Safety Evaluation Report Related to the Renewal of
Facility Operating License No. R-102 for the
University of New Mexico Research Reactor

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CONTENTS

1 INTRODUCTION

1.1 Overview

The University of New Mexico (UNM, the licensee) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for a 20-year renewal of its Class 104c Facility Operating License (NRC Docket No. 50-252). The renewal application consisted of a letter and supporting documentation dated February 21, 2007, as supplemented on November 9, 2009, and February 17 and November 19, 2010. This license renewal would authorize continued operation of the UNM AGN-201M research reactor as a NRC-licensed facility.

The application included financial qualifications, the safety analysis report (SAR), proposed technical specifications (TS), the operator requalification program, the emergency plan, the security plan, and the environmental report. With the exception of the security plan and the emergency plan, a redacted copy of this material may be examined or copied, for a fee, at the NRC's Public Document Room located at One White Flint North (first floor), 11555 Rockville Pike, Rockville, Maryland. The NRC's Agencywide Documents Access and Management System (ADAMS) provides text and image files of the NRC's public documents. Documents related to this license may be accessed through the NRC's Public Electronic Reading Room at http://www.nrc.gov. The facility's security plan is protected from public disclosure under Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390, "Public Inspections, Exemptions, Requests for Withholding." The facility's emergency plan is considered to be security-related information also protected from public disclosure.

A redacted copy of UNM's application dated February 21, 2007, is available in ADAMS (Accession No. ML092170540). A copy of the NRC's Request for Additional Information (RAIs) dated August 11, 2009, is available in ADAMS (Accession No. ML092150326). A copy of UNM's correspondence regarding the RAIs dated November 9, 2009, is available in ADAMS (Accession No. ML093410385). A copy of UNM's supplemental response to the RAIs, dated February 17, 2010, is available in ADAMS (Accession No. ML100501007). A copy of UNM's response to RAI's dated November 19, 2010, is available in ADAMS (Accession No. ML103330190).

In conducting its safety review, the NRC staff evaluated the facility against the requirements of 10 CFR Parts 20, 30, 50, 51, 55, 70, and 73; applicable regulatory guides; and relevant accepted industry standards, such as the American National Standards Institute/American Nuclear Society (ANSI/ANS) 15 series. The staff also referred to the guidance contained in NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," issued February 1996. Because there are no specific accident-related regulations for research reactors, the staff compared calculated dose values for accidents against the requirements in 10 CFR Part 20, "Standards for Protection Against Radiation," the standards for protecting employees and the public against radiation.

In SECY-08-0161, "Review of Research and Test Reactor License Renewal Applications," dated October 24, 2008 (ADAMS Accession No. ML082550140), the NRC staff gave the Commission information about staff plans to improve the review of license renewal applications for research and test reactors. The staff requirements memorandum (SRM), for SECY-08-0161, dated March 26, 2009 (ADAMS Accession No. ML090850159), directed the staff to streamline the research and test reactor renewal process, using some combination of the options presented in SECY-08-0161. The focused review process limits the review to the most safety-significant aspects of the license renewal application. The SRM directs the staff to implement a graded approach, with a scope commensurate with the risk posed by each facility. The graded approach incorporates elements of the alternative safety review approach discussed in Enclosure 1 of SECY-08-0161. In the alternative safety review approach, the staff considers the results of past NRC staff evaluations when determining the scope of the review. A basic requirement, mentioned in the SRM, is that licensees comply with applicable regulatory requirements.

The NRC staff developed interim staff guidance (ISG) (ADAMS Accession No. ML092240244) to assist in the review of license renewal applications. The NRC made a draft of the ISG available for public comment and considered public comments in its development of the final version. The NRC staff conducted the review of UNM using the focused review approach as described in the final ISG.

The purpose of this Safety Evaluation Report (SER) is to summarize the findings of the NRC staff's safety review for operation of the UNM AGN-201M research reactor and to delineate the technical details considered in evaluating the radiological safety aspects of continued operation. This SER provides the basis for renewing the license for operation of the UNM AGN-201M reactor at steady-state thermal power levels up to a maximum of 5 watts thermal (t).

