

June 16, 2005

Mr. Warren Day, Reactor Administrator  
United States Department of the Interior  
Geological Survey  
Box 25046, MS 911  
Denver Federal Center  
Denver, CO 80225-0046

SUBJECT: UNITED STATES GEOLOGICAL SURVEY—AMENDMENT RE: EXTENSION OF  
LICENSE EXPIRATION DATE (TAC NO. MB5030)

Dear Mr. Day:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment No.10 to Facility License No. R-113 for the United States Geological Survey TRIGA Reactor. The amendment changes the Facility License in response to your application of April 30, 2002, as supplemented on March 11 and 24, 2005.

The amendment changes the license expiration date from October 10, 2007, to February 24, 2009. This amendment recaptures the construction time between the issuance date of Construction Permit No. CPRR-102 on October 10, 1967, and issuance of Operating License No. R-113 on February 24, 1969.

You also requested the recapture of time during which the reactor was shut down for repairs to correct corrosion of the reactor tank. We have determined that we cannot grant your request to recapture this time while the reactor was undergoing repairs. This time is considered time available to you for operation under your facility license and is applicable to the 40-year term of the license.

A copy of the safety evaluation supporting Amendment No.10 is also enclosed.

Sincerely,

**/RA/**

Alexander Adams, Jr., Senior Project Manager  
Research and Test Reactors Section  
New, Research and Test Reactors Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Docket No. 50-274

Enclosures: 1. Amendment No.10  
2. Safety Evaluation

cc w/enclosures: Please see next page  
U.S. Geological Survey

Docket No. 50-274

cc:

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**TEMPLATE #: NRR-106**

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DEPARTMENT OF THE INTERIOR  
UNITED STATES GEOLOGICAL SURVEY  
DOCKET NO. 50-274  
AMENDMENT TO FACILITY LICENSE

Amendment No.10  
License No. R-113

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that
  - A. The application for an amendment to Facility License No. R-113 filed by the Department of the Interior, U.S. Geological Survey (the licensee) on April 30, 2002, as supplemented on March 11 and 24, 2005, conforms to the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the regulations of the Commission as stated 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. This amendment is issued in accordance with the regulations of the Commission as stated 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 a notice for this amendment is not required by 10 CFR 2.106.

2. Accordingly, the license is amended by a change to paragraph 4 of Facility License No. R-113 which is hereby amended to read as follows:
  4. This license is effective as of the date of issuance and shall expire at midnight, February 24, 2009.
3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

***/RA/***

David B. Matthews, Director  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Date of Issuance: June 16, 2005

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 10 TO

FACILITY LICENSE NO. R-113

DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

DOCKET NO. 50-274

1.0 INTRODUCTION

By letter dated April 30, 2002, as supplemented on March 11 and 24, 2005, the U.S. Geological Survey (USGS or the licensee) submitted a request to extend the expiration date of Facility License No. R-113 for the USGS TRIGA Reactor (GSTR) from October 10, 2007, to February 11, 2010.

2.0 BACKGROUND

The regulations in 10 CFR 50.51 specifies that each license will be issued for a fixed period of time not to exceed 40 years from the date of issuance. Construction Permit No. CPRR-102 was issued to the licensee on October 10, 1967. Facility Operating License No. R-113 was issued on February 24, 1969, with an expiration date of October 10, 2007, 40 years after the issuance date of the construction permit. The licensee has requested that the expiration date of the license be extended from midnight October 10, 2007, to midnight, February 11, 2010.

The USGS has requested that two periods of time be recaptured:

- (1) the period from October 10, 1967, the date of issuance of CPRR-102, until February 24, 1969, the issuance date of Facility Operating License No. R-113, and
- (2) the period from December 1, 1987, the date that fuel was removed from the reactor tank to repair corrosion in the reactor tank, until November 17, 1988, the date that the U.S. Nuclear Regulatory Commission (NRC) approved restart of the reactor.

