October 14, 2016

Dr. Yassin Hassan, Department Head
Texas A&M University
Nuclear Engineering Department
3133 TAMU
College Station, TX 77843-3133

SUBJECT: TEXAS A&M UNIVERSITY– ISSUANCE OF AMENDMENT NO. 15 TO AMENDED FACILITY OPERATING LICENSE NO. R-23 TO MODIFY LICENSE CONDITIONS AND TECHNICAL SPECIFICATIONS TO ALLOW FOR THE STORAGE OF THE AEROJET GENERAL NUCLEONICS MODEL 201-M REACTOR NON-FUEL COMPONENTS AT THE NUCLEAR SCIENCE CENTER

Dear Dr. Hassan:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 15 to Amended Facility Operating License No. R-23 for the Texas A&M University (TAMU) Aerojet General Nucleonics Model 201-Modified (AGN-201M) Reactor. The amendment consists of changes to the license and technical specifications in response to your application of November 11, 2015, as supplemented on March 3, 2016; June 3 and June 17, 2016; August 24, 2016; September 23 and September 27, 2016; and October 5, October 7, October 11, October 13, and October 14, 2016.

The amendment deletes the license condition possession limit for the special nuclear material in the form of the AGN-201M reactor fuel and the sealed plutonium beryllium neutron source, since these materials have been transferred to the R-83 license held by Texas A&M University System/Texas Engineering Experiment Station. The amendment revises the license to authorize possession-only of a utilization facility. The amendment revises the technical specifications to allow storage of the AGN-201M reactor components at the Nuclear Science Center on the TAMU College Station campus located in Brazos County, Texas, and to reduce the surveillance requirements while the reactor is in storage at the new location.

A copy of the safety evaluation supporting Amendment No. 15 is enclosed. If you have any questions, please contact me at (301) 415-3936.

Sincerely,

/RA/

Patrick G. Boyle, Project Manager
Research and Test Reactors Licensing Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-59

Enclosures:
1. Amendment No. 15 to R-23
2. Safety Evaluation

cc: w/enclosure: See next page

cc:

Mayor, City of College Station
P.O. Box Drawer 9960
College Station, TX 77840-3575

Governor's Budget
and Policy Office
PO BOX 12428
Austin, TX 78711-2428

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Gainesville, FL 32611-8300

Radiological Safety Officer
Texas A&M University
Environmental Health and Safety
1111 Research Parkway
College Station, TX 77843-4472

A copy of the safety evaluation supporting Amendment No. 15 is enclosed. If you have any questions, please contact me at (301) 415-3936.

Sincerely,

/RA/

Patrick G. Boyle, Project Manager
Research and Test Reactors Licensing Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-59

Enclosures:
1. Amendment No. 15 to R-23
2. Safety Evaluation

cc w/enclosures:

See next page

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ADAMS Accession No: ML16278A497 **NRR-088**

OFFICE	NRR/DPR/PRLB/PM	NRR/DPR/PRLB/LA*	OGC/NLO	NRR/DPR/PRLB/BC	NRR/DPR/PRLB/PM
NAME	PBoyle	NParker (ABaxter for) w/comments.	MYoung	AAdams	PBoyle
DATE	10/11/16	10/06/16	10/14/16	10/11/16	10/14/16

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TEXAS A&M UNIVERSITY

DOCKET NO. 50-59

AMENDMENT TO AMENDED FACILITY OPERATING LICENSE

Amendment No. 15
License No. R-23

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

   A. The application for an amendment to Amended Facility Operating License No. R-23, filed by the Texas A&M University (the licensee) on November 11, 2015, as supplemented on March 3, June 3 and 17, 2016, August 24, September 23 and 27, and October 5, 7, 11, 13, and 14, 2016, conforms to the standards and requirements of the Atomic Energy Act of 1954, as amended, and the regulations of the Commission as stated in Title 10, Chapter I, "Nuclear Regulatory Commission," of the *Code of Federal Regulations* (10 CFR Chapter I).

   B. The facility will operate in conformity with the application, the provisions of the Atomic Energy Act of 1954, and the rules and regulations of the Commission.

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

   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. This amendment is issued in accordance with the regulations of the Commission as stated in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," and the licensee has satisfied all applicable requirements.

   F. Prior notice of this amendment was not required by 10 CFR 2.105, "Notice of Proposed Action," and publication of a notice for this amendment is not required by 10 CFR 2.106, "Notice of Issuance."

2. Accordingly, the license is amended by modifying license conditions 2.B.(1), 2.B.(2) and 2.B.(3) to read as follows:

   (1) Pursuant to Section 104c of the Act and 10 CFR, Chapter, 1 Part 50, "Licensing of Production and Utilization Facilities" to possess, but not use or operate the reactor as a utilization facility at the designated location in College Station, Texas, in accordance with the procedures and limitations set forth in this license.

   (2) Pursuant to the Act and 10 CFR Part 30 "Rules of general applicability to domestic licensing of byproduct material" to possess, but not separate, such byproduct material present in the AGN-201M reactor non-fuel components.

   (3) Pursuant to the Act and 10 CFR Part 70 "Domestic licensing of special nuclear material" to possess, but not separate, such special nuclear material in the AGN-201M reactor non-fuel components.

3. Accordingly, the license is amended by changes to the technical specifications as indicated in the enclosure to this license amendment, and paragraph 2.C.(2) of Amended Facility Operating License No. R-23 is hereby amended as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 15, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

5. This license amendment is effective as of its date of issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Alexander Adams, Jr., Chief
Research and Test Reactors Licensing Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Attachments:
1. Changes to Amended Facility Operating License No. R-23
2. Changes to Appendix A, "Technical Specifications"

Date of Issuance: October 14, 2016

ATTACHMENT TO LICENSE AMENDMENT NO. 15

AMENDED FACILITY OPERATING LICENSE NO. R-23

DOCKET NO. 50-59

Replace the following pages of the Amended Facility Operating License with the revised pages. The revised page is identified by amendment number and contains a vertical line indicating the area of change.

Remove	Insert
2	2
3	3

2. Facility License No. R-23 is hereby amended in its entirety to read:

   A. This license applies to the homogeneous nuclear reactor model AGN-201M, Serial No. 106 (the reactor), owned by the Texas A&M University (the licensee), located on its campus at College Station, Texas and described in the application for license dated June 13, 1957, and subsequent amendments and supplements thereto, including the application for license renewal dated May 31, 1977, and supplements thereto dated September 29, December 11 and December 18, 1978, and March 23, 1979.

   B. Subject to the conditions and requirements incorporated herein, the Commission hereby licenses the Texas A&M University:

      (1) Pursuant to Section 104c of the Act and 10 CFR, Chapter, 1 Part 50, "Licensing of Production and Utilization Facilities" to possess, but not use or operate the reactor as a utilization facility at the designated locations in College Station, Texas, in accordance with the procedures and limitations set forth in this license.

      (2) Pursuant to the Act and 10 CFR Part 30 "Rules of general applicability to domestic licensing of byproduct material" to possess, but not separate, such byproduct material present in the AGN-201M reactor non-fuel components.

      (3) Pursuant to the Act and 10 CFR Part 70 "Domestic licensing of special nuclear material" to possess, but not separate, such special nuclear material in the AGN-201M reactor non-fuel components.

   C. This license shall be deemed to contain, and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; and 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) <u>Maximum Power Level</u>

         The licensee is authorized to operate the reactor at a steady-state power levels up to a maximum of 5 watts (thermal)

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through amendment 15, are hereby incorporated in their entirety 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 Commission-approved physical security plan, including all amendments and revisions made pursuant to the authority of 10 CFR 50.90 and 10 CFR 50.54(p), which are part of the license. This plan, which contains information withheld from public disclosure under 10 CFR 2.790, is entitled "Texas A&M University AGN-201M Reactor Facility Security Plan," with revisions through September 24, 1984.

