February 9, 2012

Mr. Ralph Butler, Director
Research Reactor Center
University of Missouri—Columbia
Research Park
Columbia, MO 65211

SUBJECT: UNIVERSITY OF MISSOURI—COLUMBIA AMENDMENT RE: FLUX-TRAP IRRADIATIONS REACTIVITY SAFETY TRIP DEVICE (TAC NO. ME1876)

Dear Mr. Butler:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 35 to Amended Facility License No. R-103 for the University of Missouri-Columbia Research Reactor. The amendment consists of changes to the technical specifications in response to your application of August 6, 2009, as supplemented on August 31, 2010, and January 31, July 11, and December 19, 2011.

The amendment approves the addition of the flux-trap irradiations reactivity safety trip device to the reactor protection system.

A copy of the safety evaluation supporting Amendment No. 35 is enclosed.

Sincerely,

/RA/

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

Docket No. 50-186

Enclosures:
1. Amendment No. 35
2. Safety Evaluation

cc w/enclosures:
See next page

cc:

John Ernst, Associate Director
Regulatory Assurance Group
Research Reactor Facility
Columbia, MO 65201

Homeland Security Coordinator
Missouri Office of Homeland Security
P.O. Box 749
Jefferson City, MO 65102

Planner, Dept of Health and Senior Services
Section for Environmental Public Health
930 Wildwood Drive, P.O. Box 570
Jefferson City, MO 65102-0570

Deputy Director for Policy
Department of Natural Resources
1101 Riverside Drive
Fourth Floor East
Jefferson City, MO 65101

A-95 Coordinator
Division of Planning
Office of Administration
P.O. Box 809, State Capitol Building
Jefferson City, MO 65101

Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

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UNIVERSITY OF MISSOURI-COLUMBIA

DOCKET NO. 50-186

AMENDMENT TO AMENDED FACILITY LICENSE

Amendment No. 35
License No. R-103

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

   A. The application for an amendment to Amended Facility License No. R-103, filed by the University of Missouri-Columbia (the licensee) on August 6, 2009, as supplemented on August 31, 2010, and January 31, July 11, and December 19, 2011, 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 changes to the technical specifications as indicated in the enclosure to this license amendment, and paragraph 3.B of Amended Facility License No. R-103 is hereby amended as follows:

   B. Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 35, 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 its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Jessie F. Quichocho, Chief
Research and Test Reactors Licensing Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Enclosures:
1. Amended Facility License No. R-103
2. Changes to Appendix A, “Technical Specifications”

Date of Issuance: February 9, 2012

ENCLOSURE 1 TO LICENSE AMENDMENT NO. 35

AMENDED FACILITY LICENSE NO. R-103

DOCKET NO. 50-186

Replace the following page of Amended Facility License No. R-103 with the enclosed page. The revised page is identified by amendment number and contains a vertical line indicating the area of change.

Remove	Insert
3	3

A. Maximum Power Level

The licensee may operate the reactor at steady state power levels up to a maximum of 10 MWt.

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 35, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

C. Physical Security Plan

The licensee shall maintain and fully implement all provisions of the Commission's 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 documents withheld from public disclosure pursuant to 10 CFR 73.21 entitled "Physical Security Plan for University of Missouri Research Reactor Facility" dated June 10, 1983, submitted by letter dated June 10, 1983.

4. This amended license is effective as of date of issuance and shall expire at midnight on October 11, 2006.

FOR THE ATOMIC ENERGY COMMISSION

/RA/

Karl R. Goller
Assistant Director for
Operating Reactors
Directorate of Licensing

Attachment:
Appendix "A" (Change No. 10 to the Technical Specifications)

Date of Issuance: July 9, 1974

ENCLOSURE 2

TO LICENSE AMENDMENT NO. 35

AMENDED FACILITY LICENSE NO. R-103

DOCKET NO. 50-186

Replace the following pages of Appendix A, “Technical Specifications,” with the enclosed pages. The revised pages are identified by amendment number and contain vertical lines that indicate the areas of change.

Remove	Insert
3.3 page 3	3.3 page 3
3.3 page 5	3.3 page 5

SUBJECT: Reactor Safety System (continued)

Manual Scram	1	1	1	Push Button at Control Console
Center Test Hole	2(6)	2(6)	2(6)	Scram as a result of removing the center test hole removable experiment test tubes or strainer

(1) Flow orifice or heat exchanger ΔP (psi) in each operating heat exchanger leg corresponding to the flow value in the table.

