TEXAS A&M ENGINEERING EXPERIMENT STATION
NUCLEAR SCIENCE CENTER

TEXAS A&M UNIVERSITY

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May 11, 2016 2016-0026
Docket Number 50-128 / License No. R-83

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

SUBJECT: Supplement 4 to License Amendment Request dated October 14, 2015, Facility License R-83, Docket Number 50-128. (ADAMS Accession No. ML15287A148)

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

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

The purpose of this letter is to address the following 2 issues associated with the October 14, 2015 (ADAMS Accession No. ML15287A148), license amendment request and associated supplements for the Texas A&M Engineering Experiment Station (TEES) Nuclear Science Center (NSC) TRIGA reactor, Facility Operating License No. R-83, Docket Number 50-128:

1. Proposed License Conditions

2. Correction of pagination for Section 1 of the NSC proposed Technical Specifications (TSs) changes

Issue 1: Proposed License Conditions

TEES is revising the proposed license condition contained in our letter dated March 3, 2016, (ADAMS Accession No. ML16063A264) associated with allowing the storage of fuel and special nuclear material from the Texas A&M AGN-201M reactor at the NSC site. On March 3, 2016, TEES proposed new license conditions concerning 10 CFR Parts 30 and 70 which were not in

appropriate standard format. For consistency TEES is proposing new license conditions which are in standard formatted license conditions concerning 10 CFR Parts 30 and 70 of the license. Enclosure 1 contains the new proposed license page.

Issue 2: Correction of pagination

In our letter of November 18, 2015 (ADAMS Accession No. ML15322A354), TEES proposed changes to Section 1 of the NSC TSs that included definitions associated with the AGN-201M reactor fuel and neutron startup source. Upon further review of our submittal we found that the proposed TS pages were incorrectly paginated. We have repaginated all the TS pages in Section 1 of the NSC TSs to correctly include the proposed TS changes from the November 18, 2015, letter. Enclosure 2 contains the revised NSC Section 1 of the TSs pages. Our recommendation is to issue the entire new proposed Section 1 of the NSC TSs with the license amendment to ensure accuracy of the TSs.

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

Enclosures: 1 Proposed License Changes
2 Repaginated Section 1 Technical Specification Pages

CC: next page

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ENCLOSURE 1

TEXAS ENGINEERING EXPERIMENT STATION TEXAS A&M UNIVERSITY

FACILITY LICENSE R-83, DOCKET NO. 50-128

PROPOSED CHANGES TO THE LICENSE

c. to receive, possess, and use, but not separate, in connection with the operation of the facility, such special nuclear material as may be produced by the operation of the facility.

d. to receive and possess, but not use up to 0.7 Kilograms of contained Uranium-235 as AGN-201M < 20% enriched ^{235}U reactor fuel, and any special nuclear materials produced by the operation of the AGN-201M reactor, for up to five years following issuance of license amendment xx dated May xx, 2016.

e. to receive and possess, but not use up to 0.020 kilograms of ^{239}Pu as a $^{239}PuBe$ sealed neutron start-up source in connection with storage of the AGN-201M reactor, for up to five years following issuance of license amendment xx dated May xx, 2016.

3. Pursuant to the Act and 10 CFR Part 30, the following activities are included:

a. to receive, possess, and use, in connection with the operation of the facility, a sealed antimony-beryllium neutron startup source,

b. to receive, possess, and use, in connection with the operation of the facility, a sealed 2.5-curie americium-beryllium neutron source; and,

c. to receive, possess, and use, in connection with operation of the facility, such byproduct material as may be produced by operation of the reactor, which can not be separated except for byproduct material produced in reactor experiments.

d. to receive and possess, but not use or separate, byproduct materials produced by operation of the AGN-201M reactor, including contaminated and activated AGN-201M reactor components for up to five years following issuance of license amendment xx dated May xx, 2016.

4. Pursuant to the Act and 10 CFR Part 40, “Domestic Licensing of Source Material,” to receive, possess, and use in connection with operation of the facility, not more than 6.8 kilograms of source material.