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The sections of this SER discuss the following material:

- Chapter 1 summarizes the staff's conclusions about the principal safety considerations, the history and general description of the reactor facility, information on shared facilities and equipment, comparison with similar facilities, and how the licensee complies with the Nuclear Waste Policy Act of 1982.

- Chapter 2 discusses the review of the design bases of the reactor core and its components.

- Chapter 3 discusses the licensee's radiation protection program and waste management procedures.

- Chapter 4 discusses the bases, scenarios, and accident analyses at the reactor facility.

- Chapter 5 discusses the technical specification (TS) operating limits, conditions and other requirements for the facility.

- Chapter 6 discusses the financial considerations associated with the operation of the facility.

- Chapter 7 summarizes the major conclusions of the NRC staff's review of the license renewal application.

- Chapter 8 References

1.2 Summary and Conclusions about the Principal Safety Considerations

As part of its evaluation, the staff considered information submitted by the licensee (i.e., licensee annual reports to the NRC) and inspection reports prepared by the NRC. On the basis of its review, the staff concluded the following:

- The design and use of the reactor structures, systems, and components important to safety during normal operation (discussed in Chapter 4 of the SAR) in accordance with the TS are safe, and safe operation can reasonably be expected to continue.

- The licensee has considered the expected consequences of postulated credible accidents and a maximum hypothetical accident (MHA), emphasizing those that could lead to release of fission products. The licensee performed conservative analyses and determined that the calculated potential radiation doses outside the reactor room would not exceed doses for unrestricted areas given in 10 CFR Part 20.

- The licensee's management organization, conduct of training, and research activities in accordance with the TS are adequate to ensure safe operation of the facility.

- The systems provided for the control of radiological effluents, when operated in accordance with the TS, are adequate to ensure that releases of radioactive materials from the facility are within the limits of the Commission's regulations and are as low as reasonably achievable (ALARA).

- The licensee's TS, which provide limits controlling operation of the facility, are such that there is reasonable assurance that the facility will be operated safely and reliably. As discussed in Chapter 4 of the SAR, there has been no significant degradation of the reactor, and the TS will continue to ensure that there will be no significant degradation of safety-related equipment.

- The financial data submitted with the application demonstrate that the licensee has reasonable access to sufficient revenues to cover operating costs and eventually to decommission the reactor facility acceptably.

- The licensee's program for the physical protection of the facility and its special nuclear materials complies with the requirements of 10 CFR Part 73, "Physical Protection of Plants and Materials."

- The licensee maintains an emergency plan in compliance with 10 CFR 50.54(q) and Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," providing reasonable assurance that the licensee will continue to be prepared to assess and respond to emergency events.

- The licensee’s procedures for training reactor operators and its plan for operator requalification are acceptable. These procedures give reasonable assurance that the reactor facility will be operated with competence.

On the basis of these findings, the NRC staff concludes that the licensee can continue to operate its AGN-201M research reactor in accordance with the renewed license, without endangering public and facility personnel health and safety or the environment. The issuance of the renewed license will not be inimical to the common defense and security.

1.3 General Facility Description

The UNM AGN-201M is a solid homogeneous core research reactor. The reactor assembly comprises three tanks. The reactor tank includes the core and part of the graphite reflector. The steel tank includes the reactor tank, the rest of the graphite reflector, and 10 centimeters (cm) of lead shielding (gamma reduction). The water tank includes the other two tanks surrounded by 55 cm of water (fast neutron shield). The reactor assembly is, in turn, surrounded by a biological shielding wall constructed of concrete blocks 60 cm thick in the front and 40 cm thick on the sides and the back.

The fuel design is similar to that used by other NRC-licensed AGN-201M reactors: sintered uranium dioxide (UO_2) pellets, homogeneously mixed with polyethylene pellets, compressed into cylinders. These cylinders have holes to accommodate control rods and a fuse and are stacked vertically to attain a critical loading. The uranium enrichment is less than 20 percent in the uranium-235 (U^{235}) isotope. The reactor exhibits a large prompt negative temperature coefficient, which is typical of UO_2 sintered fuel. Four control rods, with the same composition as the fuel, control reactivity.

1.4 Comparison with Similar Facilities

The UNM AGN-201M research reactor facility is similar to other research reactors licensed to operate by the NRC. The NRC licenses two other AGN-201M research reactors that use fuel similar or identical to that of UNM. Both of these AGN-201M research reactors are licensed for a maximum power level approximately equal to that at UNM.

1.5 Compliance with the Nuclear Waste Policy Act of 1982

Section 302(1)(B) of the Nuclear Waste Policy Act of 1982 specifies that the NRC may require, as a precondition to issuing or renewing an operating license for a research or test reactor, that the licensee will have entered an agreement with the U.S. Department of Energy (DOE) for the disposal of high-level radioactive wastes and spent nuclear fuel. In a letter dated May 3, 1983, R.L. Morgan, DOE, informed H. Denton, NRC, that DOE had determined that universities and other government agencies operating non-power reactors have entered into contracts with the DOE, providing that DOE retains title to the fuel and is obligated to take the spent fuel, high-level waste, or both for storage or reprocessing. An email sent from James Wade (DOE) to Paul Doyle (NRC) reconfirms this obligation with respect to the fuel at UNM (DOE Contract No. 78317, valid from May 1, 2009, through December 31, 2013. A copy of the email is available in ADAMS (Accession No. ML101250570).

1.6 Facility Modifications and History

This particular AGN-201 reactor, Serial No. 112, was transferred from the University of California, Berkley, to UNM in August 1966. The NRC issued the construction permit (CPRR-92) for reactor installation at UNM on July 08, 1966, and the operating license in September 1966. The initial license authorized operations up to 0.1 watt (t). The authorized licensed power limit was increased to 5 watts (t) by License Amendment 2, dated October 14, 1969, changing the designation for the reactor to 201M. The NRC issued Amendment 3 renewing the license for 20 years on March 24, 1987. The staff reviewed the annual reports since the last renewal and noted that UNM made no significant modifications to the reactor during this period.

2 REACTOR DESCRIPTION

2.1 Summary Description

The UNM AGN-201M reactor is essentially identical to several AGN-201M reactors that have operated around the world since the 1950s. This design is a small, homogenous, thermal reactor regularly used for operations training and student laboratory experiments at thermal power levels of 5 watts or less. The reactor uses polyethylene as the moderator and is surrounded by a graphite neutron reflector, which in turn is surrounded by lead and water shielding, all located in a stainless-steel tank. Because of the low power level, there is no need for a coolant. Reactor control is achieved by inserting or withdrawing four fuel-moderator or moderator-only control rods from the bottom of the core.

2.2 Reactor Core

The UNM AGN-201M reactor core is a right cylinder measuring 25.6 cm in diameter, and 24 cm high. The core consists of nine separate fuel-moderator disks containing particles of UO_2 (enriched to 20 percent U^{235}) and particles of polyethylene. The core is contained in a gas-tight aluminum cylindrical tank (32.2 cm in diameter, 76 cm high).

2.3 Reflector

A graphite neutron reflector surrounds the core. The graphite has a radial thickness of about 20 cm, with a density of 1.75 grams per cubic centimeter (g/cm^3). Some of the graphite is located within the core tank, with the remainder outside. Four access holes (through tubes used for experiments) pass through the graphite reflector and water to the exterior wall of the water tank.

2.4 Shielding

Radiation shielding is accomplished by lead and water within the water tank, and concrete external to the water tank. The first layer of shielding is a 10-cm lead can surrounding the graphite reflector. The core, graphite reflector, and lead shielding are all contained in a thick steel reactor tank. The steel tank acts as a secondary containment for the reactor tank and is fluid tight. A water tank (198 cm in diameter) is the third and outermost of the fluid tight containers. This tank is also stainless steel and holds about 3,800 liters of water to create the fast neutron shield. The entire assembly is in turn surrounded by concrete shielding that was added to supply additional shielding to allow raising the reactor license limit from 0.1 to 5 watts (t). There is no concrete shielding above the reactor core.