(2) Not required below 50 KW operation if natural convection flange and pressure vessel cover are removed or in operation with the reactor subcritical by a margin of at least 0.015 ΔK.

(3) Trip pressure is that which corresponds to the pressurizer pressure indicated in the table with normal primary coolant flow.

(4) Flow orifice ΔP (psi) corresponding to the flow value in the table.

(5) Core ΔP (psi) corresponding to the core flow value in the table.

(6) Not required if reactivity worth of the center test hole removable experiment test tubes and its contents or the strainer is less than the reactivity limit of specification 3.1.h. This safety function shall only be bypassed with specific authorization from the Reactor Manager.

Bases

a. The specifications on high power, primary coolant flow, primary coolant pressure, and reactor inlet temperature provide for the safety system settings outlined in specifications 2.2.a, 2.2.b, and 2.2.c. In Mode I and II operation the core differential temperature is approximately 17°F.

SUBJECT: Reactor Safety System (continued)

The scrams from the primary and pool coolant isolation valves (507A/B and 509) leaving their full open position provide a first line of protection for a loss of flow accident in that system initiated by an inadvertent closure of the isolation valve/s.

The power level interlock (PLI) scram provides assurance that the reactor cannot be operated with a power level greater than that authorized for the mode of operation selected on the Mode Selector Switch. The PLI scram also provides the interlock to assure that the reactor cannot be operated in Mode I with a pool or primary coolant flow scram by-passed.

The facility evacuation and reactor isolation scrams provide assurance that the reactor is shutdown for any condition which initiates or leads to the initiation of an evacuation or isolation. The manual scram provides assurance that the reactor can be shutdown by the operator if an automatic function fails to initiate a scram or if the operator detects an impending unsafe condition prior to the automatic scram initiation.

The center test hole scram provides assurance that the reactor cannot be operated unless the removable experiment test tubes or the strainer is inserted and latched in the center test hole. This is required any time the reactivity worth of the center test hole removable experiment test tubes and the contained experiments or the strainer exceeds the limit of specification 3.1.h. (Ref. Section 3.5 of Add. 3 to HSR). The center test hole scram may be bypassed if the total reactivity worth of the removable experiment test tubes and the contained experiments or the strainer does not exceed the limit of specification 3.1.h and is authorized by the Reactor Manger.

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 35 TO

AMENDED FACILITY LICENSE NO. R-103

THE UNIVERSITY OF MISSOURI-COLUMBIA

DOCKET NO. 50-186

1.0 INTRODUCTION

By letter dated August 6, 2009, as supplemented by letters dated August 31, 2010, and January 31, July 11, and December 19, 2011, the University of Missouri-Columbia (the licensee) requested a license amendment to change the Technical Specifications (TSs) for the University of Missouri-Columbia Research Reactor (MURR) (Agencywide Documents Access and Management System (ADAMS) accession numbers ML092220031, ML120050315, ML110320458, ML11193A265, ML11356A084 and ML 11356A085). The amendment request would add an additional safety channel known as the Flux-Trap Irradiations Reactivity Safety Trip (FIRST) device to the reactor.

The U.S. Nuclear Regulatory Commission (NRC) staff and licensee made a decision to review this license amendment request as part of the licensee's application for license renewal that was already under review by the NRC staff because it was believed that reviewing the amendment application as part of the license renewal application would allow for a quicker review of the amendment application. Because of this decision, a request for additional information from the NRC staff dated June 1, 2010 (ADAMS accession number ML101160266), contained questions concerning both the licensee's license renewal application and the amendment application. Question 10.5 of the June 1, 2010, letter concerns this amendment request. The licensee's letter of August 31, 2010, contains the answer to question 10.5 and the answers to additional questions related to the licensee's license renewal application. However the license renewal application was taking longer to review than initially anticipated and the NRC staff and licensee subsequently decided to process the amendment request as a separate request to complete it sooner than the license renewal. Only the answer to question 10.5 of the licensee's letter of August 31, 2010, is part of the application for this license amendment.

2.0 BACKGROUND

The MURR is a research reactor licensed to operate at steady-state power levels up to 10.0 MW(t). The reactor has been operating at power levels up to this maximum value for over 30 years. The reactor core is annular in shape and is contained in an annular pressure vessel made of two concentric pipes which allows pressurized operation of the reactor core. The pressure vessel is contained in the reactor pool and is surrounded by a reflector. Operation at

full licensed power requires forced convective flow of cooling water through the reactor vessel to remove generated heat from the core. The reactor control blades are external to the reactor vessel and control core reactivity by controlling the reflection of neutrons by the reflector.

