July 2, 1996

Dr. Mark G. Yudof
Executive Vice President and Provost
The University of Texas at Austin
MAI-201
Austin, Texas 78712

SUBJECT: ISSUANCE OF AMENDMENT NO. 1 TO FACILITY OPERATING LICENSE NO. R-129 - UNIVERSITY OF TEXAS AT AUSTIN (TAC NO. M85809)

Dear Dr. Yudof:

The Commission has issued the enclosed Amendment No. 1 to Facility Operating License No. R-129 for the University of Texas at Austin. The amendment consists of changes to the Technical Specifications (TSs) in response to your submittal dated January 25, 1993, as supplemented on November 11, 1995, April 16, 1996, and June 6, 1996.

The amendment changes the TSs requirement for the interlock that controls simultaneous withdrawal of control rods to reflect the as designed reactor. The amendment also clarifies the control rod types and effective modes of operation discussed in the TSs.

A copy of the related Safety Evaluation supporting Amendment No. 1 is enclosed.

Sincerely,

Original signed by: Theodore S. Michaels for

Alexander Adams, Jr., Senior Project Manager
Non-Power Reactors and Decommissioning
Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 50-602

Enclosures:
1. Amendment No. 1
2. Safety Evaluation

cc w/enclosures:
See next page

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

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cc:

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

THE UNIVERSITY OF TEXAS AT AUSTIN

DOCKET NO. 50-602

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 1
License No. R-129

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

   A. The application for an amendment to Facility Operating License No. R-129 filed by the University of Texas at Austin (the licensee) on January 25, 1993, as supplemented on November 11, 1995, April 16, 1996, and June 6, 1996, conforms to the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the regulations of the Commission as set forth in Chapter I of Title 10 of the Code of Federal Regulations (10 CFR);

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

   C. There is reasonable assurance that (i) the activities authorized by this amendment can be conducted 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. The issuance of this amendment is in accordance with the regulations of the Commission as set forth in 10 CFR Part 51, and all applicable requirements have been satisfied; and

   F. Prior notice of this amendment was not required by 10 CFR 2.105, and publication of notice for this amendment is not required by 10 CFR 2.106.

2. 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 Facility Operating License No. R-129 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 1, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Seymour H. Weiss

Seymour H. Weiss, Director
Non-Power Reactors and Decommissioning
  Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Enclosure:
Appendix A Technical
  Specification Changes

Date of Issuance: July 2, 1996

ENCLOSURE TO LICENSE AMENDMENT NO. 1

FACILITY OPERATING LICENSE NO. R-129

DOCKET NO 50-602

Replace the following pages of the Appendix A Technical Specifications with the enclosed pages. The revised pages are identified by Amendment number and contain vertical lines indicating the areas of change.

Remove Pages	Insert Pages
9	9
14	14
15	15
24	24
44	44

1.19 Reactor Shutdown

The reactor is shutdown if it is subcritical by at least one dollar in the reference core condition with the reactivity of all installed experiments included.

1.20 Reference Core Condition

The condition of the core when it is at ambient temperature (cold) and the reactivity worth of xenon is negligible (<.30 dollars).

1.21 Research Reactor

A research reactor is defined as a device designed to support a self-sustaining neutron chain reaction for research, development, educational, training, or experimental purposes, and which may have provisions for the production of radioisotopes.

1.22 Rod, Control

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

1.22.1 Shim Rod

A shim rod is a control rod with an electric motor drive that does not perform a special function such as automatic control or pulse control. The shim rod shall have scram capability.

1.22.2 Regulating Rod

A regulating rod is a control rod used to maintain an intended power level and may be varied manually or by a servo-controller. The regulating rod shall have scram capability.

1.22.3 Standard Rod

The regulating and shim rods are standard control rods.

1.22.4 Transient Rod

A transient rod is a control rod used to initiate a power pulse that is operated by a motor drive and/or air pressure. The transient rod shall have scram capability.

3.2 Reactor Control and Safety System

3.2.1 Control Assemblies

Specification(s)

The reactor shall not be operated unless the control rods are operable, and

a. Control rods shall not be operable if damage is apparent to the rod or drive assemblies.

b. The scram time measured from the instant a simulated signal reaches the value of a limiting safety system setting to the instant that the slowest scrammable control rod reaches its fully inserted position shall not exceed 1 second.

c. Maximum reactivity insertion rate of a standard control rod shall be less than 0.2% $\Delta k/k$ per second.

