131 through 135 in the experiment is less than 1.5 Ci.

(8) The experimental material and potentially damaged components shall be inspected to determine the consequences and need for corrective action if a capsule fails and releases material that could damage the reactor fuel or structure by corrosion or other means.

(9) Corrosive materials shall be doubly encapsulated. All liquid and gas samples shall be analyzed to determine whether they require double encapsulation.

Basis:

Specification (1) limits the worth of moveable experiments to less than $1.00 to provide assurance that the worth of a single moveable experiment will be limited to such a value that the reactor will not reach a state of prompt criticality if the positive worth of the experiment were to be suddenly inserted.

Specification (2) limits the maximum worth of a secured experiment to $2.00 so that the sudden addition of $2.00 of positive reactivity to the reference core will not result in the reactor achieving a power level high enough to exceed the core temperature safety limit. It was shown in the WSU HEU to LEU conversion Safety Analysis Report that a $2.00 pulse from any permissible power level will not exceed the fuel temperature safety limit.

Specification (3) limits the sum of the absolute values of reactivity worth of all experiments to ensure that the reactor will remain subcritical when in a shutdown condition in the event of a simultaneous removal of all of the experiments with one control rod and the regulatory rod withdrawn. The minimum required shutdown margin is $0.25 with all experiments with positive reactivity in the most reactive state, and the value of all experiments with negative reactivity not used in the shutdown margin determination and the non-scrammable regulating rod and the highest worth control rod in the fully withdraw position. The value of experiments with positive reactivity is included in the shutdown margin calculation to ensure that insertion of experiments with positive reactivity cannot cause the reactor to become critical. Excluding the value of experiments with negative reactivity assures that the reactor cannot become critical with simultaneous withdrawal of all experiments with negative reactivity.

Specification (4) limiting the use of explosive materials is intended to prevent damage to reactor components resulting from failure of an experiment involving explosive materials. NUREG 1537 Part 1, Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors, Appendix 14.1, Format and Content of Technical Specifications for Non-Power Reactors, Section 3.8.2 describes a limiting condition for irradiation of explosive materials, i.e. a limit of 25 mg, and that prior testing of the explosive material encapsulation ensures that no reactor damage would result in the event of a detonation.

Specification (5) is intended to reduce the likelihood that a release of airborne radioactive material in excess of the limits of Appendix B of 10 CFR 20 will be released to the atmosphere within or outside the research reactor facility. The atmospheric dilution factor of 4×10^{-3} for an elevated release has been documented in the Safety Analysis Report of May, 1974 for conversion of the WSU reactor to HEU fuel, with the Technical Specifications approved by the U.S. NRC in a letter dated June 26, 1975. The atmospheric dilution factor calculation was also demonstrated in the WSU Safety Analysis Report of 1979 which was approved by the U.S. NRC as Amendment No. 10 in a letter from the U.S. NRC in a letter dated August 11, 1982.

Specification (6)(a) applies to experiments which are set up to exhaust through a filter system. The specification is intended to prevent particulate matter from escaping if the experiment is set up such that any material released from the experiment shall first pass through a filter before reaching the pool room atmosphere or the unrestricted area outside the research reactor facility.

Specification (6)(b) applies only to materials with a boiling point that is greater than 60 °C that are irradiated under conditions that cause the sample to exceed the boiling point.

Specification (7) provides the 1.5-Ci limitation on iodine isotopes 131 through 135 to ensure that in the event of failure of a fueled experiment leading to total release of the iodine, the dose at the exclusion area boundary will be less than that allowed by 10 CFR 20 for an unrestricted area. The most restrictive limit for an iodine isotope is 2×10^{-10} µCi/mL for ^{131}I, averaged over one year. At a pool room ventilation system flow rate of 4000 ft^3/minute, 1.5 Ci of ^{131}I would result in an air effluent release of 8.6×10^{-11} µCi/mL, averaged over one year, which is well below the 10 CFR 20 Appendix B Table 2 release limit.

Specification (8) stipulates inspection in case of a capsule failure because operation of the reactor with the reactor fuel or structure damaged is prohibited.

Specification (9) provides for double encapsulation of corrosive or potentially hazardous liquid or gas samples to reduce the likelihood and consequences of an encapsulation failure.

3.7 Sealed Sources in the Reactor Pool

Applicability: This specification applies to sealed radioactive sources stored or used in the reactor pool.

Objective: The objectives of this requirement are to ensure that:

(1) sealed radioactive sources that are stored or used in the pool do not constitute a hazard to the reactor;

(2) sealed radioactive sources do not create an environmental or occupational hazard;

(3) sealed radioactive sources do not compromise the ALARA criteria of the research reactor facility.

Specifications:

(1) Sealed sources shall not be stored or used closer than five (5) feet from an operating reactor core.

(2) The total radioactivity of all sealed sources stored in the reactor pool shall not exceed 100,000 curies.

(3) All sealed source configurations shall be designed so that a loss of pool water accident shall not cause a loss of sealed source encapsulation integrity and the sources shall be stored in an appropriate shield to prevent a significant radiation hazard in the event of a loss of reactor pool water.

(4) The storage and use of sealed sources shall be considered an experiment subject to all applicable provisions for experiments in the Technical Specifications.

(5) A written Standard Operating Procedure for the storage and use of sealed sources in the reactor pool shall be in effect.

Basis:

The 10 CFR 20 Appendix B, Table 3 limit is 3×10^{-5} μCi/mL for ^{60}Co, which is the WSU sealed source material. Limits of the pool water radionuclide content are provided in the Limiting Conditions of Operation in Section 3.3 for Primary Coolant Conditions and the Surveillance Requirement in Section 4.3 for Primary Coolant Conditions.

Specification (1) limits the proximity of sealed sources to five or more feet away from the surface of the reactor core which minimizes the effect of radioactive sources on the reactor and the operation of the reactor upon the sources. The neutron flux at a distance of five feet from the core surface is insignificant and thus could not cause activation of the sources and associated shielding.

Specification (2) limits the level of radioactivity of sealed sources to a value at which the presence of the sources in the pool would have no impact upon the maximum hypothetical accident, which is the rupture of the cladding of one fuel rod in air. However, the presence of sources in the pool could contribute to the radiation hazard associated with a loss of pool water. The dose rate 25 feet above an unshielded core in the event of a loss of coolant accident would be increased by less than 2% with the presence of 100,000 curies of ^{60}Co stored in the irradiation unit in the reactor pool.

Specification (3) requires shielding of sealed sources to be provided in a manner which` will limit the radiation exposure in the reactor pool room in the event of a loss of coolant accident.

Specifications (4) and (5) provide limitations on the storage and use of sealed sources to ensure that the sealed sources are used safely. Classifying the storage of sealed sources as an experiment mandates that the storage be reviewed by the Reactor Safeguards Committee.

3.8 Boron Neutron Capture Facility

Applicability: This specification applies solely to the generation of a BNC neutron beam for BNC experiments.

Objective: The objective of the Technical Specifications in this section is to provide assurance that use of the BNC facility and a BNC neutron beam does not present a danger to any person, the reactor, or the research reactor facility.

Specifications:

(1) It shall be possible to initiate a scram of the reactor from a control panel located in the BNC facility. In the event that the BNC facility scram is inoperable, it shall be acceptable to use one of the control room scrams via communication with the reactor

(7) The BNC facility shall be equipped with a display that provides an indication of the radiation level within the BNC facility that indicates both within the BNC facility and at the local control panel and provides an audible alarm within the BNC facility and at the BNC facility control panel.

(a) The radiation monitor shall be equipped with a backup power supply.

(b) The radiation monitor audible alarm shall be set at or below 50 mrem/hr. The monitor and/or its alarm may be disabled once the BNC beam room has been searched and secured by closing and locking the BNC facility access door. If the radiation monitor and/or the audible alarm are disabled, both the monitor and the audible alarm shall automatically become functional upon opening of the BNC facility access door.

(c) Personnel entering the BNC facility shall use portable radiation detection instruments and audible alarm personal dosimeters if the radiation monitor becomes inoperable during use of the BNC facility. Use of portable radiation detection instruments and audible alarm personal dosimeters as a temporary means of satisfying this provision shall be limited to seven consecutive working days.

(8) An intercom or other means of two-way communication shall be operable between the BNC facility control panel and the reactor control room, and also between the BNC facility control panel and the interior of the BNC facility radiation shielding.

(9) It shall be possible for personnel monitoring a BNC experiment to open the BNC facility access door.

(10) It shall be possible to observe the BNC experiment by means of two independent closed-circuit television (CCTV) cameras.

(a) Each camera shall be operable at the beginning of a BNC experiment. A BNC experiment may be continued at the discretion of the experimenter if one camera fails during a BNC experiment. The BNC experiment shall be immediately stopped if both cameras fail during a BNC experiment.

(b) Emergency lighting and backup power shall be provided for one BNC facility CCTV camera.

(11) Maintenance, repair, and modification of the BNC facility shall be performed under the supervision of a Senior Reactor Operator. All modifications shall be reviewed pursuant to the requirements of 10 CFR 50.59.

(12) Personnel who are not licensed to operate the WSU research reactor may operate the controls for the BNC facility provided compliance is maintained with all technical specifications and that:

(a) instructions have been posted at the BNC facility control panel to ensure that only the appropriate target is in the irradiation facility before turning on the primary beam of radiation to begin an irradiation;

(b) training has been provided, proficiency satisfactorily demonstrated and documented on the design of the BNC facility, the controls, and the use of the controls;

(c) the procedure for conduct of the BNC experiment shall be posted at the control panel of the BNC facility with instructions to notify the reactor operator if the BNC facility operator is unable to turn the BNC neutron beam off with BNC facility controls, or if any abnormal condition occurs; a directive shall be included with this procedure to notify the reactor console operator if an abnormality occurs;

(d) personnel who are not licensed on the WSU research reactor but who have been trained under this provision may initiate bridge movement provided that verbal permission is requested and received from the reactor console operator immediately prior to such action. Emergency scrams causing a bridge retraction are an exception and may be made without first requesting permission.

(13) Personnel who are not licensed to operate the WSU research reactor shall not take any action that affects the reactivity of the research reactor without approval of a senior reactor operator.

(14) The following characterizations of the BNC neutron beam shall be carried out to prepare the BNC facility for a BNC experiment:

(a) the intensity of the beam shall be measured;

(b) the neutron energy spectrum shall be determined;

(c) the beam diameter and divergence shall be determined;

(d) the dose vs. depth profile in phantoms, evaluated from the surface of the phantom to a depth at least equivalent to the total thickness of the BNC experimental target as irradiated on a central axis. Thermal and fast neutrons and gamma ray components shall be determined in this characterization.

Basis:

Specification (1) provides a requirement to have a capability to initiate a scram from a control panel located in the BNC facility to quickly shut down the reactor in case of an emergency.

Specification (2) requires that access to the BNC facility be limited to a single door to control access and ensure that there will be no uncontrolled entry of personnel into the BNC neutron beam area.

Specifications (3)(a) and (3)(c) establish a requirement that the reactor bridge remain in or return to the retracted position upon initiation of a reactor scram, or when the BNC facility door is not closed to provide radiation protection to personnel who may be working in the vicinity of the BNC neutron beam port.

Specification (3)(b) establishes a radiation protection requirement to provide for the safety of operating personnel.

Specification (3)(d) establishes a requirement that the reactor shall scram and the reactor bridge shall move to the retracted position to provide for radiation protection of personnel.