D. The licensee shall maintain in effect and fully implement all provisions of the NRC-approved physical security plan, including amendments and changes made pursuant to the authority of 10 CFR 50.54(p). The approved security plan consists of the document withheld from public disclosure pursuant to 10 CFR 2.790(d), entitled "Security Plan for the Texas A&M University AGN-201M Reactor Facility", dated September 13, 1974

E. This license is effective as of the date of issuance and shall expire at midnight, August 26, 1997.

For the Nuclear Regulatory Commission

/RA/

Brian K. Grimes, Assistant Director
For Engineering & Projects
Division of Operating Reactors

Attachment:
Appendix A, Technical
Specifications dated

Date of Issuance: April 25, 1979

ATTACHMENT TO LICENSE AMENDMENT NO. 15

AMENDED FACILITY OPERATING LICENSE NO. R-23

DOCKET NO. 50-59

Replace the following page of the Appendix A Technical Specification with the enclosed page. The revised page is identified by amendment number and contains a vertical line indicating the area of change.

Remove	Insert
Table of Contents	Table of Contents
11	11
--	11a
14	14
--	14a
15	15

TABLE OF CONTENTS

watt, and that the total gamma, thermal neutron, and fast neutron dose rate in the accelerator room is less than 15 mrem/hr at reactor power levels less than or equal to 5.0 watts and the thermal column filled with water.

The facility shielding in conjunction with radiation monitoring, control, and restricted areas is designed to limit radiation doses to facility personnel and to the public to a level below 10 CFR 20 limits under operating conditions, and to a level below criterion 19, Appendix A, 10 CFR 50 recommendations under accident conditions.

3.5 AGN-201M Reactor Components Stored at the Nuclear Science Center (NSC) Facility

Applicability

This specification applies to all AGN-201M reactor components stored at the NSC facility.

Objective

To verify the AGN-201M reactor components, are in two specified secured locations with no evidence of tampering, while stored at the NSC facility.

Specifications

1. Accelerator Building

   AGN-201M reactor components shall be stored in a secured fenced area in the Accelerator Building. The AGN-201M Reactor Supervisor or designee shall control access to the secured fenced area.

   The following AGN-201M reactor components shall be stored in the Accelerator Building:

   a. AGN-201M reactor control panel and associated electronic equipment

   b. AGN-201M Shield Tank, Reactor Tank, Core Tank, and associated internal components

2. Cargo Container

   AGN-201M reactor components not stored in the Accelerator Building shall be stored in a secured cargo container with a tamper proof seal affixed in such a way that opening the cargo container will break the seal. Access to the cargo container shall be restricted to personnel authorized by the AGN-201M Reactor Supervisor or designee.

Bases

These Technical Specifications ensure that the AGN-201M reactor components are secured and prevent tampering while stored at the NSC facility.

4.0 SURVEILLANCE REQUIREMENTS

Actions specified in this section, with the exception of Section 4.5, are not required to be performed if during the specified surveillance period the reactor has not been brought critical or is maintained in a shutdown condition extending beyond the specified surveillance period. However, the surveillance requirements must be fulfilled prior to subsequent startup of the reactor unless reactor operation is required for performance of the surveillance. Any surveillance that can only be performed during reactor operation may be postponed until the reactor is operable.

4.1 Reactivity Limits

Applicability

This specification applies to the surveillance requirements for reactivity limits.

Objective

To assure that reactivity limits for Specification 3.1 are not exceeded.

Specification

a. Safety and control rod reactivity worths shall be measured annually, but at intervals not to exceed 16 months.

b. Total excess reactivity and shutdown margin shall be determined annually, but at intervals not to exceed 16 months.

c. The reactivity worth of an experiment shall be estimated or measured, as appropriate, before or during the first startup subsequent to the experiment's insertion.

Bases

The control and safety rod reactivity worths are measured annually to assure that no degradation or unexpected changes have occurred which could adversely affect reactor shutdown margin or total excess reactivity. The shutdown margin and total excess reactivity are determined to assure that the reactor can always be safely shutdown with one rod not functioning and that the maximum possible reactivity insertion will not result in reactor periods shorter than those that can be adequately terminated by either operator or automatic action. Based on experience with AGN reactors, significant changes in reactivity or rod worth are not expected within a 16-month period.

Specification

a. All portable radiation survey instruments assigned to the reactor facility shall be calibrated under the supervision of the Radiological Safety Office annually, but at intervals not to exceed 16 months.

b. Prior to each day's reactor operation or prior to each reactor operation extending more than one day, the reactor room high radiation area alarm shall be verified to be operable. (See Article 3.4.e)

c. A radiation survey of the reactor room, reactor control room, and accelerator room shall be performed under the supervision of the Radiological Safety Office annually, but at intervals not to exceed 16 months, to determine the location of radiation and high radiation areas corresponding to reactor operating power levels.

Bases

The periodic calibration of radiation monitoring equipment and the surveillance of the reactor room high radiation area alarm will assure that the radiation monitoring and control systems are operable during reactor operation. (See Article 3.4.e).

The periodic radiation surveys will verify the location of radiation and high radiation areas and will assist reactor facility personnel in properly labeling and controlling each location in accordance with 10 CFR 20.

4.5 Reactor Components Stored at the Nuclear Science Center (NSC) Facility

Applicability

This applies to the surveillance requirements of the AGN-201M reactor components stored at the NSC Facility.

Objective

To verify the AGN-201M reactor components remain stored in specified locations and protected from tampering while at the NSC facility.

Specifications

a. NSC Accelerator Building

1. Once a quarter the secured fenced area in the Accelerator Building shall be inspected to verify all reactor components are present and no indications of tampering exist. If indications of tampering are discovered, the Director of Nuclear Engineering or designee shall be notified. In addition, a special report in accordance with Technical Specification Section 6.9.3 shall be transmitted to the U.S. NRC.

2. Once a quarter a radiation and contamination survey shall be conducted around the exterior of the stored AGN-201M reactor components to verify that contamination is not migrating from the contained reactor components. If detectable loose surface contamination exceeds levels acceptable for an unrestricted area, the reactor components shall be decontaminated and repackaged as necessary.

b. Cargo Container

1. Once a quarter a survey of the cargo container is required to verify that the tamper proof seal has not been broken. In the event the seal is found broken, the Director of Nuclear Engineering or designee shall be notified and an inventory of the cargo container shall be performed. In addition, a special report in accordance with Technical Specification Section 6.9.3 shall be transmitted to the U.S. NRC.

2. Once a quarter a radiation and contamination survey shall be conducted of the exterior of the cargo container to verify that contamination is not migrating from the contained components. If detectable loose surface contamination exceeds levels acceptable for an unrestricted area, the cargo container exterior shall be decontaminated and the source of contamination identified and secured.

Bases

These surveillances shall verify the components necessary for reassembly of the AGN-201M reactor remain secure, no indications of tampering exist, and the radiological conditions of storage remain unchanged.

5.0 DESIGN FEATURES

5.1 Reactor

a. The reactor core, including control and safety rods, contains approximately 660 grams of U-235 in the form of <20% enriched UO_2 dispersed in approximately 11 kilograms of polyethylene. The lower section of the core is supported by an aluminum rod hanging from a fuse link. The fuse melts at a fuse temperature of about 120°C causing the lower core section to fall away from the upper section reducing reactivity by at least 5% Δ k/k. Sufficient clearance between core and reflector is provided to insure free fall of the bottom half of the core during the most severe transient.

b. The core is surrounded by a 20 cm thick high density (1.75 gm/cm^3) graphite reflector followed by a 10 cm thick lead gamma shield. The core and part of the graphite reflector are sealed in a fluid-tight aluminum core tank designed to contain any fission gases that might leak from the core.

c. The core, reflector, and lead shielding are enclosed in and supported by a fluid-tight steel reactor tank. An upper or "thermal column tank" may serve as a shield tank when filled with water or a thermal column when filled with graphite.

d. The 6 ½ foot diameter, fluid-tight shield tank is filled with water constituting a 55 cm thick fast neutron shield. The fast neutron shield is formed by filling the tank with approximately 1000 gallons of water. The complete reactor shield shall limit doses to personnel in unrestricted areas to levels less than permitted by 10 CFR 20 under operating conditions.

e. Two safety rods and one control rod (identical in size) contain less than 15 grams of U-235 each in the same form as the core material. These rods are lifted into the core by electromagnets, driven by reversible DC motors through lead screw assemblies. Deenergizing the magnets causes a spring-driven, gravity-assisted scram. The fourth rod or fine control rod (approximately one-half the diameter of the other rods) is driven directly by a lead screw. This rod may contain fueled or unfueled polyethylene.

