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SAFETY EVALUATION REPORT
RENEWAL OF SPECIAL NUCLEAR MATERIAL
LICENSE SNM-95 FOR
THE PENNSYLVANIA STATE UNIVERSITY
DOCKET NUMBER 70-113

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LIST OF ACRONYMS AND ABBREVIATIONS

10 CFR.....	Title 10 of the <i>Code of Federal Regulations</i>
APB.....	Academic Projects Building
ALARA.....	As Low As Reasonably Achievable
ANSI.....	American National Standard Institute
CAA.....	Controlled Access Area
CHP.....	Certified Health Physicist
DCE.....	Decommissioning Cost Estimate
DFP.....	decommissioning funding plan
DOE.....	U.S. Department of Energy
DOT.....	U.S. Department of Transportation
EA.....	Environmental Assessment
EH&S.....	Environmental Health and Safety
EIS.....	Environmental Impact Statement
HazMat.....	hazardous material
ISA.....	integrated safety analysis
LAR.....	license amendment request
LRA.....	license renewal application
LSC.....	Liquid Scintillation Count
MC&A.....	Material Control and Accounting
mph.....	miles per hour
NFPA.....	National Fire Protection Association
NRC.....	U.S. Nuclear Regulatory Commission
ORP.....	Office of Research Protection
OSHA.....	Occupational Safety and Health Administration
PA.....	Pennsylvania
²³⁹ Pu.....	Plutonium-239
PI.....	Principle Investigator
PSP.....	Physical Security Plan
PSU.....	The Pennsylvania State University
Pu.....	plutonium
RAI.....	request for additional information
RPO.....	Radiation Protection Office
RPP.....	Radiation Protection Program
RSEC.....	Radiation Science and Engineering Center
RSO.....	Radiation Safety Officer
RTR.....	research test reactor
RWP.....	radiation work permit
SER.....	Safety Evaluation Report
SGA.....	Self-Guarantee Agreement
SI.....	System of International units
SNM.....	Special Nuclear Material
SRP.....	Standard Review Plan
STA.....	Standby Trust Agreement
²³³ U.....	Uranium-233
²³⁵ U.....	Uranium-235
U.....	Uranium
UIC.....	University Isotope Committee
U.S.	United States

I. INTRODUCTION

The Pennsylvania State University (PSU) was first issued a Special Nuclear Material (SNM) license in 2003, License SNM-95, dated October 27, 2003 (Ref. 1). The current license was scheduled to expire on October 31, 2013. On September 23, 2013 (Ref. 2), PSU submitted a timely application for renewal of the license. The term of the license, if granted, would be 10 years. On November 18, 2013 (Agencywide Documents Access and Management System [ADAMS] Accession Number ML13311A122), the U.S. Nuclear Regulatory Commission (NRC) sent PSU a non-acceptance letter, noting that the license renewal application (LRA) did not contain required information. However, the letter also stated that the license would remain in timely renewal until a final determination has been made to deny the application.

By letter dated August 1, 2014 (Ref. 3), PSU resubmitted the LRA. The request was made pursuant to the requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 70, Section 70.33, and Paragraph 70.38(a). The LRA did not request any new radioactive material. However, a new location and use for SNM were included in the LRA.

On November 19, 2014, the NRC accepted the application for a detailed technical review. (ADAMS Accession Number ML14259A467) (Ref.7). A notice of opportunity to request a hearing on the license application was published in the *Federal Register* (FR) on February 2, 2015 (80 FR 5580) (Ref. 15). No requests for a hearing were received. The licensee submitted changes to selected pages of its application by letter dated June 18, 2015 (Ref. 6), corrected sections of the application by letter dated August 26, 2016 (Ref. 4), and a revised application by letter dated November 5, 2016 (Ref. 5).

PSU's initial application to renew license SNM-95 did not include a Decommissioning Funding Plan (DFP). By letter dated December 19, 2013, PSU submitted a DFP (ADAMS Accession Number ML13358A287) (Ref. 12). PSU resubmitted an update to the DFP by letter dated October 1, 2015, (ADAMS Accession Number ML15280A395) (Ref. 10) and submitted an update of the DFP for all PSU licenses by letter dated December 14, 2016, (ADAMS Accession Number ML16355A178) (Ref. 13). By letter dated July 3, 2017, (ADAMS Accession Number ML17170A291) (Ref. 14), the NRC staff approved PSU's December 14, 2016 DFP. A description of the findings is included in this Safety Evaluation Report (SER).

In addition to PSU's SNM-95, PSU holds other licenses issued by NRC. PSU has a research test reactor (RTR) licensed by NRC (Docket 50-005, License R-2). Though some programs involving SNM and the RTR overlap, the RTR license is independent of the SNM license. Additionally, Agreement State licenses issued by the Commonwealth of Pennsylvania are independent of the subject of this license renewal. Therefore, the RTR license and the Agreement State licenses are not discussed in this

II. SCOPE OF REVIEW

The NRC staff conducted its safety and safeguards review in accordance with 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material;" 10 CFR Part 20, "Standards for Protection Against Radiation;" 10 CFR Part 73, "Physical Protection of Plants and Materials;" 10 CFR Part 74, "Material Control and Accounting of Special Nuclear Material;" and other applicable regulations. The NRC staff used the guidance documents listed in Section VII, REFERENCES of this SER, to conduct its safety review. NUREG-1520, "Standard Review Plan (SRP) for Fuel Facilities License Applications" (Ref. 16), provides guidance to staff reviewers who perform

safety and environmental impact reviews of applications using SNM. The NRC staff's safeguards review included the review of PSU's Physical Security Plan (PSP) and Material Control and Accounting (MC&A) Plan.

The NRC staff reviewed the information submitted in the renewal application and supplements. The renewal application contains twelve sections; Section 1, General Information, describes the site overview, possession limits and authorized activities under the license, institutional information, equipment and facilities; Section 2, Organization and Administration describes in detail organizational structure; Section 3, Integrated Safety Analysis (ISA), provides that an ISA is not applicable to the PSU application; Section 4, Radiation Protection, describes training programs, monitoring, written procedures, ventilation and respiratory protection, control of radiological risk and physical security; Section 5, Nuclear Criticality Safety, discusses why a critical safety program is not required. Section 6, Chemical Process Safety, describes the locations and uses of SNM, and Section 7, Fire Safety, describes the fire system inspections, testing and maintenance; Section 8, Emergency Management, describes the planning for emergency events; Section 9, Environmental Protection, describes the proposed environmental protection measures, Section 10, Decommissioning, describes the current decommissioning plan status, and decommissioning funding; Section 11, Management measures, describes procedures review, audits, records management, and material control and accountability, and Section 12, Cross Reference and Review.

1.0 General Information

1.1 Purpose of Review

The staff reviewed the applicant's site description and overview, generally described in Section 1 of the LRA, against the acceptance criteria in NUREG-1520, Rev. 2, Section 1 of the Standard Review Plan, ADAMS Accession Number ML101390110 (Ref. 16).

1.2 Staff Review and Analysis

1.2.1 Facility Layout

PSU is a non-profit educational institution incorporated under the laws of the Commonwealth of Pennsylvania. PSU is a land-grant university for Pennsylvania and is comprised of 23 major campuses throughout the Commonwealth of Pennsylvania. Possession and use of radioactive materials are limited to five locations, either under an Agreement State license or an NRC license. The NRC license (SNM-95) only pertains to the University Park campus, which is the main campus. The University Park campus is located in University Park, in the State College Borough, Centre County, PA.

The LRA provides a description of the major roads and states the population of the town of University Park as of 2012. Additionally, the LRA illustrates wind statistics including the direction, magnitude, and frequency of winds. Tornado activity is less than the overall U.S. average. On June 5, 1975, a category F2 (maximum wind speeds of 113 mph to 157 mph) tornado occurred 4.3 miles away from the borough center. On May 31, 1985, a category F4 (maximum wind speeds of 207 mph to 260 mph) tornado occurred 40.9 miles away from the center of the State College Borough. Precipitation in the area is typically between 3 to 4 inches per month.

The State College area has earthquake activity significantly below the average in other areas in Pennsylvania. It is 96 percent less than the overall U.S. average. On August 15, 1991, a magnitude 3.0 earthquake occurred 10.6 miles away from the city center. On November 14, 1997, another magnitude 3.0 earthquake occurred 95.6 miles away from State College center.

