



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

DISMANTLING OF FACILITY AND DISPOSITION OF COMPONENT PARTS

MEMPHIS STATE UNIVERSITY

DECOMMISSIONING

FACILITY OPERATING LICENSE NO. R-127

DOCKET NO. 50-538

1.0 INTRODUCTION

The staff has reviewed the Memphis State University (MSU) plan to dismantle the 0.1 Watt (thermal) Argonne National Laboratory (AGN-201) Research and Training Reactor at its campus, dispose of its component parts and radioactive material, and decontaminate the facility. The objective of this plan is to terminate the license of the MSU facility, and to return the facility to unrestricted use. The AGN-201 was shut down in March 1985, and has not been operated since. At that time, the fuel was removed from the core tank and placed in storage. Following receipt of a SAFSTOR status (possession-only) approval under License No. R-127, Amendment No. 5, dated June 17, 1985, all reactor fuel has been shipped offsite to a Department of Energy facility, Oak Ridge National Laboratory, for storage. The Radium-Beryllium startup source is in storage in Building 113, and is licensed under Tennessee Radioactive Materials License No. R-79177-C89. Upon license termination, arrangement has been made with the Institute for Resource Management Inc. (IRM) to take possession of the decommissioned reactor component parts and all related components except for the fuel. Toward this end, the staff review of the plan considered management responsibilities and commitment to follow applicable regulations, relevant regulatory guides, and standards; the health physics program, including procedures, equipment, instrumentation, survey techniques, training, and personnel dosimetry; waste disposal; and the final survey. The acceptance criteria used by the staff are stated in Regulatory Guides 8.8, "Information Relevant to Ensuring that Occupational Exposures at Nuclear Power Stations Will Be As Low As Is Reasonable Achievable" (Revision 3, June 1978) and 1.86, "Termination of Operating Licenses for Nuclear Reactors."

2.0 FACILITY DESCRIPTION

The MSU Reactor Facility is located in an annex to the ground floor of Building 113 which is situated in the Northwest corner of the MSU South Campus. The reactor was obtained from Argonne National Laboratory and was licensed to operate at a maximum power level of 0.1 W. (thermal). The inherent design features of the reactor and the low power at which it was operated precluded the buildup of significant amounts of fission products. The fission product inventory is considered to be negligible.

3.0 DISCUSSION

The MSU AGN-201 Nuclear Research and Training Reactor was in operation at MSU from December 10, 1976 to March 31, 1985. MSU conducted more than 2,400 startups and accumulated approximately 960 hours of operations at critical (0.1 W, thermal) during its eight years of active operations.

During the eight years of operation the only operational occurrences that necessitated reporting were those of power failures. None of these power failures resulted in radioactive spills or releases.

There will be no requirement for Safe Storage since all radioactivity will be removed from the MSU facility and the facility will be returned for unrestricted use. The licensee has agreed that the radiation levels for unrestricted use will not exceed 5 micro R/hr at one meter from the surface (see Section 4.5). The collective dose equivalent to the staff for the decommissioning operation is estimated to be less than 2 person-rem. Collective radiation exposure to the general public will be insignificant.

4.0 EVALUATION

The licensee proposed to dismantle the facility in accordance with their dismantling plan. They intend to decontaminate the facility below the radiation and contamination levels of Regulatory Guide 1.86 and the staff positions, as addressed in Section 4.5 of this safety evaluation, for unrestricted access and use. In completing the approved process to place this reactor in SAFSTOR status, the reactor, all reactor components, and all equipment which was in contact with radioactive materials were surveyed for contamination and met minimum detectable activity levels. All fixed radiation monitors and alarms will remain in operation until the license is terminated. The Institute for Resource Management Inc. (IRM) has agreed to purchase the decommissioned reactor component parts. The non-radioactive components may be utilized in other projects within the MSU complex or disposed of as scrap. Contaminated reactor components and rubble will be disposed of at a licensed burial facility or retained for use under the State of Tennessee license.

4.1 Radiation Sources

The primary sources of radiation in the MSU facility consist of a Radium-Beryllium neutron source, and radioactive material from the reactor structures and components. The Radium-Beryllium neutron source was removed and placed in a shielded container in Building 113. The source is on loan to MSU and licensed by the state. The inherent design features of this reactor and the low power at which it was operated precluded the buildup of significant amounts of fission products, and the fission product inventory is considered to be negligible. Smear surveys were conducted by the licensee to detect the presence of activation products and none were detected.

The shield tank and thermal column tank water was sampled for radioactivity, found to be within NRC regulations for disposal, and drained according to approved procedures in the MSU AGN-201 Maintenance and Storage Manual. The reactor vessel interior including the thermal column tank, the graphite reflector cylinder, and the rod drive assemblies were surveyed for residual radioactivity and loose surface contamination; they were then placed in storage. The staff finds the licensee's plans for disposition of sources of radioactivity associated with this operation to be acceptable.