Specification (3)(e) provides a requirement that the reactor bridge automatically retract upon loss of power to the BNC facility to provide radiation protection to personnel who may have to enter the BNC neutron beam area during a power outage to perform procedures to provide for safe operation and shutdown of the BNC facility.

Specification (3)(f) provides a requirement for a means to manually move the reactor bridge so that it is possible to move the reactor bridge to the retracted position if building power is lost.

Specification (3)(g) provides a requirement to initiate a signal that will cause the reactor bridge to move to the retracted position to control the amount of radiation entering the BNC facility through the BNC neutron beam port if an urgent need arises to quickly enter the beam area.

Specification (3)(h) puts in place a provision that would prevent startup of the reactor while personnel are working in the area of the BNC neutron beam port.

Specification (4) requires a reactor bridge position indicator to notify personnel of the beam status with respect to reactor proximity to the beam port.

Specification (5) provides for alternate means of positively verifying the reactor bridge position via video link, which provides a great degree of certainty with regard to information on the reactor position.

Specification (6) requires that the reactor power is displayed on the BNC facility control panel so that personnel performing work in the BNC facility will have accurate live-time information about reactor operational status so that work may be performed safely.

Specification (7) provides for radiation monitors and audible alarms to provide personnel with information on radiation levels within the BNC facility and to alert personnel to the presence of elevated radiation levels. The monitor and alarm may be disabled only after the BNC facility has been searched, closed, and locked so that it will not act as a distraction to personnel operating the BNC facility once BNC neutron beam use commences.

Specification (8) requires an intercom system to provide a means for prompt communication between BNC experimenter(s) and the reactor operator in the reactor control room.

4 SURVEILLANCE REQUIREMENTS

4.0 General

Applicability: This specification applies to the surveillance requirements of systems related to reactor safety.

Objective: The objective is to verify the proper operation of systems related to reactor safety.

Specifications: Additions, modifications, or maintenance to the pool room ventilation system, the core and its associated support structure, the pool or its penetrations, the pool coolant system, the control rod drive mechanisms, or the reactor safety systems shall be made and tested in accordance with the specifications to which the systems were originally designed and fabricated or to specifications approved by the Reactor Safeguards Committee. A system shall not be considered operable until after it has been successfully tested.

Basis: This specification relates to changes in reactor systems that could directly affect the safety of the reactor or the health and safety of personnel. As long as changes or replacements to these systems continue to meet the original design specifications, it can be assumed that they meet the presently accepted operating criteria.

4.1 Reactor Core Parameters

4.1.1 Steady State Operation

Applicability: This specification applies to the surveillance requirements for reactor power level.

Objective: The objective of this specification is to verify the operability of the reactor power level monitoring system to ensure that the maximum power level is not exceeded.

Specifications: The surveillance requirements for the reactor safety systems that monitor reactor power level are described in Section 4.2.3.

Basis: The power level information and control is provided by the power level monitoring system. This specification ensures the proper functioning of the reactor power level monitoring systems providing a means to ensure that the maximum reactor power level is not exceeded.

4.1.2 Pulse Mode Operation

Applicability: This specification applies to the authorized limits for fuel temperature during pulsing operation.

Objective: The objective of this surveillance requirement is to assure that the peak fuel temperature limit is not reached or surpassed during pulsing.

(2) The pressure drop across the absolute filter in the pool room ventilation system shall be measured semiannually.

(3) The air flow rates in the pool room ventilation system shall be measured biennially.

Basis:

Specification (1) requires visual confirmation of pool room ventilation system operability by cycling the system through the operational modes while observing the fans and dampers. This is to be done to provide a high degree of confidence that the pool room ventilation system is operable.

Specification (2) requires the pressure drop across the pool room ventilation filter to be measured to determine whether the filter needs to be changed.

Specification (3) requires air flow rates to be measured to provide data which can be used to determine whether the pool room ventilation system is operating as designed.

4.5 Radiation Monitoring System and Effluents

4.5.1 Radiation Monitoring System

Applicability: This specification applies to the surveillance monitoring for the area monitoring equipment, argon-41 monitoring system, and continuous air monitoring system.

Objectives: The objectives are to ensure that the radiation monitoring equipment is operating properly and capable of performing its intended function, and that the alarm points are set correctly.

Specifications:

(1) All radiation monitoring systems shall be verified to be operable by a monthly channel test.

(2) The following surveillance activities shall be performed on an annual basis:

(a) The reactor bridge and beam room radiation monitoring system shall be calibrated using a certified radioactive source.

(b) A calibration shall be performed on the continuous air monitor in terms of counts per unit time per unit of radioactivity using calibrated beta-particle emitting sources.

(c) A calibration of the exhaust gas monitor system shall be done using at least two different calibrated gamma-ray sources.

Basis:

Specification (1) requires monthly verification of radiation monitoring systems operability to confirm that the systems are performing as designed.

Specification (2) requires calibration of the bridge and beam room monitoring system, the continuous air monitor, and the exhaust gas monitor because these radiation detection systems provide important information about the working environment within the licensed areas of the Dodgen Research Facility and about the gas effluent releases due to reactor operation.

4.5.2 Effluents

Applicability: This surveillance requirement applies to monitoring of gaseous and liquid effluents.

Objective: The objective of this surveillance requirement is to ensure that gaseous and liquid effluents have radionuclide contents that are below 10 CFR 20 limits.

Specifications:

(1) The level of ^{41}Ar in the effluent gas shall be continuously monitored during operation of the reactor.

(2) The environmental radiation monitoring program required by Section 3.5.2(2) shall measure the integrated radiation exposure in and around the Dodgen Research Facility on a quarterly basis.

(3) The radiation levels determined by the environmental monitoring program shall be tabulated and examined annually.

(4) The annual discharge of ^{41}Ar shall be calculated annually.

(5) The continuous air monitor shall be continuously monitored during operation of the reactor.

(6) Before discharge, the research reactor facility liquid effluents collected in the holdup tanks shall be analyzed for their radioactivity content.

Basis:

Specification (1) requires continuous monitoring of ^{41}Ar releases to determine compliance with 10 CFR 20 release limits, and the limits imposed by these Technical Specifications.

Specification (2) requires quarterly measurement of radiation in and around the Dodgen Research Facility to demonstrate compliance with limits of radiation exposure to the public and to personnel in the Dodgen Research Facility.

(5) A safety analysis shall document conformance to the requirements of Section 3.6(5).

(6) A safety analysis shall document conformance to the requirements of Section 3.6(6).

(7) A safety analysis shall document that the total radioactive inventory of the iodine isotopes 131 through 135 in a fueled experiment is less than 1.5 Ci.

(8) The results of an inspection and any corrective action taken following a sample failure that releases material that could damage reactor fuel or the reactor structure shall be reviewed by the research reactor facility Director and the Reactor Safeguards Committee and shall be determined to be satisfactory before operation of the reactor is resumed.

(9) Minor modifications to a reviewed and approved experiment may be made at the discretion the Reactor Supervisor, provided that the hazards associated with the modifications have been reviewed and a determination has been made and documented that the modifications do not create a significantly different, a new, or a greater hazard than the originally approved experiment.

Basis:

Specification (1) requires a determination of the reactivity worth of moveable experiments to provide a high degree of confidence that the reactor cannot be inadvertently brought to a prompt critical state by installation or removal of a moveable experiment and that compliance is maintained with these Technical Specifications.

Specification (2) requires a determination of the reactivity worth of secured experiments to provide a high degree of confidence that the experiment cannot cause undesirable influences on reactor behavior, such as inducing unacceptable changes in shutdown margin, and that compliance is maintained with these Technical Specifications.

Specification (3) requires a determination of the reactivity worth of all experiments to provide a high degree of confidence that the assembly of experiments cannot cause undesirable influences on reactor behavior, such as inducing unacceptable changes in shutdown margin, and that compliance is maintained with these Technical Specifications.

Specification (4) provides surveillance requirements on the use of explosives in experiments to remove the risk of damage to the reactor due to an inadvertent detonation of the explosive material.

Specifications (5) and (6) provides for a safety analysis for experiments involving materials which could off-gas, sublime, volatilize or produce aerosols and provides specifications for acceptance criteria.

Specification (7) provides a surveillance requirement for the permitted inventory of radioactive isotopes of iodine in an experiment to protect the health and safety of personnel and the public if the experiment suffers a catastrophic failure and releases all of the radioactive iodine.

Specifications:

(1) Operability of the BNC facility reactor scram mechanism shall be checked and documented before operation of the experiment commences each day that the BNC facility is used to carry out a BNC experiment. A scram test shall be carried out from full power before BNC facility use if more than 6 months have elapsed during which the BNC facility was not used for BNC experiments, or after a component or system modification which could affect the scram system.

(2) Single door access to the BNC facility shall be confirmed before each day of operation of the BNC facility.

(3) The operability of each system listed in Specifications 3.8(3)(a) through 3.8(3)(h) shall be checked and documented before operation of the experiment commences each day that the BNC facility is used to carry out a BNC experiment.

(4) Operability of the reactor bridge position sensor shall be checked and documented before operation of the experiment commences each day that the BNC facility is used to carry out a BNC experiment.

(5) Operability of an alternate means of monitoring reactor bridge position in the event of a failure of the bridge position readout, as permitted in Technical Specification 3.8(5), shall be checked and documented before operation of the experiment commences each day that the BNC facility is used to carry out a BNC experiment.

(6) Operability of the display of the reactor linear power and log power display channels shall be checked and documented before operation of the experiment commences each day that the BNC facility is used to carry out a BNC experiment.

(7) Operability of the radiation monitor, radiation monitor alarm, portable radiation detection instruments and personal dosimeters shall be checked and documented before operation of the experiment commences each day that the BNC facility is used to carry out a BNC experiment. The radiation monitor shall be calibrated quarterly for every calendar quarter that the BNC facility is in use to perform a BNC experiment.

(8) Operability of the intercom system or two way communication system shall be checked and documented before operation of the experiment commences each day that the BNC facility is used to carry out a BNC experiment.

(9) Operability of the BNC facility access door shall be checked and documented before operation of the experiment commences each day that the BNC facility is used to carry out a BNC experiment.

(10) Operability of the closed circuit television monitoring system and emergency lighting and backup power system shall be checked and documented before operation of the experiment commences each day that the BNC facility is used to carry out a BNC experiment.

5 DESIGN FEATURES

5.1 Site and Facility Description

Applicability: This specification applies to the Washington State University research reactor site location and facility description. The research reactor is located within the Dodgen Research Facility, which is a concrete building located approximately one mile east of the main portion of the WSU campus.

Objective: The objective is to specify the site and the research reactor facility of the Washington State University research reactor.

Specifications:

(1) The site is that area bound by the perimeter that encloses the research reactor facility, (also known as the Dodgen Research Facility), the fenced area immediately outside the east pool room loading dock door and the fenced area immediately outside the beam room west loading dock door.

(2) The Washington State University research reactor shall be located in the licensed area of the Dodgen Research Facility.

(3) The research reactor facility shall be a restricted area.

Basis:

Descriptions of the Nuclear Science Center, Dodgen Research Facility, reactor building, and site are provided in detail in the Washington State University Safety Analysis Report.

Specification (1) provides a description of the site.

Specification (2) provides a description of the location of the research reactor and that the location of the research reactor shall be within the licensed area of the Dodgen Research Facility.

Specification (3) requires that the research reactor facility be a restricted area.

Specification (3) describes the requirements for the transient rod. The transient control rod, which is used to produce a reactor pulse, shall have provisions for variable reactivity insertion.

5.5 Fuel Storage

Applicability: This specification applies to the storage of reactor fuel and fueled devices at times when it is not in the reactor core.

Objective: The objective is to ensure that reactor fuel rods and fueled devices in storage will not become critical ($k_{eff} = 1$) and will not reach an unsafe temperature.

Specifications:

(1) All fuel rods and fueled devices shall be stored in a geometrical array where the k_{eff} is less than 0.8 for all conditions of moderation and reflection.

(2) Irradiated fuel rods and fueled devices shall be stored in an array which will permit sufficient natural convective cooling by water or air, so that the fuel rod or fueled device temperature will not exceed design values.

Basis: The limits imposed by Specifications 5.5(1) and 5.5(2) are conservative and ensure safe storage.

5.6 Radiation Monitoring System

Applicability: This specification describes the functions and components of the area radiation monitoring equipment, the continuous air monitor and the exhaust gas monitor.

Objective: The objective is to describe the radiation monitoring equipment that shall be operable to ensure safe operation of the reactor.

Specifications:

(1) The area radiation monitors shall be sensitive to gamma radiation, shall monitor radiation fields in key locations, and shall alarm and readout at the reactor control console.

(2) The Continuous Air Monitor shall:

(a) be capable of particulate collection, and detection of beta and gamma radiation;

(b) monitor particulate radioactivity in the pool room air, alarm and readout at the reactor control console;

(c) be capable of causing the pool room ventilation system to switch from the normal mode into the dilution mode upon initiation of a high continuous air monitor alarm signal when the reactor is operating.

(3) The exhaust gas monitor shall be capable of detecting gamma radiation, and shall monitor ^{41}Ar content in pool room ventilation system exhaust air, and shall alarm and readout at the reactor control console.

Basis:

The area radiation monitoring system described in specification (1) is intended to provide information of the level of radiation to operating personnel to maintain a safe work environment and if necessary, to evacuate the research reactor facility and take the necessary steps to prevent the spread of radioactive materials to the surroundings.

The continuous air monitor described in specification (2) samples air above the reactor core, and would be the most likely monitor to first detect a leak of fission products from the reactor.

The exhaust gas monitor described in specification (3) is required to sample and monitor pool room ventilation system exhaust air to provide a live time indication and a record of the level of radioactivity in exhaust gas effluent. The primary effluent component that is monitored is Ar-41.

5.7 Reactor Building and Ventilation System

Applicability: This specification applies to the building that houses the reactor.

Objective: The objective is to ensure that provisions are made to restrict the amount of radioactivity released into the environment.

Specifications:

(1) The reactor shall be housed in a licensed area designed to restrict leakage. The minimum free volume in the licensed area shall be at least 10^9 cm^3.

(2) The licensed area shall be equipped with a ventilation system designed to filter and exhaust air or other gases from the licensed area and release them from a stack at a height of 46 ± 2 feet from the ground level in the front of the Dodgen Research Facility.

(3) A set of controls for the pool room ventilation system shall be located outside the reactor pool room and control room areas. The controls shall be capable of changing the pool room ventilation system mode of operation into the dilute or isolate mode.

(4) The pool room ventilation system shall have a dilution mode of operation with the following characteristics:

(a) air from the reactor pool room shall be mixed and diluted with outside air before being discharged from the research reactor facility when the pool room ventilation system is operated in the dilution mode;

(b) the exhaust air from the reactor pool room shall pass through a filter before being discharged from the research reactor facility when the pool room ventilation system is operated in the dilution mode.

Basis:

Specification (1) addresses licensed area design. The licensed area is designed so that the pool room ventilation system will maintain a negative pressure with respect to the atmosphere outside the reactor pool room to minimize uncontrolled leakage to the environment. The reactor pool room air would be maintained at a negative pressure with respect to the surroundings in both the normal and dilute modes, with respect to limiting the release of effluents through controlled pathways. The free air volume within the licensed area is isolated when the pool room ventilation system is operated in the isolation mode.

Specification (2) provides a requirement for the air exhaust system stack height to be above ground level to provide a greater dilution effect for exhaust effluent gases than would be the case for ground level releases.

Specification (3) provides a requirement that a set of controls for isolation, dilution, and normal operation of the pool room ventilation system are located external to the control and reactor pool rooms, so that proper handling of airborne radioactive materials in emergency situations can be managed with a minimum of exposure to personnel.

Specification (4) provides a requirement that the reactor pool room ventilation system have a dilution mode to minimize release rates of airborne radioactive material, and that the exhaust air be passed through an air filter before release. This is to control the rate at which airborne effluents can be released from the research reactor facility. The air filtration system will remove most particulate material, restricting releases to gases that can pass though an air filter, such as argon, krypton and xenon.

5.8 Reactor Pool Water System

Applicability: This specification applies to the pool containing the reactor and to the cooling of the core by the pool water.

Objective: The objective is to ensure that coolant water shall be available to provide adequate cooling of the reactor core and adequate radiation shielding.

Specifications:

(1) The reactor core shall be cooled by natural convection water flow.

(2) All piping extending more than 5 feet below the surface of the pool shall have adequate provisions to prevent inadvertent siphoning of the pool.

6 ADMINISTRATIVE CONTROL

6.1 Responsibility and Organization

(1) The Washington State University research reactor shall be operated by the Nuclear Science Center of Washington State University. The organization of the research reactor facility management and operation shall be as shown in Figure 6.1. The responsibilities and authority of the Level 2, Level 3, and Level 4 operating staff shall be defined in writing in these Technical Specifications.

(2) The following organizational levels and responsibilities shall exist:

(a) Vice President for Research (Level 1): The Vice President for Research is the head of the WSU Office of Research.

(b) Director of the Nuclear Science Center (Level 2): The Director of the Nuclear Science Center shall report to the Vice President for Research. The Director is responsible for ensuring that regulatory requirements and implementation are in accordance with requirements of the U.S. Nuclear Regulatory Commission, the Code of Federal Regulations, the State of Washington, and Washington State University regulations and the requirements of the WSU Reactor Safeguards Committee.

(c) Reactor Supervisor (Level 3):

(i) The Reactor Supervisor shall report to the Director of the Nuclear Science Center and is responsible for guidance, oversight, and technical support of reactor operations.

(ii) The Reactor Supervisor shall report to the Director of the Nuclear Science Center and to the Reactor Safeguards Committee in matters of radiation protection.

(d) Reactor Operating Staff (Level 4): The reactor operating staff shall report to the Reactor Supervisor. Reactor operating staff shall include one or more licensed Senior Reactor Operator, Reactor Operator or Reactor Operator trainee.

(e) Radiation Protection

(i) Radiation protection activities shall be carried out by Level 3 or Level 4, with supervisory function performed by the Level 3, Reactor Supervisor.

(ii) The Reactor Safeguards Committee shall perform the review and audit function over the radiation protection activities within the research reactor facility.

(b) a second designated person present at the research reactor facility able to carry out written instructions;

(c) a designated Senior Reactor Operator who shall be readily available in the Dodgen Research Facility or on call.

(2) A Senior Reactor Operator who is "on call" shall be defined as an individual who:

(a) has been specifically designated and this designation is known to the Reactor Operator on duty;

(b) keeps the Reactor Operator on duty informed of where he/she can be rapidly contacted and the contact telephone number;

(c) is capable of getting to the research reactor facility in less than 30 minutes and shall remain within a 15 mile radius of the research reactor facility;

(3) It is not necessary to have a Senior Reactor Operator on call if the Reactor Operator in the control room is a Senior Reactor Operator. If the Reactor Operator in the control room is a Senior Reactor Operator a second person shall be present in the research reactor facility as described in Section 6.2(1)(b).

6.2.2 Contact Information

(1) A list of personnel including name and telephone number shall be readily available in the control room for use by the Reactor Operator. The list shall include:

(a) facility Director;

(b) Reactor Supervisor;

(c) all licensed Reactor Operators and Senior Reactor Operators.

6.2.3 Events Requiring the Direction of an SRO

A licensed senior reactor operator shall be present at the research reactor facility for:

(1) Initial startup and approach to power;

(2) All fuel movement or relocation;

(3) All control rod relocations within the core region;

(4) Relocation of any in-core experiments or irradiation facilities with a reactivity worth greater than $1.00;

(5) Recovery from unplanned or unscheduled shutdown; or

(7) biennial review and approval of all standard operating procedures and changes to the standard operating procedures;

(8) biennial review of the emergency plan and the security plan;

(9) annual review of the radiation protection program;

(10) review audit reports.

6.4.5 Audits

(1) The RSC or a subcommittee shall audit reactor operations semiannually. The semiannual audit shall include at least the following:

(a) review of the reactor operating records;

(b) inspection of the reactor operating areas;

(c) review of reportable occurrences;

(d) radiation exposures within and outside the research reactor facility;

(e) operations for conformance to the Technical Specifications and license conditions.

(2) The RSC or a subcommittee shall audit the following at biennial intervals:

(a) emergency plan and implementing procedures;

(b) retraining and requalification program;

(c) security plan.

6.4.6 Records

The activities of the RSC shall be documented by the secretary of the Committee and distributed as follows:

(1) A written report of all audits performed under Section 6.4.5 shall be prepared and forwarded to Level 1 and Level 2 management within 3 months after the audit has been complete.

(2) A written report of all reviews performed under Section 6.4.4 shall be prepared and forwarded to the Level 1 and Level 2 management within 30 days following the completion of the review.

(7) facility radiation and contamination surveys;

(8) Reactor Safeguards Committee meeting records and audit reports.

6.9.2 Life of the Facility Records Retention

Records of the following components or items shall be kept for the life of the facility:

(1) gaseous and liquid radioactive effluents released to the environs;

(2) off-site environmental monitoring surveys required by the Technical Specifications;

(3) radiation exposures for all personnel monitored;

(4) updated, corrected and as-built drawings of the research reactor facility;

(5) fuel inventories, receipts, and shipments;

(6) reviews and reports of violations of Safety Limits;

(7) reviews and reports of violations of a Limiting Safety Systems Setting;

(8) reviews and reports of violations of a Limiting Condition of Operation.

6.9.3 Training Records

Record of training, retraining and requalification of licensed personnel shall be maintained at all times the individual is employed or until the operator license is renewed.

6.10 Reports to the U.S. Nuclear Regulatory Commission

All reports in this Section shall be submitted to the U.S. Nuclear Regulatory Commission Document Control Desk.

6.10.1 Written Reports Due Within 10 Days

Written reports of the following shall be submitted to the U.S. NRC within 10 days:

(1) A release of radioactivity above permissible limits in unrestricted areas whether or not the release resulted in property damage, personal injury, or exposure. The written report (and, to the extent possible, the preliminary telephone report) shall describe, analyze, and evaluate safety implications, and outline the corrective measures taken or planned to prevent recurrence of the event.