5.2 Fuel Storage

Fuel, including fueled experiments and fuel devices not in the reactor, shall be stored in locked rooms in the nuclear engineering department laboratories. The storage array shall be such that K_{eff} is no greater than 0.8 for all conditions of moderation and reflection.

5.3 AGN-201M Reactor and Associated Components Storage Locations

The AGN-201M reactor and associated components shall be stored in either of the following locations:

- Zachry Engineering Center
  - Reactor Room
  - Control Room
  - Accelerator Room
- Texas A&M Engineering Experiment Station Nuclear Science Center facility
  - Accelerator Building
  - Cargo Container

6.0 ADMINISTRATIVE CONTROLS

6.1 Organization

The administrative organization for control of the reactor facility and its operation shall be as set forth in Figure 1 attached hereto. The authorities and responsibilities set forth below are designed to comply with the intent and requirements for administrative controls of the reactor facility as set forth by the Nuclear Regulatory Commission.

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 15 TO

FACILITY OPERATING LICENSE NO. R-23, DOCKET NO. 50-59

TEXAS A&M UNIVERSITY AEROJET GENERAL NUCLEONICS REACTOR

1.0 INTRODUCTION

By letter dated November 11, 2015 (Ref. 1), as supplemented by letters dated March 3, 2016 (Ref. 2), June 3, 2016 (Ref. 3), June 17, 2016 (Ref. 4), August 24, 2016 (Ref. 5), September 23 (Ref. 6), September 27, 2016 (Ref. 7), October 5, 2016 (Ref. 24), October 7, 2016 (Ref. 22), October 11 (Ref. 23), October 13, (Ref. 25) and October 14, 2016 (Ref. 26), Texas A&M University (TAMU) (the licensee or the University) requested a license amendment to change amended Facility Operating License No. R-23, including Appendix A, "Technical Specifications for Texas A&M University AGN-201M Reactor (Serial #106)." The requested amendment would make changes to the license conditions and technical specifications (TSs) necessary to allow storage of the TAMU Aerojet General Nucleonics Model 201-Modified (AGN-201M) reactor at the Texas A&M Engineering Experiment Station (TEES) Nuclear Science Center (NSC) site. The proposed changes would revise the following TSs:

- revise the Table of Contents to reflect the new pages and sections added to the TSs.
- add TS 3.5, "AGN-201M Reactor Components," to require that the AGN-201M reactor components be stored in secure, access-controlled locations while they are at the NSC;
- add TS 4.5, "Reactor Components Stored at the NSC Facility," to impose surveillance requirements to inventory and perform contamination and radiation surveys while the reactor (non-fuel) components are in storage;
- revise existing TS 4.0, "Surveillance Requirements," to add that TS 4.5 would be applicable while the AGN-201M reactor components are in storage at the NSC, and also to clarify that TS-required surveillances that cannot be performed without reactor operation would not need to be performed prior to reactor startup, but must be performed as soon as practical after reactor startup; and,
- revise existing TS 5.3, "Reactor Room, Reactor Control Room, Accelerator Room," to reflect the new storage location of the AGN-201M reactor and associated components at the NSC.

The proposed amendment to the facility operating license would also make the following changes:

- delete the license condition for possession of the AGN-201M reactor fuel and neutron startup source because the material has been transferred to License No. R-83
- change the license condition for the utilization of the facility to reflect a possession only status
- separate the Part 30 and Part 70 possession limits, creating new conditions for each material type and removing the special nuclear material (SNM) components of the AGN-201M reactor

2.0 BACKGROUND

2.1 Background on the Proposed Action

The AGN-201M reactor is a moveable, self-contained reactor that is located inside the Zachry Building on the TAMU campus in College Station, Texas (Brazos County). Two rooms in the Zachry Building house the reactor and the control console. These rooms also provide laboratory space for experiments conducted in the reactor. TAMU has decided to reallocate the space containing these rooms in the Zachry Building for other purposes, and as a result, needs to move the AGN-201M reactor and related components to another location. The components that would be stored at the NSC under control of License No. R-23 include the following: the control panel and associated electronic equipment, Shield Tank, Reactor Tank, Core Tank, and associated internal components. Additional tools and handling equipment will be stored in the closed and secured cargo container within the boundaries of the NSC.

The Texas A&M University System (TAMUS) has a Training, Research, and Isotope Production General Atomics (TRIGA) reactor operated by the TEES under License No. R-83, located at the NSC. License Amendment 18 to License No. R-83, which was issued on August 31, 2016 (Ref. 20), allows possession and storage of the AGN-201M reactor fuel, control rods (constructed of fuel material), and plutonium-beryllium (Pu-Be) startup source. All three items listed above will remain under control of License No. R-83 while they are in storage at the NSC. By letter dated October 5, 2016 (Ref. 21) the licensee indicated that the fuel, control rods, and neutron startup source have been transferred to the NSC and “are now stored under the provision of the NSC license (R-83)” as authorized by Amendment No. 18.

The licensee for the NSC TRIGA reactor (License No. R-83) is TEES/TAMUS. The licensee for the AGN-201M reactor (License No. R-23) is TAMU. TEES and TAMU are entities within TAMUS.

The licensee plans to move the de-fueled reactor and components from the Zachry Building and place them in storage locations within the restricted area of the NSC. The reactor and components will remain under control of the TAMU AGN-201M reactor License No. R-23 while in storage at the NSC. If the proposed amendment is granted, License No. R-83 and License No. R-23 would separately control items containing SNM and/or byproduct material.

The proposed amendment to License No. R-23 would allow the AGN-201M reactor and components to be moved from the Zachry Building, but it does not remove the rooms in the Zachry Building from the license. After the reactor and components have been moved, the rooms will be decontaminated and a final survey will be performed. Once the final survey is reviewed and approved by the NRC staff, TAMU intends to request an amendment to the R-23 license that would remove the Zachry Building rooms from the license and thus allow the rooms to be released for unrestricted use.

Storage of the AGN-201M reactor fuel components (fuel, control rods, and startup source), non-fuel components and associated equipment at the NSC will continue until a new building, which is currently planned to be near the NSC, can be constructed to house the AGN-201M reactor. Consistent with the R-23 license, TAMU plans to reassemble the AGN-201M reactor in the new

location, transfer the SNM (fuel, fueled control rods, and neutron startup source), and the byproduct material in the SNM, back on to the AGN-201M license, and resume normal operations (under the R-23 license). TAMU plans to submit additional license amendment requests, to seek permission to the move the AGN-201M reactor to its new operational location, once construction of the new building is completed, and to resume operations.

2.2 Description and Proposed Actions for the AGN-201M Reactor and Components

The safety analysis report (SAR) describes the AGN-201M reactor as a self-contained, free-standing reactor (see Figure 1). A hermetically-sealed core tank contains the reactor fuel. The reactor tank contains a lead shield surrounding the graphite reflector which encloses the core tank. The main structure for the reactor is a 1000-gallon tank called the water shield containing chromated water. Heat generated by the reactor is conducted through the graphite reflector and lead shield into the water tank, where it is removed by natural convection. The reactor's four fueled control and safety rods are driven into the reactor core through penetrations in the bottom of the core tank by separate control rod drive assemblies. The reactor operations are controlled from a console connected to the reactor which provides control and safety functions, as well as radiation monitoring during operation of the reactor (Refs. 1 and 12).

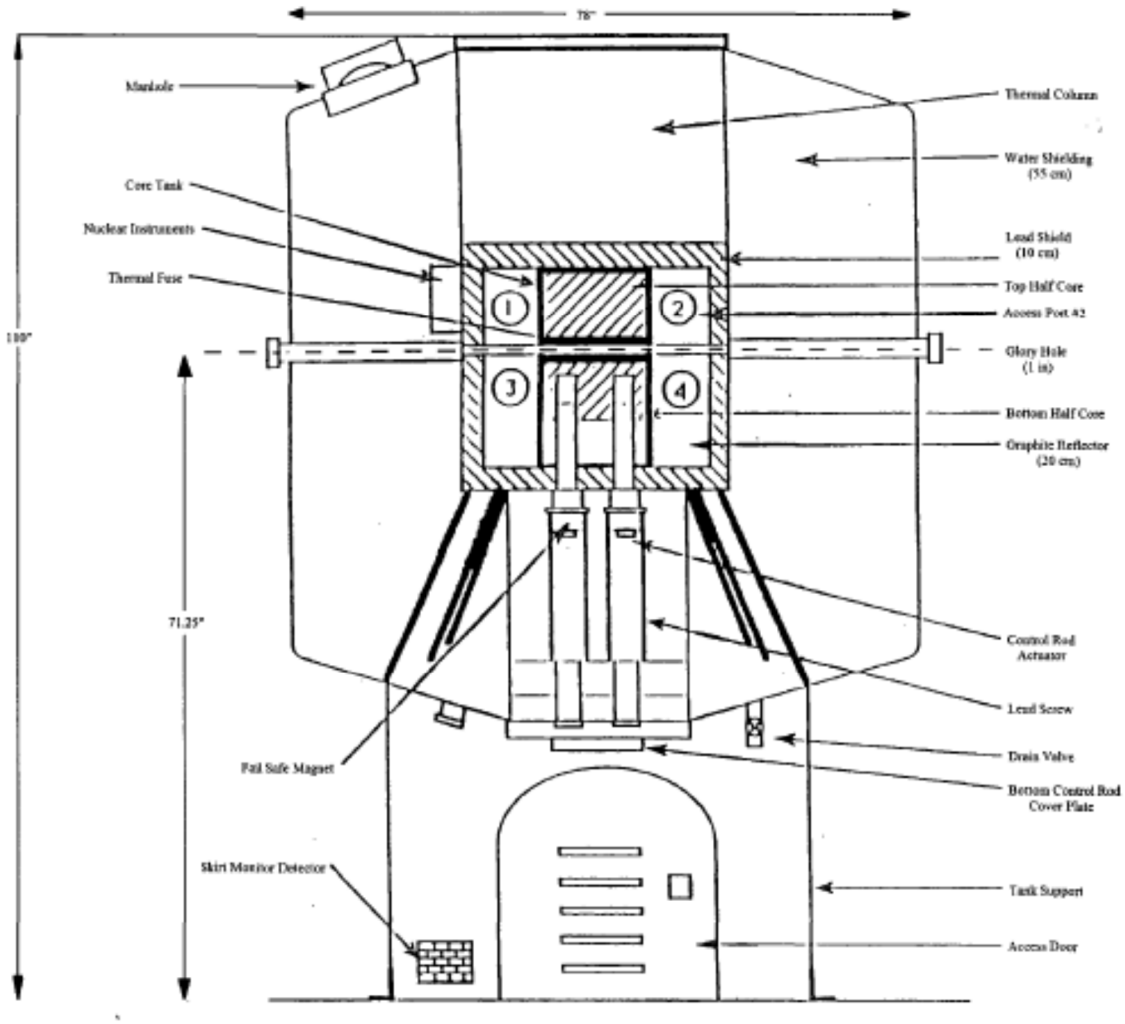

Figure 1 - AGN reactor

The fuel, fueled control rods, and Pu-Be startup source were removed from the AGN-201M reactor and transferred to the NSC on October 3, 2016. The license plans to disassemble the non-fuel components of the reactor (the water shield tank will be drained, and the water disposed of, in accordance with the regulations, during the disassembly process), packaged, and transported to the NSC (Ref. 1). Packaging and transportation of the non-fuel reactor components is regulated by the requirements of 49 CFR, “Transportation.”

The radioactive material present in the non-fuel reactor components currently located at the Zachry Building includes trace amounts activation products of materials used to construct the non-fuel components, fission products that may have migrated to the non-fuel components, such as the core tank, and surface contamination from contact with the fuel, which may include

trace amounts of SNM. The AGN-201M reactor has a licensed power level of 5 watts. The reactor was not operated from 1997 to 2010 while the control console was being modified and the reactor ceased operation in 2013 following the discovery of a single point of failure vulnerability in the new control console (Ref. 13). As a result of this limited operating history, the AGN-201M fuel has extremely low levels of fission and activation products (trace quantity). External radiation dose rates from the AGN-201M non-fuel components of the reactor are expected to present a minimal radiation hazard based on the operating history of the TAMU AGN-201M reactor, and radiological surveys conducted to date. Draining and disassembly of the reactor will be performed under TAMU's radiological program to ensure that any radiological exposures remain within requirements in 10 CFR Part 20. The TAMU radiological protection staff periodically conduct radiation and contamination surveys throughout the TAMU campus. No radiological concerns related to the AGN-201M reactor have been encountered to date. The reactor safety board, which includes representatives from the radiation safety office, has reviewed the radiological control procedures for disassembly of the reactor. Any adverse or unexpected radiation or contamination levels will be addressed by staff utilizing established procedures. The quantities of activation and byproduct materials are expected to be several orders of magnitude (a factor of 1000 or more) below those listed in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 37, Appendix A Table 1 for Category 2 quantity of material (Ref. 2).

2.3 Nuclear Science Center

The NSC SAR (Ref. 15), states that the NSC is located on the TAMUS campus in College Station, Texas. The NSC SAR Section 1.1, "Introduction," states, in part, that "[t]he facility is a university-operated research reactor designed to provide a center for the university's students in various disciplines and for outside research and commercial users."

TAMU plans to construct a new building for operation of the AGN-201M reactor, but until the new facility is built, the AGN-201M reactor will be disassembled and the reactor components, and associated equipment and SNM will be stored at the NSC, within the restricted area. The NSC TRIGA reactor License No. R-83, Appendix A, "Technical Specifications and Bases," TS 5.1, "Site Description," (Ref. 14) indicates that the restricted area for the NSC is defined by the fence surrounding the NSC site. In its response to NRC Staff RAI 2.b.i (Ref. 10) by letter dated March 3, 2016 (Ref. 2), the licensee indicated that the License No. R-23 restricted area at the NSC would be the entire fenced-in area surrounding the NSC consistent with how it is identified for License No. R-83. As identified in TS 3.4 "Radiation Monitoring, Control, and Shielding," the reactor room and accelerator room are only considered to be restricted areas when the reactor is not shutdown. Since the reactor will be disassembled into it various components and reactor operations would not be possible, no significant radiation hazards are anticipated while the reactor components are in storage.

The SNM in the form of the AGN-201M fuel, control rods, and neutron startup source were transferred to License No. R-83; therefore, storage requirements for the AGN-201M SNM are controlled under License No. R-83.

3.0 REGULATORY EVALUATION

The NRC staff reviewed the licensee's amendment request, as supplemented, to ensure that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by possession in the proposed manner, (2) activities proposed 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. The NRC staff considered the following regulatory requirements and guidance during its review of the proposed changes.

The regulations in 10 CFR Part 20, "Standards for Protection against Radiation," establish standards for protection against ionizing radiation resulting from activities conducted under licenses issued by the NRC. The regulations in 10 CFR Part 20 include limits on doses to workers and members of the public, as well as other requirements including posting requirements for areas in which radiation levels exceed certain thresholds. The regulation, 10 CFR 20.1801, "Security of stored material," states that "[t]he licensee shall secure from unauthorized removal or access licensed materials that are stored in controlled or unrestricted areas."

The regulations in 10 CFR Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," in part, provide regulatory requirements for storage of byproduct material.

The regulations in 10 CFR Part 37, "Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material," provide regulatory requirements for the physical protection of radioactive byproduct material. Appendix A, "Category 1 and Category 2 Radioactive Materials," lists quantities of radioactive materials that are considered Category 1 or Category 2 quantities, and to which regulations in 10 CFR Part 37 are applicable.

The regulations in 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," provide regulatory requirements for licensing of non-power reactors.

The regulations in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," provide regulatory requirements for the protection of the environment.

The regulations in 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," provide regulatory requirements for the receipt, possession, use, and transfer of SNM.

The regulations in 10 CFR Part 73, "Physical Protection of Plants and Materials," provide regulatory requirements for the physical protection and security of SNM at fixed sites and in transit.

The Atomic Energy Act of 1954, as amended, Section 182a, requires that each utilization facility operating license to include TSs. The regulatory requirements related to the content of the TSs are in 10 CFR 50.36, "Technical specifications." Section 50.36 requires that TSs include the following categories: (1) safety limits, limiting safety systems settings and limiting control

settings, (2) limiting conditions for operation, (3) surveillance requirements, (4) design features, and (5) administrative controls.

NUREG-1537, Part 1, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Format and Content," (Ref. 16) provides guidance for the format and content of non-power reactor licensing applications submitted to the NRC. NUREG-1537, Part 1, Appendix 14.1, "Format and Content of Technical Specifications for Non-Power Reactors," provides guidance on the format and content of non-power reactor TSs. NUREG-1537, Part 1, Appendix 14.1, references American Nuclear Standards Institute/ American Nuclear Society (ANSI/ANS) Standard 15.1-1990, "The Development of Technical Specifications for Research Reactors," (Ref. 17) except as noted in NUREG-1537, Part 1, Appendix 14.1.

NUREG-1537, Part 2, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Standard Review Plan and Acceptance Criteria," (Ref. 18), provides guidance to NRC staff on the conduct of licensing action reviews for non-power reactor licensing applications. Chapter 14, "Technical Specifications," provides guidance for the review acceptability of proposed TSs.

Because the safety evaluation report for License Amendment 18 to License No. R-83 contains the safety evaluation of the storage requirements for the SNM associated with the AGN-201M reactor (fuel, control rods, and neutron startup source) and finds them acceptable, this safety evaluation does not evaluate the storage of SNM (in the form of fuel, fueled control rods, or neutron startup source) from the AGN-201M reactor.

4.0 TECHNICAL EVALUATION

4.1 Proposed Storage Locations at the NSC

4.1.1 Details of the Proposed Storage Locations at the NSC

The proposed storage locations for the non-fuel components of the AGN-201M reactor at the NSC are identified and discussed in the licensee's letters dated March 3, 2016 (Ref. 2), and June 3, 2016 (Ref. 3). The Accelerator Building would contain the AGN-201M reactor control panel and associated electronic equipment. The Accelerator Building would also contain the water shield tank, the reactor tank, the core tank, and associated internal components. All other non-fuel reactor components would be stored in a cargo container within the cargo container storage location. TAMU has proposed TSs that would require that the AGN-201M non-fuel reactor components be stored in these locations (see Section 4.2.2.1), and stated that both the Accelerator Building storage location and the cargo container storage location are within the restricted area for License No. R-83 for the NSC TRIGA reactor. License No. R-83 Appendix A TS 5.1 "Site Description" Specification states: "The licensed area of the facility is the area inside the site boundary. The boundary is defined by the fence surrounding the site. This description coincides with that of the restricted area."

Since these locations are within the NSC restricted area, physical security and radiological controls have already been established for the proposed storage locations for the non-fuel

AGN-201M reactor components. The licensee stated in RAI response dated March 3, 2016, that the "NSC Radiation Protection Program is adequate for the safe possession and storage of the AGN reactor components at the NSC site." The NRC oversight program includes inspection of radiological controls at the NSC. The NRC staff observed the proposed storage locations during its site visit in February 2016.

The boundary of the NSC restricted area is controlled by the NSC TRIGA license No. R-83 TSs (see Section 2.4). In its letter dated March 3, 2016, in response to RAI 2.b.i TAMU indicated that the storage locations for the non-fuel reactor components and associated equipment are within the restricted area at the NSC. The restricted area described for License No. R-23, as described in RAI response dated March 3, 2016, matches the restricted area described for License No. R-83. The TEES currently has appropriate security and radiological controls in place for the restricted area at NSC.

4.1.2 Radiological Considerations

The NRC safety evaluation report on the NSC license renewal (Ref. 19) Section 1.10, states, in part, that "[t]he NRC inspection program has shown that the licensee has procedures and equipment to safely handle licensed material within the restricted area." As discussed in Section 2.3 of this safety evaluation, the AGN-201M non-fuel components are not expected to pose an additional radiation hazard based on radiological surveys routinely conducted by the TAMU radiological protection staff and the limited operating history of the TAMU AGN-201M reactor. In addition, the reactor was operating the reactor room is a controlled access area, however, immediately after shutdown of the reactor the dose levels return to near background levels.

According to the proposed TS 3.5, the reactor components that are stored in the Accelerator Building will be in an access-controlled, secured fenced area of the building. Access to the cargo container in which other reactor components are stored will be controlled with tamper proof seals. The proposed TS 4.5 requires inspection of the storage areas for evidence tampering, along with quarterly radiation and contamination surveys. The radiological surveys conducted around the exterior of both the fenced-off area of the Accelerator Building and the cargo container, ensure that radioactive material is not migrating outside of the designated storage areas for the reactor components (Refs. 3 and 4). Section 4.2 of this report discusses the wording of the proposed TSs in detail.

As discussed above, the reactor components contain only minimal activation products, byproduct material, or SNM. As described in the amendment application, as supplemented, access to the components will be controlled. The proposed TS, require that surveillances be performed to ensure no radioactive material migrates outside the designated storage area. Based on these controls and its observations of the proposed storage location the NRC staff finds that the radiological controls present continue to meet 10 CFR 20.1101, "Radiation protection programs," and 10 CFR 20.1801, "Security of stored material," requirements.

The proposed storage areas are within a location that is already considered to be a radiological area. TAMU has an established and effective radiological program. Storage of the AGN-201M

reactor non-fuel components does not increase the radiological hazard. Therefore, the NRC staff finds the storage location to be acceptable.

4.1.3 Security Considerations

License No. R-83, License Condition 2.C.3, "Physical Security Plan" requires TEES/TAMUS to maintain and implement the Commission-approved physical security plan. The physical security plan covers the licensed area of the NSC TRIGA facility. License No. R-83, TS 5.1, "Site Description" (Ref. 12), states that licensed area and the restricted area are the same area. Since the Accelerator Building and cargo container are within the NSC restricted area, radioactive materials in those locations would be protected by the NSC security plan.

In a letter dated February 8, 2016, Dr. Hassan, Professor and Department Head of the Nuclear Engineering Department at TAMU, designated Dr. McDeavitt of the TEES "to act as "the administrative officer responsible for the operation ... [of] the AGN-201M Reactor Facility," to fulfill the requirements and duties of the AGN Technical Specifications 6.1.3." TS 6.1.3 states in part: "In this capacity he shall have final authority and ultimate responsibility for the operation, maintenance, and the safety of the reactor facility within the limitation set forth in the facility license." In this role, Dr. McDeavitt will have responsibility for both the TRIGA and the AGN-201M reactors. Dr. McDeavitt is the Director of the TEES NSC and as such, has "the line management responsibility for adhering to the terms and conditions of the NSC license and TS and for safeguarding the public and facility personnel from undue radiation exposure." The designation of Dr. McDeavitt as an officer, for the AGN-201M reactor makes him responsible License No. R-23 for the AGN-201M reactor in a role similar to License No. R-83 (TS 6.1.1.3.a) for the TRIGA reactor. As a result, Dr. McDeavitt has the security responsibility for both reactors at the NSC.

The non-fuel components would be stored in secure, access-controlled locations while they are at the NSC. For the non-fuel components stored in the Accelerator Building, a quarterly surveillance will be performed to ensure no removal or tampering of the components. The cargo container containing the other non-fuel components will be secured with a tamper proof seal, and a quarterly surveillance will be performed to confirm that the seal remains unbroken. If the seal is found to be broken, an inventory of the components in the cargo container will be performed (Refs. 3 and 4). TAMU has proposed TSs that would require the a tamperproof seal and performance of these surveillances (see Section 4.2.2.2).

As discussed in Section 2.3 of this safety evaluation, the quantities of byproduct material in the non-fuel AGN-201M reactor components are expected to be well below the Category 1 or Category 2 quantities to which the 10 CFR Part 37 requirements for physical protection of byproduct material would be applicable.

The NRC staff has reviewed the security conditions of the proposed storage locations for the non-fuel AGN-201M reactor components at the NSC. The non-fuel components will be stored in secure, access-controlled areas that are protected by the NSC physical security plan. Surveillances will be performed to identify tampering or removal of the components. The quantities of radioactive material in the components are minimal. Based on this information, the NRC staff concludes that the security conditions of the proposed AGN-201M reactor component

storage at the NSC are consistent with the requirements in 10 CFR 20.1801 and are therefore acceptable.

4.1.4 Other Considerations

The Accelerator Building will provide weather protection for the water shield tank, contained reactor tank, and core tank, as well as the sensitive electronic equipment (the AGN-201M reactor control panel and associated equipment) stored in that location. The climate controlled area is needed for storage of equipment such as the computers related to the control console. The cargo container will provide adequate weather protection for the other non-fuel reactor components that are not stored in the accelerator building. Minimizing water intrusion reduces the risk of corrosion to the equipment while in storage.

The NRC staff reviewed the proposed storage locations, and concludes that they are sufficient to provide weather protection for the non-fuel reactor components while they are in storage.

4.2 Proposed Changes to License Conditions and Technical Specifications

The licensee proposed changes to the license conditions in License No. R-23 and the TSs.

4.2.1 Proposed Changes to License Conditions

The licensee proposed changes to current facility operating license conditions 2.B.(1) and 2.B.(3), and proposed the deletion license condition 2.B.(2).

4.2.1.1 Changes to License Condition 2.B

License Condition 2.B currently reads:

> B. Subject to the conditions and requirements incorporated herein, the Commission hereby licenses the Texas A&M University:
>
> (1) Pursuant to Section 104c of the Act and 10 CFR, Chapter I, Part 50, "Licensing of Production and Utilization Facilities", to possess, use and operate the reactor as a utilization facility at the designated location in College Station, Texas, in accordance with the procedures and limitations set forth in this license.
>
> (2) Pursuant to the Act and 10 CFR Part 70, "Special Nuclear Material," to receive, possess, and use up to 700 grams of contained uranium 235, enriched to less than 20 percent in uranium dioxide (UO_2) embedded in radiation stabilized polyethylene, and up to 16 grams of plutonium 239 in the form of a sealed Pu-Be neutron source, both in connection with operation of the reactor.

(3) Pursuant to the Act and 10 CFR Parts 30 and 70 to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the reactor.

The licensee has proposed to revise License Condition 2.B to read as follows:

B. Subject to the conditions and requirements incorporated herein, the Commission hereby licenses the Texas A&M University:

(1) Pursuant to Section 104c of the Act and 10 CFR, Chapter I, Part 50, "Licensing of Production and Utilization Facilities", to possess the reactor as a utilization facility at the designated locations in College Station, Texas, in accordance with the procedures and limitations set forth in this license.

(2) DELETED

(3) Pursuant to the Act and 10 CFR Parts 30 and 70 to possess, but not separate, such byproduct and special nuclear materials that have been produced by the operation of the reactor.

The revised License Condition 2.B reflects the fact that the AGN-201M reactor will not be operated prior to being placed in storage at the NSC. Deletion of License Condition 2.B.(2) reflects the transfer of the SNM, in the form of AGN-201M reactor fuel, control rods, and startup source to the NSC and License No, R-83.

The licensee requested that the license conditions become effective upon transfer of the SNM from the AGN-201M reactor, License No. R-23 to the NSC License No. R-83. Subsequent to the licensee's request, on October 3, 2016 the SNM, in the form of the AGN-201M reactor fuel, control rods, and startup source, was moved to the NSC and placed on License No. R-83. By letter dated October 5, 2016 (Ref. 21) the licensee informed the NRC of the completion of the SNM transfer and proposed that the license conditions reflect the completion of the transfer. The NRC staff's revised wording, for proposed license conditions B.(2) and B.(3)., as agreed upon by TAMUS/TEES (Ref. 23), reads as follows:

B. Subject to the conditions and requirements incorporated herein, the Commission hereby licenses the Texas A&M University:

(1) Pursuant to Section 104c of the Act and 10 CFR, Chapter, 1 Part 50, "Licensing of Production and Utilization Facilities" to possess, but not use or operate the reactor as a utilization facility at the designated location in College Station, Texas, in accordance with the procedures and limitations set forth in this license.

(2) Pursuant to the Act and 10 CFR Part 30 “Rules of general applicability to domestic licensing of byproduct material” to possess, but not separate, such byproduct material present in the AGN-201M reactor non-fuel components.

(3) Pursuant to the Act and 10 CFR Part 70 “Domestic licensing of special nuclear material” to possess, but not separate, such special nuclear material present in the AGN-201M reactor non-fuel components.

The NRC staff reviewed the license condition changes proposed by the amendment. The NRC staff finds that TAMU has identified storage locations for this material consistent with the requirements in NRC regulations. The proposed conditions clearly identify the type and quantity of material being controlled by the license and the reactor cannot be operated. The NRC staff finds the proposed wording in License Conditions 2.B.1, 2.B.2, and 2.B.3 allow for storage of the AGN-201M reactor components at the NSC and prohibits the use of the AGN-201M reactor non-fuel components while in storage. Therefore, the proposed license conditions are acceptable.

4.2.2 Proposed Changes to Technical Specifications

The licensee proposed to add TS 3.5, “AGN-201M Reactor Components Stored at the Nuclear Science Center (NSC) Facility,” revise existing TS 4.0, “Surveillance Requirements,” add new TS 4.5, “Reactor Components Stored at the NSC Facility,” delete existing TS 5.2, “Fuel Storage,” and revise existing TS 5.3, “Reactor Room, Reactor Control Room, Accelerator Room.”

4.2.2.1 Addition of TS 3.5 “AGN-201M Reactor Components Stored at the Nuclear Science Center (NSC) Facility

TAMU proposed a limiting condition for operation designed to ensure that the equipment, used to mitigate a design basis accident or transient, is stored in a manner that will allow the equipment to perform its intended safety function when the reactor is returned to service. TAMU’s proposed TS 3.5, “AGN-201M Reactor Components Stored at the Nuclear Science Center (NSC) Facility,” stated:

Applicability

This specification applies to all AGN-201M reactor components stored at the NSC facility.

Objective

To verify the AGN-201M reactor components, are in two specified secured locations with no evidence of tampering, while stored at the NSC facility.

Specifications

1. Accelerator Building

   AGN-201M reactor components shall be stored in a secured fenced area in the Accelerator Building. The AGN-201M Reactor Supervisor or designee shall control access to the secured fenced area.

   The following AGN-201M reactor components shall be stored in the Accelerator Building:

   a. AGN-201M reactor control panel and associated electronic equipment

   b. AGN-201M Shield Tank, Reactor Tank, Core Tank, and associated internal components

2. Cargo Container

   AGN-201M reactor components not stored in the Accelerator Building shall be stored in a secured cargo container with a tamper proof seal affixed in such a way that opening the cargo container will break the seal. Access to the cargo container shall be restricted to personnel authorized by the AGN-201M Reactor Supervisor or designee.

Proposed TS 3.5 would require that the AGN-201M non-fuel reactor components be stored in the specific, secure, access-controlled locations discussed in Section 4.1.1, while the components are in storage at the NSC. As discussed in Sections 4.1.2 and 4.1.3, storing the components in these locations would help ensure that the storage complies with the radiation restricted area protection regulations of 10 CFR Part 20, and the 10 CFR 20.1801 requirement that licensed materials be secured from unauthorized removal or access. Storage of the components in these specific locations would also help ensure that the components are protected from adverse weather conditions, as discussed in Sections 4.1.4.

