

UNITED STATES NUCLEAR REGULATORY COMMISSION

UNIVERSITY OF UTAH

FACILITY OPERATING LICENSE NO. R-126

DOCKET NO. 50-407

NUCLEAR REACTOR FACILITY

ENVIRONMENTAL ASSESSMENT AND

FINDING OF NO SIGNIFICANT IMPACT

[NRC-2011-0153]

AGENCY: Nuclear Regulatory Commission.

ACTION: Environmental Assessment and Finding of No Significant Impact.

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Nos. ML092090027 and ML111720666. Also see the license's annual reports for years 2003-2004 (ADAMS Accession No. ML042240097), 2004-2005 (ADAMS Accession No. ML052150028), 2005-2006 (ADAMS Accession No. ML061980026), 2006-2007 (ADAMS Accession No. ML071910231), 2007-2008 (ADAMS Accession No. ML082050236), 2008-2009 (ADAMS Accession No. ML091950580), and 2009-2010 (ADAMS Accession No. ML102150226).

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FOR FURTHER INFORMATION CONTACT: Geoffrey Wertz, Project Manager, Research and Test Reactor Licensing Branch, Division of Policy and Rulemaking, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555. Telephone: 301-415-0893; e-mail: Geoffrey.wertz@nrc.gov.

SUPPLEMENTAL INFORMATION

The U.S. Nuclear Regulatory Commission (NRC or the Commission) is considering issuance of a renewed Facility Operating License No. R-126, to be held by University of Utah (the licensee), which would authorize continued operation of the University of Utah TRIGA Reactor (UUTR), located in Salt Lake City, Salt Lake County, Utah. Therefore, as required by Title 10 of the *Code of Federal Regulations* (10 CFR) Section 51.21, the NRC is issuing this Environmental Assessment and Finding of No Significant Impact.

ENVIRONMENTAL ASSESSMENT

Identification of the Proposed Action:

The proposed action would renew Facility Operating License No. R-126 for a period of 20 years from the date of issuance of the renewed license. The proposed action is in accordance with the licensee's application dated March 25, 2005, as supplemented by the letter dated June 8, 2011. In accordance with 10 CFR 2.109, the existing license remains in effect until the NRC takes final action on the renewal application.

Need for the Proposed Action:

The proposed action is needed to allow the continued operation of the UUTR to routinely provide teaching, research, and services to numerous institutions for a period of 20 years.

Environmental Impacts of the Proposed Action:

The NRC has completed its safety evaluation of the proposed action to issue a renewed Facility Operating License No. R-126 to allow continued operation of the UUTR for a period of 20 years and concludes there is reasonable assurance that the UUTR will continue to operate safely for the additional period of time. The details of the NRC staff's safety evaluation will be provided with the renewed license that will be issued as part of the letter to the licensee approving its license renewal application. This document contains the environmental assessment of the proposed action.

The UUTR is located on the main campus of University of Utah and is housed in the Merrill Engineering Building. The Merrill Engineering Building is a multipurpose building designed to conform to the zone 3 requirements of the Uniform Building Code. The UUTR reactor tank, concrete pad, footing, and structures also comply with zone 3 requirements of the Uniform Building Code. Adjacent to the site is a parking lot to the north; fields, parking lots and a roadway to the east and west; and academic and research buildings to the south. The

nearest permanent residences are located approximately 137 meters (150 yards) west of the building. Student dormitories on the campus are more than 914 meters (1000 yards) from the reactor site.

The UUTR is a pool-type, light water moderated and cooled research reactor licensed to operate at a steady-state power level of 100 kilowatt thermal power (kW(T)) in non-pulse mode. The fuel is located at the bottom of the inner aluminum tank with a water volume of approximately 31,000 liters (8000 gallons) and a depth of 7.3 meters (24 feet). The reactor is fueled with standard TRIGA (Training, Research, Isotope production, General Atomics) low enriched uranium fuel. A detailed description of the reactor can be found in the UUTR Safety Analysis Report (SAR). There have been no major modifications to the Facility Operating License since renewal of the license on April 17, 1985.

The licensee has not requested changes to the facility design or operating conditions as part of the license renewal. No changes are being made in the types or quantities of effluents that may be released offsite. The licensee has systems in place for controlling the release of radiological effluents and implements a radiation protection program to monitor personnel exposures and to calculate releases of radioactive effluents. As discussed in the NRC staff's safety evaluation, the systems and radiation protection program are appropriate for the types and quantities of effluents expected to be generated by continued operation of the reactor. Accordingly, there would be no increase in routine occupational or public radiation exposure as a result of license renewal. As discussed in the NRC staff's safety evaluation, the proposed action will not significantly increase the probability or consequences of accidents. Therefore, license renewal would not change the environmental impact of facility operations. The NRC staff evaluated information contained in the licensee's application, as supplemented, and data reported to the NRC by the licensee for the last six years of operation to determine the projected

radiological impact of the facility on the environment during the period of the renewed license. The NRC staff found that releases of radioactive material and personnel exposures were all well within applicable regulatory limits. Based on this evaluation, the NRC staff concluded that continued operation of the reactor would not have a significant environmental impact.