Inward of the MURR reactor vessel is a flux trap which contains the center test hole which experiences the peak neutron flux. The center test hole is open to the reactor pool. The center test hole is considered to be an experimental facility. Canisters which are placed into the center test hole along with the samples held by the canisters are considered experiments. Irradiations in this center test hole have occurred over the operational lifetime of the MURR.

3.0 EVALUATION

The licensee has requested an amendment to the facility TSs that would add the FIRST device to the reactor. The FIRST device consists of equipment and electronics that would initiate a reactor shutdown by scram if certain conditions are not met with the operation of the center test hole.

The center test hole is defined by TS 1.3 as the volume in the flux trap occupied by the removable experiment test tubes. The flux trap is defined by TS 1.6 as being that portion of the reactor through the center of the core bounded by the 4.5 inch inside diameter tube and 15 inches above and below the core vertical center line.

As described by the licensee, operation of the reactor requires that the center test hole contain either a specially designed experiment test tube canister (center test hole canister or canister) or a strainer. The strainer prevents inadvertent objects from entering the region in the center of the core when a center test hole canister is not being used, thus preventing unplanned reactivity changes, either positive or negative. The use of the FIRST device is similar for a center test hole canister or strainer. The strainer, according to the licensee's application, has a length of seven inches and does not enter into the flux trap. Because of this, the strainer does not have a reactivity contribution to the reactor.

The open-top experiment test tubes of the center test hole canisters are used for the irradiation of experiments. Three different center test hole canisters for the center test hole have been built and used at MURR: a six experiment test tube design, a three experiment test tube design, and a single experiment test tube design. The center test hole canisters are used for irradiation of either secured experiments which do not change position throughout the irradiation period, or can be used for movable experiments where the experimental material can be placed or removed while the reactor is operating. Secured and moveable experiments are defined in TS 1.24 and TS 1.11, respectively. However, in no circumstances are the center test hole canisters removed or inserted with the control blades withdrawn.

The proposed FIRST device contains limit switches which indicate if the canister or strainer is secure in the center test hole. If the canister or strainer is not secure, the reactor safety system is tripped resulting in a reactor scram (the safety system actuation can be bypassed under circumstances described below). The proposed changes to the reactor safety system would effectively make the center test hole canister an experimental facility and a normal part of the reactor and not considered in the application of the limits of TS 3.1.h.

TS 3.1.h states that the absolute value of the reactivity worth of all experiments in the center test hole shall not exceed 0.006 delta k/k. Although not specifically spelled out in the TS, the licensee currently considers the center test hole canisters experiments for purposes of compliance with TS 3.1.h. The licensee has measured the reactivity value of the three experiment test tube canister at 0.0036 delta k/k. Similarly, the licensee has measured the reactivity value of the six experiment test tube canister at 0.0050 delta k/k. Inclusion of the reactivity worth of the center test hole canister toward the overall limit of reactivity significantly limits the reactivity worth available for experimental materials in the center test hole canister irradiation test tubes.

The center test hole canister or the strainer is latched into position for operation with two separate latching fingers. The two fingers are located 180 degrees apart on the canister head or strainer and independently latch the canister or strainer in place. A special tool is used to keep the fingers spread as the canister or strainer is placed in position in the center test hole. Alignment of the canister is ensured by flanges and slots built into the structure of the canister and the reflector tank. When the canister or strainer is in the proper position, a mechanism in the tool is used that withdraws the rod allowing the latching fingers to return to their locking position, securing the canister or strainer in place. The latching and alignment mechanisms design has been successfully used by the licensee since original construction of the reactor.