C. This license shall be deemed to contain, and is subject to the conditions specified 10 CFR Parts 20, 30, 40, 50, 51, 55, 70, and 73 of the Commission’s regulations; is subject to all 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 a steady-state power level up to a maximum of 1000 kilowatts (thermal) and to pulse the reactor in accordance with the limitations in the Technical Specifications.

2. Technical Specifications

The Technical Specifications contained in Appendix A are hereby incorporated in their entirety in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

ENCLOSURE 2

TEXAS ENGINEERING EXPERIMENT STATION TEXAS A&M UNIVERSITY

FACILITY LICENSE R-83, DOCKET NO. 50-128

PROPOSED CHANGES TO THE TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS

1 Introduction

1.1 Scope

This document constitutes the Technical Specifications for the Facility License No. R-83 as required by 10 CFR 50.36 and supersedes all prior Technical Specifications. This document includes the "bases" to support the selection and significance of the specifications. Each basis is included for information purposes only. They are not part of the Technical Specifications, and they do not constitute limitations or requirements to which the licensee must adhere.

1.2 Format

These specifications are formatted to NUREG-1537 and ANSI/ANS 15.1-2007.

1.3 Definitions

AGN-201M Neutron Start Up Source

A plutonium-beryllium (α,n) source used in the AGN-201M reactor to ensure the detectors are in their normal operating range and to verify operation of the low level interlock.

ALARA

The ALARA program (As Low as Reasonably Achievable) is a program for maintaining occupational exposures to radiation and release of radioactive effluents to the environs as low as reasonably achievable.

Audit

An audit is a quantitative examination of records, procedures, or other documents after implementation from which appropriate recommendations are made.

Channel

A channel is the combination of sensors, lines, amplifiers, and output devices that are connected for the purpose of measuring the value of a parameter.

Channel Test

A channel test is the introduction of a signal into the channel to verify that it is operable.

Channel Calibration

A channel calibration is an adjustment of the channel such that its output corresponds, with acceptable accuracy, to known values of the parameter that the channel measures. Calibration shall encompass the entire channel, including equipment actuation, alarm, or trip and shall be deemed to include a channel test.

Channel Check

A channel check is a qualitative verification of acceptable performance by observation of channel behavior. This verification, where possible, shall include comparison of the channel with other independent channels or systems measuring the same variable.

Confinement

Confinement is an enclosure of the overall facility that is designed to limit the release of effluents between the enclosure and its external environment through controlled or defined pathways.

Control Rod

A control rod is a device fabricated from neutron-absorbing material or fuel, or both, that is used to establish neutron flux changes and to compensate for routine reactivity losses. A control rod can be coupled to its drive unit allowing it to perform a safety function when the coupling is disengaged.

Regulating Control Rod

The regulating rod is a low-worth control rod used primarily to maintain an intended power level that need not have scram capability. Its axial position may be varied manually or by the servo controller.

Shim Safety Control Rod

A shim safety rod is a control rod having an electric motor drive and scram capabilities. It shall have a fueled follower section.

Transient Control Rod

The transient rod is a pneumatically driven control rod with scram capabilities that is capable of providing rapid reactivity insertion to produce a pulse.

Core Configuration

The core configuration includes the number, type, or arrangement of fuel elements, reflector elements, and regulating/shim-safety/transient rods occupying the core grid.

Core Lattice Position

The core lattice position is that region in the core (approximately 3” x 3”) over a grid-plug hole. A fuel bundle, an experiment, or a reflector element may occupy the position.

Excess Reactivity

Excess reactivity is that amount of reactivity that would exist if all control rods were moved to the maximum reactive condition from the point where the reactor is exactly critical (*keff* = 1) at reference core conditions.

Experiment

An operation, hardware, or target (excluding devices such as detectors, foils, etc.) that is designed to investigate non-routine reactor characteristics, or that is intended for irradiation within the pool, or in a beam port or irradiation facility. Hardware rigidly secured to a core or shield structure so as to be a part of its design to carry out experiments is not normally considered an experiment.

Secured Experiment

A secured experiment is any experiment, experiment facility, or component of an experiment that is held in a stationary position relative to the reactor by mechanical means. The restraining forces must be substantially greater than those to which the experiment might be subjected by hydraulic, pneumatic, buoyant, other forces that are normal to the operating environment of the experiment, or by forces that can arise as a result of credible malfunctions.

Unsecured Experiment

An unsecured experiment is any experiment or component of an experiment that does not meet the definition of a secured experiment.

Movable Experiment

A movable experiment is one where it is intended that all or part of the experiment may be moved in or near the core or into and out of the reactor while the reactor is operating.

Experimental Facilities

Experimental facilities shall mean beam ports, including extension tubes with shields, thermal columns with shields, vertical tubes, through tubes, in-core irradiation baskets, irradiation cell, pneumatic transfer systems, and in-pool irradiation facilities.

Experiment Safety Systems

Experiment safety systems are those systems, including their associated input circuits, which are designed to initiate a scram for the primary purpose of protecting an experiment or to provide information for operator intervention.

Fuel Bundle

A fuel bundle is a cluster of two, three, or four fuel elements and/or non-fueled elements secured in a square array by a top handle and a bottom grid plate adapter. Non-fueled elements shall be fabricated from stainless steel, aluminum, boron, or graphite materials.

Fuel Element

A fuel element is a single TRIGA fuel rod of LEU 30/20 type.

Fuel – AGN-201M

UO_2 enriched to < 20% ^{235}U mixed with polyethylene and pressed into cylindrical discs and fueled control rod ends, and 0.4 grams of ^{235}U mixed with polystyrene.

Instrumented Fuel Element (IFE)

An instrumented fuel element is a special fuel element in which one or more thermocouples are embedded for the purpose of measuring the fuel temperatures during operation.

License

The written authorization, by the U.S. NRC, for an individual or organization to carry out the duties and responsibilities associated with a personnel position, material, or facility requiring licensing.

Licensee

A licensee is an individual or organization holding a license.

LEU Core

An LEU core is an arrangement of TRIGA-LEU fuel in a reactor grid plate.

Limiting Safety System Setting (LSSS)

The limiting safety system setting is the fuel element temperature, which if exceeded, shall cause a reactor scram to be initiated, preventing the safety limit from being exceeded.

Measured Value

A measured value is the value of a parameter as it appears on the output of a channel.

Operable

Operable means a component or system is capable of performing its intended function.

Operating

Operating means a component or system is performing its required function.

Operational Core – Steady State

A steady state operational core shall be an LEU core which meets the requirements of the Technical Specifications.

Operational Core – Pulse

A pulse operational core is a steady state operational core for which the maximum allowable pulse reactivity insertion has been determined.

Pool Water Reference Operating Level

The pool water reference operating level is 10 inches below the top of the pool wall. This level is designed to prevent pool water from rising above the top of the liner.

Protective Action

Protective action is the initiation of a signal or the operation of equipment within the reactor safety system in response to a parameter or condition of the reactor facility having reached a specified limit.

Pulse Mode

Pulse mode operation shall mean any operation of the reactor with the mode selector switch in the pulse position.

Reactivity Worth of an Experiment

The reactivity worth of an experiment is the value of the reactivity change that results from the experiment being inserted into or removed from its intended position.

Reactor Console Secured

The reactor console is secured whenever all control rods have been verified to be fully inserted and the console key has been removed from the console.

Reactor Operating

The reactor is operating whenever it is not secured or shutdown.

Reactor Operator

A Reactor Operator is an individual who is licensed to manipulate the controls of a reactor.

Reactor Safety Systems

Reactor safety systems are those systems, including their associated input channels, which are designed to initiate automatic reactor protection or to provide information for initiation of manual protective action.