1.2.2 Process Overview

PSU describes its proposed use of SNM as limited to calibration, teaching, research, and development purposes. PSU stated that SNM will be used by authorized users approved by the University Isotope Committee (UIC).

1.2.3 Descriptive Summary of Licensed Material

The following sections contain a description of the possession limits, authorized activities, place of use, organization, technical qualifications, training, radiation safety, calibration, effluent control, criticality safety, environmental protection, emergency planning, material control and security, financial assurance, and compliance history.

The NRC staff confirmed that the LRA described the locations where the SNM is to be used in sufficient detail at the University Park campus. The licensee submitted drawings describing the relationship of specific facility features. Drawings illustrate the layout of the buildings and structures. The LRA described the types, and amounts of waste materials as well as the end-destination of radioactive wastes.

1.2.4 Possession Limits

The maximum quantity of SNM that may be possessed and used is identified by isotope, enrichment, chemical and physical form, and mass in grams. Table 1 lists the quantities requested and the maximum quantities of SNM that may be possessed by PSU under License SNM-95:

MATERIAL	FORM	QUANTITY
Uranium enriched in the U-235 Isotope	Any	[REDACTED]
U-233	Any	[REDACTED]
Plutonium 239	Sealed Pu-Be sources	[REDACTED]
Plutonium 239/238	Plated alpha sources or fission foils	[REDACTED]
Fission Product Samples	Non dispersible solid or liquid	[REDACTED]

The LRA requests a reduction of fission product samples from the existing license quantity of [REDACTED]. There are no additions or increases in the amounts or types of radioactive material beyond what is currently authorized. The LRA requests a new use location [REDACTED] and a new use (Laser Included Breakdown Spectroscopy or LIBS) for specific SNM.

The SNM is used and stored in [REDACTED] buildings on the University Park campus — [REDACTED]. [REDACTED]

Three diagrams show, in progressive detail, the location of the SNM. The location of the 23 PSU campuses is illustrated on an outline of the Commonwealth of Pennsylvania. The location of buildings where the SNM is located are indicated on a map of the main campus. Locations of authorized activities within buildings are indicated on floor plans.

1.3 Evaluation Findings

The NRC staff reviewed the LRA and concludes that PSU adequately described its facility and the proposed uses of the SNM for which the renewal is sought. Therefore, the NRC staff concludes that the information in the PSU application and supplements meet the requirements of 10 CFR 70.22 and 10 CFR 70.33 and is acceptable.

2.0 Organization and Administration

2.1 Purpose of Review

The staff reviewed the applicant's organization and the qualifications of administrative and radiation protection personnel, generally described in Section 2 of the LRA, against the acceptance criteria in NUREG-1520, Rev. 2, Section 2 of the Standard Review Plan, ADAMS Accession Number ML101390110 (Ref. 16). The administration of the facility involves operations, organizational structure, and facility security. In addition, an application should present information on the facility's organization, training programs, operational reviews and audits, radiation protection procedures and actions, recordkeeping and reports. The following discussion summarizes information provided by the applicant and the staff's evaluation as to whether the information provided by the applicant meets the acceptance criteria.

2.2 Staff Review and Analysis

As described in the application, the licensee's management is headed by and reports to the President of PSU. Current Principal Officers of PSU are:

- Dr. Eric Baron, President, 201 Old Main, University Park, PA
- Mr. Stephen Dunham, Vice President and General Counsel, 507 Rider Building, State College, PA;
- Mr. David Gray, Sr. Vice President for Finance and Business/Treasurer, 208 Old Main, University Park, PA;
- Dr. Nicholas Jones, Executive Vice President and Provost, 201 Old Main, University Park, PA; and
- Dr. Neil Sharkey, Vice President for Research and Management Representative, 304 Old Main, University Park, PA.

The LRA stated that PSU is governed by a Board of Trustees consisting of 32 members, including the following:

- Five trustees who serve in an ex officio capacity by virtue of their position within the University or the Commonwealth of Pennsylvania,
- Six trustees who are appointed by the Governor,
- Nine trustees who are elected by the alumni,

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- Six trustees who are elected by organized agricultural societies within the Commonwealth, and
- Six trustees who are elected by the Board of Trustees representing business and industry.

The PSU management structure is illustrated with an organization chart in the application. The Director of the Environmental Health and Safety (EH&S) Department is responsible, through several levels of management, to the President of PSU. The UIC and the Dean of the College of Engineering, are also responsible, through several different levels of management, to the President of PSU. The radiation safety officer (RSO) reports to the Director of the EH&S, but supports the UIC. The RSO is not under the College of Engineering. The RSO is in charge of the Radiation Protection Office (RPO), which is under EH&S. The RPO staff address radiation aspects of EH&S.

The UIC is the body responsible for all university programs involving radioactive material, and consists of individuals who have knowledge of, and experience with radioactive materials. Collectively, the UIC has expertise in a range of technical areas, such as life sciences, nuclear engineering, and veterinary medicine. Though the membership of the UIC may change, the expertise is maintained. Additionally, the UIC reviews and approves or denies authorized user permits, reviews annual audit findings and makes recommendations to radiation safety staff for appropriate action, enforces radiation safety requirements, reviews regulatory actions such as license amendments submissions to the NRC, and establishes and approves minutes of all proceedings and actions taken by the committee.

While the Vice President of Research has ultimate responsibility for license SNM-95, authority is delegated to the UIC, the RSO, and to the RPO staff. PSU has a policy stating that neither employees nor students are to perform work that is known to be hazardous without proper instruction. The UIC can deny an application from a Principle Investigator (PI) proposing research.

The UIC approves all new PIs and major changes in materials or use after an assessment of all hazards (e.g., chemical, radiation, biological, mechanical) of an experimental plan has been performed and approved by the RSO. The UIC may use consultants and experts when needed and request their presence at UIC meetings.

PSU has staff with varying levels of qualifications and corresponding levels of responsibilities:

- A PI may be a PhD professor, an instructor (a person with an advanced degree who teaches), or a research assistant (a person with or without an advanced degree, but with sufficient prior experience in the characteristics and safe use of the SNM).
- The RSO must have an advanced degree in health physics, physics, science, or a related area. The RSO must have multiple years of experience in managing a medical or university health physics program.
- The assistant RSO must have an advanced degree in health physics, physics, science, or a related area. Experience in a medical or university health physics program is highly desirable.

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- A staff health physicist must at least have a Bachelor of Science degree in health physics, physics, science, or a related area. Experience in a medical or university health physics program is highly desirable.
- A senior specialist must at least have a high school diploma but no other relevant experience. This individual works under the supervision of the RSO or a staff health physicist.
- A student assistant may be hired to perform basic health physics tasks or other tasks under the supervision of radiation safety staff. No previous experience is required.

The primary management representative for PSU is the Vice President for Research, and he has the ultimate authority to stop work. By a letter of delegation, equal authority is delegated to the RSO for all radioactive material and radiation-related activities. The RPO staff have stop work authority by both their oversight function and position at the EH&S Department and with the authority from the RSO. Documented PSU policy states that employees and students are not to perform hazardous functions and operations without proper instructions and authorization. The policy states that employees and students are to report unsafe conditions, practices, or equipment to the supervisor, instructor, or safety officer.

PSU has documented policies that prohibit retaliation by any member of the university faculty, staff, or student body for directing that unsafe work stop and reporting safety concerns. Protection from such retaliation is also provided by Pennsylvania's Whistleblower Law, 43 P.S. Section 1421. Retaliation is subject to disciplinary sanctions ranging from a warning to termination or expulsion from the university.

Additionally, PSU maintains a fully qualified hazardous materials response team that supports the county and regional police, fire, and hazardous material (HazMat) response organizations. The team is cross trained in chemical, biological, and radiological emergency response and is the first responder to all incidents involving radioactive materials that is beyond the control of the laboratory personnel.

PSU maintains an armed police force trained to respond to radiological security incidents. The police maintain radiation detection equipment and train with local, regional, U.S. Department of Homeland Security, and Federal Emergency Management Agency organizations.

The local fire department provides firefighting services to the PSU campus, and are HazMat trained to Pennsylvania State standards including chemical, biological, and radiological response. The local fire department works in conjunction with the PSU campus police and the PSU HazMat team to respond to all buildings and laboratories as needed.

All required records are maintained by the Radiation Protection Office, and/or the Office of Research Protection (ORP) either electronically or in hardcopy. Electronic records are maintained on Penn State network storage which is backed up regularly. Paper records are maintained in an office environment or archive facility.