In its amendment request the licensee discussed the condition of various facility systems and the ability of these systems to continue to function adequately during the recaptured time period.

3.0 EVALUATION

The licensee has requested that the NRC to recapture two periods of time, as discussed above, and extend the expiration date of the facility license accordingly.

The staff has determined that the time between October 10, 1967, the date of issuance of CRR-102, and February 24, 1969, the issuance date of Facility Operating License No. R-113, represents time that was not available for operation due to construction under an issued construction permit. This period of time amounts to 503 days. Adding this time to the expiration date of the Facility Operating License of October 10, 2007, extends the expiration date until February 24, 2009, for a license term of 40 years.

The staff has also determined that the time between December 1, 1987, the date that fuel was removed from the reactor tank to repair corrosion in the reactor tank, until November 17, 1988, the date that the U.S. Nuclear Regulatory Commission (NRC) approved restart of the reactor, cannot be used to extend the expiration date of the license because this time was authorized by the license for reactor operation. The repairs to the reactor tank were not carried out under the authorization of an additional construction permit. Therefore no time is available to recapture.

The reactor is a General Atomic TRIGA Mark I design with a maximum steady-state power level of 1 megawatt thermal power (MW(t)). The reactor can be operated in a pulse mode with reactivity insertions not to exceed 2.1% delta k/k. The reactor core is located at the bottom of an open pool with about 20 ft (6 m) of water above the core for radiation shielding. The fuel moderator elements consist of a homogeneous mixture of uranium-zirconium hydride. The elements are rods about 28 in (71 cm) long with a diameter of about 1.5 in (4 cm). The fuel elements are clad in stainless steel. The reactor pool is surrounded by a biological shield. The reactor is located within a confinement building.

The facility normally operates during the day shift from Monday to Friday. Although authorized to pulse, the number of pulses performed has been limited. Less than 200 pulses have been performed on the reactor, with 145 pulses done during the first 10 years of operation.

The NRC staff has evaluated the safety issues associated with issuance of the proposed license amendment recapturing construction permit time. These issues involve the condition of various facility systems and that ability to continue to function adequately during the recapture period. Very few, if any, components in a research reactor are subjected to potentially damaging high temperatures and pressures or high neutron fluence. However, corrosion can be of concern at research reactors.

The facility technical specifications (TSs) contain surveillance requirements for components with a safety function. The licensee has developed procedures to carry out the surveillance requirements of the TSs and has carried out these surveillances in accordance with the TSs and procedures, as verified by the NRC inspection program for the facility. The TS-required surveillance procedures help to ensure that facility equipment functions as described in the hazards analysis report (or safety analysis report) and that unacceptable degradation of equipment is not occurring. The NRC research and test reactor (R&TR) inspection program reviews the frequencies and results of these surveillances to ensure compliance with the requirements of the TSs. The NRC inspection program has not identified programmatic problems in the area of facility surveillance and condition of equipment. Equipment failures that have occurred were corrected, but the licensee has taken steps to minimize recurrence.

In the amendment request the licensee discussed the material condition of the confinement, reactor safety system, cooling systems, radiation monitoring systems and reactor tank. The licensee described the maintenance and repair that are performed on facility systems, if necessary. The building that the reactor is in is owned by the General Services Administration (GSA). GSA maintains the building in good repair. For example, the roof of the reactor building was replaced several years ago.

In the 1987–1988 timeframe, the licensee replaced the reactor tank because of leakage due to corrosion. The corrosion was caused by moisture between the outside of the reactor tank and the concrete monolith that the reactor tank sits in. The replacement tank is considerably more rugged than the original tank. The tank thickness increased from 0.25 inch of aluminum to 1 inch of aluminum. The new tank is designed with an air void on the outside of the tank to eliminate corrosion due to moisture on the outside of the tank.