According to the licensee's amendment application, the inner pressure vessel of the reactor extends above the top of the pressure vessel head. The upper lip of the inner pressure vessel is thicker than the lower portions of the inner pressure vessel providing a latching surface. The center test hole canister or strainer fits inside of the inner pressure vessel and latches to the top ring of the inner pressure vessel. The center test hole canister and latching mechanism are verified by two members of the operations staff and in those instances where the canister could not be verified to be secure, it was either reinstalled or repaired. The licensee stated that "no instances of improper latching or unintended canister removal have occurred," and that "there is no common failure that could affect both latching fingers." The NRC staff reviewed the design of the center test hole canister or strainer latching mechanism and finds that the latching mechanism is robust and redundant and that the mechanism will prevent inadvertent removal of the canister or strainer once the canister or strainer has been securely latched. The NRC staff also reviewed licensee-supplied procedure EX-RO-105, "Reactor Irradiation Experiments," Revision 14, and finds that the procedure for the use of the center test hole canister (noted in the procedure as the "flux trap") contains detailed steps for use of the canister. These steps include cautions that the canister "SHALL NOT, under any circumstances, be unlatched while the reactor is operation." Further, the restrictions in the procedure required by TS are specifically called out with the corresponding TS number.

According to the licensee's application, a support rig is secured to the top of the reactor pressure vessel by attaching to existing fittings on the reactor pressure vessel. This support rig acts as a platform for the two plunger-style sensors that are used to verify the location of the center test hole canister or strainer. When the canister or strainer is in place, the sensors are compressed between the support rig and the flux trap holder wear ring, an existing part of the canister or strainer. Separate cables from each sensor are routed out of the pool and connect with the reactor safety system through K-relay isolation relays, similar to those already in use at MURR. Each sensor cable is wired into a keyed bypass switch that allows each sensor to be isolated

from the SCRAM circuit for testing, maintenance and when FIRST device operation is not required.

According to the licensee's application, the design of the FIRST device meets the guidance of the Institute of Electrical and Electronic Engineers (IEEE) Standard 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations," regarding redundancy, single-failure criteria, and channel independence, among others. Two separate sensors and associated cabling are routed to independent channels of the reactor safety system. Each circuit has a separate keyed bypass switch allowing each channel to be tested independently.

The NRC staff reviewed the design and circuitry of the FIRST device. IEEE 279 has been withdrawn and replaced with IEEE Standard 603, "Standard Criteria for Safety Systems for Nuclear Power Generating Stations." The current version of this standard is IEEE 603-2009. The NRC staff reviewed the licensee's application describing the applicability of the guidance and justification for the referenced functional categories of IEEE 279. The NRC staff compared these to the new functional categories of IEEE 603, with particular emphasis on single failure criteria, completion of protective action, appropriateness for the environment in which the FIRST device is operated, capability for testing, and operation and independence. The NRC staff finds that the FIRST device has redundant sensors and circuitry and that no single failure of a component will render the device incapable of performing its function. The NRC staff further finds that the keyed bypass switches allow either channel to be independently tested or troubleshot, if necessary. According to the licensee, the cabling for the sensors is waterproof and capable of withstanding the radiation environment for at least 10 years based on material of construction and measured radiation levels in the reactor pool. The NRC staff has reviewed the integrated dose rate calculations and the published radiation aging data for the cabling material and finds the licensee's evaluation acceptable. The portion of the cabling most susceptible to radiation damage is the cable insulation. Failure of the insulation would prevent a signal to the reactor control system which would prevent control blade withdrawl if the reactor was shutdown, or generate a scram signal if the reactor was operating. The NRC staff reviewed the design of the cabling and finds that cable failure would result in a safe condition and require cable replacement prior to reactor operation using the FIRST system. Based on these findings, the NRC staff concludes that the design of the FIRST device meets the guidance of IEEE 603-2009 in the areas discussed above.

According to the licensee, the proposed change of the addition of the FIRST device would require that the two redundant sensors and associated circuitry have positive indication that the center test hole of the reactor is occupied prior to movement of control blades. To implement this change, the licensee proposed adding a line to the specification table of TS 3.3 a. which specifies the number of safety system channels required in the three operational modes. The proposed addition reads:

Center Test Hole	$2^{(6)}$	$2^{(6)}$	$2^{(6)}$	Scram as a result of removing the center test hole removable experiment test tubes or strainer

As part of this addition, the licensee also proposes to add a new footnote 6 to TS 3.3 a. as follows:

> footnote (6) Not required if reactivity worth of the center test hole removable experiment test tubes and its contents or the strainer is less than the reactivity limit of 3.1.h. This safety function shall only be bypassed with specific authorization from the Reactor Manager.