I. Radiological Impact

Environmental Effects of Reactor Operations:

Gaseous radioactive effluents are discharged by the ventilation exhaust system located on the roof of the building at a volumetric flow rate of approximately 0.61 cubic meters per second (22 cubic feet per second). The remainder of the facility is maintained at negative pressure which minimizes other release pathways. The only significant nuclide found in the gaseous effluent stream is argon-41. Licensee calculations indicate that annual argon-41 releases will result in a maximum concentration in the ventilation exhaust of $9.33\text{E-}10$ microCuries per milliliter ($\mu\text{Ci/ml}$). The previous seven years of operational experience shows that the maximum average annual concentration was $7.9\text{E-}11$ $\mu\text{Ci/ml}$, which is below the limit of $1.0\text{E-}8$ $\mu\text{Ci/ml}$ specified in 10 CFR 20 Appendix B for air effluent releases. The NRC staff performed an independent calculation and found the licensee's calculation to be reasonable. The licensee also performed calculations to estimate the potential release of nitrogen-16 resulting from activation of reactor pool water into the reactor facility. The NRC staff performed independent calculations and found the licensee's calculations to be reasonable. Total gaseous radioactive releases reported to the NRC in the licensees' annual reports were approximately 1 percent or less of the air effluent concentration limits set by 10 CFR 20, Appendix B. The potential radiation dose to a member of the general public resulting from this concentration is approximately 0.5 millirems (mrem) (0.005 milliSieverts (mSv)) and this demonstrates

compliance with the dose limit of 100 mrem (1 mSv) set by 10 CFR 20.1301. Additionally, this potential radiation dose demonstrates compliance with the air emissions dose constraint of 10 mrem (0.1 mSv) specified in 10 CFR 20.1101(d).

The licensee disposes of liquid radioactive wastes by transfer to the University's Radiological Health Department for proper disposal under the University's broad scope byproduct material license. During the past six years, the licensee reported no routine releases of liquid radioactive waste by any method.

The University's Radiological Health Department oversees the handling of solid low-level radioactive waste generated at the UUTR. The bulk of the waste consists of ion exchange resin, irradiated samples, lab-ware, and anti-contamination clothing. Upon removal from the facility by the Radiological Health Department, the waste is controlled under the University's broad scope byproduct material license. The Radiological Health Department disposes of the waste by decay in storage or shipment to a low level waste broker in accordance with all applicable regulations for transportation of radioactive materials. To comply with the Nuclear Waste Policy Act of 1982, the University of Utah has entered into a contract with the U.S. Department of Energy (DOE) that provides that DOE retains title to the fuel utilized at the UUTR and that DOE is obligated to take the fuel from the site for final disposition.

As described in Chapter 11 of the UUTR Safety Analysis Report (SAR), personnel exposures are well within the limits set by 10 CFR 20.1201, and as low as is reasonably achievable (ALARA). The Radiological Health Department tracks personnel exposures, which are usually less than 10 mrem (0.1 mSv) per year. Operating experience which documented radiation exposures to personnel working in the UUTR from both direct and airborne radiation during normal operation have been reviewed and assessed. The licensee conducts an environmental monitoring program to record and track the radiological impact of UUTR

operation on the surrounding unrestricted area. The program consists of quarterly exposure measurements at six locations. Three locations are on the roof of the Merrill Engineering Building and three are on adjacent buildings. The University's Radiological Health Department administers the program and maintains the appropriate records. Over the past six years, the survey program indicated that radiation exposures at the monitoring locations did not significantly change. No correlation exists between total annual reactor operations and annual exposures measured at the monitoring locations. Based on the NRC staff's review of the past six years of data, the NRC staff concludes that operation of the UUTR does not have any significant radiological impact on the surrounding environment. No changes in reactor operation that would affect off-site radiation levels are expected as a result of the proposed action.

Environmental Effects of Accidents:

Accident scenarios are discussed in Chapter 13 of the UUTR SAR. The maximum hypothetical accident (MHA) is the cladding failure of a single irradiated fuel element in air with no radioactive decay of the contained fission products taking place prior to the release. The licensee conservatively calculated doses to facility personnel and the maximum potential dose to a member of the public. NRC staff performed independent calculations to verify that the doses represent conservative estimates for the MHA. Occupational doses resulting from this accident would be well below 10 CFR Part 20 limit of 50 mSv (5000 mrem). Maximum doses for members of the public resulting from this accident would be well below 10 CFR Part 20 limit of 1 mSv (100 mrem). The proposed action will not increase the probability or consequences of accidents.