Reactor Secured

The reactor is secured when:

Either

(1) There is insufficient moderator available in the reactor to attain criticality or there is insufficient fissile material present in the reactor to attain criticality under optimum available conditions of moderation and reflection;

Or

(2) All of the following conditions exist:

(a) All control rods are fully inserted;

(b) The console key switch is in the "off " position and the key is removed from the console lock;

(c) The reactor is shutdown;

(d) No work is in progress involving core fuel, core structure, installed control rods, or control rod drives unless the control rod drives are physically decoupled from the control rods;

(e) No experiments are moved or serviced that have, on movement, a reactivity worth exceeding $1.00.

Reactor Shutdown

The reactor is shut down if it is subcritical by at least $1.00 in the reference core condition with the reactivity worth of all installed experiments included.

Reference Core Condition

The condition of the core when it is at ambient temperature (cold) and the reactivity worth of xenon is less than $0.01.

Reportable Occurrence

Any of the following events is a reportable occurrence:

(1) Operation with actual safety system settings for required systems less conservative than the LSSS specified in the Technical Specifications;

(2) Operation in violation of a Limiting Condition of Operation listed in Section 3 unless prompt remedial action is taken as permitted in Section 3;

(3) Operation with a required reactor or experiment safety system component in an inoperative or failed condition which renders or could render the system incapable of performing its intended safety function. If the malfunction or condition is caused during maintenance, then no report is required;

(4) An unanticipated or uncontrolled change in reactivity greater than $1.00. Reactor trips resulting from a known cause are excluded;

(5) Abnormal and significant degradation in reactor fuel or cladding, or both, coolant boundary, or confinement boundary; and

(6) An observed inadequacy in the implementation of either administrative or procedural controls, such that the inadequacy causes or could have caused the existence or development of an unsafe condition with regard to reactor operations.

Review

A review is a qualitative examination of records, procedures, or other documents prior to implementation from which appropriate recommendations are made.

Safety Channel

A safety channel is a channel in the reactor safety system.

Safety Limit

Safety limits for nuclear reactors are limits upon important process variables that are found to be necessary to reasonably protect the integrity of certain of the physical barriers that guard against the uncontrolled release of radioactivity. For the Texas A&M NSC TRIGA reactor the safety limit is the maximum fuel element temperature that can be permitted with confidence that no damage to any fuel element cladding will result.

Scram Time

Scram time is the elapsed time between the initiation of a scram signal and the instant that the slowest scrammable control rod reaches its fully inserted position.

Senior Reactor Operator

A Senior Reactor Operator is an individual who is licensed to direct the activities of reactor operators. Such an individual is also a reactor operator.

Shall, Should and May

The word “shall” is used to denote a requirement; the word “should” to denote a recommendation; and the word “may” to denote permission, neither a requirement nor a recommendation.

Shutdown Margin

Shutdown margin is the minimum shutdown reactivity necessary to provide confidence that the reactor can be made subcritical by means of the control and safety systems, starting from any permissible operating condition. This margin is determined assuming that the most reactive scrammable rod and any

non-scrammable rods are fully withdrawn, and that the reactor will remain subcritical by this calculated margin without any further operator action.

Steady State Mode

Steady state mode of operation shall mean operation of the reactor with the mode selector switch in the steady state position.

Surveillance Intervals

The maximum surveillance intervals are provided for operational flexibility and the average surveillance intervals should be maintained over the long term.

Annually - an interval not to exceed 15 months.
Biennially - an interval not to exceed 30 months.
Monthly - an interval not to exceed 6 weeks.
Quarterly - an interval not to exceed 4 months.
Semiannually - an interval not to exceed 7.5 months.
Weekly - an interval not to exceed 10 days.

True Value

The true value is the actual value of a parameter.

Unscheduled Shutdown

An unscheduled shutdown is any unplanned shutdown of the reactor caused by actuation of the reactor safety system, operator error, equipment malfunction, or a manual shutdown in response to conditions that could adversely affect safe operation. It does not include shutdowns that occur during testing or check out operations.