The NRC staff reviewed the proposed TS 3.5, and concludes that TS 3.5 would help ensure that the non-fuel AGN-201M reactor components at the NSC be stored in a manner that would be in compliance with NRC regulations and would protect the components from exposure to the elements. Therefore, based on the information above, the NRC staff finds that the proposed TS 3.5 is acceptable.

4.2.2.2 Addition of TS 4.5

TAMU's proposed surveillance requirement in TS 4.5, "Reactor Components Stored at the Nuclear Science Center (NSC) Facility," states:

Applicability

This applies to the surveillance requirements of the AGN-201M reactor components stored at the NSC Facility.

Objective

To verify the AGN-201M reactor components remain stored in specified locations and protected from tampering while at the NSC facility.

Specifications

a. NSC Accelerator Building

1. Once a quarter the secured fenced area in the Accelerator Building shall be inspected to verify all reactor components are present and no indications of tampering exist. If indications of tampering are discovered, the Director of Nuclear Engineering or designee shall be notified. In addition, a special report in accordance with Technical Specification Section 6.9.3 shall be transmitted to the U.S. NRC.

2. Once a quarter a radiation and contamination survey shall be conducted around the exterior of the stored AGN-201M reactor components to verify that contamination is not migrating from the contained reactor components. If detectable loose surface contamination exceeds levels acceptable for an unrestricted area, the reactor components shall be decontaminated and repackaged as necessary.

b. Cargo Container

1. Once a quarter a survey of the cargo container is required to verify that the tamper proof seal has not been broken. In the event the seal is found broken, the Director of Nuclear Engineering or designee shall be notified and an inventory of the cargo container shall be performed. In addition, a special report in accordance with Technical Specification Section 6.9.3 shall be transmitted to the U.S. NRC.

2. Once a quarter a radiation and contamination survey shall be conducted of the exterior of the cargo container to verify that contamination is not migrating from the contained components. If detectable loose surface contamination exceeds levels acceptable for an unrestricted area, the cargo container exterior shall be decontaminated and the source of contamination identified and secured.

Proposed TS 4.5, Specification a.1., would require quarterly surveillance to ensure that all non-fuel reactor components stored in the Accelerator Building are present and have not been tampered with. Proposed TS 4.5, Specification b.1., would require quarterly surveillance to

ensure that the tamper-proof seal of the cargo container containing other non-fuel reactor components has not been broken, and would require that an inventory of the container be performed if the seal is found broken.

Proposed TS 4.5, Specifications a.2. and b.2., would require quarterly radiological surveys to be performed around the exterior of the non-fuel reactor components stored in the Accelerator Building and on the exterior of the cargo container containing other non-fuel reactor components. If loose surface contamination levels on the exterior of the components stored in the Accelerator Building or on the exterior of the cargo container indicated the radioactive material could be migrating from the components, TAMU would remove the contamination to reduce it to levels acceptable for an unrestricted area, and would take corrective actions to stop further spread of the contamination.

The NRC staff reviewed the proposed TS 4.5, and concludes that the proposed TS 4.5 would help ensure that proposed TS 3.5 would be met by verifying that the non-fuel reactor components are present in the secure locations required by proposed TS 3.5 while they during the storage period at the NSC. The NRC staff also concludes that by requiring radiological surveys to be performed on and around the non-fuel reactor components stored at the NSC, proposed TS 4.5 would help ensure that the storage of the components at the NSC is in compliance with the radiation protection requirements in 10 CFR Part 20. ANSI/ANS 15.1 (Ref. 17) does not recommend specific intervals for surveillances related to performing equipment inventories or performing radiological surveys. However, ANSI/ANS 15.1 states that in general, surveillances involving inspection of equipment should be performed annually to biennially, and surveillances involving radiological effluent monitoring shall be performed quarterly to annually. The NRC staff therefore concludes that the quarterly surveillance intervals in proposed TS 4.5 are sufficient and are conservative relative to the guidance in ANSI/ANS 15.1. Therefore, based on the information above, the NRC staff finds that proposed TS 4.5 is acceptable.

4.2.2.3 Revision of Current TS 4.0

The current surveillance requirements TS 4.0, “Surveillance Requirements,” states:

> Actions specified in this section are not required to be performed if during the specified surveillance period the reactor has not been brought critical or is maintained in a shutdown condition extending beyond the specified surveillance period. However, the surveillance requirements must be fulfilled prior to subsequent startup of the reactor.

TAMU’s proposed TS 4.0, “Surveillance Requirements,”as supplemented by letter dated October 14, 2016 states:

> Actions specified in this section, with the exception of Section 4.5, are not required to be performed if during the specified surveillance period the reactor has not been brought critical or is maintained in a shutdown condition extending beyond the specified surveillance period. However, the surveillance requirements must be fulfilled prior to subsequent startup of the reactor unless reactor operation is required for performance of the surveillance. Any

> surveillance that can only be performed during reactor operation may be postponed until the reactor is operable.

Current TS 4.0 states that surveillance requirements specified in TS Section 4 (which includes existing TS 4.1, “Reactivity Limits,” TS 4.2, “Control and Safety Systems,” TS 4.3, “Reactor Structure,” and TS 4.4, “Radiation Monitoring and Control”) are not required to be performed if the reactor has been in an extended shutdown. Proposed TS 4.5 requires surveillance of the AGN-201M non-fuel reactor components in storage at the NSC. TS 4.0 was revised to add the requirement to perform TS 4.5 even while the reactor is in an extended shutdown condition.

Current TS 4.0 also states that if surveillance requirements are not performed because the reactor is in an extended shutdown, then those surveillance requirements must be fulfilled prior to subsequent startup of the reactor. TAMU proposed to revise this portion of TS 4.0 to state that the surveillance requirements must be fulfilled prior to the subsequent startup of the reactor “unless reactor operation is required for performance of the surveillance,” and that “Any surveillance that can only be performed during reactor operation may be postponed until the reactor is operable.” TAMU stated that this revision is necessary because the surveillances required by existing TS 4.1 and TS 4.4, Specification c., could not be performed prior to subsequent startup of the reactor. Performance of those surveillances requires reactor operation (Ref. 4). The current TS 4.1, “Reactivity Limits,” states:

> Applicability
>
> This specification applies to the surveillance requirements for reactivity limits.
>
> Objective
>
> To assure that the reactivity limits for Specification 3.1 are not exceeded.
>
> Specification
>
> a. Safety and control rod reactivity worths shall be measured annually, but at intervals not to exceed 16 months.
>
> b. Total excess reactivity and shutdown margin shall be determined annually, but at intervals not to exceed 16 months.
>
> c. The reactivity worth of an experiment shall be estimated or measured, as appropriate, before or during the first startup subsequent to the experiment’s insertion.

Existing TS 4.4, “Radiation Monitoring and Control,” Specification c., states:

> A radiation survey of the reactor room, reactor control room, and accelerator room shall be performed under the supervision of the Radiological Safety Officer

> annually, but at intervals not to exceed 16 months, to determine the location of radiation and high radiation areas corresponding to reactor operating power levels.

No changes are being proposed to existing TS 4.1 or TS 4.4, Specification c.

The NRC staff reviewed the proposed revisions to current TS 4.0. The NRC staff concludes that the revision of the current TS 4.0 would help clarify that the proposed TS 4.5 would be applicable while the non-fuel reactor components are in storage at the NSC. The NRC staff also concludes that the revision of the current TS 4.0 would help clarify that surveillance activities, such as reactivity measurements and radiation surveys, that are required by existing surveillance TSs, but that cannot be performed when the reactor is shutdown, are not required to be performed prior to reactor operation, but would be required to be performed as soon as practical after reactor startup. Deviation from the surveillance frequency, resulting from an extended shutdown, is necessary to allow the surveillance to be performed at the earliest opportunity ensuring proper operation of the protection equipment. Therefore, based on the information above, the NRC staff finds that the proposed revision to TS 4.0 is acceptable.