II. Non-Radiological Impacts

The UUTR core is cooled by a light water primary system consisting of the reactor pool, a heat removal system, and a processing system. Cooling occurs by natural convection, with the heated coolant rising out of the core and into the bulk pool water. The large heat sink provided by the volume of primary coolant allows a few hours of full-power operation without any secondary cooling. The heat removal system transfers heat to the secondary system via a 25 kilowatt (kW) heat exchanger. The secondary system is cooled using an R134a-based refrigeration system. The refrigeration system releases heat to a potable water system which is released to the sanitary sewer. During operation, the secondary system is maintained at a higher pressure than the primary system to minimize the likelihood of primary system contamination entering the secondary system, and ultimately the environment. Release of thermal effluents from the UUTR will not have a significant effect on the environment. Given that the proposed action does not involve any change in the operation of the reactor and the heat load dissipated to the environment, the NRC staff concludes that the proposed action will not have a significant impact on the local water supply.

National Environmental Policy Act (NEPA) Considerations:

NRC has responsibilities that are derived from NEPA and from other environmental laws. These include the Endangered Species Act (ESA), Coastal Zone Management Act (CZMA), National Historic Preservation Act (NHPA), Fish and Wildlife Coordination Act (FWCA), and Executive Order 12898 Environmental Justice. The following presents a brief discussion of impacts associated with these laws and other requirements.

I. Endangered Species Act

No effects on the aquatic or terrestrial habitat in the vicinity of the plant, or to threatened, endangered, or protected species under the Endangered Species Act would be expected.

II. Costal Zone Management Act

The UUTR is not located within any managed coastal zones, nor would the UUTR effluents and emissions impact any managed costal zones.

III. National Historic Preservation Act

The NHPA requires Federal agencies to consider the effects of their undertakings on historic properties. National Register of Historic Places (NRHP) lists the closest historical site as the Isaac C. and Dorothy S. Clark House approximately 250 meters (0.16 Miles) west of the UUTR. Given the distance between the facility and the Isaac C. and Dorothy S. Clark House, continued operation of the UUTR will not impact any historical sites. Based on this information, the NRC finds that the potential impacts of license renewal would have no adverse effect on historic and archaeological resources at UUTR.

IV. Fish and Wildlife Coordination Act

The licensee is not planning any water resource development projects, including any of the modifications relating to impounding a body of water, damming, diverting a stream or river, deepening a channel, irrigation, or altering a body of water for navigation or drainage.

IV. Executive Order 12898 – Environmental Justice

The environmental justice impact analysis evaluates the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations that could result from the relicensing and the continued operation of the University of Utah TRIGA reactor. Such effects may include human health, biological, cultural, economic, or social impacts. Minority and low-income populations are subsets of the general

public residing around the UUTR and all are exposed to the same health and environmental effects generated from activities at the UUTR.

Minority Populations in the Vicinity of the UUTR — According to 2000 census data, 15.6 percent of the population (approximately 1,765,000 individuals) residing within a 50-mile radius of the UUTR identified themselves as minority individuals. The largest minority group was Hispanic or Latino (approximately 175,000 persons or 9.9 percent), followed by “Some other race” (approximately 98,000 persons or about 5.6 percent). According to the U.S. Census Bureau, about 19.1 percent of the Salt Lake County population identified themselves as minorities, with persons of Hispanic or Latino origin comprising the largest minority group (11.9 percent). According to census data 3-year average estimates for 2006–2008, the minority population of Salt Lake County, as a percent of total population, had increased to 23.8 percent.

Low-Income Populations in the Vicinity of the UUTR — According to 2000 census data, approximately 24,300 families and 147,000 individuals (approximately 5.7 and 8.3 percent, respectively) residing within a 50-mile radius of the UUTR were identified as living below the Federal poverty threshold in 1999. The 1999 Federal poverty threshold was \$17,029 for a family of four.

According to census data in the 2006–2008 American Community Survey 3–Year Estimates, the median household income for Utah was \$56,484, while 10.0 percent of the state population and 6.9 percent of families were determined to be living below the Federal poverty threshold. Salt Lake County had a higher median household income average (\$58,000) and slightly lower percentages (9.3 percent) of individuals and families (6.6 percent) living below the poverty level.