4.2 Health and Safety Management

The Radiation Protection Program for the Dismantling and Decommissioning Program is an extension of the existing Radiation Protection Program. A Radiation Safety Subcommittee has been established with the responsibility for monitoring and assuring safe operations. A member of the Committee will be assigned to inform the full Committee of the overall planning and dismantling activities, progress, and adherence to health and safety standards and procedures. The licensee stated that it is their policy that all operations be planned and executed to conform with NRC regulations and appropriate regulatory guides and to maintain exposures at as low as is reasonably achievable (ALARA) levels. The staff finds the above program to be acceptable.

4.3 Health Physics Program Objectives

The goal of the health physics program is to assure that the criteria for release of the facility and equipment therein for unrestricted use are satisfied and that this end product will be achieved with ALARA exposure to the workers and the general public.

Health physics functions will be provided by both MSU and their contractor personnel. The qualification and training of the contractor personnel staff have been indicated, and are acceptable to the staff.

The reactor facility and its environs will be monitored during the decommissioning operation in the same manner as that in effect during the normal operating period. Additional monitoring will be performed and documented during the dismantling phase to ensure a complete radiation record of the facility. Health physics personnel will be responsible for maintenance of radioactive exposure records, implementation of the environmental survey program, ensuring compliance with work procedures, training, and specific work tasks. Additionally, Health Physics, together with Industrial Hygiene, will be responsible for area and airborne radioactivity surveys; administering the respiratory protection program; assisting in decontamination of personnel, equipment and facilities; conducting radiation protection training; personnel dosimetry; and assuring that all personnel working in radiation areas properly utilize protective clothing. The staff finds the above to be acceptable.

4.4 Dose Commitment

The staff has estimated that the collective dose equivalent expected for the entire decontamination/dismantling operation will be less than 2 person-rem. This estimation is based on the expected levels of radioactivity from all sources, the manner in which experienced and well-trained workers will be performing their tasks in the expected radiation fields, review of dismantling plan procedures by the Reactor Safety Subcommittee, with the aim of maintaining personnel exposure to a minimum, and use of enclosures to control movement of radioactive particulates. These measures for assuring that the collective exposure will be ALARA are acceptable to the staff.

4.5 "Unrestricted Use" Release Criteria

The staff criteria for release of areas for unrestricted use or unrestricted access are the surface contamination levels found in Regulatory Guide 1.86, Table 1, and meeting an exposure rate limit of less than 5 micro R/hr above natural background at 1 meter from the measured surfaces. Alternately, if it can be shown that the maximum radiation exposure to an individual would be less than the staff's recommended annual exposure limit of 10 mR/yr because of potential occupancy in the vicinity of the radiation source, then levels greater than 5 micro R/hr would be acceptable. The licensee has committed to these criteria and the staff finds this commitment acceptable.

4.6 Health Physics Instrumentation

Continuing evaluation of the radiological status of the facility will be carried out by health physics personnel during dismantling and clean-up procedures. Levels of radiation will, therefore, be known at all times in areas where personnel are working. During dismantlement, each component of the reactor will be surveyed for fixed and removable contamination using a Ludlum Model 3 Survey Meter with Alpha Probe, a Ludlum Model 3 with a thin window pancake probe, and a FAG Model F-40 Nuclear Survey Meter. The FAG meter will be calibrated by IRM to 2 micro R/hr. After dismantlement a total building survey will be performed using the previously noted instruments. Readings will be made at the floor and walls, and 1 meter from the floor and walls throughout the building, and outside the building adjacent to the reactor room at the walls and at 1 meter from the walls. The decommissioned reactor component parts will not be released to IRM until the license has been terminated.

Our review indicates that the instruments to be used by the licensee during the dismantling and decontamination operation, and his plan for sample analysis, are acceptable for use in a final termination survey to characterize the status of the reactor facility with respect to unrestricted use of its equipment and facilities. The staff, therefore, finds this acceptable.

4.8 SAFSTOR

There will be no further requirement for Safe Storage since all radioactivity will be removed from the MSU facility and the facility released for unrestricted use.

5.0 ENVIRONMENTAL CONSIDERATION

An Environmental Assessment and Finding of No Significant Impact relating to the proposed action was published in the Federal Register on January 26, 1988 (53 FR 2112). Pursuant to 10 CFR 51.32, the Commission has determined that the issuance of this Order will have no significant impact on the environment.

6.0 CONCLUSION

Based on our review of the facility health physics organization, equipment, and procedures, the staff concludes that the licensee's health physics program is in compliance with the guidelines of Regulatory Guide 1.86 and 8.8 for providing adequate protection to assure a radiologically safe program for dismantling the MSU facility, disposing of associated radioactive material, and decontamination for unrestricted use. The staff also concludes, that the dismantling and decontamination operations can be conducted without undue risk to the health and safety of the public or MSU staff and without any significant impact on the environment. The staff, therefore, finds the licensee's plan to be acceptable.

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Dated: January 26, 1988