All radioactive material use locations are inspected at least quarterly by the Radiation Protection Program (RPP) staff. Audits include but are not limited to, checks of postings and labeling,

waste handling, security, meters and instrumentation, training status, use of personal protective equipment and general lab safety. Audits are reviewed by the RSO.

2.3 Evaluation Findings

The NRC staff has reviewed the organization and administration for PSU against the acceptance criteria in Chapter 2 of the SRP (NUREG-1520). PSU described its organization and management policies for providing adequate safety management for the safe operation of the facility. The senior organizational management structure and policies were reviewed by NRC staff and found acceptable for the following reasons. The NRC staff determined that the organization has elements of redundancy (i.e., multiple levels of review for safety) and diversity (i.e., individuals and committee) to oversee and ensure that SNM is used and stored in a safe manner. Responsibility takes the form of groups and individuals. In one line of the organization, responsibility is with a committee. In the other line of the organization, responsibility is with individuals. The organization ensures that perspectives on safety are not dominated by a single individual, but are nonetheless, focused. The staff has reviewed the information and concluded that PSU has an acceptable organization, administrative policies, and sufficient qualified resources to provide for the safe operation of the facility under both normal and abnormal conditions.

3.0 Integrated Safety Analysis Summary

The NRC staff reviewed the LRA to determine whether PSU was required to provide an Integrated Safety Analysis (ISA) Summary, pursuant to the provisions in 10 CFR Part 70 Subpart H, "Additional Requirements for Certain Licensees Authorized to Possess a Critical Mass of Special Nuclear Material." The NRC staff finds that the activities proposed under the renewed license are not activities described in 10 CFR 70.60. Under its license SNM-95, PSU is not be engaged in enriched uranium processing, fabrication of uranium fuel or fuel assemblies, uranium enrichment, enriched uranium hexafluoride conversion, plutonium processing, fabrication of mixed-oxide fuel or fuel assemblies, scrap recovery of SNM, or any other activity that the commission determines could significantly affect public health and safety. Additionally, PSU does not possess a critical mass quantity of SNM in the physical sense of needing a Criticality Safety Program. The NRC staff finds that the activities proposed under the renewed license are not activities described in 10 CFR 70.60 and therefore, could not significantly affect public health and safety.

For these reasons, 10 CFR Part 70, Subpart H is not applicable to the LRA. As a result, the NRC staff concludes that PSU is not required to submit an ISA Summary in support of its LRA.

4.0 Radiation Protection

4.1 Purpose of Review

The NRC staff conducted this review to assess whether the RPP described in PSU's LRA is adequate to protect the radiological health and safety of staff and students, and complies with the regulatory requirements in 10 CFR Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations," 10 CFR Part 20, "Standards for Protection Against Radiation," and 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material."

The regulatory requirements for the review of radiation protection are generally described in 10 CFR 70.23(a)(3) and (4). Approval of an application requires that the proposed equipment and facilities are adequate to protect health and minimize danger to life or property; and that the applicant's proposed procedures to protect health and to minimize danger to life or property are adequate. Section 13 of this report discusses protection of the public and the environment.

4.2 Staff Review and Analysis

4.2.1 *Commitment to Radiation Protection Program Implementation*

The RPP is the means by which the licensee meets the requirements of 10 CFR Part 20. Per 10 CFR 20.1101, an RPP must include : (1) development , implementation, and documentation of a radiation protection program; (2) an As Low as Reasonably Achievable (ALARA) program; (3) Periodic review of the radiation protection program; and (4) a constraint on air emissions of radioactive material to the environment.

1) Development, Implementation, and Documentation of a Radiation Protection Program

10 CFR 20.1101(a) requires that an applicant develop, document and implement a radiation protection program commensurate with the scope and extent of licensed activities and sufficient to ensure compliance with the provisions of this part.

The LRA contains a description of the PSU organization that is relevant to the radiation protection program. The College of Engineering, where SNM is used, is independent of the EH&S. The UIC reviews and approves all proposed uses of SNM. The have stop work authority. That is, the RSO and the UIC are authorized to act on radiological safety concerns without further administrative approval. The RSO and PSU have a policy instructing all employees and students to only perform any hazardous function with proper instructions and authorization. PSU has documented policies that specifically prohibit retaliation by any member of the faculty, staff, or student body for reporting unsafe conditions. Such reporting can be done in confidence or anonymously reported to the University's ORP. If the person is not satisfied with the action taken, then the matter can be brought to the attention of the Pennsylvania State Department of Environmental Protection, or the NRC.

The UIC is delegated authority and responsibility by PSU's Vice President for Research and Executive Vice President to review and either approve or deny all requests for the use of SNM. The UIC is discussed in Section 2.0 of this SER. The UIC approves all new PIs or authorized users and major changes in materials or uses following review and approval by the RSO. In addition, the UIC reviews annual audit findings and makes recommendations for appropriate actions. A PI is responsible for all activities under their authorization.

The RSO is responsible for the following duties:

- Managing the RPO staff,
- Managing the radiation safety program,
- Ensuring compliance of the radiation safety program with state and federal regulations, and NRC license conditions,
- Providing training and recommendations to individuals that use radioactive materials,

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- Acting as the agent of the UIC to ensure that the use of radioactive material is consistent with recommendations and requirements of the committee,
- Serving as representative of the University to regulatory agencies to act in licensing manners,
- Providing corrective action when deficiencies are identified, and
- Reviewing procedures, policies, and practices as part of the annual report to the UIC.

The NRC staff determined that the licensee describes an adequate organizational structure, providing appropriate management oversight of SNM, ensuring the radiation safety organization is adequately trained and staffed with sufficient independence to ensure effective safety oversight, and annually reviewed by key management personnel. The program has multiple levels of reviews by individuals and a committee before proposed uses of SNM are implemented. The program has daily oversight by the RPO. The RPO management and staff have stop work authority in circumstances where unsafety conditions arise. PSU policy provides for facility, staff, and students to report unsafe conditions to the University, the State of Pennsylvania, or the NRC, without fear of retaliation.

The licensee has established clear organizational relationships among the individual positions responsible for the RPP and other line managers. The acceptance criteria in NUREG-1520 state that a suitably educated, experienced, and trained radiation protection program director (i.e., the RSO) has the following:

- Direct access to managers at the university,
- Skills in interpreting data and regulations pertinent to radiation protection,
- Familiarity with the operations at the university,
- Participation as a resource in radiation safety management decisions, and
- Responsibility for establishing and implementing the radiation protection program.

The minimum education, experience, and training requirements for the RPP director and staff are discussed in Section 2.0 of this SER, and satisfy the above criteria.

The NRC staff reviewed PSU's development, documentation and implementation of its RPP. The NRC staff has determined that the RPP satisfies the applicable criteria in NUREG-1520, and therefore, has an adequate program to protect health and minimize danger to life or property. The NRC staff finds that the licensee meets the requirement of 10 CFR 20.1101(a).

- 2) A documented management commitment to keep exposures As Low As Reasonably Achievable (ALARA)

10 CFR 20.1101(b) requires a licensee to use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable (ALARA).

The LAR references PSU's ALARA Statement found in the *Rules and Procedures for the Use of Radioactive Material at the Pennsylvania State University* document and provides its website address. The policy of PSU, as established and regulated by the UIC, is that the release of radioactive material and the exposure of people to ionizing radiation be kept ALARA. Section 1 of PSU's ALARA policy, provides the three principles the policy is based on:

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- Exposures of personnel to radiation or the release of radioactive material to the environment may not exceed the limits in the federal and state regulations
- Unplanned exposure of personnel or uncontrolled releases to the environment that exceed ten percent of permissible limits will be investigated by the Radiation Protection Office of Environmental Health and Safety to determine whether the exposures or releases were ALARA and whether action is required to limit future exposures or releases. Planned operations with estimated exposures or releases that will exceed 10 percent of the permissible limits will be subject to an ALARA review by Radiation Protection staff prior to beginning the operation.
- Exposures and releases that do not exceed ten percent of the permissible limits are low enough that no further consideration of ALARA is necessary.

The formal process to use SNM at the university is discussed in Section 2.0 of this SER. Written procedures accomplish the following:

- Compliance with regulations and NRC license is ensured;
- Procedures are prepared for UIC approval;
- Personnel working with SNM are trained and qualified;
- Physical security of SNM is maintained;
- Inventory and associated records are maintained; and
- A definite period of use of SNM is established.