In response to a comment from the State of Utah Division of Radiation Control, an evaluation for a 10 mile radius was performed. Minority Populations in the Vicinity of the UUTR

— According to 2000 census data, 21.5 percent of the population (approximately 517,000 individuals) residing within a 10-mile radius of the UUTR identified themselves as minority individuals. The largest minority group was Hispanic or Latino (approximately 68,000 persons or 13.1 percent), followed by “Some other race” (approximately 38,000 persons or about 7.3 percent). According to the U.S. Census Bureau, about 19.1 percent of the Salt Lake County population identified themselves as minorities, with persons of Hispanic or Latino origin comprising the largest minority group (11.9 percent). According to 2010 census data, the minority population of Salt Lake County, as a percent of total population, had increased to 26.0 percent.

Low-Income Populations in the Vicinity of the UUTR — According to 2000 census data, approximately 9,000 families and 52,000 individuals (approximately 7.2 and 10.0 percent, respectively) residing within a 10-mile radius of the University of Utah TRIGA reactor was identified as living below the Federal poverty threshold in 1999. According to 2009 American Community Survey 1–Year Estimates, the median household income for Utah was \$55,117, while 11.5 percent of the state population and 7.8 percent of families were determined to be living below the Federal poverty threshold. The 1999 Federal poverty threshold was \$17,029 for a family of four. Salt Lake County had a higher median household income average (\$57,006) and slightly lower percentages (10.3 percent) of individuals and families (6.9 percent) living below the poverty level.

Impact Analysis—Potential impacts to minority and low-income populations would mostly consist of radiological effects, however radiation doses from continued operations associated with the license renewal are expected to continue at current levels, and would be well below regulatory limits.

Based on this information and the analysis of human health and environmental impacts presented in this environmental assessment, the proposed relicensing would not have disproportionately high and adverse human health and environmental effects on minority and low-income populations residing in the vicinity of the UUTR.

Environmental Impacts of the Alternatives to the Proposed Action:

As an alternative to license renewal, the NRC staff considered denial of the proposed action. If the NRC denied the request for license renewal, reactor operations would end and decommissioning would be required. The NRC staff notes that, even with a renewed license, the UUTR will eventually require decommissioning, at which time the environmental effects of decommissioning will occur. Decommissioning will be conducted in accordance with an NRC-approved decommissioning plan which will require a separate environmental review under 10 CFR 51.21. Cessation of facility operations would reduce or eliminate radioactive effluents and emissions. However, as previously discussed in this environmental assessment, radioactive effluents resulting from facility operations constitute only a small fraction of the applicable regulatory limits. Therefore, the environmental impacts of license renewal and denial of the application for license renewal are similar. In addition, denial of the request for license renewal would cease the benefits of teaching, research, and services provided by UUTR.

Alternative Use of Resources:

The proposed action does not involve the use of any different resources or significant quantities of resources beyond those previously considered in the issuance of Amendment No. 8 to Facility Operating License No. R-126 for the University of Utah's Nuclear Reactor dated April 4, 2005, which increased the possession limit for special nuclear materials.

Agencies and Persons Consulted:

The NRC staff provided a draft of this environmental assessment to the State of Utah Division of Radiation Control for review on July 5, 2011. The Utah Division of Radiation Control responded with three comments on August 18, 2011. The first comment identified a typographical error, which was easily corrected by the NRC staff. The second comment questioned the periodicity of the personnel dose tracking, and the third comment questioned the use of a 50-mile radius, rather than a 10-mile radius, for the area evaluated in the environmental justice review. The NRC staff responded to the second comment with an explanation that the personnel dose was tracked on a monthly, not annual basis. The NRC staff responded to the third comment by providing an additional analysis for the environmental justice review using a 10-mile radius (see page 10 of this document). The State of Utah Division of Radiation Control acknowledged the NRC staff response with an electronic mail message dated August 22, 2011 (ADAMS Accession ML112350572). The comments were accepted by the NRC staff and incorporated into the environmental assessment.

In a letter to the Utah State Historic Preservation Office dated March 15, 2010 (ADAMS Accession No. ML100740648), the NRC staff described the proposed activity and requested concurrence with the NRC staff's conclusion that no historic properties would be affected. On March 23, 2010, the Utah State Historic Preservation Office responded by letter (ADAMS Accession No. ML100900420) and concurred with the NRC staff's conclusion that no historical properties would be affected by the proposed action.

Finding of No Significant Impact:

On the basis of the environmental assessment, the NRC concludes that the proposed action will not have a significant effect on the quality of the human environment. Accordingly,

the NRC has determined not to prepare an environmental impact statement for the proposed action.

Dated at Rockville, Maryland, this 21st day of September, 2011.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Patricia A. Silva, Acting Chief
Research and Test Reactors Licensing Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation