TEXAS A&M ENGINEERING EXPERIMENT STATION
NUCLEAR SCIENCE CENTER

TEXAS A&M UNIVERSITY

Dr. Sean M. McDeavitt
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June 17, 2016 2016-0036
Docket Number 50-59 / License No. R-23

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555
Ref: 10 CFR 50.90

SUBJECT: Supplemental Information Regarding Texas A&M University License Amendment Request Dated November 11, 2015, for the AGN-201M Reactor, Facility License R-23, Docket Number 50-59 (ADAMS Accession No. ML15315A027)

Attn: Mr. Alexander Adams Jr., Chief,
Research and Test Reactors Branch
Office of Nuclear Reactor Regulation

Mr. Patrick M. Boyle, Project Manager,
Research and Test Reactors Branch
Office of Nuclear Reactor Regulation

The purpose of this letter is to provide supplemental information (see Attachment) regarding the Texas A&M University (TAMU) license amendment dated November 11, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15315A027), for the Aerojet General Nucleonics Model 201-Modified (AGN-201M) Reactor, Facility License R-23, Docket Number 50-59, and as supplemented by letters dated March 3, 2016 (ADAMS Accession No. ML16063A384), and June 3, 2016 (ADAMS Accession No. ML16155A388). Specifically, TAMU is proposing to modify the license and technical specifications (TSs) proposed in our letter dated June 3, 2016.

The proposed changes to the AGN-201M license and TS Sections 3.5 and 5.3 will ensure that when the AGN-201M reactor components are being disassembled, transported, and stored at the Texas A&M Engineering Experiment Station Nuclear Science Center (NSC) facility, the license and TSs will specify the approved locations for the AGN-201M reactor components.

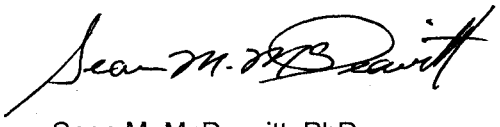
TS Section 4.0 is being changed to add an exception for the new surveillance TS Section 4.5, and to reflect the surveillances which require reactor operation in order to be performed. TS Section 4.5 terminology is also being changed. The term “damage” is being replaced with “no indications of tampering exist.”

The license and TSs changes proposed in the June 3, 2016, letter are superseded by the license and TSs proposed in this letter. In addition, TAMU is proposing to implement the license and TS changes upon the receipt of the AGN-201M fuel and special nuclear materials at the NSC facility.

This supplemental information does not change the initial "no significant hazards determination" stated in the November 11, 2015, application. Should you have any questions regarding the information provided in this submittal, please contact me or Mr. Jerry Newhouse at (979) 845-7551 or via email at mcdeavitt@tamu.edu or newhouse@tamu.edu.

Oath of Affirmation
I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Sincerely,



Sean M. McDeavitt, PhD
Director, TEES Nuclear Science Center
Submitted with Level 2 Delegate Authorization from Dr. Yassin Hassan in letter dated February 8, 2016 (ADAMS Accession No. ML16043A048)

Attachment: Supplemental Information

Enclosure 1: License Changes
Enclosure 2: Technical Specification Changes

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cc:

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ATTACHMENT

TEXAS A&M UNIVERSITY

AEROJET GENERAL NUCLEONICS MODEL 201-MODIFIED REACTOR

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

SUPPLEMENTAL INFORMATION

1.0 INTRODUCTION

The purpose of this letter is to provide supplemental information, regarding the Texas A&M University (TAMU) license amendment dated November 11, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15315A027), for the Aerojet General Nucleonics Model 201-Modified (AGN-201M) Reactor, Facility License R-23, Docket Number 50-59, and as supplemented by letters dated March 3, 2016 (ADAMS Accession No. ML16063A384), and June 3, 2016 (ADAMS Accession No. ML16155A388). Specifically, TAMU is proposing to modify the license and technical specifications (TS) enclosed in our letter dated June 3, 2016.

Changes are being proposed to the AGN-201M license and TS Sections 3.5 and 5.3 to ensure that when the AGN-201M reactor components are being disassembled, transported and stored at the Texas A&M Engineering Experiment Station Nuclear Science Center (NSC) facility, the license and TS will specify the approved locations of the AGN-201M reactor components.

TS Section 4.0 is being changed to add an exception for the new surveillance TS Section 4.5, and to reflect the surveillances which require reactor operation in order to be performed. TS Section 4.5 terminology is also being changed. The term “damage” is being replaced with “no indications of tampering exist.”

The license and TS changes proposed in the June 3, 2016, letter are superseded by the proposed license and TSs changes contained in this letter. In addition, TAMU is proposing to implement the license and TS changes upon the receipt of the AGN-201M fuel and special nuclear materials (SNM) at the NSC facility.