The licensee's staff and students have equipment to use SNM as discussed in Section 1.4 of the LRA. Equipment includes a hot cell, fume hoods, glove boxes, personal protective equipment, and radiation survey equipment. Radioactive waste is stored in a large shielded room that has an intrusion alarm and sprinkler system.

The NRC staff determined that the licensee has written approved procedures to carry out activities related to the radiation protection program. A formal procedure exists that takes a proposed use of SNM through several levels of review. The RSO ensures that the proposed use of SNM will be in accordance with sound radiation safety practices, thus, keeping dose ALARA. Final approval is given by the UIC, which has diverse technical expertise and experience.

Additionally, the NRC staff determined that the policy and practices are adequate to keep exposures to ionizing radiation ALARA. PSU has thresholds for taking action before regulatory limits are exceeded. Licensee staff and students have equipment to prevent and mitigates exposures. The NRC staff reviewed PSU's process and determined that PSU has a documented management commitment to keep exposures ALARA. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 20.1101(b).

3) Periodic review of the radiation protection program

10 CFR 20.1101(c) requires a licensee to periodically (at least annually) review the radiation protection program content and implementation.

The UIC has quarterly meetings, and annual reviews of the RPP. At such reviews, recommendations for improving the program and enforcing radiation safety requirements can be

provided to the university. The radiation protection staff is qualified and regularly engaged with university investigators and support staff in the review of and consultation on protocols. Also, where SNM is used, fume hoods are inspected annually and radiation survey instruments are calibrated annually. Additionally, refresher training is provided to all authorized radioactive material users annually.

NRC staff reviewed PSU's periodic reviews and determined that the licensee's reviews are performed by the UIC with support from qualified radiation protection staff. At the location where SNM is used, fume hoods are inspected annually to ensure that they are functioning to prevent inhalation of SNM. Survey meters are calibrated to ensure accurate measurements of radiation.

The NRC staff reviewed PSU's periodic reviews of their RPP, and confirmed that PSU reviews its RPP at least annually. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 20.1101(c).

4) A constraint on air emissions of radioactive material to the environment

10 CFR 20.1101(d) states in part, that to implement the ALARA requirements of 10 CFR 20.1101(b), a constraint on air emissions of radioactive material to the environment, such that the individual member of the public likely to receive the highest dose will not be expected to receive a total effective dose equivalent in excess of 10 mrem (0.1 mSv) per year from these emissions.

In the LRA, PSU stated that the level of detail and content submitted by a PI, and subsequently evaluated by the RSO and UIC, is appropriate to the level of hazard for the material, quantity and intended use being requested. Among other factors are the anticipated incidents and releases, and response(s) to those incidents. The impacts on in-lab workers and the public (i.e. all areas outside the authorized work location[s]) are evaluated. Waste(s) generated, and handling, storage, and disposal procedures. The LRA includes descriptions of activities, as well as the fume hoods and glove boxes which may be used to control emissions.

The NRC staff reviewed the implementation of ALARA of the radiation protection program in regards to air emissions using the regulatory acceptance criteria in NUREG-1520. The LRA commits to a program to control and monitor airborne emissions. The NRC staff determined that the program includes sufficient training, procedures, and records to maintain exposures ALARA. Occupational exposure includes internal exposure to radioactive material as well as external exposure to radiation. PSU addresses exposures to personnel who have been trained to work with radioactive material but only work in the vicinity. Individuals who have been trained by EH&S and are working under a supervisor's authorization to use radioactive material or radiation producing equipment are considered "occupationally exposed" to radiation. Individuals not trained to work with radioactive material or radiation producing equipment are considered members of the public. Laboratories evaluate ventilation and respiratory system requirements during the authorization process to ensure that systems function properly

Airborne monitoring for personnel is specified dependent on the material in use and the experimental procedure, as defined in the authorization. Most of the facilities covered under SNM-95 do not require special ventilation equipment, as the materials under this license are primarily sealed sources. As described in the LRA, sealed sources do not require special ventilation.

In the LRA, PSU states that since almost all of the SNM in inventory is solid and most uses of SNM are for instrument setup and calibration or plated foils for fission chambers, it has been determined from previous experiments that airborne monitoring will not be needed frequently. The RSO and PI are responsible for assessing the material(s), experimental procedure(s), and potential accident scenarios to determine if or what type(s) of engineering controls and/or airborne monitoring might be required. The LRA states that respiratory protection equipment is available as needed for circumstances or experiments, and if needed, will comply with OSHA 29 CFR 1910.134, NRC, and/or other accepted standards (e.g. ANSI Z88.2 - *Practices for Respiratory Protection*, 1992).

Where required, activities involving dispersible material utilize fume hoods, glove boxes, disposable gloves, safety glasses and laboratory coats. Fume hoods are inspected annually as part of the University hood maintenance program. Hoods are removed from service if they do not meet the minimum standard or exceed the maximum standards as shown in Table 1 of the LRA. Atmospheric pressures inside glove boxes are to be maintained less than the surrounding air pressure whenever un-encapsulated SNM is inside the glove box. Negative air pressure is verified prior to each use of the device and periodically during operation.

The NRC staff reviewed PSU's air emissions program, and confirmed that an individual member of the public likely to receive the highest dose will not be expected to receive a total effective dose equivalent in excess of 10 mrem (0.1 mSv) per year from these emissions. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 20.1101(d).

For these reasons, the staff finds that the RPP provides reasonable assurance that PSU will satisfy the requirements in 10 CFR 20.1101(a) during the renewed license term. Therefore, the NRC staff finds that the RPP is acceptable.

4.2.2 Radiation Safety Training

10 CFR 70.22(a)(6) states that each application for a license shall contain the technical qualification, including training and experience of the applicant and members of his staff to engage in the proposed activities in accordance with the regulations in this chapter. 10 CFR 19.12(a) specifies training requirements for all individuals who in the course of employment are likely to receive in a year an occupational dose in excess of 100 millirem (1 mSv). The staff reviewed the applicant's training commitments against the acceptance criteria in NUREG-1520, Section 4.4.5.3. The following discussion identifies each acceptance criterion from NUREG-1520 and provides the staff's evaluation as to whether the information provided by the applicant meets the criterion:

(1) Design and implement an employee RP training program that complies with the requirements of 10 CFR Parts 19 and 20;

Section 4.2 of the LRA states that all radiation workers receive instruction in accordance with 10 CFR 19.12 prior to beginning work with licensed material. Radiation workers are initially trained by staff in the RPO and must pass a certification exam with a score of greater than or equal to 70 percent. The LRA provides that this instruction is web-based training followed by an exam covering the training information and an in-person training session on survey meters and techniques.

(2) Provide training, to all personnel and visitors entering restricted areas, that is commensurate with the health risk to which they may be exposed, or provide trained escorts;

Section 4.2 of the LRA describes the training program that each PI, user, and visitor must complete, regardless of prior experience. The content of the training generally follows that described in NUREG-1556 Vol. 7, "Program-Specific Guidance About Academic, Research and Development, and Other Licenses of Limited Scope, Including Electron Capture Devices and X-Ray Fluorescence Analyzers," Appendix J. In special circumstances, the RSO and Chair of the UIC may accept training provided at another institution if it is equivalent in content and received within the past 12 months.

(3) Provide a level of training based on the potential radiological health risks associated with that employee's work responsibilities;

Section 4.2.2 of the LRA describes additional specialized training. In addition to the general training, specialized training appropriate to the material used and for the hazards anticipated, will be provided by the PI and/or RSO. The LRA further provides that the need for specialized training is determined by the UIC during the review of the PIs authorization application.

(4) Incorporate, in the RP training program, the provisions of 10 CFR 19.12 and additional relevant topics such as: correct handling of radioactive materials; the storage, transfer, or use of radioactive material as relevant to the individual's activities; minimization of exposures to radiation and/or radioactive materials; access and egress controls and escort procedures; radiation safety principles, policies, and procedures; monitoring for internal and external exposures; monitoring instruments; contamination control procedures, including protective clothing and equipment; ALARA and exposure limits; radiation hazards and health risks; emergency response; and responsibility to report promptly any condition that may lead to, or cause, a violation of regulations and license or create unnecessary exposure;

The training requirements correspond to the training requirements specified in 10 CFR 19.12. An outline of the training subjects PSU presents and tests for was provided in "Penn State University Response to NRC Request for Additional Information" (ADAMS Accession Number ML15224A812). The training includes, but is not limited to understanding the radiological, chemical, and health hazards of the SNM requested and the requested experimental use, the need for physical security appropriate to the isotope and quantity of material requested; and the safety measures to be used appropriate to the requested isotope and quantity being requested.