2.5 Control Rods and Drives

The UNM research reactor has four control rods: two safety rods, one coarse control rod, and one fine control rod. Criticality may only be achieved with the addition of the fuel-moderator contained in the safety and control rods. The safety and coarse control rods are magnetically coupled to a carriage and compress a spring as they enter the core from the bottom. A scram signal, which de-energizes the electromagnet, causes these rods to be ejected out the bottom of the core by gravity, assisted by the springs, to the full-out position. The fine control rod must be driven out of the reactor because it is mechanically coupled to its carriage.

2.5.1 Safety Rods

The two safety rods are identical. Each is 5 cm in diameter with an active length of 16 cm. The active fuel portion is identical to the mixture contained in the fuel-moderator disks and is doubly encapsulated in aluminum containers. Each rod has a total travel length of 24 cm; the time to fully insert the rods is between 40 and 50 seconds. The scram removal time is approximately 200 milliseconds from the time the rod starts exiting the core. Each rod is worth approximately 1.25 percent reactivity (ΔK/K).

2.5.2 Coarse Control Rod

The coarse control rod is 5 cm in diameter with an active length of 16 cm. The active fuel portion is identical to the mixture contained in the fuel-moderator disks and is doubly encapsulated in aluminum containers. The coarse control rod has a total travel length of 24 cm and has two insertion speeds: high (about 0.5 cm/second) or low (about 0.25 cm/second). At high speed, the time to fully insert the rod is between 40 and 50 seconds. The scram removal time is approximately 200 milliseconds from the time the rod starts exiting the core. The rod is worth approximately 1.25 percent ΔK/K.

2.5.3 Fine Control Rod

The fine control rod is 2.5 cm in diameter with an active length of 16 cm. The active portion may be identical to the mixture contained in the fuel-moderator disks or may be polyethylene only. It is doubly encapsulated in aluminum containers. The fine control rod has a total travel length of 24 cm and has two insertion speeds: high (about 0.5 cm per second) or low (about 0.25 cm per second). At high speed, the time to fully insert the rod is between 40 and 50 seconds. The fine control rod cannot decouple magnetically, but it is driven out at the fast withdrawal rate upon a scram. The rod is worth approximately 0.31 percent ΔK/K if made of fuel material and approximately 0.155 percent ΔK/K if made of polyethylene only.

2.6 <u>Dynamic Design Evaluation</u>

2.6.1 Reactor Physics and Reactivity Control

The UNM AGN-201M reactor is operated by manipulating control rods in response to observed changes in measured reactor parameters (neutron flux). Interlocks prevent inadvertent reactivity additions, and a scram system initiates a rapid automatic shutdown when trip set points are reached. The design of the fuel-moderator has an inherently strong negative reactivity feedback (-2.8×10^{-4}/degrees Celsius) as a result of rapid core expansion. This negative feedback enhances stability and safety and is effective even if control rods or safety instrumentation fail to perform their intended functions.

2.6.2 Shutdown Margin, Excess Reactivity, and Experiment Reactivity Worth

TS 3.1.a limits the available excess reactivity with all control and safety rods fully inserted and including the potential reactivity worth of all experiments to 0.65 percent ΔK/K ($0.878) referenced to 20 degrees Celsius. This limitation ensures that the reactor will not go prompt critical, and that reactor periods would be of sufficient magnitude to allow the reactor protection system or operator to shut down the reactor before any safety limit would be reached.

TS 3.1.b limits the shutdown margin with both the most reactive safety or control rod and the fine control rod fully inserted to a minimum of 1 percent ΔK/K ($1.35). TS 3.2.c limits the average reactivity addition rate for each control or safety rod to a maximum of 0.065 percent ΔK/K per second ($0.00877 per second). The shutdown margin and reactivity addition limitations ensure that the reactor would be subcritical even if the highest worth rod failed in the fully inserted position upon receipt of a scram signal.

2.7 <u>Conclusions</u>

The NRC staff concludes that the UNM AGN-201M is designed and built according to good industrial practices. The reactor consists of standardized components representing many reactor-years of operation, and it includes both diverse and redundant safety-related systems which are further analyzed in Chapter 4.

The NRC staff's review of the reactor facility included studying its design, installation, and operation limitations based on its original and proposed TS, facility-prepared SAR, and other pertinent documents. The design features are similar to other AGN-201M research reactors licensed by the NRC. The fuel, low-enriched sintered UO_2 in a polyethylene matrix, is the same as the fuel used by the other two AGN-201M reactors. A review of the operating experience of the UNM reactor since 1976, and the operation of AGN-201M reactors in general since the 1950s, has shown that they have all performed safely. On the basis of all of these factors, the NRC staff concludes that there is reasonable assurance that the reactor can continue to operate safely, as limited by its proposed TS, for the proposed duration of the license.

3 RADIATION PROTECTION AND WASTE MANAGEMENT

3.1 Radiation Protection Program

3.1.1 Radiation Sources

The primary source of radiation at the UNM AGN-201M reactor facility is the reactor itself. Once shut down, the fission product activity decays to a low level in a matter of days. The level in the polyethylene is low enough to allow a fuel disk to be handled without shielding 24 hours after shutdown. All fission products generated by the reactor are contained within the fuel disks. Water, lead, and concrete shielding surrounding the core reduce radiation exposure during operations to acceptable levels.

Secondary sources of radiation associated with the UNM AGN-201M reactor facility are the plutonium-beryllium neutron source, activated foils, and samples. Exposure to radiation from these sources and from activated experimental components is controlled through operating procedures that use the normal protective measures of time, distance, and shielding.

3.1.2 Radiation Protection Program

UNM has a structured radiation protection program with a health physics staff equipped with radiation detection equipment to determine, control, and document occupational radiation exposures at all university facilities. The UNM AGN-201M reactor console contains four fixed-position radiation area monitors with alarm setpoints and an audible warning. In addition, portable beta-gamma detectors (ion chamber and Geiger-Müller) are available to operations personnel. UNM health physics staff perform radiation surveys according to the procedures in the UNM radiation safety policies and procedures.

3.2 Radioactive Waste Generation and Management

Because of the low power level and resultant low neutron flux levels, the UNM AGN-201M reactor has generated negligible radioactive waste (airborne, liquid, or solid). For most research reactors, the generation of radioisotopes argon-41 and nitrogen-16 are the most significant radioactive waste products; however, because of the design and low power levels associated with the AGN-201M reactor, even these radioisotopes are not produced in sufficient quantity to constitute a significant radiological hazard.

Materials activated in the experimental facilities are generally short half-life nuclides for student laboratory use. The facility maintains records of radionuclides produced by the reactor. Transfers of radioactive materials to other licensees are rare. When transfers do occur, they are conducted according to appropriate State and Federal regulations. All radioactive waste is transferred to appropriate personnel for disposal, according to the applicable UNM procedures.

3.3 Conclusions

On the basis of its review of the operational history of the UNM AGN-201M reactor (Annual Reports submitted by the licensee and Inspection Reports conducted by the NRC), the staff concludes that any airborne radioactivity release from the reactor operating at 5 watts (t) will be insignificant. The operational history of the reactor also supports the staff's conclusion that the waste management activities at UNM have been, and are expected to continue to be, conducted in compliance with 10 CFR Part 20 consistent with the guidance in ANSI/ANS 15.11-1993, "Radiation Protection at Research Reactor Facilities," and "as low as reasonably achievable" principles.

4 ACCIDENT ANALYSES

NUREG-1537 specifies accidents for consideration. The licensee considered the potential consequences on the reactor fuel and on the radiological health and safety of the licensee's staff and the public for the MHA (the licensee term was "maximum credible reactivity accident") and the loss of shielding water from the reactor shield tank.

Traditional accidents of loss of coolant, loss of coolant flow, and mishandling of fuel were not considered for the AGN-201M because the reactor does not use a coolant, and because fuel handling does not require shielding to protect the fuel handler if the fuel is handled 24 hours or more after shutdown. Safety precautions related to handling the fuel including radiation protection are controlled administratively by the facility licensee's procedures.

4.1 Maximum Hypothetical Accident

The licensee determined that the MHA for the UNM AGN-201M research reactor is the insertion of fissionable material (U^{235}) into the reactor core via the glory hole. The original analysis for a 2 percent $\Delta K/K$ insertion was put forth by the reactor designer (Aerojet General Nucleonics) and published in the hazards summary report for the AGN-201 reactor in August 1957. The analysis made the following assumptions:

- At time zero (t_0) a 2-percent step increase in reactivity is inserted into the reactor at full-power operation.
- The energy in the core at t_0 is negligible compared to the energy liberated during the ensuing excursion.
- No heat is removed from the core during the excursion.

The licensee calculated that during the MHA the reactor would reach a peak power of approximately 75 megawatts, rapidly decrease to approximately 200 kilowatts, and then slowly decay—all within a window of 300 milliseconds. The total energy released from the core within this time is calculated to be 2.4 megajoules. The licensee calculated the maximum temperature in the core (other than the core fuse) to be 100 degrees Celsius. The calculated dose to an individual at the surface of the concrete shield would be 1 rem. The temperature within the fuse would be greater because of its position in the middle of the core and the higher density of fuel within it. The fuse is expected to melt and add 5 percent negative reactivity, shutting down the reactor and preventing recurrence of the accident.

The licensee's prediction that only the thermal fuse would melt is reasonable because the melting temperature for the polyethylene in the fuel matrix is 200 degrees Celsius. Therefore, the assumption that fission products would be contained within the fuel and within the primary and secondary containers is also reasonable. Some gaseous fission product would be released from the melted fuse, but this is considered a small amount. Calculations show it to be approximately 2 millicuries, and as such would not be detectable at the site boundary.

4.2 Conclusions

The NRC staff evaluated the licensee's assumptions and methods of calculating doses and found them to be conservative and appropriate. The licensee analyzed a variety of credible, although unlikely, accident scenarios and found the consequences to be bounded by the MHA. The NRC staff evaluated the accident scenarios and assumptions and concludes that the licensee has analyzed an appropriate spectrum of credible accidents and that the MHA bounds the consequences of the credible accidents. The licensee has shown that credible accidents do not have any significant offsite radiological consequences. Accordingly, the NRC staff concludes that accidents at the UNMR will not pose a significant risk to the health and safety of the public, facility personnel, or the environment.

5 TECHNICAL SPECIFICATIONS

The licensee submitted a copy of its TS as part of its license renewal. These TS define certain features, characteristics, and conditions governing the operation of the UNM AGN-201M research reactor facility and are explicitly included in the renewed license as Appendix A. The staff reviewed the format and content of the TS using the guidance in ANSI/ANS 15.1-1990, “The Development of Technical Specifications for Research Reactors,” and the guidance in applicable sections of NUREG-1537.

The NRC staff finds the submitted TS to be acceptable and concludes that normal plant operation within the limits of the TS will not result in offsite radiation exposures in excess of the limits specified in 10 CFR Part 20. Furthermore, the limiting conditions for operation and surveillance requirements will limit the likelihood of malfunctions and mitigate the consequences of potential accidents to the staff, public, and environment.

6 FINANCIAL QUALIFICATIONS

6.1 Financial Ability To Operate the Reactor

The NRC specifies the financial requirements for nonelectric-utility licensees in 10 CFR 50.33(f):

> Except for an electric utility applicant for a license to operate a utilization facility of the type described in §50.21(b) or §50.22, [an application shall state] information sufficient to demonstrate to the Commission the financial qualification of the applicant to carry out, in accordance with regulations of this chapter, the activities for which the permit or license is sought.

UNM does not qualify as an “electric utility,” as defined in 10 CFR 50.2, “Definitions.” Under 10 CFR 50.33(f)(2), applications to renew or extend the term of any operating license for a non-power reactor shall include the financial information that is required in an application for an initial license. The NRC staff has determined that UNM must meet the financial qualifications requirements of 10 CFR 50.33(f) and is subject to a full financial qualifications review. UNM must provide information to demonstrate that it possesses or has reasonable assurance of obtaining the funds necessary to cover estimated operating costs for the period of the license. Therefore, UNM must submit estimates of the total annual operating costs for each of the first 5 years of facility operations from the expected license renewal date and indicate the sources of funds to cover those costs.

In supplements to the application dated November 9, 2009, and February 17, 2010, UNM submitted its projected operating costs for the UNM AGN-201M for each of the fiscal years (FYs) 2011 through 2015. The projected operating costs for the reactor are estimated to range from $52,000 in FY 2011 to $56,000 in FY 2015. Funds to cover the operating costs will be provided as part of UNM’s state-funded general budget. UNM expects that this funding source will continue for FYs 2011 through 2015. On the basis of its review of UNM’s estimated operating costs and its projected source of funds to cover those costs, the NRC staff finds them to be reasonable.

The NRC staff finds that UNM has demonstrated reasonable assurance of obtaining the necessary funds to cover the estimated facility operation costs for the period of the license. Accordingly, the staff has determined that UNM has met the financial qualifications requirements pursuant to 10 CFR 50.33(f) and is financially qualified to engage in activities related to the UNM AGN-201M.

6.2 Financial Ability To Decommission the Facility

The NRC has determined that the requirements to provide reasonable assurance of decommissioning funding are necessary to ensure the adequate protection of public health and safety. In 10 CFR 50.33(k), the NRC requires that an application for an operating license for a utilization facility demonstrate how reasonable assurance will be provided that funds will be available to decommission the facility. Under 10 CFR 50.75(d), each applicant for or holder of an operating license for a non-power reactor shall submit a decommissioning report that contains a cost estimate for decommissioning the facility, an indication of the funding methods to be used to provide funding assurance for decommissioning, and a description of the means of adjusting the cost estimate and associated funding level periodically over the life of the facility. The acceptable methods for providing financial assurance for decommissioning appear in 10 CFR 50.75(e)(1).

The application, dated on February 21, 2007, referenced a decommissioning cost estimate of $50,000 in 2007 dollars. In the November 9, 2009, supplement, UNM updated the decommissioning cost estimate of the UNM AGN-201M to $97,850 in 2010 dollars. The cost estimate summarized costs by labor, equipment, waste disposal, fuel disposal, reactor vessel disposal, and a 25-percent contingency factor. According to UNM, the estimated decommissioning costs for the UNM AGN-201M are based on discussions with UNM Safety and Risk Services personnel as well as their experiences in dealing with mixed, hazardous, and radioactive waste. UNM escalated the decommissioning cost estimate to 2010 dollars using a conservative average increase of 3 percent per year based on the U.S. Bureau of Labor Statistics Consumer Price Index. According to UNM, the decommissioning cost estimate will be updated every 10 years beginning in 2020, and the adjusted costs will be based on the average Consumer Price Index for the previous 10 years. The NRC staff reviewed the 2010 decommissioning cost estimate submitted by UNM for the UNM AGN-201M ($97,850 in FY 2010 dollars). Taking into consideration experience at other facilities with similar construction and operational history and circumstances surrounding limited disposal options, the staff concludes that the decommissioning cost estimate for the UNM AGN-201M is reasonable.

UNM has elected to use a statement of intent (SOI) to provide financial assurance, as allowed by 10 CFR 50.75(e)(1)(iv) for a Federal, State, or local government licensee. The SOI must contain or reference a cost estimate for decommissioning and indicate that funds for decommissioning will be obtained when necessary.

UNM provided an SOI, dated November 2, 2009, stating that the signator will “request and obtain these funds sufficiently in advance of decommissioning to prevent delay of required activities.” The estimated costs of decommissioning are approximately $100,000 for the DECON option.

To support the SOI and UNM’s qualifications to use an SOI, the application stated that UNM is a major State educational institution in New Mexico and included documentation that corroborates this statement. The application also provided information supporting UNM’s representation that the decommissioning funding obligations of UNM are backed by the full faith and credit of the State of New Mexico. UNM also provided documentation verifying that the signator of the SOI, David W. Harris, Executive Vice President for Administration, Chief Operating Officer and Chief Financial Officer, is authorized to execute contracts on behalf of UNM.

UNM’s information on decommissioning funding assurance as described above and the NRC staff finds that UNM is a State of New Mexico government licensee under 10 CFR 50.75(e)(10(iv), the SOI is acceptable, the decommissioning cost estimate as well as the annual costs for the DECON option are reasonable, and UNM’s means of adjusting the cost estimate and associated funding level periodically over the life of the facility is reasonable. The staff notes that any adjustment of the decommissioning cost estimate must incorporate changes in costs resulting from the availability of disposal facilities, and that under 10 CFR 50.9, “Completeness and Accuracy of Information,” UNM has an obligation to update any changes in the projected cost, including changes in costs resulting from increased disposal options.

6.3 Foreign Ownership, Control, or Domination

Section 104d of the Atomic Energy Act, as amended, prohibits the NRC from issuing a license under Section 104 of the Atomic Energy Act to "any corporation or other entity if the Commission knows or has reason to believe it is owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government." The NRC regulation 10 CFR 50.38, "Ineligibility of Certain Applicants," contains language to implement this prohibition. According to the application, UNM is a State of New Mexico government licensee and is not owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government. The NRC staff does not know or have reason to believe otherwise.

6.4 Nuclear Indemnity

The NRC staff notes that UNM currently has an indemnity agreement with the Commission that does not have a termination date. Therefore, UNM will continue to be a party to the present indemnity agreement following issuance of the renewed license. Under 10 CFR 140.71, "Scope," UNM, as a nonprofit educational institution, is not required to provide nuclear liability insurance. The Commission will indemnify UNM for any claims arising out of a nuclear incident under the Price-Anderson Act, Section 170 of the Atomic Energy Act, as amended, and in accordance with the provisions of its indemnity agreement pursuant to 10 CFR 140.95, "Appendix E—Form of Indemnity Agreement with Nonprofit Educational Institutions," up to $500 million. Also, UNM is not required to purchase property insurance under 10 CFR 50.54(w).

6.5 Conclusions

The NRC staff reviewed the financial status of the licensee and concludes that there is reasonable assurance that the necessary funds will be available to support the continued safe operation of the UNM AGN-201M and, when necessary, to shut down the facility and carry out decommissioning activities. In addition, the NRC staff concludes that there are no problematic foreign ownership or control issues or insurance issues that would prevent the issuance of a renewed license.

7 CONCLUSIONS

On the basis of its evaluation of the application as set forth in the previous chapters of this SER, the NRC staff concludes the following:

- The application, as supplemented, filed by UNM for renewal of the operating license for its AGN-201M research reactor, complies with the requirements of the Atomic Energy Act of 1954, as amended, and with the Commission's regulations set forth in 10 CFR Chapter I, "Nuclear Regulatory Commission."

- There is reasonable assurance that the facility will be operated in conformance with the application (as amended) and with the provisions of the Atomic Energy Act and the rules and regulations of the Commission.

- There is reasonable assurance that (1) the activities authorized by the operating license will be conducted without endangering public health and safety and (2) such activities will be conducted in compliance with the Commission's regulations as set forth in 10 CFR Chapter I.

- The licensee is technically and financially qualified to engage in the activities authorized by the license in accordance with the Commission's regulations in 10 CFR Chapter I.

- The renewal of this license is not inimical to the common defense and security or to public health and safety.

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