Further, the licensee proposes to add the following to the bases for TS 3.3:

> The center test hole scram provides assurance that the reactor cannot be operated unless the removable experiment test tubes or the strainer is inserted and latched in the center test hole. This is required any time the reactivity worth of the center test hole removable experiment test tubes and the contained experiments or the strainer exceeds the limit of specification 3.1.h. (Ref. Section 3.5 of Add. 3 to HSR). The center test hole scram may be bypassed if the total reactivity worth of the removable experiment test tubes and the contained experiments or the strainer does not exceed the limit of specification 3.1.h and is authorized by the Reactor Manager.

There was a typographical error in the initial TS replacement pages submitted by the licensee. The wording of footnote 6 referred to TS 3.6.h. This should be TS 3.1.h. This was discussed during a phone conference between L. Foyto of MURR and the NRC MURR project manager on December 15, 2011. A corrected TS page was submitted with the licensee's December 19, 2011, letter.

The NRC staff has reviewed the proposed changes to the specification table of TS 3.3 a. and the license application including circuit diagrams and mechanical drawings. According to the licensee, each of the two sensors associated with the proposed safety channel for the FIRST device is wired to a dedicated keyed switch on the operator's control panel. Use of the keyed switches (bypass mode) allows the sensors to be removed from the permissive logic for testing and maintenance purposes, or for periods where the reactivity value of irradiation samples with the reactivity effect of the canisters included are less than the TS 3.1.h. limit. Based on our review, the NRC staff finds that the proposed addition to TS Table 3.3 a. provides reasonable assurance that control blades cannot be withdrawn without the center test hole occupied and the FIRST device providing positive indication to the reactor safety system. The NRC staff concludes that the proposed addition to TS Table 3.3 a. provides reasonable assurance that the reactor safety system, when needed, will initiate a reactor scram upon movement of the center test hole canister while in operation.

The NRC staff reviewed the addition of the FIRST device and proposed TS in the framework of the other existing TSs. TS 5.4 a. requires a semi-annual calibration for all reactor instrumentation required by TSs. This includes calibration of both the reactor safety system (TS 3.3) and the reactor instrumentation (TS 3.4). TS 5.4 c. requires that all nuclear instrumentation channels be tested before each reactor startup.

According to the licensee, the FIRST device is tested to ensure compliance with TS 5.4.a. using Compliance Check Procedure CP-36, "FIRST Scrams." The FIRST device is channel tested as

part of each reactor startup as part of FM-57, “Long Form Startup Checklist.” The licensee stated that the device is tested without the canister in place to verify that the trip actuator amplifiers (TAAs) will not energize in this configuration and prevent rod withdrawal. Subsequently, the center test hole canister is latched into place and again tested to verify that the TAAs will energize. The NRC staff finds that this is a suitable test to meet the surveillance requirement of TS 5.4 c. and to ensure the continued operability of the FIRST device.

The NRC staff reviewed the TSs related to experiments at MURR and their safety basis. The basis for the 0.006 delta k/k limit on experiments in the center test hole is to ensure that the reactor is not placed in a prompt critical situation upon the sudden insertion or removal of an experiment from the reactor. The redundant latching mechanisms and the verification sensors preclude operation without the center test hole firmly in place. As the experiment reactivity limits remain the same, the NRC staff finds that the proposed change would be bound by the reactivity insertion analysis of the MURR Safety Analysis Report.

Further, based on our review of the licensee’s TSs, the NRC staff finds that experiment materials placed in the center test hole canister would still be bound by the requirements of TS 3.6 which limits the quantity and characteristics of irradiated materials to that which has been previously analyzed in the Safety Analysis Report. These requirements limit the irradiation of flammable, corrosive, or explosive material. Further, experiments must be designed so that experiment failure will not affect the reactor fuel, control elements, or any other experiment. The NRC staff finds that removal of the canister assembly at power is also prohibited by TS 3.6 e. which allows only moveable experiments to be removed from the center test hole with the reactor operating. Should an attempt be made to remove the center canister, the redundant sensors would send a trip signal to the control elements and immediately shut down the reactor.

The licensee noted that due to the positive void coefficient of the center test hole region removal of the center test hole canister at power would insert negative reactivity into the core. Therefore, the licensee concluded that the only positive reactivity addition as a result of the movement of the center test hole canister is during insertion into the reactor, which can only occur during reactor shutdown conditions when the control blade shutdown margin would prevent inadvertent criticality. The NRC staff reviewed the application on the reactor physics parameters regarding the center test hole canister and agrees with the licensee’s conclusion regarding a positive reactivity effect of the canister in the center test hole and that a positive reactivity addition only occurs when the canister is inserted. This condition is only allowed when the reactor is shutdown (TS 3.6 e.) and prompt criticality is prevented by the required shutdown margin (TS 3.1 e.).