(2) a violation of a safety limit;

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 22 TO

FACILITY OPERATING LICENSE NO. R-76

WASHINGTON STATE UNIVERSITY

WASHINGTON STATE UNIVERSITY MODIFIED TRIGA NUCLEAR REACTOR

DOCKET NO. 50-027

1.0 INTRODUCTION

By letter dated August 8, 2023 (Agencywide Documents Access and Management System Accession No. ML23220A385), as supplemented by letters dated January 11, 2023, (ML24011A169), February 23, 2024 (ML24054A196), and March 11, 2024 (ML24071A186), Washington State University (WSU, licensee) applied for an amendment to Facility Operating License No. R-76 for the Washington State University Modified TRIGA (Training, Research, Isotopes, General Atomics) Nuclear Reactor. The license amendment request (LAR) proposed changes to technical specifications (TSs), section 3, “Limiting Conditions of Operation,” section 4, “Surveillance Requirements,” section 5, “Design Features,” and section 6, “Administrative Control.” The proposed changes would clarify the use of certain descriptive language when referring to certain parts or a whole of either the WSU nuclear reactor, a licensed area, the pool room ventilation system, or the research reactor facility as defined in TSs section 1, “Definitions.”

2.0 REGULATORY EVALUATION

The U.S. Nuclear Regulatory Commission (NRC, the Commission) staff reviewed the LAR and evaluated the proposed changes to the TSs based on the following regulations and guidance:

- Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, “Domestic Licensing of Production and Utilization Facilities,” Section 50.2, “Definitions,” which provides definitions for the regulatory evaluation and Section 50.36, “Technical specifications,” which provides the requirements for TSs to be included in facility operating licenses, including for a research reactor.

- NUREG-1537, Part 1, “Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Format and Content,” Appendix 14.1, “Format and Content of Technical Specifications for Non-Power Reactors” (ML042430055), which

provides guidance to applicants and licensees on preparing research reactor license applications and TSs.

- NUREG-1537, Part 2, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Standard Review Plan and Acceptance Criteria," Chapter 14, "Technical Specifications" (ML042430048), which provides guidance to the NRC staff on reviewing research reactor LARs.

- American National Standards Institute/American Nuclear Society (ANSI/ANS)-15.1-2007, "The Development of Technical Specifications for Research Reactors" section 1.3, "Definitions," with a list of definitions that provides uniform interpretation of terms and phrases used in this and associated standards. The 2007 version is a revision of ANSI/ANS 15.1-1990, which is cited in NUREG-1537, Parts 1 and 2, but provisions in sections 6.1, "Organization," and section 6.1.1, "Structure," of the 2007 version of the standard do not substantively differ from those in the 1990 version cited in NUREG-1537.

3.0 TECHNICAL EVALUATION

The WSU Modified TRIGA nuclear reactor is a natural convection, water-cooled, and shielded reactor located in the WSU Nuclear Science Center on the campus of Washington State University in Pullman, Washington. The WSU nuclear reactor was originally designed for plate-type, material test reactor fuel assemblies but was converted to the use of TRIGA fuel rods contained in assemblies that can hold up to four rods each. The reactor was originally fueled with highly-enriched (70 percent Uranium-235) TRIGA fuel lifetime improvement program (FLIP) fuel and low-enriched (less than 20 percent Uranium-235) (LEU) TRIGA low density standard fuel elements (SFEs), but was converted to LEU fuel with a nominal enrichment of 19.75 percent in a fuel element with the same geometry and with the same cladding as the FLIP fuel. Only the FLIP fuel elements were replaced by the conversion. The existing low-enriched SFEs remained in use. The TRIGA fuel is uranium-zirconium hydride. Facility Operating License No. R-76 authorizes WSU to operate the reactor at steady-state power not in excess of 1.0 megawatt (thermal) and to pulse the reactor in accordance with the limitations in the TSs.

The proposed TS changes are denoted using ~~strikeout~~ to indicate a deletion and **bold** to indicate an addition.

3.1 TS 3.4 Ventilation System

The licensee proposed changes to TS 3.4, "Applicability." The licensee proposed removing the term "facility" and adding the term "pool room" to be consistent with the term "Pool Room Ventilation System," as defined in TS section 1.

TS 1, "Definitions," states, in part:

> Pool Room Ventilation System: The pool room ventilation system is the combination of fans, dampers, filters, ductwork and controls that provides controlled movement of air into and out of the reactor pool room.

Current TS 3.4, "Applicability," states:

> This specification applies to the operation of the facility ventilation system.

Proposed TS 3.4, “Applicability,” states:

> This specification applies to the operation of the ~~facility~~ **pool room** ventilation system.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 3.4, “Applicability” and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 3.4, “Applicability” acceptable.

The licensee proposed changes to TS 3.4, “Objective.” The licensee proposed adding the term “pool room” to be consistent with the term “Pool Room Ventilation System,” as defined in TS section 1.

TS 1, “Definitions,” states, in part:

> Pool Room Ventilation System: The pool room ventilation system is the combination of fans, dampers, filters, ductwork and controls that provides controlled movement of air into and out of the reactor pool room.

Current TS 3.4, “Objective,” states:

> The objective is to ensure that the ventilation system is operable to mitigate the consequences of the possible release of radioactive materials resulting from reactor operation.

Proposed TS 3.4, “Objective,” states:

> The objective is to ensure that the **pool room** ventilation system is operable to mitigate the consequences of the possible release of radioactive materials resulting from reactor operation.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 3.4, “Objective” and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 3.4, “Objective” acceptable.

The licensee proposed changes to TS 3.4, Specification (1), Specification (2), Specification (3) and Specification (4). The licensee proposes deleting the term “facility” as it is used as a descriptive term outside of terms defined in TS section 1 and adding the term “pool room” to be consistent with the term “Pool Room Ventilation System,” as defined in TS section 1.

TS 1, “Definitions,” states, in part:

> Pool Room Ventilation System: The pool room ventilation system is the combination of fans, dampers, filters, ductwork and controls that provides controlled movement of air into and out of the reactor pool room.

Current TS 3.4, Specification (1), states:

> The reactor shall not be operated unless the facility ventilation system is operable and operating, except for periods of time not to exceed 48 hours to permit repair or testing of the ventilation system. The ventilation system is operable when flow rates, dampers and fans are functioning normally. The normal, dilute and isolation modes shall be operable for the ventilation system to be considered operable.
>
> (a) The exhaust flow rate of the ventilation system in the normal mode, from the reactor pool room, shall be not less than 4000 cfm.
>
> (b) The exhaust flow rate of the ventilation system in the dilute mode, from the reactor pool room, shall be 300 cfm.

Proposed TS 3.4, Specification (1), states:

> The reactor shall not be operated unless the ~~facility~~ **pool room** ventilation system is operable and operating, except for periods of time not to exceed 48 hours to permit repair or testing of the **pool room** ventilation system. The **pool room** ventilation system is operable when flow rates, dampers and fans are functioning normally. The normal, dilute and isolation modes shall be operable for the **pool room** ventilation system to be considered operable.
>
> (a) The exhaust flow rate of the **pool room** ventilation system in the normal mode, from the reactor pool room, shall be not less than 4000 cfm.
>
> (b) The exhaust flow rate of the **pool room** ventilation system in the dilute mode, from the reactor pool room, shall be 300 cfm.

Current TS 3.4, Specification (2), states:

> The reactor pool room atmospheric pressure shall be maintained negative with respect to the areas outside the pool room when the ventilation system is in the normal or dilute mode.

Proposed TS 3.4, Specification (2), states:

> The reactor pool room atmospheric pressure shall be maintained negative with respect to the areas outside the pool room when the **pool room** ventilation system is in the normal or dilute mode.

Current TS 3.4, Specification (3), states:

> The ventilation system shall automatically switch to dilute mode upon a high activity alarm from the Continuous Air Monitor.

Proposed TS 3.4, Specification (3), states:

> The **pool room** ventilation system shall automatically switch to dilute mode upon a high activity alarm from the Continuous Air Monitor.

Current TS 3.4, Specification (4), states:

> The ventilation system shall be switched to the isolate mode upon initiation of a reactor scram.

Proposed TS 3.4, Specification (4), states:

> The **pool room** ventilation system shall be switched to the isolate mode upon initiation of a reactor scram.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds that the proposed changes further clarify TS 3.4, Specification (1), Specification (2), Specification (3) and Specification (4) and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 3.4, Specification (1), Specification (2), Specification (3) and Specification (4) acceptable.

The licensee proposed changes to TS 3.4, “Basis.” The licensee proposes adding the terms “research” and “pool room” to be consistent with the terms “Research Reactor Facility” and “Pool Room Ventilation System,” as defined in TS section 1. The licensee also proposes deleting the term “building” as it is used as a descriptive term outside of terms defined in TS section 1.

TS 1, “Definitions,” states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.
>
> Pool Room Ventilation System: The pool room ventilation system is the combination of fans, dampers, filters, ductwork and controls that provides controlled movement of air into and out of the reactor pool room.

Current TS 3.4, “Basis,” states:

> Basis: The ^{41}Ar gaseous radioactive effluent release under normal operations of the reactor facility is limited to 20 Ci of ^{41}Ar per year. The environmental monitoring program, as reported in annual reports to the U.S. NRC shows that there are no measurable exposures in the environment arising from operation of the reactor. Therefore, operating the reactor with the ventilation system in the dilute or isolate mode presents no increased risk to the public or the environment since, when in the dilute or isolate mode, the amount of effluent air released from the reactor pool room is less than when the ventilation system is operating normally. Operation of the reactor with the ventilation system shut down or in isolate mode for short periods of time to make system repairs or tests does not compromise the control over the release of airborne radioactive materials. Moreover, radiation monitors within the building, independent of the ventilation system, can give warning of high levels of radiation when the ventilation system is shut down or in isolate mode.

A high activity alarm from the Continuous Air Monitor would be the first indication of a loss of cladding integrity of a fuel rod. The high activity alarm from the Continuous Air Monitor causes the ventilation system to automatically switch into the dilute mode.

All reactor scrams trigger the ventilation system controls to shift the ventilation system into the isolate mode, irrespective of the cause of the reactor scram.

Proposed TS 3.4, "Basis," state:

Basis: The ^{41}Ar gaseous radioactive effluent release under normal operations of the **research** reactor facility is limited to 20 Ci of ^{41}Ar per year. The environmental monitoring program, as reported in annual reports to the U.S. NRC shows that there are no measurable exposures in the environment arising from operation of the reactor. Therefore, operating the reactor with the **pool room** ventilation system in the dilute or isolate mode presents no increased risk to the public or the environment since, when in the dilute or isolate mode, the amount of effluent air released from the reactor pool room is less than when the **pool room** ventilation system is operating normally. Operation of the reactor with the ventilation system shut down or in isolate mode for short periods of time to make system repairs or tests does not compromise the control over the release of airborne radioactive materials. Moreover, radiation monitors within the ~~building~~ **research reactor facility**, independent of the **pool room** ventilation system, can give warning of high levels of radiation when the **pool room** ventilation system is shut down or in isolate mode.

A high activity alarm from the Continuous Air Monitor would be the first indication of a loss of cladding integrity of a fuel rod. The high activity alarm from the Continuous Air Monitor causes the **pool room** ventilation system to automatically switch into the dilute mode.

All reactor scrams trigger the **pool room** ventilation system controls to shift the **pool room** ventilation system into the isolate mode, irrespective of the cause of the reactor scram.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds that the term "building" in TS 3.4, "Basis" is referring to the research reactor facility, as defined in TS section 1. The NRC staff finds the proposed changes further clarify TS 3.4, "Basis" and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 3.4, "Basis" acceptable.

3.2 TS 3.5 Radiation Monitoring System and Effluents

The licensee proposed changes to TS 3.5.1, "Radiation Monitoring Systems," "Basis." The licensee proposes adding the term "research reactor" to be consistent with the term "Research Reactor Facility" as defined in TS section 1.