(5) Review and evaluate the accuracy, effectiveness, and adequacy of the radiation protection training program curriculum and instructors, as applicable, at least every 3 years and to conduct refresher training at least every 3 years.

Section 4.2.3 of the LRA describes the annual standard refresher training provided to all individuals working with SNM material. The effectiveness of this training is evaluated through quarterly lab inspections where compliance with specific use requirements is checked. The LRA further provides that retraining may be required at any time if deemed necessary by the RSO, the UIC, or the supervisor of the user to ensure the performance of the user meets the requirements. Documentation of training is retained by EH&S and/or the ORP for at least three years.

Based on the staff's evaluation of the LRA pertaining to the acceptance criteria in Section 4.4.5.3 of NUREG-1520, the staff finds PSU provides reasonable assurance that the PSU training program will continue to ensure that personnel are qualified by reason of training and experience to safely use licensed material in accordance with the 10 CFR 70.23(a)(2) requirements. The PSU training instruction and information on the following topics:

- Storage, transfer, or use of radiation and radioactive material,
- Health protection problems associated with exposure to radiation and SNM,
- Precautions and procedures to minimize exposure,
- Applicable provisions of Commission regulations and licenses for the protection of personnel from exposure to radiation and radioactive material,
- Responsibilities to report promptly any condition which may lead to or cause a violation of Commission regulations and licenses or unnecessary exposure to radiation and radioactive material, and
- Appropriate response to warnings made in the event of any unusual occurrence may involve exposure to radiation and radioactive material.

The NRC staff concludes that the program meets the criteria in NUREG-1520. Therefore, the NRC staff finds that this program is acceptable.

4.2.3 Ventilation and Respiratory Protection Programs

10 CFR 70.22(a)(7) states that each application for a license shall contain a description of equipment and facilities which will be used by the applicant to protect health and minimize danger to life or property (such as handling devices, working areas, shields, measuring and monitoring instruments, devices for the disposal of radioactive effluents and wastes, storage facilities, criticality accident alarms, etc.). Acceptance criteria for an applicant's ventilation and respiratory protection program is found in NUREG-1520, Section 4.4.6.3 (Ref 16). PSU's use of SNM under SNM-95 is not expected to produce airborne activity warranting respiratory protection or bioassay. If any new uses or locations in the future produce airborne activity warranting respiratory protection or bioassay, PSU must submit a license amendment request (LAR). Section 4.5 of the LRA provides that, any future amendment requests that require ventilation will have systems will comply with OSHA 29 CFR 1910.134, NRC, and/or other accepted standards, which may include American Conference of Government Industrial Hygienists, Industrial Ventilation: A Manual of Recommended Practice for Design; Energy Research and Development Administration, Nuclear Air Cleaning Handbook, ASHRAE Handbook; and ANSI/AHIA Z9.5 – Lab Ventilation Standard.

The NRC staff has determined that PSU's use of SNM is not expected to produce airborne activity warranting respiratory protection or bioassay, and therefore compliance with this regulation is not applicable. If PSU employs new uses or locations in the future that produce airborne activity warranting respiratory protection or bioassay, PSU must submit an LAR and the NRC will review PSU's program against the applicable criteria.

4.2.4 Radiation Survey and Monitoring Programs

10 CFR 70.22(a)(8) states that each application for a license shall contain proposed procedures to protect health and minimize danger to life or property (such as procedures to avoid accidental criticality, procedures for personnel monitoring and waste disposal, post-criticality accident

emergency procedures. The staff reviewed the applicant's radiation survey and monitoring program commitments against the acceptance criteria in NUREG-1520, Section 4.4.7.3 (Ref. 16). The following discussion identifies each acceptance criterion from NUREG-1520 and summarizes the staff's evaluation as to whether the information provided by the applicant meets the criterion:

(1) Provide radiation survey and monitoring programs that are necessary to comply with the requirements of 10 CFR Part 20 and that are reasonable to evaluate the magnitude and extent of radiation levels, the concentrations or quantities of radioactive material, and the potential radiological hazards.

PSU controls possession and use of radioactive materials in accordance with "The Rules and Procedures for Users of Radioactive Material at The Pennsylvania State University" (The Rules and Procedures) approved by the UIC. The Rules and Procedures requires compliance with NRC regulations, and includes general requirements for each project using radioactive material or sources to utilize appropriate radiation detection equipment to ensure that potential contamination is adequately controlled. The Rules and Procedures describe how surface contamination surveys are made by scanning, wiping, or smearing. The frequency depends upon the potential for contamination, as prescribed in either written procedures or material authorizations. Surveys are also made routinely during or after experiment changes, maintenance, or other activities where there is a potential for surface contamination. After reviewing PSU's radiation survey and monitoring program, the NRC staff concludes that the procedures are reasonable to evaluate the magnitude and extent of radiation levels, the concentration of radioactive material, and the potential radioactive hazards because the program is consistent with the acceptance criteria in NUREG-1520.

(2) Prepare written procedures for the radiation survey and monitoring program that include an outline of the program objectives, sampling procedures, data analysis methods, types of equipment and instrumentation to be used, frequency of measurements, recordkeeping and reporting requirements, and actions to be taken when measurements exceed 10 CFR Part 20 occupational dose limits or administrative levels established by the RPO.

PSU controls possession and use of radioactive materials in accordance with The Rules and Procedures. The Rules and Procedures outline the possession, use, and transfer of all licensed material on university-controlled property and presents the applicant's general procedures for conducting routine radiological surveys. Other procedures are utilized for individual experiments. The procedures discuss the purpose of conducting surveys and describe how equipment is obtained, how instruments are inspected and tested for operability, how the instruments are used, and how surveys are documented. It specifies the frequency and techniques for surveys, as well as the equipment, records, and reporting requirements for surveys and monitoring. The NRC staff concludes that the Rules and Procedures include an outline of the program objectives, sampling procedures, data analysis methods, types of equipment and instrumentation to be used, frequency of measurements, recordkeeping and reporting requirements, and actions to be taken when measurements exceed 10 CFR Part 20 occupational dose limits or administrative levels established by the RPO, consistent with the NUREG-1520 criteria, and are therefore acceptable.

(3) Design and implement a personnel monitoring program for external occupational radiation exposure that outlines methods or procedures to do the following:

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- Identify the criteria for worker participation in the program,
- Identify the types of radiation to be monitored,
- Specify how exposures will be measured, assessed and recorded,
- Identify the type and sensitivity of personal dosimeters to be used, when they will be used, and how the collected data will be processed and evaluated, and
- Identify the plant's administrative exposure levels or action levels at which actions are taken to investigate the cause of exposures exceeding these levels.

PSU describes personnel monitoring requirements in section 4.3.3 of the LRA. Potential exposure levels for individuals are evaluated by the RSO and UIC when each proposed project is reviewed and approved. PSU uses a National Voluntary Laboratory Accreditation Program certified vendor. Potential exposure levels for individuals are evaluated by the RPO staff during the registration and training of radiation workers. Only a small fraction of radiation workers at the facilities enter designated radiation areas and require dosimeter monitoring under 10 CFR 20.1502, "Conditions Requiring Individual Monitoring of External and Internal Occupational Dose." Dosimeters are processed on a quarterly basis and provide the dose record. Radiation monitoring is supplemented with pocket ionization chambers to allow the estimation of personnel dose in between badge readouts. Pocket ionization chambers are calibrated periodically and the results are recorded at preset levels. The RSO specifies that dosimetry is required for individuals who are likely to receive over 10 percent of the limits specified in 10 CFR 20.1502. Therefore, The NRC staff concludes that PSU's personnel monitoring program for external occupational radiation exposures outlines methods or procedures that are consistent with the applicable NUREG-1520 criteria.

(4) Design and implement a personnel monitoring program, for internal occupational, radiation exposures, based on the requirements of 10 CFR 20.1201, 20.1204, and 20.1502(b), that outlines methods or procedures to do the following:

- Identify the criteria for worker participation in the program,
- Identify the type of sampling to be used, the frequency of collection and measurement, and the minimum detection levels,
- Specify how worker intakes will be measured, assessed, and recorded,
- Specify how the data will be processed, evaluated, and interpreted, and
- Identify the plant's administrative exposure levels or the levels at which actions are taken to investigate the causes of exposures exceeding these levels.

Although there is no current use of authorized SNM material that could result in an individual's intake of the material because they are all in sealed form, PSU has a personnel monitoring program. Potential exposure levels for individuals are evaluated by the RSO and UIC when each proposed project is reviewed and approved. The need for bioassay would be identified before any such project was approved. PSU commits to monitoring any individual who could receive in excess of 10 percent of the Annual Limit on Intake. Potential exposure levels for individuals are evaluated by the RPO staff during the registration and training of radiation workers. Only a small fraction of radiation workers at the facilities enter designated radiation areas and require monitoring under 10 CFR 20.1502, "Conditions Requiring Individual Monitoring of External and Internal Occupational Dose." Dosimeters are processed on a quarterly basis and provide the dose record. Radiation monitoring is supplemented with pocket ionization chambers to allow the estimation of personnel dose in between badge readouts.

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Pocket ionization chambers are calibrated periodically and the results are recorded at preset levels. Therefore, The NRC staff concludes that PSU's personnel monitoring program for internal occupational radiation exposures outlines methods or procedures satisfy the criteria in NUREG-1520 and are therefore acceptable.

(5) Design and implement an air sampling program in areas of the plant identified as potential airborne radioactivity areas, to conduct airflow studies and to calibrate and maintain the airborne sampling equipment in accordance with the manufacturer's recommendations;

PSU uses local airborne monitoring equipment to monitor potential exposures to individuals. The RSO and PI, as well as other experienced RSEC staff assess the materials, procedures, and potential releases of radioactive material scenarios when each proposed project is reviewed and approved. To complete assessments, the RSO and PI may use point-of-use or local airborne monitoring equipment in the vicinity of the experiment. As a preventative method, PSU uses engineering solutions such as hot cells, fume hoods, and glove boxes. Additionally, PSU evaluates airflow studies, face velocities of fume hoods, and negative pressures. The LRA also describes the calibration and record keeping of all instruments. Therefore, PSU's local airborne monitoring program identifies potential airborne radioactivity areas, conducts airflow studies and that PSU calibrates and maintains the airborne sampling equipment in accordance with the manufacturer's recommendations. The NRC staff concludes that the program meets the criteria in NUREG-1520, and is therefore acceptable.

(6) Implement additional procedures, as may be required by 10 CFR Part 20 and the ISA Summary, to control the concentration of airborne radioactive material (e.g., control of access, limitation of exposure times to licensed materials, and use of respiratory protection equipment);

The NRC staff has determined that PSU's use of SNM is not expected to produce airborne activity warranting respiratory protection or bioassay, and therefore compliance with this regulation is not applicable. If PSU employs new uses or locations in the future that produce airborne activity warranting respiratory protection or bioassay, PSU must submit an LAR and the NRC will review PSU's program against the applicable criteria.). Therefore, the NRC staff concludes that this criterion is not applicable to PSU's SNM-95.

(7) Conduct a contamination survey program in areas of the facility identified in the ISA Summary most likely to be radiologically contaminated (the program must include the types and frequencies of surveys for various areas of the facility and the action levels and actions to be taken when contamination levels are exceeded);

PSU is not required to have an ISA because it is not engaged in activities listed in 10 CFR 70.60. However, they do employ methods to control surface contamination. The surface contamination surveillance program, includes frequency of surveys, tolerance levels, and action levels. The RSO or UIC review the survey frequency of each proposed project when it is reviewed and approved. Acceptable surface contamination levels are taken from Regulatory Guide 8.24, "Health Physics Surveys During Enriched Uranium, -235 Processing and Fuel Fabrication". Contamination in excess of action levels require immediate actions to decontaminate the area. The staff concludes that although this criterion is not applicable to PSU's SNM-95, PSU's program meets the criteria in NUREG-1520.

(8) Implement the facility's corrective action program when the results of personnel monitoring, personnel contamination monitoring, or contamination surveys exceed the applicant's administrative personnel contamination levels;

Due to the nature of the limited materials and uses, PSU is not required to have a formal corrective action program. Any deficiencies which are identified are reviewed during administrative update reviews and the annual review of radiation protection activities. Therefore, the NRC staff concludes that this criterion is not applicable to PSU's SNM-95.

(9) Use equipment and instrumentation with sufficient sensitivity for the type or types of radiation being measured and calibrate and maintain equipment and instrumentation in accordance with manufacturers' recommendations or applicable ANSI standards;

The LRA describes the variety of portable and fixed instrumentation at the RPO applicable to the materials and their applied uses under the license. Survey instruments are calibrated in-house at PSU with a National Institute of Standards and Technology traceable Cesium-137 calibrator held under a State license. Radiation survey instruments are calibrated annually and contamination survey instruments are calibrated every 3 years. Instruments include check sources for daily use and radiation workers are trained to perform operational checks. The NRC finds that PSU uses equipment and instrumentation with sufficient sensitivity for the types of radiation being measured and calibrate and maintain equipment and instrumentation in accordance with manufacturer's recommendations. The NRC staff concludes that the program meets the criteria in NUREG-1520, and is therefore acceptable.

(10) Establish policies to ensure that equipment and materials removed from restricted areas to unrestricted areas are not contaminated above the release levels presented in Appendix A, "Acceptable Surface Contamination Levels," to Regulatory Guide 8.24.

PSU's surface contamination levels were provided in Attachment 2 of the LRA. PSU describes acceptable surface contamination levels taken from Regulatory Guide 8.24, "*Health Physics Surveys During Enriched Uranium-235 Processing and Fuel Fabrication.*" Contamination in excess of acceptable levels require immediate actions to decontaminate the area. The NRC staff finds that PSU has established policies to ensure that equipment and materials removed from restricted areas to unrestricted areas are not contaminated above the release levels presented in Appendix A, "Acceptable Surface Contamination Levels," to Regulatory Guide 8.24. Therefore, the NRC staff concludes that PSU has established policies that meet the criteria in NUREG-1520, and is therefore acceptable.

(11) Leak-test all sealed sources consistent with direction provided in Appendix C, "Leak Test Requirements," to Regulatory Guide 8.24 or the applicable regulations for the materials involved (e.g., 10 CFR 31.5(c)(2) has direction for leak testing of certain byproduct devices);

Section 4.3.5 of the LRA provides that leak testing of sealed sources is conducted by the RPO in accordance with conditions 17 and 18 of the existing license. Conditions 17 and 18 are consistent with the guidance provided in Regulatory Guide 8.24 (NRC, 2012). The NRC staff finds that PSU's process of leak testing sealed source are consistent with direction provided in Appendix C, "Leak Test Requirements," to Regulatory Guide 8.24. Therefore, the NRC staff concludes that the program meets the criteria in NUREG-1520 and is acceptable.

(12) Establish and implement an access control program that ensures that (1) signs, labels, and other access controls are properly posted and operative, (2) restricted areas are established to prevent the spread of contamination and are identified with appropriate signs, and (3) step-off pads, change facilities, protective clothing facilities, and personnel-monitoring instruments are provided in sufficient quantities and locations;

Section 4.7 of the LRA describes the physical security and control of SNM under SNM-95. The LRA provides that the normal SNM storage location is [REDACTED] shown in Attachment 5 of the application. The [REDACTED] facility is secured [REDACTED]. Access is limited to people that are deemed "trustworthy and reliable" and have the facility Director's approval. The LRA further provides that [REDACTED]. In addition to the physical security of the [REDACTED] building, most of the SNM is normally stored [REDACTED]. The [REDACTED] will be posted for use of radioactive material in accordance with 10 CFR 20.1902. All radioactive material will be labeled in accordance with 10 CFR 20.1904 and University requirements. NRC staff finds that PSU's access control program ensures that signs, labels, and other access controls are properly posted and operative; restricted areas are established to prevent the spread of contamination and are identified with appropriate signs, and step-off pads, change facilities, protective clothing facilities, and personnel-monitoring instruments are provide in sufficient quantities and locations. Therefore, The NRC staff concludes that PSU's access control program meets the criteria in NUREG-1520 and is acceptable.

(13) Establish a radiation reporting program consistent with the requirements of 10 CFR Parts 19 and 20.

PSU describes its RPP, which includes a documented program to ensure that occupational radiological exposures are ALARA; an organization with adequate qualification requirements for the radiation protection personnel; approved, written radiation protection procedures and radiation work permits (RWPs) for radiation protection activities radiation protection training for all personnel who have access to restricted areas; a program to control airborne concentrations of radioactive material with engineering controls and respiratory protection; a radiation survey and monitoring program that includes requirements for controlling radiological contamination within the facility and monitoring of external and internal radiation exposures; other programs to maintain records, report to the NRC in accordance with 10 CFR Part 20 and 10 CFR Part 70 and correct for releases of radioactive material at the facility. The NRC staff finds that during the renewed license term the applicant's RPP is consistent with the requirements of 10 CFR Parts 19 and 20. Therefore, the NRC staff concludes that PSU's RPP meets the criteria in NUREG-1520 and is therefore acceptable.

The PSU LRA does not propose any significant changes to the radiation survey and monitoring programs, which have been successfully implemented for many years. Based on the staff's evaluation of PSU's commitments to follow the acceptance criteria in Section 4.4.7.3 of NUREG-1520 (Ref. 16), the staff finds that the application provides reasonable assurance that the proposed equipment and procedures to be used in the radiation survey and monitoring programs will continue to adequately protect health and minimize danger to life and property as required by 10 CFR 70.23(a)(3) and (a)(4). Therefore, the NRC staff finds that these programs are acceptable.

4.2.5 Additional Program Requirements

Each licensee shall maintain records of the RPP, including the provisions of the program, survey records, audits and other records identified in Subpart L of 10 CFR Part 20. Each licensee shall make reports and notifications, including theft or loss, notification of incidents, and other reports as required by Subpart M of 10 CFR Part 20. The staff reviewed the applicant's additional program commitments against the acceptance criteria in NUREG-1520, Section 4.4.9.3 (Ref 16). The following discussion identifies each acceptance criterion from NUREG-1520 and summarizes the staff's assessment of whether the information provided in the application meets the criterion.

1) Maintain records of the RP program (including program provisions, audits, and reviews of the program content and implementation), radiation survey results (air sampling, bioassays, external-exposure data from monitoring of individuals, internal intakes of radioactive material), and results of its corrective action program referrals, RWPs, and planned special exposures. Section 11.3 of the PSU's LRA describes the records to be retained, as specified by 10 CFR Part 20, Subpart L. All required records are maintained by the RPO and/or the ORP either electronically or in hardcopy. The LRA provides that Electronic records are maintained on PSU's network storage which is backed up regularly. Paper records are maintained in an office environment or archive facility to ensure longevity. The NRC finds that PSU's record keeping program facilitates the maintenance of records of the RPP, radiation survey results, RWPs, and planned special exposures. The NRC concludes that PSU's record keeping program meets the criteria in NUREG-1520 and is therefore acceptable.

(2) Establish a program to report to the NRC, within the time specified in regulations, incidents specified in 10 CFR 20.2202, "Notifications of Incidents," and safety significant specified in 10 CFR 70.74. Refer reportable events to the facility's corrective action program and report to the NRC both the corrective action(s) taken (or planned) to protect against a recurrence and any proposed schedule to achieve compliance with applicable license conditions.

As provided in the LRA, all PIs and users are instructed to notify the RPO of incidents involving radioactive material. The university Rules and Procedures lists the dedicated phone number that is monitored by the EH&S staff. PSU describes its program for notifying the NRC of incidents involving radiation or radioactive materials in accordance with 10 CFR 20.2201, 2202, 2203, and 10 CFR 70.50. According to the LRA, reports are made to the Headquarters Operations Center and pertinent local or state agencies. The NRC finds that PSU's program allows for the reporting of incidents in the time, incidents and safety significance specified in regulations. The NRC concludes that PSU's reporting program meets the criteria in NUREG-1520, and is therefore acceptable.

(3) Prepare and submit to the NRC an annual report required by 10 CFR 20.2206(b).

The LRA describes its process to prepare and submit an annual report to the NRC by the UIC or RSO, or designee, within the time limits specified by 10 CFR 20.2206(b). The NRC concludes that PSU's process of preparation and submission of annual reports to the NRC meets the criteria in NUREG-1520 and is therefore acceptable.

(4) Refer to the facility's corrective action program any incident that results in an occupational exposure to radiation that exceeds the dose limits in Appendix B to 10 CFR Part 20 or in 10 CFR

70.74, and report to the NRC both the corrective action taken (or planned) to protect against a recurrence and the proposed schedule to achieve compliance with the applicable license condition or conditions.

Due to the nature of the limited materials and uses, PSU is not required to have a formal corrective action program. However, PSU takes an active role in compliance and safety, reviewing any deficiencies which are identified during administrative update reviews and the annual review of radiation protection activities. The NRC concludes that this criterion is not applicable to SNM-95.

PSU's LRA does not propose any significant changes to the recordkeeping and reporting commitments discussed in sections 4 and 10 of its application. Based on the staff's evaluation of the application and PSU's submission to follow PSU's Rules and Practices, the staff finds the application provides reasonable assurance that PSU will comply with the requirements in 10 CFR 20.2202, 20.2206 and 70.74. Therefore, the NRC staff finds that these program commitments are acceptable.

4.3 Evaluation Findings

The applicant has committed to an acceptable RPP that includes the following:

- An effective, documented program to ensure that occupational radiological exposures are ALARA,
- An organization with adequate qualification requirements for the radiation protection personnel,
- Approved, written radiation protection procedures and RWPs for radiation protection activities radiation protection training for all personnel who have access to restricted areas,
- Radiation protection training for all personnel who have access to restricted areas,
- A program to control airborne concentrations of radioactive material with engineering controls and respiratory protection,
- A radiation survey and monitoring program that includes requirements for controlling radiological contamination within the facility and monitoring of external and internal radiation exposures, and
- Other programs to maintain records; report to the NRC in accordance with 10 CFR Part 20 and 10 CFR Part 70; and appropriately respond to, investigate, and prevent incidents and accidents involving radiological exposures or uncontrolled releases of radioactive material.

The NRC staff concludes there is reasonable assurance that during the renewed license term the applicant's radiation protection program will meet the applicable requirements of 10 CFR Parts 19, 20, and 70 as discussed in Section 4.2 above.

5.0 Nuclear Criticality Safety

5.1 Purpose of Review

The purpose of this review was to determine whether PSU's Nuclear Criticality Safety (NCS) Program is adequate to support safe operation of the facility, as required by 10 CFR Part 70.

The NCS programmatic review determined that the licensee’s NCS Program is adequate to meet the applicable regulatory requirements of 10 CFR Part 70, and provides reasonable assurance that licensed activities will be conducted safely and will be subcritical under both normal and credible abnormal conditions.

5.2 Staff Review and Analysis

The staff conducted its review in accordance with the applicable acceptance criteria in Chapter 5, “Nuclear Criticality Safety,” of NUREG-1520, Rev. 2 (Ref. 16). NUREG-1520 is the Standard Review Plan for fuel cycle facilities licensed under 10 CFR Part 70. The staff recognizes that because PSU is not a fuel cycle facility, not all regulatory requirements and program elements discussed in Chapter 5 of NUREG-1520 apply. For example, compliance with Subpart H of Part 70 is not required. The applicable acceptance criteria are discussed below.

5.2.1 Authorized Possession and Use of Special Nuclear Material

The LRA requests a possession limit of [REDACTED]. The types and quantities of SNM stated in the LRA are insufficient to form a minimum critical mass, and therefore criticality is not credible. This is shown in Table 2.

Table 2. Possession limits compared to critical mass.

	Isotope		
	²³⁵ U	²³³ U	²³⁹ Pu
Possession Limit	REDACTED		
Critical Mass	700	520	450

The total quantity of SNM is less than 450 grams, and therefore does not meet the definition of a critical mass as defined in 10 CFR 70.4, “Definitions”.

5.3 Evaluation Findings

The NRC staff has determined that the licensee is not required to meet the requirements of Subpart H to 10 CFR Part 70, or to establish and maintain a criticality alarm system under 10 CFR 70.24(a). Criticality is not credible with the stated type and quantity of SNM. As such, a NCS Program is unnecessary.

6.0 Fire Protection

6.1 Purpose of Review

The purpose of this review was to determine, with reasonable assurance, that the applicant designed a facility that provides adequate protection against fires and explosions that could affect the safety of licensed materials and thus present an increased radiological risk. The review also established that the application considered radiological consequences of fires and instituted suitable safety controls to protect workers, the public, and the environment.