4.2.2.4 Revision of TS 5.3

The design features TS 5.3, “Reactor Room, Reactor Control Room, Accelerator Room,” states:

> a. The reactor room houses the reactor assembly and accessories required for its operation and maintenance.
>
> b. The reactor control room houses the reactor control console.
>
> c. The accelerator room is directly above the reactor room and a hole in the accelerator room floor provides access to the thermal column.
>
> d. The reactor room, reactor control room, and accelerator room are separate rooms in the Zachry Engineering Center, constructed with adequate shielding and other radiation protective features to limit doses in restricted and unrestricted areas to levels no greater than permitted by 10 CFR 20, under normal operating conditions, and to a level below criterion 19, Appendix A, 10 CFR 50 recommendations under accident conditions.
>
> e. The access doors to the reactor room, reactor control room, and accelerator room shall contain locks.

TAMU’s proposed (revised) TS 5.3, “AGN-201M Reactor and Associated Components Storage Locations,” states:

> The AGN-201M reactor and associated components shall be stored in either of the following locations:

- Zachry Engineering Center
    - Reactor Room
    - Control Room
    - Accelerator Room
- Texas A&M Engineering Experiment Station Nuclear Science Center facility
    - Accelerator Building
    - Cargo Container

The proposed TS 5.3 describes the existing locations for the AGN-201M and adds specific locations at the NSC where TAMU plans to store AGN-201M reactor and its associated components until a new building is constructed to house them. The NRC staff reviewed the proposed revisions to current TS 5.3.

The NRC staff concludes that the proposed TS 5.3 would ensure that the AGN-201M non-fuel reactor components are located either in the reactor room, control room, and accelerator room at the Zachry Engineering Center, areas currently controlled by License No. R-23 and specified in current TS 5.3; or, in the Accelerator Building and cargo container at the NSC. The new locations are acceptable storage locations as discussed in Section 4.1. Therefore, based on the information above, the NRC staff finds that the proposed revision to TS 5.3 is acceptable.

4.3 Conclusion

The NRC staff reviewed the information provided by the licensee in the amendment request, as supplemented, regarding the proposed license conditions and TSs. The NRC staff conducted a site visit and observed the conditions of the proposed storage of the AGN-201M non-fuel reactor components at the NSC. The NRC staff also reviewed the licensee's proposed revision of license condition 2.B, addition of TS 3.5, revision of TS 4.0, addition of TS 4.5, and revision of TS 5.3, related to the proposed relocation of the AGN-201M non-fuel reactor components and storage of the components at the NSC. On the basis of its review, the NRC staff concludes that the licensee has shown that reactor and associated components at NSC can be stored safely and in compliance with applicable NRC regulations. The NRC staff also concludes that the proposed license conditions and TSs are consistent with the proposed action and are adequate to demonstrate that the storage conditions will be properly maintained. To ensure the items are secure and do not endanger the public heal or safety. In addition, the NRC staff finds that the proposed revisions to the TSs are in accordance with the regulations in 10 CFR 50.36. Therefore the NRC staff concludes that the proposed revision of license condition 2.B, addition of TS 3.5, revision of TS 4.0, addition of TS 4.5, and revision of TS 5.3 are acceptable.

5.0 ENVIRONMENTAL CONSIDERATION

Pursuant to 10 CFR 51.22(a), licensing actions are eligible for a categorical exclusion if the action does not individually or cumulatively have a significant effect on the human environment. As further specified at 10 CFR 51.22(c)(9), the issuance of an amendment to a

license for a reactor under 10 CFR Part 50 that changes a requirement with respect to installation or use of a facility component located within the restricted area is a licensing action that is eligible for a categorical exclusion if the amendment meets the exclusion criteria in 10 CFR 51.22(c)(9)(i)-(iii).

The NRC staff determined that the amendment is eligible for a categorical exclusion under 10 CFR 51.22(c)(9) for the following reasons. As discussed in Section 4.1.1, the proposed amendment would allow changes in the installation or use of a facility component located within the restricted area, as defined in 10 CFR Part 20, because the AGN-201M reactor (including the fuel, control rods, neutron startup source, and all support equipment) would be disassembled, packaged, transferred, and then stored at locations within the restricted area of the Texas A&M Engineering Experiment Station NSC. The NRC staff visited the site and confirmed that the proposed storage locations of the reactor and components (the NSC Accelerator building and cargo containers) are within the NSC restricted area. In addition, the proposed amendment meets the requirements for the eligibility criteria categorical exclusion in 10 CFR 51.22(c)(9) discussed below:

(i) The amendment or exemption involves no significant hazards consideration; [10 CFR 51.22(c)(9)(i)]

Under 10 CFR 50.92(c), the NRC may make a final determination that a license amendment involves no significant hazards consideration if operation of the facility, in accordance with the amendment, would not:

(1) involve a significant increase in the probability or consequences of an accident previously evaluated; or [10 CFR 50.92(c)(1)]

The amendment modifies the license to possess but not use or operate the reactor and authorizes storage of the reactor and associated components at the NSC. Previously evaluated accident scenarios involve the reactor while in a configuration that allows critical operation such as an overpower event or criticality accident. Because the reactor fuel has been removed from the reactor, and the reactor will be disassembled, it is physically impossible to achieve criticality. Additionally, the associated reactor components required for operation (e.g. control rod drives and control console) will be disconnected from the reactor and stored in a location physically separated from the reactor, also renders any reactor operations impossible. Therefore, the NRC staff finds that this amendment would not increase the probability or consequences of an accident previously evaluated.

(2) create the possibility of a new or different kind of accident from any accident previously evaluated; or [10 CFR 50.92(c)(2)]

As discussed in Section 2.4, the non-fuel components of the shutdown reactor contain a very small quantity of radioactive material and would pose a minimal radiation hazard during storage. No new or different kinds of accidents can occur during storage or transportation of the reactor and reactor components. The fuel, control rods, and neutron startup source have already been placed in the fuel

storage room at the NSC transferred to License No. R-83. The reactor and associated components will remain in a defueled, drained, and disconnected condition, with no external power applied condition until a new building has been constructed at the NSC. The reactor and associated components will be transported safety in accordance with the DOT regulations. Therefore, the NRC staff finds that this amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.

(3) *involve a significant reduction in a margin of safety* [10 CFR 50.92(c)(3)]

The amendment will not reduce the safety margin because the reactor will be defueled, disassembled, and inoperable during storage. The reactor non-fuel components would be packaged, transferred, and then stored within the restricted area of the NSC. The reactor components only contain trace amounts of radioactive material, which would not impact the margin of safety and would decay during storage. The license would be modified to possession-only and operation of the reactor would be prohibited. Existing TSs on shutdown margin or other core parameters for operation of the reactor remain unchanged. Therefore, the NRC staff finds that this amendment would not involve a significant reduction in a margin of safety.

Based on the above, the NRC staff concludes that this amendment involves no significant hazards consideration.

(ii) *There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite; and* [10 CFR 51.22(c)(9)(ii)]

The disassembled reactor components, including the fuel, control rods, neutron startup source, and all support equipment, would be stored separately at the NSC. Since reactor would be in a possess, but not use or operate condition, there would be no change in the types of effluents or increase in the amount of any effluents released offsite as a result of this amendment.

(iii) There is no significant increase in individual or cumulative occupational radiation exposure. [10 CFR 51.22(c)(9)(iii)]

Individual and cumulative occupational radiation exposure would remain the same or decrease because the proposed amendment would modify the license to possess, but not use or operate the reactor. Since the reactor is not operating, the handling and transportation of the reactor presents less radiological exposure potential than normal operations. As discussed in Section 2.4, the non-fuel components of the disassembled reactor contain a very small quantity of radioactive material and would pose a minimal radiation hazard during storage. TS 4.5 imposes requirements ensuring that storage of the reactor components at the NSC complies with the radiation protection regulations in 10 CFR Part 20. Therefore, the NRC staff finds that there would be no significant increase in individual or cumulative occupational radiation exposure.

Finally, the proposed amendment would not affect biota, water resources, cultural resources, or socioeconomic conditions in the region because the action involves no ground disturbing activities, surface water or groundwater resources, and a small number of workers. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be performed in connection with the issuance of this amendment.

6.0 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.

7.0 REFERENCES

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Date: October 14, 2016