None of the reactor's components are subjected to high neutron fluence because of the reactor's low power level. Reactor components are not routinely replaced. The licensee inspects the control rods and fuel elements in accordance with the TSs on a regular basis. Three minor fuel clad leaks have occurred over the life of the reactor in 1969, 1992 and 1994. The 1969 leak was due to a manufacturing defect during early operation of the reactor. The other two failures occurred in instrumented fuel elements which developed pinhole leaks. The facility radiation-monitoring system quickly detected leaking fission products and the reactor was shut down. The leaking fuel elements were located and permanently removed from service. These types of fuel leaks occur occasionally at TRIGA design reactors. The experience at USGS is not unusual.

The replacement tank and the primary coolant piping are aluminum and are not subject to ductile-brittle transition. Because of the low reactor power level transmutation of aluminum into silicon by thermal neutrons is not significant and the formation of microscopic voids by fast neutrons is not significant. The primary coolant conductivity is measured routinely and maintained within ranges where the aqueous corrosion resistance of aluminum and stainless steel is high.

The licensee has maintained the reactor safety system, radiation-monitoring system, and engineered safety features. Systems have been maintained by replacing components that have failed or reached the end of their lives. Systems have also been updated and replaced to take advantage of advances in technology. The original nuclear control and instrumentation system was replaced in 1991 and upgraded in 2000. The area radiation-monitoring system was replaced in 1993 and the continuous air monitor electronics were replaced in 1999.

NRC review of GSTR annual reports has shown, and the NRC R&TR inspection program has verified, that the effluent releases from the reactor facility are below allowable limits and that public and staff exposure to radiation is well controlled and below allowable limits. Airborne effluents meet the concentration limits of TS B.3 and B.4 and are within the constraint on air emissions of 10 mrem per year total effective dose equivalent given in 10 CFR 20.1101(d). The licensee does not release liquid effluents to the environment. Occupational staff exposure to radiation meets the requirements of 10 CFR Part 20, Subpart C and radiation dose to members of the public meets the requirements in 10 CFR Part 20, Subpart D. The staff expects that releases and exposures will continue to be within limits during the construction permit recapture period.

The licensee has maintained administrative controls and programs for emergency preparedness, security, and operator training in compliance with the regulations and the facility emergency, security, and operator requalification plans. Changes to the facility are carried out in accordance with the regulations. Changes are reviewed by facility management and the safety committee (the Reactor Operations Committee). Modifications to the facility are tracked and TS E.11 requires that following maintenance or modification of the control or safety systems, the associated system shall be verified to be operable. TS H 4 requires that any additions, modifications, or maintenance to the core and its associated support structure, the pool structure, rod drive mechanisms, or the reactor safety system shall be made and tested in accordance with the specifications to which the systems or components were originally designed and fabricated or with specifications approved by the Reactor Operations Committee as suitable and not involving an unreviewed safety question.

After considering the design, operation, testing, and monitoring of the structures, systems, and components, the staff concludes that an operating license for the GSTR with a 40-year term is consistent with NRC safety evaluations, supporting amendments, and licensing documentation. The staff considered the licensee's request to recapture two periods of time, one related to construction permit time (October 10, 1967 to February 24, 1969) and one related to reactor repair (December 1, 1987 to November 17, 1988) and concludes that only the construction permit time represents time under the facility license not available for operation and therefore available for recapture. Also, the NRC staff considers that the licensee's organization has maintained the capability to continue operations safely during the recapture period. Therefore, based on the discussion above, the NRC staff finds there is reasonable assurance that the GSTR will continue to operate safely for the additional period of time (503 days) authorized by this amendment.

### 3.0 ENVIRONMENTAL CONSIDERATION

The Commission has prepared an Environmental Assessment and Finding of No Significant Impact (EA), which was published in the *Federal Register* on June 3, 2005 (70 FR 32662).

On the basis of the EA and this safety evaluation, the Commission has determined that no environmental impact statement is required and that issuance of this amendment will have no significant adverse effect on the quality of the human environment.

### 4.0 CONCLUSION

The staff has concluded, on the basis of 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 Contributor: A. Adams, Jr.

Date: June 16, 2005