2.0 PROPOSED LICENSE CHANGE

TAMU is proposing two new changes to the AGN-201M license. The first change TAMU is proposing is to change the word “location” to “locations” in Section B.2.(1) of the License. This change is being proposed to ensure consistency between the license and the new proposed TS Section 5.3. The proposed license and TS changes specify the approved locations of the AGN-201M reactor components, during the time these components are being disassembled and transported from the Zachry Engineering Center and stored at the specified NSC facility locations.

The second change TAMU is proposing is editorial. The proposed change is to change the word “has” to “have” in Section B.2.(3) of the License.

These changes do not affect the other proposed license changes in the June 3, 2016, supplement.

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3.0 PROPOSED TECHNICAL SPECIFICATION CHANGES

3.1 New Proposed TS Section 3.5

TAMU is proposing a new TS Section 3.5. The new TS Section 3.5 requires the AGN-201M reactor components, while stored at the NSC facility, be located in only two specified secured locations. The AGN-201M reactor components will be stored in either the NSC Accelerator Building in a secured fenced area, or in a secured cargo container in the restricted area at the NSC facility. Once the AGN-201M reactor components have been transported to the NSC facility, a receipt inspection shall be performed to verify no damage has occurred.

Accelerator Building

The following AGN-201M reactor components shall be stored at the NSC facility 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

The new proposed TS Section 3.5 requires the AGN-201M reactor components stored in the Accelerator Building be placed in a secured fenced area. In addition, the proposed TS adds a requirement that access to the secured fenced area be controlled by the AGN-201M Reactor Supervisor or designee. This new TS requirement will ensure that the AGN-201M reactor components are in a secured location to prevent tampering.

Cargo Container

All other AGN-201M reactor components not stored in the Accelerator Building shall be stored in a secured cargo container in the restricted area at the NSC facility.

The new proposed TS Section 3.5 shall require the cargo container be secured and a tamper proof seal affixed. The TS also restricts access to the cargo container to personnel authorized by the AGN-201M Reactor Supervisor or designee. This shall ensure the AGN-201M reactor components remain secured and no indications of tampering exist while stored at the NSC facility.

3.2 New Proposed TS 4.0

TS Section 4.0 is being changed to reflect two changes. Specifically, actions specified in this section, with the exception of TS Section 4.5, are not required to be performed if during the specified surveillance period and the surveillance requirements must be fulfilled prior to subsequent startup of the reactor unless reactor operation is required for performance of the surveillance. Such surveillance shall be performed as soon as practical after reactor startup. These changes are based on the necessity to retain TS Section 4.5 which contains specific requirements regarding the storage of AGN-201M reactor components at the NSC facility. The second change focuses on the ability to perform required surveillances before reactor start-up and as soon as practical following reactor start-up. Specifically TS Section 4.1 and 4.4c cannot be performed without reactor operation, thus requiring this change to TS Section 4.0. In order to perform

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these two surveillances the reactor must be critical and configured to perform these surveillances.

3.3 New Proposed TS 4.5

TS Section 4.5 terminology is being changed to expand and accurately reflect the desired meaning of the term “damage.” It is being replaced with “no indications of tampering exist.” TAMU is of the opinion that this change will serve as a precise interpretation of any issues that could be identified, with the packaged inventory stored at the NSC facility.

3.4 New Proposed TS 5.3

TAMU is proposing to change TS Section 5.3 to reflect that the AGN-201M reactor components shall be stored in accordance with the AGN-201M License at the Zachry Engineering Center or at the two approved locations at the NSC facility.

4.0 TECHNICAL SPECIFICATION IMPLEMENTATION

TAMU is requesting implementation of the proposed license and TS changes based upon receipt and acceptance of AGN-201M fuel and SNM at the NSC facility.

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ENCLOSURE 1

TEXAS A&M UNIVERSITY

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

AMENDED FACILITY OPERATING LICENSE

AGN-201M REACTOR

PROPOSED CHANGES TO THE LICENSE

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 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.

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(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.

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) Maximum Power Level

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

ENCLOSURE 2

TEXAS A&M UNIVERSITY

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

AMENDED FACILITY OPERATING LICENSE

AGN-201M REACTOR

PROPOSED CHANGES TO THE TECHNICAL SPECIFICATIONS

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 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. Such surveillance shall be performed as soon as practical after reactor startup.

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 (Ref. 3.4e) shall be verified to be operable.

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 (Ref. 3.4e) will assure that the radiation monitoring and control systems are operable during reactor operation.

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 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. De-energizing 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

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5.3 Reactor Room, Reactor Control Room, Accelerator Room

The AGN-201M reactor and associated components shall be housed in the following locations approved by the AGN-201M License:

- 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.