TS 1, “Definitions,” states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 3.5.1, “Basis,” states, in part:

> Basis: The radiation monitors inform the reactor operator about danger from radiation so that there will be sufficient time to evacuate the facility and take the necessary steps to prevent the spread of radioactivity to the surroundings.

Proposed TS 3.5.1, “Basis,” states, in part:

> Basis: The radiation monitors inform the reactor operator about danger from radiation so that there will be sufficient time to evacuate the **research reactor** facility and take the necessary steps to prevent the spread of radioactivity to the surroundings.

The NRC staff reviewed the proposed changes using guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 3.5.1 “Basis” to be consistent with the term “Research Reactor Facility” as defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 3.5.1, “Basis” acceptable.

The licensee proposed changes to TS 3.5.2, “Effluents,” “Applicability.” The licensee proposes deleting the term “WSU TRIGA” and adding the term “research” to be consistent with the term “research reactor facility” as defined in TS section 1.

TS 1, “Definitions,” states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 3.5.2, “Applicability,” states:

> This specification applies to the concentration of ^{41}Ar in air effluent and to liquid effluents that may be discharged from the WSU TRIGA reactor facility.

Proposed TS 3.5.2, “Applicability,” states:

> This specification applies to the concentration of ^{41}Ar in air effluent and to liquid effluents that may be discharged from the ~~WSU TRIGA~~ **research** reactor facility.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds that the term “WSU TRIGA” in TS 3.5.2, “Applicability” is referring to the research reactor facility, as defined in TS section 1. The NRC staff finds the proposed changes further clarify TS 3.5.2, “Applicability” and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information

described above, the NRC staff finds the proposed changes to TS 3.5.2, “Applicability” acceptable.

The licensee proposed changes to TS 3.5.2, “Objective.” The licensee proposes deleting the term “WSU” and adding the terms “research” and “facility” to be consistent with the term “research reactor facility” as defined in section 1 of the TSs.

TS 1, “Definitions,” states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 3.5.2, “Objective,” states:

> The objective of this specification is to protect the health and safety of the public by limiting discharge of ^{41}Ar from the WSU research reactor facility and to limit the annual population radiation exposure due to operation of the WSU reactor.

Proposed TS 3.5.2, Objective, state:

> The objective of this specification is to protect the health and safety of the public by limiting discharge of ^{41}Ar from the ~~WSU~~ research reactor facility and to limit the annual population radiation exposure due to operation of the ~~WSU~~ **research** reactor **facility**.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds that the proposed changes further clarify TS 3.5.2, “Objective” to be consistent with the term “Research Reactor Facility” as defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 3.5.2, “Objective” acceptable.

The licensee proposed changes to TS 3.5.2, Specification (1) and Specification (2). The licensee proposes adding the term “research reactor” to be consistent with the term “Research Reactor Facility” as defined in TS section 1.

TS 1, “Definitions,” states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 3.5.2, Specification (1), states:

> The concentration of ^{41}Ar in the effluent gas discharged from the facility into the unrestricted area, after environmental dilution shall not exceed 1×10^{-8} µCi/mL averaged over one year.

Proposed TS 3.5.2, Specification (1), states:

> The concentration of ^{41}Ar in the effluent gas discharged from the **research reactor** facility into the unrestricted area, after environmental dilution shall not exceed 1×10^{-8} µCi/mL averaged over one year.

Current TS 3.5.2, Specification (2) states:

> An environmental radiation monitoring program shall be conducted to measure the integrated radiation exposure in and around the facility.

Proposed TS 3.5.2, Specification (2), states:

> An environmental radiation monitoring program shall be conducted to measure the integrated radiation exposure in and around the **research reactor** facility.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 3.5.2, Specifications (1) and Specification (2) to be consistent with the term "Research Reactor Facility" as defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 3.5.2, Specification (1) and Specification (2) acceptable.

The licensee proposed changes to TS 3.5.2, "Basis." The licensee proposes adding the term "pool room" to be consistent with the term "Pool Room Ventilation System" as defined in section 1 of the TSs.

TS 1, "Definitions," states, in part:

> Pool Room Ventilation System: The pool room ventilation system is the combination of fans, dampers, filters, ductwork and controls that provides controlled movement of air into and out of the reactor pool room.

Current TS 3.5.2, "Basis," states, in part:

> Section 6.5 of the safety analysis report for conversion of the WSU TRIGA reactor to FLIP fuel establishes a 3.4×10^{-3} atmospheric dilution factor for an average 4.4 mph wind speed. Given a ventilation system exhaust discharge rate of 4000 cubic feet per minute, a dilution factor of 3.4×10^{-3} and a maximum discharge of 20 Ci/year, the maximum concentration of ^{41}Ar released into the unrestricted area would be 1.1×10^{-9} µCi/mL.

Proposed TS 3.5.2, "Basis," states, in part:

> Section 6.5 of the safety analysis report for conversion of the WSU TRIGA reactor to FLIP fuel establishes a 3.4×10^{-3} atmospheric dilution factor for an average 4.4 mph wind speed. Given a **pool room** ventilation system exhaust discharge rate of 4000 cubic feet per minute, a dilution factor of 3.4×10^{-3} and a maximum discharge of 20 Ci/year, the maximum concentration of ^{41}Ar released into the unrestricted area would be 1.1×10^{-9} µCi/mL.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 3.5.2, "Basis" and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 3.5.2, "Basis" acceptable.

3.3 TS 3.6 Limitations on Experiments

The licensee proposed changes to TS 3.6, Specification (5). The licensee proposes adding the terms "pool" and "research reactor" to be consistent with the definition of "Licensed Area" and the term "Research Reactor Facility" as defined in section 1 of the TSs.

TS 1, "Definitions," states, in part:

> Licensed Area: The licensed area is the part of the Dodgen Research Facility building which is subject to the requirements of the WSU license R-76. This area includes:
>
> (1) the reactor pool room (also known as Room 201) and adjacent rooms that allow direct unrestricted access to the pool room
>
> (2) the beam room (also known as Room 2) and adjacent rooms that allow direct unrestricted access to the beam room.
>
> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 3.6, Specification (5), states, in part:

> shall be limited in radioactivity so that if 100% of the gaseous radioactivity or radioactive aerosols produced escaped to the reactor room or the atmosphere of the unrestricted area outside the facility, the airborne concentration of radioactivity would not exceed the limits of 10 CFR 20, Appendix B, Table 1 or Table 2 averaged over one year. An atmospheric dilution factor of 3.4×10^{-3} for gaseous discharges from the facility shall be used in calculations of unrestricted area effluent discharges.

Proposed TS 3.6, Specification (5), states, in part:

> shall be limited in radioactivity so that if 100% of the gaseous radioactivity or radioactive aerosols produced escaped to the reactor **pool** room or the atmosphere of the unrestricted area outside the facility, the airborne concentration of radioactivity would not exceed the limits of 10 CFR 20, Appendix B, Table 1 or Table 2 averaged over one year. An atmospheric dilution factor of 3.4×10^{-3} for gaseous discharges from the **research reactor** facility shall be used in calculations of unrestricted area effluent discharges.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 3.6, Specification (5) and prevent redefinition of descriptive terms outside of those terms defined in

TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 3.6, Specification (5) acceptable.

The licensee proposed changes to TS 3.6, "Basis," Specification (5), TS 3.6, "Basis," Specification (6)(a) and TS 3.6, "Basis," Specification (7). The licensee proposes adding the terms "pool room" and "research reactor" to be consistent with the term "Pool Room Ventilation System" and the term "Research Reactor Facility" as defined in section 1 of the TSs.

TS 1, "Definitions," states, in part:

> Pool Room Ventilation System: The pool room ventilation system is the combination of fans, dampers, filters, ductwork and controls that provides controlled movement of air into and out of the reactor pool room.
>
> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 3.6, "Basis," Specification (5), states:

> Specification (5) is intended to reduce the likelihood that a release of airborne radioactive material in excess of the limits of Appendix B of 10 CFR 20 will be released to the atmosphere within or outside the facility. The atmospheric dilution factor of 4×10^{-3} for an elevated release has been documented in the Safety Analysis Report of May, 1974 for conversion of the WSU reactor to HEU fuel, with the Technical Specifications approved by the U.S. NRC in a letter dated June 26, 1975. The atmospheric dilution factor calculation was also demonstrated in the WSU Safety Analysis Report of 1979 which was approved by the U.S. NRC as Amendment No. 10 in a letter from the U.S. NRC in a letter dated August 11, 1982.

Proposed TS 3.6, "Basis," Specification (5), states:

> Specification (5) is intended to reduce the likelihood that a release of airborne radioactive material in excess of the limits of Appendix B of 10 CFR 20 will be released to the atmosphere within or outside the **research reactor** facility. The atmospheric dilution factor of 4×10^{-3} for an elevated release has been documented in the Safety Analysis Report of May, 1974 for conversion of the WSU reactor to HEU fuel, with the Technical Specifications approved by the U.S. NRC in a letter dated June 26, 1975. The atmospheric dilution factor calculation was also demonstrated in the WSU Safety Analysis Report of 1979 which was approved by the U.S. NRC as Amendment No. 10 in a letter from the U.S. NRC in a letter dated August 11, 1982.

Current TS 3.6, "Basis," Specification (6)(a), states:

> Specification (6)(a) applies to experiments which are set up to exhaust through a filter system. The specification is intended to prevent particulate matter from escaping if the experiment is set up such that any material released from the experiment shall first pass through a filter before reaching the pool room atmosphere or the unrestricted area outside the facility. Specification (6)(b)

applies only to materials with a boiling point that is greater than 60 °C that are irradiated under conditions that cause the sample to exceed the boiling point.

Proposed TS 3.6, "Basis," Specification (6)(a), states:

> Specification (6)(a) applies to experiments which are set up to exhaust through a filter system. The specification is intended to prevent particulate matter from escaping if the experiment is set up such that any material released from the experiment shall first pass through a filter before reaching the pool room atmosphere or the unrestricted area outside the **research reactor** facility. Specification (6)(b) applies only to materials with a boiling point that is greater than 60 °C that are irradiated under conditions that cause the sample to exceed the boiling point.

Current TS 3.6, "Basis," Specification (7), states:

> Specification (7) provides the 1.5-Ci limitation on iodine isotopes 131 through 135 to ensure that in the event of failure of a fueled experiment leading to total release of the iodine, the dose at the exclusion area boundary will be less than that allowed by 10 CFR 20 for an unrestricted area. The most restrictive limit for an iodine isotope is 2×10^{-10} µCi/mL for ^{131}I, averaged over one year. At a ventilation system flow rate of 4000 ft^3/minute, 1.5 Ci of ^{131}I would result in an air effluent release of 8.6×10^{-11} µCi/mL, averaged over one year, which is well below the 10 CFR 20 Appendix B Table 2 release limit.