According to the licensee, a temporary prototype of the FIRST device was installed in December 2008 to test operability of the device and evaluate potential operational problems. The prototype was not wired into the reactor safety system. Testing of the device led to minor modifications to the canister wear ring to ensure better contact with the switches. The licensee indicates that since the modifications, no further contact problems with the switches have occurred. The NRC staff reviewed the design of the FIRST device and finds that the design is functionally adequate and includes redundancy to ensure that the switches will engage only if the center test hole canister or strainer is properly seated.

The NRC staff asked the licensee about the impact on the control rod worth curves by considering the center test hole canister as an experimental facility rather than as an experiment. The licensee demonstrated through both analytical and experimental results that rod worth curves are not significantly altered by the presence or absence of any of the center test hole canisters. The licensee further stated that reactivity worth determinations are performed at low power levels (50 kW(t)) for short periods of time to preclude xenon poison buildup. The NRC staff reviewed the methodology and analysis and finds that the licensee was thorough and used appropriate methods to evaluate the effect on rod worth curves. Further, the NRC staff finds that no change to the rod worth curve methodology is warranted and finds that the low-power conditions are sufficient to determine reactivity values as required in TS 3.1.

As discussed in this evaluation, the NRC staff concluded that the FIRST device will initiate a reactor scram when needed. Reactivity insertion accidents are the only class of accidents with the potential to be impacted by this amendment. The NRC staff concluded that the reactivity insertion analysis of the MURR Safety Analysis Report continues to be bounding. TS limits for experiments are unchanged by this amendment. For these reasons the addition of the FIRST device does not create the possibility of a new or different kind of accident from any accident previously evaluated. The proposed amendment will not cause a significant increase in the probability an accident previously evaluated because the only class of accidents with the potential to be impacted by this amendment are reactivity insertion accidents and the licensee has proposed no changes in the handling of experiments in the center test hole that would significantly increase the probability of an initiating event. The consequences of an accident are likewise unchanged because the use of the FIRST device will not affect accident releases or change effluent release paths from the facility. The NRC staff concludes that failure of the FIRST device is unlikely; however, as discussed above, the positive void coefficient of the center test hole limits the failure of the FIRST device to analyzed events. Because the addition of the FIRST device compensates for the exclusion of the reactivity worth of the center test hole canister from the determination of experiment worth, the margin of safety is not reduced. Based on this evaluation, the NRC staff concludes that operation of the reactor under this amendment involves no significant hazards consideration.

The NRC staff reviewed the design and operation of the FIRST device and the environment in which the device will be used as well as how the FIRST device fits into the framework of the existing and proposed TS requirements. Based on the above findings, the NRC staff concludes that the FIRST device with the associated safety scrams can be installed and operated as proposed by the licensee with no undue risk to the health and safety of the public or the environment.

3.0 ENVIRONMENTAL CONSIDERATION

This amendment involves changes in the installation or use of a facility component located within the restricted area, as defined in 10 CFR Part 20, or changes in inspection and surveillance requirements. The NRC staff determined in section 3.0 of this evaluation that this amendment involves no significant hazards consideration. Furthermore, the addition of the FIRST device to the facility involves no significant increase in the amounts or change in the types of any effluents that may be released off site because the device does not change the fission product inventory of the reactor or impact accidents that could lead to release of that fission product inventory. Also, the amendment does not change potential release paths from

the facility. There is no significant increase in individual or cumulative occupational radiation exposure because the amendment does not change how the licensee handles activated samples. Accordingly, this amendment meets the eligibility criteria for categorical exclusion as 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.

4.0 CONCLUSIONS

The staff has concluded, on the basis of the considerations discussed above, that (1) the amendment involves a no significant hazards consideration because the amendment does not involve a significant increase in the probability or consequences of accidents previously evaluated, create the possibility of a new kind of accident or a different kind of accident from any accident previously evaluated, or involve a significant reduction in a margin of safety; (2) there is reasonable assurance that the health and safety of the public will not be endangered by the proposed activities; and (3) there is reasonable assurance that 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: A. Adams, Jr., NRC
J. Willison, URS Safety Management Solutions
C. Neill, URS Safety Management Solutions

Date: February 9, 2012