DOCKET NO: 70-152

LICENSEE: Purdue University
West Lafayette, Indiana

SUBJECT: SAFETY EVALUATION REPORT, AMENDMENT 3 TO SNM-142, APPLICATION DATED AUGUST 6, 2012

BACKGROUND

By application dated August 6, 2012, Purdue University (Purdue) requested an amendment to SNM-142 to allow the packaging and shipping of natural uranium fuel rods and 1.3 percent enriched uranium fuel rods for disposal by the U.S. Department of Energy (DOE) (Agencywide Documents Access and Management System Accession Number ML12221A323).

License Condition 11 of SNM-142 requires U.S. Nuclear Regulatory Commission's (NRC's) approval by license amendment before using (e.g., moving) the Special Power Excursion Reactor Test fuel rods, fuel rods, Californium sources, or natural uranium pellets. By this application, Purdue University requested NRC's approval to move the fuel rods and the natural uranium for re-packaging and shipment.

SCOPE OF REVIEW

The safety review of the license amendment application included an evaluation of the licensee's criticality safety and radiation safety programs.

DISCUSSION

Applicant's Amendment Request

Purdue University possesses 6000 natural uranium rods and 2845 rods of 1.3 percent enriched uranium. In accordance with Amendment 2 to Materials License SNM-142, the rods were loaded into containers and moved by cart to loading docks where the rods were placed into seven B-12 boxes.

Each B-12 box was loaded with 857 natural uranium rods and 405 rods enriched to 1.3 percent. The enriched uranium rods were maintained in a subcritical slab geometry as specified in ANSI 8.1 (2007). The rods were secured and packed to prevent movement.

In this request, the rods will be removed from the B-12 boxes and loaded directly into drums. They may be resized, if required.

Once the rods are repackaged, ownership of the material will be transferred to the DOE with ultimate disposal at the Nevada Test Site. The containers will comply with applicable regulations under Title 49 of the *Code of Federal Regulations* (49 CFR).

NRC STAFF REVIEW

Criticality Safety

The present loading of fuel in the B-12 boxes is less than a critical mass. The licensee commits to limit handling to one box at a time: both by administrative control (procedure) and practical restrictions in the work area.

Movement and packaging of the fuel will not involve changing its physical form and will not require the use of any moderating materials. There is an extremely large margin in terms of the mass, geometry, and moderation for involved enrichments. Criticality would require, at a minimum, partial flooding of the containers, concurrent with an upset in at least one other controlled parameter. No single moderation, geometry, mass, or enrichment upset can credibly lead to criticality. Therefore, the double contingency principle is satisfied for the movement and loading of material enriched up to 1.3wt percent. The staff did not evaluate criticality safety during shipment, as this will be done under the jurisdiction of DOE.

The licensee exemption from the CAAS requirements of 10 CFR 70.24 extends to the corridor and loading dock areas where multiple Model 9979 Type AF shipping containers will be staged and handled prior to loading onto the transport vehicle. The regulations in 10 CFR 70.24, Criticality Accident Requirements, require that licensees authorized to possess SNM in a quantity exceeding 700 grams of contained 235U shall maintain in each area in which such licensed SNM is handled, used, or stored, a monitoring system capable of detecting a criticality that produces an absorbed dose in soft tissue of 20 rads of combined neutron and gamma radiation at an unshielded distance of 2 meters from the reacting material within 1 minute.

Since the shipping containers, which are limited to a maximum of 350 grams U-235 per container, are packaged in accordance with a current DOE certificate of compliance for transportation which is required to meet the QA and operational aspects of 10 CFR 71, the likelihood of a criticality event is sufficiently low to justify this exemption request. NRC staff grants the requested exemption based on the use of an approved shipping container which is loaded in accordance with the DOE certificate of compliance.

Radiation Protection

All activities associated with this request will be performed in accordance with the radiation protection program used at the facility to meet the requirements of 10 CFR Parts 20 and 70, including surveys and personnel monitoring, training practices, use of written procedures, use of personnel protective equipment, commitments for maintaining doses as low as is reasonably achievable, and waste disposal practices. Radioactive material is not likely to become airborne or uncontained as it is sealed in fuel rods and presents minimal risk of contamination or internal exposure. The unirradiated fuel also presents a minimal external hazard due to the low exposure rate associated with the material, limited quantity, and limited contact time with personnel. The licensee has developed contingencies for the potential breach of a rod(s) during the operation. The amendment request also clarified the roles and responsibilities of the different individuals performing the work under the Radiation Protection Program, including areas outside the temporary containment, and emphasized the continual oversight by the Purdue staff.

The information provided in the request is adequate to demonstrate compliance with the applicable regulatory requirements.

Security

All activities will be performed under the existing Purdue Security Plan and the applicable requirements of 10 CFR Part 73.

ENVIRONMENTAL REVIEW

NRC has determined that the proposed amendment 3 of SNM-142 belongs to a category of actions which the Commission has declared to be a categorical exclusion, in accordance with 10 CFR 51.22(c)(14)(v). Therefore, neither an Environmental Assessment nor an Environmental Impact Statement was prepared for this action.

CONCLUSION

Upon completion of the safety review of Purdue's amendment application, NRC staff has concluded that the licensee continues to be qualified by reason of training and experience to use the specified material for the purpose requested in accordance with applicable regulations, has adequate equipment, facilities, and procedures to protect health and minimize danger to life or property. Staff recommends that the license's amendment request be granted; and that License Condition 11 remain for the fuel rods and the natural uranium pellets that are retained by Purdue.

Principle Contributors
Merritt N. Baker
Sheena Whaley