Proposed TS 3.6, "Basis," Specification (7), states:

> Specification (7) provides the 1.5-Ci limitation on iodine isotopes 131 through 135 to ensure that in the event of failure of a fueled experiment leading to total release of the iodine, the dose at the exclusion area boundary will be less than that allowed by 10 CFR 20 for an unrestricted area. The most restrictive limit for an iodine isotope is 2×10^{-10} µCi/mL for ^{131}I, averaged over one year. At a **pool room** ventilation system flow rate of 4000 ft^3/minute, 1.5 Ci of ^{131}I would result in an air effluent release of 8.6×10^{-11} µCi/mL, averaged over one year, which is well below the 10 CFR 20 Appendix B Table 2 release limit.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 3.6, "Basis," Specification (5), TS 3.6, "Basis," Specification (6)(a) and TS 3.6, "Basis," Specification (7). to be consistent with the terms "Pool Room Ventilation System" and "Research Reactor Facility" as defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 3.6, "Basis," Specification (5), TS 3.6, "Basis," Specification (6)(a) and TS 3.6, "Basis," Specification (7) acceptable.

3.4 TS 3.7 Sealed Sources in the Reactor Pool

The licensee proposed changes to TS 3.7, "Objective" (3). The licensee proposes adding the term "research reactor" to be consistent with the term "Research Reactor Facility" as defined in section 1 of the TSs.

TS 1, “Definitions,” states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 3.7, “Objective” (3), states:

> sealed radioactive sources do not compromise the ALARA criteria of the facility.

Proposed TS 3.7, “Objective” (3), states:

> sealed radioactive sources do not compromise the ALARA criteria of the **research reactor** facility.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 3.7, “Objective” (3) to be consistent with the term “Research Reactor Facility” as defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 3.7, “Objective” (3) acceptable.

3.5 TS 3.8 Boron Neutron Capture Facility

The licensee proposed changes to TS 3.8, “Objective.” The licensee proposes adding the term “research” to be consistent with the term “research reactor facility” as defined in section 1 of the TSs.

TS 1, “Definitions,” states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 3.8, “Objective,” states:

> Objective: The objective of the Technical Specifications in this section is to provide assurance that use of the BNC facility and a BNC neutron beam does not present a danger to any person, the reactor, or the reactor facility.

Proposed TS 3.8, “Objective,” states:

> Objective: The objective of the Technical Specifications in this section is to provide assurance that use of the BNC facility and a BNC neutron beam does not present a danger to any person, the reactor, or the **research** reactor facility.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 3.8, “Objective” to be consistent with the term “Research Reactor Facility” as defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 3.8, “Objective” acceptable.

The licensee proposed changes to TS 3.8, Specification (1) and TS 3.8, “Basis,” Specification (1). The licensee proposes removing the term “area” as it is used as a descriptive term outside the term “BNC Facility” as defined in section 1 of the TSs.

TS 1, “Definitions,” states, in part:

> BNC Facility: BNC facility shall mean the boron neutron capture facility that includes the BNC neutron beam, bridge moving system, beam monitoring equipment, beam shielding room, access door and experimental area viewing equipment. Experimental bench(s), experiment positioning equipment and other equipment used for neutron beam targets shall not be considered part of the BNC Facility for purposes of this definition except insofar as radiation safety (i.e., activation and/or contamination) is concerned.

Current TS 3.8, Specification (1), states:

> It shall be possible to initiate a scram of the reactor from a control panel located in the BNC facility area. In the event that the BNC facility scram is inoperable, it shall be acceptable to use one of the control room scrams via communication with the reactor operator as a temporary means of satisfying this provision. Use of this temporary provision is limited to seven consecutive working days.

Proposed TS 3.8, Specification (1), states:

> It shall be possible to initiate a scram of the reactor from a control panel located in the BNC facility ~~area~~. In the event that the BNC facility scram is inoperable, it shall be acceptable to use one of the control room scrams via communication with the reactor operator as a temporary means of satisfying this provision. Use of this temporary provision is limited to seven consecutive working days.

Current TS 3.8, “Basis,” Specification (1), states:

> Specification (1) provides a requirement to have a capability to initiate a scram from a control panel located in the BNC facility area to quickly shut down the reactor in case of an emergency.

Proposed TS 3.8, “Basis,” Specification (1), states:

> Specification (1) provides a requirement to have a capability to initiate a scram from a control panel located in the BNC facility ~~area~~ to quickly shut down the reactor in case of an emergency.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 3.8, Specification (1) and TS 3.8, “Basis,” Specification (1) and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 3.8 (1) and TS 3.8 (1) “Basis” acceptable.

The licensee proposed changes to TS 3.8, Specification (7), TS 3.8, Specification (12)(b) and TS 3.8, "Basis," Specification (7). The licensee proposes adding the term "BNC" to be consistent with the term "BNC Facility" as defined in section 1 of the TSs.

TS 1, "Definitions," states, in part:

> BNC Facility: BNC facility shall mean the boron neutron capture facility that includes the BNC neutron beam, bridge moving system, beam monitoring equipment, beam shielding room, access door and experimental area viewing equipment. Experimental bench(s), experiment positioning equipment and other equipment used for neutron beam targets shall not be considered part of the BNC Facility for purposes of this definition except insofar as radiation safety (i.e., activation and/or contamination) is concerned.

Current TS 3.8, Specification (7), states, in part:

> The BNC facility shall be equipped with a display that provides an indication of the radiation level within the facility that indicates both within the facility and at the local control panel and provides an audible alarm within the facility and at the BNC facility control panel.

Proposed TS 3.8, Specification (7), states, in part:

> The BNC facility shall be equipped with a display that provides an indication of the radiation level within the **BNC** facility that indicates both within the **BNC** facility and at the local control panel and provides an audible alarm within the **BNC** facility and at the BNC facility control panel.

Current TS 3.8, Specification (12)(b), states, in part:

> training has been provided, proficiency satisfactorily demonstrated and documented on the design of the facility, the controls, and the use of the controls;

Proposed TS 3.8, Specification (12)(b), states, in part:

> training has been provided, proficiency satisfactorily demonstrated and documented on the design of the **BNC** facility, the controls, and the use of the controls;

Current TS 3.8, "Basis," Specification (7), states:

> Specification (7) provides for radiation monitors and audible alarms to provide personnel with information on radiation levels within the BNC facility and to alert personnel to the presence of elevated radiation levels. The monitor and alarm may be disabled only after the facility has been searched, closed, and locked so that it will not act as a distraction to personnel operating the facility once BNC neutron beam use commences.

Proposed TS 3.8, "Basis," Specification (7), states:

> Specification (7) provides for radiation monitors and audible alarms to provide personnel with information on radiation levels within the BNC facility and to alert personnel to the presence of elevated radiation levels. The monitor and alarm may be disabled only after the **BNC** facility has been searched, closed, and locked so that it will not act as a distraction to personnel operating the **BNC** facility once BNC neutron beam use commences.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 3.8, Specification (7), TS 3.8, Specification (12)(b) and TS 3.8, "Basis," Specification (7) and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 3.8, Specification (7), TS 3.8, Specification (12)(b) and TS 3.8, "Basis," Specification (7) acceptable.

3.6 TS 4.0 General

The licensee proposed changes to TS 4.0, Specifications. The licensee proposes adding the term "pool room" to be consistent with the term "Pool Room Ventilation System" as defined in section 1 of the TSs.

TS 1, "Definitions," states, in part:

> Pool Room Ventilation System: The pool room ventilation system is the combination of fans, dampers, filters, ductwork and controls that provides controlled movement of air into and out of the reactor pool room.

Current TS 4.0, Specifications, states:

> Additions, modifications, or maintenance to the ventilation system, the core and its associated support structure, the pool or its penetrations, the pool coolant system, the control rod drive mechanisms, or the reactor safety systems shall be made and tested in accordance with the specifications to which the systems were originally designed and fabricated or to specifications approved by the Reactor Safeguards Committee. A system shall not be considered operable until after it has been successfully tested.

Proposed TS 4.0, Specifications, states:

> Additions, modifications, or maintenance to the **pool room** ventilation system, the core and its associated support structure, the pool or its penetrations, the pool coolant system, the control rod drive mechanisms, or the reactor safety systems shall be made and tested in accordance with the specifications to which the systems were originally designed and fabricated or to specifications approved by the Reactor Safeguards Committee. A system shall not be considered operable until after it has been successfully tested.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537, and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 4.0, Specifications and prevent redefinition of descriptive terms outside of those terms defined in TS

section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 4.0, Specifications acceptable.

3.7 TS 4.4 Ventilation System

The licensee proposed changes to TS 4.4, Specification (3) and TS 4.4, "Basis," Specification (1) and Specification (3). The licensee proposed adding the term "pool room" to be consistent with the term "Pool Room Ventilation System," as defined in TS section 1.

TS 1, "Definitions," states, in part:

> Pool Room Ventilation System: The pool room ventilation system is the combination of fans, dampers, filters, ductwork and controls that provides controlled movement of air into and out of the reactor pool room.

Current TS 4.4, Specification (3), states:

> The air flow rates in the ventilation system shall be measured biennially.

Proposed TS 4.4, Specification (3), state:

> The air flow rates in the **pool room** ventilation system shall be measured biennially.

Current TS 4.4, "Basis," Specification (1), states:

> Specification (1) requires visual confirmation of ventilation system operability by cycling the system through the operational modes while observing the fans and dampers. This is to be done to provide a high degree of confidence that the ventilation system is operable.

Proposed TS 4.4, "Basis," Specification (1), states:

> Specification (1) requires visual confirmation of **pool room** ventilation system operability by cycling the system through the operational modes while observing the fans and dampers. This is to be done to provide a high degree of confidence that the **pool room** ventilation system is operable.

Current TS 4.4, "Basis," Specification (3), states:

> Specification (3) requires air flow rates to be measured to provide data which can be used to determine whether the ventilation system is operating as designed.

Proposed TS 4.4, "Basis," Specification (3), states:

> Specification (3) requires air flow rates to be measured to provide data which can be used to determine whether the **pool room** ventilation system is operating as designed.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 4.4,

Specification (3) and TS 4.4, “Basis,” Specification (1) and Specification (3) and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 4.4, Specification (3) and TS 4.4, “Basis,” Specification (1) and Specification (3) acceptable.

3.8 TS 4.5.2 Effluents

The licensee proposed changes to TS 4.5.2, Specification (6). The licensee proposes adding the term “research reactor” to be consistent with the term “Research Reactor Facility” as defined in section 1 of the TSs.

TS 1, “Definitions,” states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 4.5.2, Specification (6), states:

> Before discharge, the facility liquid effluents collected in the holdup tanks shall be analyzed for their radioactivity content.

Proposed TS 4.5.2, Specification (6), states:

> Before discharge, the **research reactor** facility liquid effluents collected in the holdup tanks shall be analyzed for their radioactivity content.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 4.5.2, Specification (6) and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 4.5.2, Specification (6) acceptable.

3.8 TS 4.6 Limitations on Experiments

The licensee proposed changes to TS 4.6, Specification (8). The licensee proposes adding the term “research reactor” to be consistent with the term “Research Reactor Facility” as defined in section 1 of the TSs.

TS 1, “Definitions,” states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 4.6, Specification (8), states:

> The results of an inspection and any corrective action taken following a sample failure that releases material that could damage reactor fuel or the reactor structure shall be reviewed by the facility Director and the Reactor Safeguards

> Committee and shall be determined to be satisfactory before operation of the reactor is resumed.

Proposed TS 4.6, Specification (8), states:

> The results of an inspection and any corrective action taken following a sample failure that releases material that could damage reactor fuel or the reactor structure shall be reviewed by the **research reactor** facility Director and the Reactor Safeguards Committee and shall be determined to be satisfactory before operation of the reactor is resumed.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 4.6, Specification (8) and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 4.6, Specification (8) acceptable.

3.9 TS 4.8 Boron Neutron Capture Facility

The licensee proposed changes to TS 4.8, Specification (2). The licensee proposes adding the term “BNC” to be consistent with the term “BNC Facility” as defined in section 1 of the TSs.

TS 1, “Definitions,” states, in part:

> BNC Facility: BNC facility shall mean the boron neutron capture facility that includes the BNC neutron beam, bridge moving system, beam monitoring equipment, beam shielding room, access door and experimental area viewing equipment. Experimental bench(s), experiment positioning equipment and other equipment used for neutron beam targets shall not be considered part of the BNC Facility for purposes of this definition except insofar as radiation safety (i.e., activation and/or contamination) is concerned.

Current TS 4.8, Specification (2), states:

> Single door access to the facility shall be confirmed before each day of operation of the BNC facility.

Proposed TS 4.8, Specification (2), states:

> Single door access to the **BNC** facility shall be confirmed before each day of operation of the BNC facility.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 4.8, Specification (2) and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 4.8, Specification (2) acceptable.

3.10 TS 5.1 Site and Facility Description

The licensee proposed the removal of TS 5.1, Specification (3). The licensee indicated that the removal of TS 5.1, Specification (3) is necessary because it redefines the term “The facility” to be the Licensed Area which is already defined in TS section 1.

TS 1, “Definitions,” states, in part:

> Licensed Area: The licensed area is the part of the Dodgen Research Facility building which is subject to the requirements of the WSU license R-76. This area includes:
>
> (1) the reactor pool room (also known as Room 201) and adjacent rooms that allow direct unrestricted access to the pool room
>
> (2) the beam room (also known as Room 2) and adjacent rooms that allow direct unrestricted access to the beam room.

Current TS 5.1, Specification (3), states:

> The facility shall be the following:
>
> (a) the room in which the WSU research reactor is located, also known as Room 201, the reactor control room which is within Room 201, the pump room, primary coolant water purification room, primary coolant and makeup water valve manifold room;
>
> (b) the research reactor beam room, also known as Room 2.

Proposed TS 5.1, Specification (3), is deleted:

> ~~The facility shall be the following:~~
>
> ~~(a) the room in which the WSU research reactor is located, also known as Room 201, the reactor control room which is within Room 201, the pump room, primary coolant water purification room, primary coolant and makeup water valve manifold room;~~
>
> ~~(b) the research reactor beam room, also known as Room 2.~~

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes are consistent with TS section 1, which defines the term “Licensed Area” and recognize that a single definition for “Licensed Area” only is needed. Based on the information described above, the NRC staff finds the proposed changes and removal of TS 5.1, Specification (3) acceptable.

The licensee proposed changes to TS 5.1, Specification (4) and to renumber Specification (4) to Specification (3). The licensee proposes adding the term “research reactor” to be consistent with the term “Research Reactor Facility” as defined in section 1 of the TSs.

TS 1, “Definitions,” states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 5.1, Specification (4), states:

> The facility shall be a restricted area.

Proposed TS 5.1, Specification (4**3**), states:

> The **research reactor** facility shall be a restricted area.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds that the proposed changes further clarify TS 5.1, Specification (4) and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed renumbering of TS 5.1, Specification (4) and changes to TS 5.1, Specification (4) acceptable.

The licensee proposed changes to TS 5.1, “Basis.” The licensee proposes deleting the terms “and (3)” and “and the licensed area,” and adding an “s” to the term “provide” for grammar, to be consistent with the proposed TS 5.1, Specification (3), removal. The licensee is also proposing adding the term “research reactor” to be consistent with the term “Research Reactor Facility” as defined in section 1 of the TSs.

TS 1, “Definitions,” states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 5.1, “Basis,” states, in part:

> Specifications (2) and (3) provide a description of the location of the research reactor and the licensed area, and that the location of the research reactor shall be within the licensed area of the Dodgen Research Facility.
>
> Specification (4) requires that the facility be a restricted area.

Proposed TS 5.1, “Basis,” states, in part:

> Specifications (2) ~~and (3)~~ provide**s** a description of the location of the research reactor ~~and the licensed area,~~ and that the location of the research reactor shall be within the licensed area of the Dodgen Research Facility.
>
> Specification (4**3**) requires that the **research reactor** facility be a restricted area.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 5.1, “Basis” and prevent redefinition of descriptive terms outside of those terms defined in TS section 1.

Based on the information described above, the NRC staff finds the proposed changes to TS 5.1, "Basis" acceptable.

3.11 TS 5.6 Radiation Monitoring System

The licensee proposed changes to TS 5.6, Specification (2)(c). The licensee proposes adding the term "pool room" to be consistent with the term "Pool Room Ventilation System" and deleting the term "building" as it is used as a descriptive term outside of terms defined in TS section 1.

TS 1, "Definitions," states, in part:

> Pool Room Ventilation System: The pool room ventilation system is the combination of fans, dampers, filters, ductwork and controls that provides controlled movement of air into and out of the reactor pool room.

Current TS 5.6, Specification (2)(c), states:

> be capable of causing the building ventilation system to switch from the normal mode into the dilution mode upon initiation of a high continuous air monitor alarm signal when the reactor is operating.

Proposed TS 5.6, Specification (2)(c), states:

> be capable of causing the ~~building~~ **pool room** ventilation system to switch from the normal mode into the dilution mode upon initiation of a high continuous air monitor alarm signal when the reactor is operating.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds that the term "building" in TS 5.6, Specification (2)(c) is referring to the pool room ventilation system, as defined in TS section 1. The NRC staff finds that the proposed changes further clarify TS 5.6, Specification (2)(c) and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 5.6, Specification (2)(c) acceptable.

The licensee proposed changes to TS 5.6, Specification (3) and TS 5.6, "Basis." The licensee proposes adding the term "pool room" to be consistent with the term "Pool Room Ventilation System" as defined in section 1 of the TSs.

TS 1, "Definitions," states, in part:

> Pool Room Ventilation System: The pool room ventilation system is the combination of fans, dampers, filters, ductwork and controls that provides controlled movement of air into and out of the reactor pool room.

Current TS 5.6, Specification (3) states:

> The exhaust gas monitor shall be capable of detecting gamma radiation, and shall monitor ^{41}Ar content in ventilation system exhaust air, and shall alarm and readout at the reactor control console.

Proposed TS 5.6, Specification (3) would state:

> The exhaust gas monitor shall be capable of detecting gamma radiation, and shall monitor ^{41}Ar content in **pool room** ventilation system exhaust air, and shall alarm and readout at the reactor control console.

Current TS 5.6, "Basis," states, in part:

> The exhaust gas monitor described in specification (3) is required to sample and monitor ventilation system exhaust air to provide a live time indication and a record of the level of radioactivity in building exhaust gas effluent. The primary effluent component that is monitored is Ar-41.

Proposed TS 5.6, "Basis," states, in part:

> The exhaust gas monitor described in specification (3) is required to sample and monitor **pool room** ventilation system exhaust air to provide a live time indication and a record of the level of radioactivity in ~~building~~ exhaust gas effluent. The primary effluent component that is monitored is Ar-41.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 5.6, Specification (3) and TS 5.6, "Basis" and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 5.6, Specification (3) and TS 5.6, "Basis" acceptable.

The licensee proposed changes to TS 5.6, "Basis." The licensee proposes adding the term "research reactor" to be consistent with the term "Research Reactor Facility" as defined in section 1 of the TSs.

TS 1, "Definitions," states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 5.6, "Basis," states, in part:

> The area radiation monitoring system described in specification (1) is intended to provide information of the level of radiation to operating personnel to maintain a safe work environment and if necessary, to evacuate the facility and take the necessary steps to prevent the spread of radioactive materials to the surroundings.

Proposed TS 5.6, "Basis," states, in part:

> The area radiation monitoring system described in specification (1) is intended to provide information of the level of radiation to operating personnel to maintain a safe work environment and if necessary, to evacuate the **research reactor** facility and take the necessary steps to prevent the spread of radioactive materials to the surroundings.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 5.6, "Basis," to be consistent with the term "Research Reactor Facility" as defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 5.6, "Basis," acceptable.

3.12 TS 5.7 Reactor Building and Ventilation System

The licensee proposed changes to TS 5.7, Specification (1). The licensee proposes removing the term "facility" and adding the term "licensed area" to be consistent with the definition of "Licensed Area" in section 1 of the TSs.

TS 1, "Definitions," states, in part:

> Licensed Area: The licensed area is the part of the Dodgen Research Facility building which is subject to the requirements of the WSU license R-76. This area includes:
>
> (1) the reactor pool room (also known as Room 201) and adjacent rooms that allow direct unrestricted access to the pool room
>
> (2) the beam room (also known as Room 2) and adjacent rooms that allow direct unrestricted access to the beam room.

Current TS 5.7, Specification (1), states:

> The reactor shall be housed in a facility designed to restrict leakage. The minimum free volume in the facility shall be at least 10^9 cm^3.

Proposed TS 5.7, Specification (1), states:

> The reactor shall be housed in a ~~facility~~ **licensed area** designed to restrict leakage. The minimum free volume in the ~~facility~~ **licensed area** shall be at least 10^9 cm^3.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 5.7, Specification (1) and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 5.7, Specification (1) acceptable.

The licensee proposed changes to TS 5.7, Specification (2). The licensee proposes removing the term "reactor building" and adding the term "licensed area" to be consistent with the definition of "Licensed Area" in section 1 of the TSs. The licensee also proposed to remove the word "building" after the term "Dodgen Research Facility."

TS 1, "Definitions," states, in part:

> Licensed Area: The licensed area is the part of the Dodgen Research Facility building which is subject to the requirements of the WSU license R-76. This area includes:

(1) the reactor pool room (also known as Room 201) and adjacent rooms that allow direct unrestricted access to the pool room

(2) the beam room (also known as Room 2) and adjacent rooms that allow direct unrestricted access to the beam room.

Current TS 5.7, Specification (2), states:

> The reactor building shall be equipped with a ventilation system designed to filter and exhaust air or other gases from the reactor building and release them from a stack at a height of 46 ± 2 feet from the ground level in the front of the Dodgen Research Facility building.

Proposed TS 5.7, Specification (2), states:

> The ~~reactor building~~ **licensed area** shall be equipped with a ventilation system designed to filter and exhaust air or other gases from the ~~reactor building~~ **licensed area** and release them from a stack at a height of 46 ± 2 feet from the ground level in the front of the Dodgen Research Facility ~~building~~.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 5.7, Specification (2) and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 5.7, Specification (2) acceptable.

The licensee proposed changes to TS 5.7, Specification (3). The licensee proposes adding the term “pool room” to be consistent with the term “Pool Room Ventilation System” as defined in section 1 of the TSs.

TS 1, “Definitions,” states, in part:

> Pool Room Ventilation System: The pool room ventilation system is the combination of fans, dampers, filters, ductwork and controls that provides controlled movement of air into and out of the reactor pool room.

Current TS 5.7, Specification (3), states:

> A set of controls for the ventilation system shall be located outside the reactor pool room and control room areas. The controls shall be capable of changing the ventilation system mode of operation into the dilute or isolate mode.

Proposed TS 5.7, Specification (3), states:

> A set of controls for the **pool room** ventilation system shall be located outside the reactor pool room and control room areas. The controls shall be capable of changing the **pool room** ventilation system mode of operation into the dilute or isolate mode.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 5.7,

Specification (3) and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 5.7, Specification (3) acceptable.

The licensee proposed changes to TS 5.7, Specification (4), Specification (4)(a) and Specification (4)(b). In TS 5.7, Specification (4), the licensee proposes removing the term "reactor" to be consistent with the term "Pool Room Ventilation System" as defined in section 1 of the TSs. In TS 5.7, Specification (4)(a) and Specification (4)(b), the licensee proposes adding the terms "research reactor" and "pool room" to be consistent with the term "Research Reactor Facility" and the term "Pool Room Ventilation System" as defined in section 1 of the TSs.

TS 1, "Definitions," states, in part:

> Pool Room Ventilation System: The pool room ventilation system is the combination of fans, dampers, filters, ductwork and controls that provides controlled movement of air into and out of the reactor pool room.
>
> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 5.7, Specification (4), states:

> The reactor pool room ventilation system shall have a dilution mode of operation with the following characteristics:
>
> (a) air from the reactor pool room shall be mixed and diluted with outside air before being discharged from the facility when the ventilation system is operated in the dilution mode;
>
> (b) the exhaust air from the reactor pool room shall pass through a filter before being discharged from the facility when the ventilation system is operated in the dilution mode.

Proposed TS 5.7, Specification (4), states:

> The ~~reactor~~ pool room ventilation system shall have a dilution mode of operation with the following characteristics:
>
> (a) air from the reactor pool room shall be mixed and diluted with outside air before being discharged from the **research reactor** facility when the **pool room** ventilation system is operated in the dilution mode;
>
> (b) the exhaust air from the reactor pool room shall pass through a filter before being discharged from the **research reactor** facility when the **pool room** ventilation system is operated in the dilution mode.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 5.7, Specification (4), Specification (4)(a) and Specification (4)(b) to be consistent with the terms "Pool Room Ventilation System" and "Research Reactor Facility" as defined in TS section 1.

Based on the information described above, the NRC staff finds the proposed changes to TS 5.7, Specification (4), Specification (4)(a) and Specification (4)(b) acceptable.

The licensee proposed changes to TS 5.7, "Basis," Specification (1), Specification (3) and Specification (4). For TS 5.7, "Basis," Specification (1), the licensee proposes removing the term "facility" and the term "reactor building" and adding the term "licensed area" to be consistent with the definition of "Licensed Area" in section 1 of the TSs and proposed TS 5.7, Specification (1). For TS 5.7, Basis, Specification (1) and Specification (3), the licensee proposes adding the term "pool room" to be consistent with the term "Pool Room Ventilation System" as defined in section 1 of the TSs. For TS 5.7, "Basis," Specification (4), the licensee proposes adding the term "research reactor" to be consistent with the term "Research Reactor Facility" as defined in section 1 of the TSs.

TS 1, "Definitions," states, in part:

> Licensed Area: The licensed area is the part of the Dodgen Research Facility building which is subject to the requirements of the WSU license R-76. This area includes:
>
> (1) the reactor pool room (also known as Room 201) and adjacent rooms that allow direct unrestricted access to the pool room
>
> (2) the beam room (also known as Room 2) and adjacent rooms that allow direct unrestricted access to the beam room.
>
> Pool Room Ventilation System: The pool room ventilation system is the combination of fans, dampers, filters, ductwork and controls that provides controlled movement of air into and out of the reactor pool room.
>
> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 5.7, "Basis," Specification (1), states:

> Specification (1) addresses facility design. The facility is designed so that the ventilation system will maintain a negative pressure with respect to the atmosphere outside the reactor pool room to minimize uncontrolled leakage to the environment. The reactor pool room air would be maintained at a negative pressure with respect to the surroundings in both the normal and dilute modes, with respect to limiting the release of effluents through controlled pathways. The free air volume within the reactor building is isolated when the ventilation system is operated in the isolation mode.

Proposed TS 5.7, "Basis," Specification (1), states:

> Specification (1) addresses ~~facility~~ **licensed area** design. The ~~facility~~ **licensed area** is designed so that the **pool room** ventilation system will maintain a negative pressure with respect to the atmosphere outside the reactor pool room to minimize uncontrolled leakage to the environment. The reactor pool room air would be maintained at a negative pressure with respect to the surroundings in both the normal and dilute modes, with respect to limiting the release of effluents

through controlled pathways. The free air volume within the ~~reactor building~~ **licensed area** is isolated when the **pool room** ventilation system is operated in the isolation mode.

Current TS 5.7, “Basis,” Specification (3), states:

> Specification (3) provides a requirement that a set of controls for isolation, dilution, and normal operation of the ventilation system are located external to the control and reactor pool rooms, so that proper handling of airborne radioactive materials in emergency situations can be managed with a minimum of exposure to personnel.

Proposed TS 5.7, “Basis,” Specification (3), states:

> Specification (3) provides a requirement that a set of controls for isolation, dilution, and normal operation of the **pool room** ventilation system are located external to the control and reactor pool rooms, so that proper handling of airborne radioactive materials in emergency situations can be managed with a minimum of exposure to personnel.

Current TS 5.7, “Basis,” Specification (4), states:

> Specification (4) provides a requirement that the reactor pool room ventilation system have a dilution mode to minimize release rates of airborne radioactive material, and that the exhaust air be passed through an air filter before release. This is to control the rate at which airborne effluents can be released from the facility. The air filtration system will remove most particulate material, restricting releases to gases that can pass though an air filter, such as argon, krypton and xenon.

Proposed TS 5.7, “Basis,” Specification (4), states:

> Specification (4) provides a requirement that the reactor pool room ventilation system have a dilution mode to minimize release rates of airborne radioactive material, and that the exhaust air be passed through an air filter before release. This is to control the rate at which airborne effluents can be released from the **research reactor** facility. The air filtration system will remove most particulate material, restricting releases to gases that can pass though an air filter, such as argon, krypton and xenon.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 5.7, “Basis,” Specification (1), Specification (3) and Specification (4) and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 5.7, “Basis,” Specification (1), Specification (3) and Specification (4) acceptable.

3.13 TS 6.1 (2)(e)(ii) Radiation Protection

The licensee proposed changes to TS 6.1, Specification (2)(e)(ii). The licensee proposes adding the term “research reactor” to be consistent with the term “Research Reactor Facility” as defined in section 1 of the TSs.

TS 1, “Definitions,” states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 6.1, Specification (2)(e)(ii), states, in part:

> The Reactor Safeguards Committee shall perform the review and audit function over the radiation protection activities within the facility.

Proposed TS 6.1, Specification (2)(e)(ii), states, in part:

> The Reactor Safeguards Committee shall perform the review and audit function over the radiation protection activities within the **research reactor** facility.

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 6.1, Specification (2)(e)(ii) to be consistent with the term “Research Reactor Facility” as defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 6.1, Specification (2)(e)(ii) acceptable.

3.14 TS 6.2 Staffing

The licensee proposed changes to TS 6.2.1, “Minimum Staffing Levels.” For TS 6.2.1, Specification (1)(b), the licensee proposes adding the term “research reactor” and removing the term “complex”. For TS 6.2.1, Specification (2)(c), the licensee proposes adding the terms “research” and “research reactor”. For TS 6.2.1, Specification (3), the licensee proposes adding the term “research reactor”. All of these changes are proposed to be consistent with the term “Research Reactor Facility” as defined in section 1 of the TSs.

TS 1, “Definitions,” states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 6.2.1, Specification (1)(b), states:

> a second designated person present at the facility complex able to carry out written instructions;

Proposed TS 6.2.1, Specification (1)(b), states:

> a second designated person present at the **research reactor** facility ~~complex~~ able to carry out written instructions;

Current TS 6.2.1, Specification (2)(c), states:

> is capable of getting to the reactor facility in less than 30 minutes and shall remain within a 15 mile radius of the facility;

Proposed TS 6.2.1, Specification (2)(c), states:

> is capable of getting to the **research** reactor facility in less than 30 minutes and shall remain within a 15 mile radius of the **research reactor** facility;

Current TS 6.2.1, Specification (3), states:

> It is not necessary to have a Senior Reactor Operator on call if the Reactor Operator in the control room is a Senior Reactor Operator. If the Reactor Operator in the control room is a Senior Reactor Operator a second person shall be present in the facility as described in Section 6.2(1)(b).

Proposed TS 6.2.1, Specification (3), states:

> It is not necessary to have a Senior Reactor Operator on call if the Reactor Operator in the control room is a Senior Reactor Operator. If the Reactor Operator in the control room is a Senior Reactor Operator a second person shall be present in the **research reactor** facility as described in Section 6.2(1)(b).

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds that the proposed changes further clarify TS 6.2.1, Specification (1)(b), TS 6.2.1, Specification (2)(c) and TS 6.2.1, Specification (3) and prevent redefinition of descriptive terms outside of those terms defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 6.2.1, Specification (1)(b), TS 6.2.1, Specification (2)(c) and TS 6.2.1, Specification (3) acceptable.

The licensee proposed changes to TS 6.2.3 “Events Requiring the Direction of an SRO.” The licensee proposes adding the term “research reactor” to be consistent with the term “Research Reactor Facility” as defined in section 1 of the TSs.

TS 1, “Definitions,” states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 6.2.3, states, in part:

> A licensed senior reactor operator shall be present at the facility for:

Proposed TS 6.2.3, states, in part:

> A licensed senior reactor operator shall be present at the **research reactor** facility for:

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 6.2.3 to be consistent with the term "Research Reactor Facility" as defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 6.2.3 acceptable.

3.15 TS 6.4.5 Audits

The licensee proposed changes to TS 6.4.5, Specification (1)(d). The licensee proposes adding the term "research reactor" to be consistent with the term "Research Reactor Facility" as defined in section 1 of the TSs.

TS 1, "Definitions," states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 6.4.5, Specification (1)(d), states:

> radiation exposures within and outside the facility;

Proposed TS 6.4.5, Specification (1)(d), states:

> radiation exposures within and outside the **research reactor** facility;

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 6.4.5, Specification (1)(d) to be consistent with the term "Research Reactor Facility" as defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 6.4.5, Specification (1)(d) acceptable.

3.16 TS 6.9.2 Life of the Facility Records Retention

The licensee proposed changes to TS 6.9.2, Specification (4). The licensee proposes adding the term "research" to be consistent with the term "Research Reactor Facility" as defined in TS section 1.

TS 1, "Definitions," states, in part:

> Research Reactor Facility: The research reactor facility includes all areas within which the owner or operator directs authorized activities associated with the reactor.

Current TS 6.9.2, Specification (4), states:

> updated, corrected and as-built drawings of the reactor facility;

Proposed TS 6.9.2, Specification (4), states:

> updated, corrected and as-built drawings of the **research** reactor facility;

The NRC staff reviewed the proposed changes using the guidance in NUREG-1537 and ANSI/ANS-15.1-2007. The NRC staff finds the proposed changes further clarify TS 6.9.2, Specification (4) to be consistent with the term “Research Reactor Facility” as defined in TS section 1. Based on the information described above, the NRC staff finds the proposed changes to TS 6.9.2, Specification (4) acceptable.

4.0 ENVIRONMENTAL CONSIDERATION

The amendment changes recordkeeping, reporting, or administrative procedures or requirements; or changes the format of the license or otherwise makes editorial, corrective, or other minor revisions. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(10)(ii), or (v). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

5.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission’s regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: P. Torres, NRR
D. Hardesty, NRR
L. Tran, NRR

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