3.2.2 Reactor Control System

Specification(s)

The reactor shall not be operable unless the minimum safety interlocks are operable. The following control system safety interlocks shall be operable:

Control Rod Drive Interlock Function	Number Operable	Control Rod	Effective Mode* M	A	S	P
a. Startup Withdrawal - prevent rod up movement if startup signal is less than 2 counts per second	3	Standard rods	X	X		
	1	Transient rod	X	X	X	X
b. Simultaneous Withdrawal - prevent rod up movement for two or more rods	3	Standard rods	X			
	2	Shim rods		X		
	1	Transient rod	X	X		
c. Non pulse condition - prevent air actuation if rod drive is not down	1	Transient rod	X	X		
d. Pulse Withdrawal - prevent withdrawal of non pulse rods	3	Standard rods			X	X
e. Transient Withdrawal - prevent air actuation if linear power is more than 1 kilowatt	1	Transient rod			X	X

*Modes are: (M) Manual, (A) Auto, (S) Square Wave, and (P) Pulse

3.2.3 Reactor Safety System

Specification(s)

The reactor shall not be operable unless the minimum safety channels are operable. The following control rod scram safety channels shall be operable.

Safety System Function	Number Operable	Safety Channel	Effective Mode* M, A, S	P
a. Scram at ≤550°C	2	Fuel Temperature	X	X
b. Scram at ≤1.1 Mw	2	Power Level	X	
Scram at ≤2000Mw	1	Pulse Power		X
c. Scram on loss	2	High Voltage	X	X
d. Scram on loss	1	Magnet Current	X	X
e. Scram on demand	1	Manual Scram Console Button	X	X
f. Scram on loss of timer reset	2	Watchdog Trip Microprocessor scan rate	X	X

*Modes are: (M) Manual, (A) Auto, (S) Square Wave, and (P) Pulse

3.2.4 Reactor Instrument System

Specification(s)

A minimum configuration of measuring channels shall be operable. The following minimum reactor parameter measuring channels shall be operable:

Instrument System Function	Number Operable	Measuring Channel	Effective Mode* M, A, S	P
a. Temperature	2	Fuel Temperature	X	X
b. Power	2	Power Level	X	
c. Pulse	1	Pulse Power		X
d. Pulse	1	Pulse Energy		X

*Modes are: (M) Manual, (A) Auto, (S) Square Wave, and (P) Pulse

5.0 DESIGN FEATURES

5.1 Site and Facility Description

5.1.1 Location

Specification(s)

a. The site location is in the northeast corner of The University of Texas at Austin J.J. Pickle Research Campus.

b. The TRIGA reactor is installed in a designated room of a building constructed as a Nuclear Engineering Teaching Laboratory.

c. The reactor core is assembled in an above ground shield and pool structure with horizontal and vertical access to the core.

d. License areas of the facility for reactor operation shall consist of the room enclosing the reactor shield and pool structure, and the adjacent area for reactor control. (room 1.104, corridor 3.200; and rooms 3.202, 3.204, and 3.208)

5.1.2 Confinement

Specification(s)

a. The reactor room shall be designed to restrict leakage and will have a minimum enclosed air volume of 4120 cubic meters.

b. Ventilation system should provide two air changes per hour and shall isolate air in the reactor area upon detection of a limit signal related to the radiation level.

c. An air purge system should exhaust experiment air cavities and shall be filtered by high efficiency particulate absorption filters.

d. All exhaust air from the reactor area enclosure shall be ejected vertically upward at a point above the facility roof level.

5.1.3 Safety Related Systems

Specifications

Any modifications to the air confinement or ventilation system, the reactor shield, the pool or its penetrations, the pool coolant system, the core and its associated support structure, the rod drive mechanisms or the reactor safety system shall be made and tested in accordance with the specifications to which the systems were originally designed and fabricated. Alternate specifications may be approved by the Nuclear Reactor Committee. A system shall not be considered operable until after it is tested successfully.

Interlocks applicable to the transient rod determine the proper rod operation during manual mode and pulse mode operation. The non pulse condition interlock determines the allowable position of the rod drive for actuation of the FIRE switch. Actuation of the switch applies the air impulse for removal of the transient rod from the reactor core.

Auto mode applies the same interlock controls as the manual mode to the shim and transient rods. Servo calculations limit reactivity insertions by controlling regulating rod drive speed. One limit, a reactor period of four decades per minute, restricts simultaneous up motion of the regulating rod with any other rod.

Two basic interlocks control rod movements for the pulse mode. The interlock to prevent withdrawal of the motor driven rods in the pulse mode is designed to prevent changing the critical state of the reactor prior to the pulse. A power level interlock controls potential fuel temperature changes by setting a limit of less than 1 kilowatt for initiation of any pulse.

Square wave mode applies the same interlock controls as the pulse mode to all control rods. A pulse transient terminates the mode by changing to auto or manual mode. The change to auto or to manual mode becomes effective when a preset condition (demand power) occurs or a preset time (ten seconds) expires.

A.3.2.3 Reactor Safety System

Applicability

These specifications apply to operation of the reactor safety system.

Objective

The objective is to determine the minimum safety system scrams operable for the operation of the reactor.

Bases

Safety system scram functions consist of three types. These scram types are the limiting safety system settings, operable system conditions, and the manual or program logic scrams. The scrams cause control rod insertion and reactor shutdown.

Scrams for limiting safety system settings consist of signal trip levels that monitor fuel temperature and power level. The trip levels are conservative by a significant margin relative to the fuel element temperature safety limit.

Operation without adequate control and safety system power supplies is prevented by scrams on neutron detector high voltage and control rod magnet current.

Manual action of the scram switch, key switch, or computer actuation of watchdog timers will initiate a protective action of the reactor safety system. Either of two watchdog circuits provide updating timers to terminate operation in the event that key digital processing routines fail, such as a display system. Each watchdog circuit with four resettable timers contains one trip relay and monitors one microcomputer.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 1 TO

FACILITY OPERATING LICENSE NO. R-129

DOCKET NO. 50-602

THE UNIVERSITY OF TEXAS AT AUSTIN

1.0 INTRODUCTION

By letter dated January 25, 1993, the University of Texas at Austin (UT or the licensee) notified NRC of a reportable event at its TRIGA research reactor, and applied for an amendment to Facility Operating License No. R-129. The licensee reported that as part of a test of an update replacement of the control system software for the reactor instrumentation and control (I&C) system it was discovered that a discrepancy existed between one requirement for control rod interlocks in the technical specifications (TSs) and the reactor control system design. The licensee proposed to remove the discrepancy by amendment of the TSs, and enclosed a proposed revision. The licensee also committed not to operate the reactor in automatic or square-wave modes pending NRC action on the application. The licensee supplemented their request by letters dated November 11, 1995, April 16, 1996, and June 6, 1996.

2.0 EVALUATION

Non-power reactors are designed to avoid or limit possible accidents or malfunctions that could lead to loss of fuel integrity or uncontrolled release of radioactive material. One such potential accident is a nuclear power excursion initiated by insertion of a large amount of reactivity in a short amount of time. To limit such an event, many non-power reactors with multiple control rods are typically designed so that only one rod can be withdrawn at a time with the reactor in manual operating mode. This is usually accomplished by an interlock system activated by a manual switch on each rod.

The UT reactor has three types of control rods; two shim rods, which are manually controlled; one regulating rod which may be controlled manually or by an automatic servo-controller; and one transient rod which can be used to control the reactor manually or can be used to initiate a power pulse. The reactor has four operating modes; manual where all rods are manually controlled by the operator; automatic where a servo-controller moves the regulating rod to maintain the reactor at a set power level; pulse mode where the pulse rod can be rapidly removed from the core to initiate a power pulse; and square wave, where reactor power is rapidly increased to a power level within the steady state power limit, held at that power for some period of time and then the reactor is shut down.

These I&C systems are designed so that when an automatic servo-controller is in control of the regulating rod, it may be possible to insert additional reactivity by moving a shim rod simultaneously by manually activating its individual switch. The UT TS contained an error in that it considered manual mode (where simultaneous withdrawal of two rods is prohibited) to also consist of automatic mode and square wave modes instead of considering each mode separately. This prohibited the reactor from being operated as designed.

If a shim rod were withdrawn while the reactor was operating at steady power in automatic mode, the servo-controller would react to try to compensate for the added reactivity by inserting. If the requested reactor power level was below the actual power level, a shim rod could be manually withdrawn while the regulating rod was withdrawing until the requested power level was reached. Most TRIGA reactors, such as the one at UT, are designed to operate in this way. The automatic servo-controller on this reactor is also designed with a minimum reactor period limiter, so that if the reactor period were to be decreased to this limit by manual withdrawal of a shim rod, even if the actual power were well below the demand power level, the servo-controller would drive the regulating rod into the core to decrease the reactivity. This additional feature provides further assurance that short reactor periods cannot be initiated by inadvertent manual control rod withdrawal while the reactor is operating in the automatic mode.

In addition to these instrumentation safety features, TRIGA reactors are designed to operate safely in the pulsed mode, with rapid insertions of reactivity. The UT reactor is authorized to operate in the pulse mode with reactivity insertions up to 3.14$.

The UT TRIGA reactor has a General Atomics designed and supplied I&C system whose design was reviewed and approved by the NRC staff and is similar to that reviewed and approved by the staff for the General Atomics Mark I TRIGA reactor, the Armed Forces Radiobiology Research Institute TRIGA reactor, the Dow Chemical Company TRIGA reactor, the United States Geological Survey TRIGA reactor, and the University of Illinois TRIGA reactor. UT TS 3.2.2 was inadvertently written to state that the control-rod interlock could prevent simultaneous withdrawal of more than one rod under all conditions, which would include when the automatic servo-controller is operating in either steady state or square wave mode. Thus, the TSs are not consistent with the reactor system, as built and operating. Because the staff considers the safety of the reactor I&C system acceptable, as designed, correcting the TSs is an acceptable remedy.

Changes to the TSs have been requested by the licensee to clarify the TSs and allow the TSs to accuracy reflect the existing I&C system.

The definition for shim rod, TS 1.22.1 currently reads:

> A shim rod is a control rod having an electric motor drive and scram capabilities.

The licensee has proposed changing this definition to read as follows to clarify ambiguities in the original definition:

> A shim rod is a control rod with an electric motor drive that does not perform a special function such as automatic control or pulse control. The shim rod shall have scram capability.

The licensee has proposed changes to the table in TS 3.2.2 including footnotes defining reactor operating modes which shows control safety system interlocks. The changes show specifically the types of control rod for which interlocks must be functioning for each effective mode of operation. The proposed TS clearly shows that in manual mode all four rods are interlocked to prevent simultaneous withdrawal and in automatic mode two shim rods and one transient rod must have their simultaneous withdrawal interlock function operable which allows simultaneous withdrawal of the regulating and one other rod. The licensee has also proposed changes to the basis for this TS to clarify the operation of the regulating rod under automatic control. This allows the TS to agree with the design of the I&C system.

The licensee has proposed changes to the table in TS 3.2.3 including footnotes defining operating modes which shows scram safety channels that shall be operable. The changes clearly show all effective modes to be consistent with TS 3.2.2. The licensee also rearranged the information in the table without changing the information.

The licensee has proposed changes to the table in TS 3.2.4 including footnotes defining operating modes which shows minimum measuring channels that shall be operable. The changes clearly show all effective modes to be consistent with TS 3.2.2. The licensee also rearranged the information in the table and added a new column to the table on instrument system function.

The staff has determined that the proposed changes to the TS would result in no change in the actual reactor systems or operating conditions and that the proposed changes to the TS clarify the actual design and achieve consistency with the I&C system. These operating conditions have been found acceptable on several other licensed TRIGA reactors. Thus, this license amendment would not change radiological risks to the operating staff, the environment, or the public and therefore, is acceptable to the staff.

In the letter dated June 6, 1996, the licensee proposed an additional change to the UT TSs. UT has changed the name of the site the reactor is located at from the Balcones Research Center to the J. J. Pickle Research Campus. The licensee proposed changing TS 5.1.1 a. to reflect this change. This change is administrative in nature and is therefore acceptable to the staff.

3.0 ENVIRONMENTAL CONSIDERATION

This amendment involves changes in the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20 and changes in inspection and surveillance requirements. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and there is no significant increase in individual or cumulative occupational radiation exposure. 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 prepared in connection with the issuance of this amendment.

This amendment also involves changes in recordkeeping, reporting, or administrative procedures or requirements. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(10). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

4.0 CONCLUSION

The staff has concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of accidents previously evaluated, or create the possibility of a new or different kind of accident from any accident previously evaluated, and does not involve a significant reduction in a margin of safety, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by the proposed activities, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or the health and safety of the public.

Principal Contributors: R. E. Carter, INEL
A. Adams, Jr., NRC

Dated: July 2, 1996