6.2 Staff Review and Analysis

6.2.1 Fire Hazards Analysis

Section 7.4.3.2 of the NRC's SRP (Ref. 16) states that a licensee should conduct a fire hazards evaluation for each facility (or part), that if totally consumed by fire, could release special nuclear material in quantity and form that could cause at least an intermediate consequence, as defined in 10 CFR 70.61. The staff finds that a formal fire hazards analysis is not required because of the low risk to public health and safety of the materials covered by the SNM-95 license. The activities described in the LRA do not meet the conditions in 10 CFR 70.60 which would require an ISA of hazards, including fires. In accordance with 10 CFR 70.60, the facility is not required to have an ISA of hazards, including fires

6.2.2 Facility Design

The licensee provided that three buildings at the University Park campus contain SNM. The majority of the SNM is in the [REDACTED].

All [REDACTED] buildings were built in accordance with Pennsylvania Department of Labor and Industry Title 34. Renovations, alterations, and additions since 2004 have been designed and constructed to the Pennsylvania Uniform Construction Code (State-wide building code) which includes the National Electrical Code (National Fire Protection Association [NFPA] 70), International Fire Code, and International Fuel Gas Code.

The transport of licensed material between licensed locations [REDACTED] is accomplished by [REDACTED]. The transportation, packaging, marketing, accident reporting, and training are conducted in accordance with 10 CFR 71.5, "Transportation of licensed material."

[REDACTED]

The [REDACTED], and is constructed of non-combustible materials and features 1 hour fire rated corridors with self-closing fire doors. REDACTED]

In renovated areas [REDACTED], emergency power circuits are provided to all required exit signs and light fixtures to provide constant illumination of exits and egress paths. In older areas, emergency power is provided to exit signs and lights by emergency battery packs connected to the building electrical system for charging.

When not in use, SNM is stored [REDACTED]

[REDACTED]

The [REDACTED] is constructed of non-combustible materials and features self-closing fire doors. An automatic sprinkler system is installed in some of the SNM storage areas. Emergency power is provided to exit signs and lights by emergency battery packs which are connected to the building's Alternating Current electrical system for charging.

The SNM use and storage locations [REDACTED]. All alarmed areas also have motion sensors. The combustible loading is of a low quantity, consisting of mostly metal enclosed electronics, tools, metal shelving, books and manuals, and paper products.

[REDACTED]

The [REDACTED]. [REDACTED] where SNM is stored are constructed of concrete block walls and floors, and are [REDACTED]. When not in use, the SNM is stored [REDACTED]. The building construction features fire rated corridors and doors with self-closing mechanisms.

Normal and emergency power circuits are provided to all required exit signs and specific light fixtures to provide constant illumination of exits and exit-ways. Ventilation is for room air comfort only as there are no fume hoods or other experimental specific exhaust drops.

Portable fire extinguishers are installed throughout [REDACTED]. These extinguishers are maintained in operable condition, inspected quarterly, and tested by trained technicians of the PSU Office of Physical Plant.

6.2.3 Fire Protection and Detection Systems

A fire detection and alarm system is installed in accordance with National Fire Alarm and Signaling (NFPA) Code 72, and the Pennsylvania Uniform Construction Code standards. The fire alarm system is actuated by manual pull stations (with horn/strobe units to notify occupants) or automatic smoke detectors. The fire detection and alarm system is monitored 24/7 by the PSU Police Dispatch Center; the system is maintained in operable condition, routinely inspected, and tested by trained technicians of the PSU Office of Physical Plant.

The Pennsylvania codes do not require evacuation drills. University buildings have, or are in the process of developing, a written evacuation plan covering exit locations, designated meeting areas, and fire extinguisher locations.

6.2.4 Training and Emergency Response

In section 7.1.1 of the LRA, PSU states that fire extinguisher training for faculty, staff, and students is voluntary. Training consists of classroom instruction on fire prevention for offices and laboratories, types and uses of extinguishers, extinguisher use, and practice with a hands-on extinguisher simulator.

Section 2.9 of the LRA provides that the local fire department is trained in hazardous material response for chemical and radiological incidents in accordance with State of Pennsylvania standards. The PSU Hazardous Materials response team and RPO provide support when radiological materials are involved in an incident. PSU has met with the local fire department in the past to discuss the hazards, including radiological, in University laboratories. The RPO, working through the PSU EH&S Fire Marshall, will regularly inform the fire department chiefs where SNM is located and discuss response measures in the event of an incident.

6.3 Evaluation Findings

The staff reviewed the fire hazards and facility fire protection, and the fire safety and emergency responses in PSU's application. The fire protection and detection systems are installed in accordance with the applicable codes and standards and portable fire extinguishers are available and maintained by the appropriately qualified staff.

The NRC staff determined that PSU has met the applicable guidance provided in the NFPA standards for fire alarms and fire extinguishers. Furthermore, given a fire, a release of the SNM is unlikely because the SNM is in a form that is unlikely to volatilize or otherwise readily disperse as a result of a fire. Additionally, the NRC staff determined that the buildings and renovations were built to applicable codes at the time of construction. The buildings are made of non-combustible materials. SNM is stored in safes that have adequate fire ratings

PSU provided information on potential fire hazards, fire consequences, and required controls, and the staff finds the procedures meet the requirements of 10 CFR 70.22(a)(7) and 70.65(a). The NRC staff determined that PSU demonstrated compliance with the performance requirements of 10 CFR 70.61 for fire protection, related to postulated accident scenarios.

The NRC staff has determined that the applicant has adequate fire equipment, procedures, and a facility design to meet the applicable requirements 10 CFR 70.23.

In addition, the NRC staff determined that, in the event of a fire, the local fire department is trained to respond and address any chemical or radiological hazards, and are supported by the PSU Hazardous Materials response team and the RPO.

7.0 Decommissioning Funding Plan and Financial Assurance

7.1 Purpose of Review

The NRC staff conducted this review to determine with reasonable assurance that the licensee will be able to decommission the facility safely and in accordance with NRC regulations. Nuclear facilities licensed under 10 CFR Part 70 are required to comply with financial assurance and recordkeeping requirements in 10 CFR 70.25, "Financial Assurance and Recordkeeping for Decommissioning." In addition, licensees must submit decommissioning plans for NRC approval in accordance with 10 CFR 70.38(g).

7.2 Staff Review and Analysis

Financial assurance and decommissioning funding requirements are found in 10 CFR 70.22(a)(9) and 70.25, which require licensed nuclear facilities to establish financial assurance to cover the estimated costs for site decommissioning, decontamination and reclamation. 10 CFR 70.25(a)(2) requires an applicant for a specific license that authorizes possession and use of unsealed SNM in certain quantities to submit a DFP. 10 CFR 70.25(e)(2) requires a licensee, at the time of license renewal, to resubmit a DFP with adjustments that are necessary to account for any changes to costs or the amount of contamination. The NRC staff reviewed the DFP in accordance with the staff guidance in NUREG-1757, Vol. 3, Rev. 1, Section 4 and Appendix A.3 (Reference 22).

7.2.1. Decommissioning Funding Plan

The licensee submitted a revised version of the DFP on December 14, 2016 (ADAMS Accession Number ML16355A178) (Ref. 13). The previous DFP was submitted by letter dated December 19, 2013 (ADAMS Accession Number ML13358A287) (Ref. 23).

The NRC staff reviewed the existing DFP, self-guarantee agreement (SGA) and the standby trust agreement (STA) as part of the verification that PSU meets the requirements of 10 CFR 70.22(a)(9). Based on this review, the NRC staff determined that the financial assurance mechanisms maintained by PSU are adequate to ensure that sufficient funds will be available to carry out all required decommissioning activities prior to license termination, and therefore, meets the requirements in 10 CFR 70.25(a), 10 CFR 70.25(e), and 70.25 (f).

7.2.2. Detailed Cost Estimate

10 CFR 70.25(e)(1)(i)-(iv) requires that the DFP, submitted for review and approval by NRC, contain a detailed cost estimate for decommissioning that reflects: the cost of an independent contractor to perform the work; the cost of meeting the 10 CFR 20.1402 criteria for unrestricted use; the volume of contamination in the onsite subsurface material that will require remediation; an adequate contingency factor; identification and justification for key assumptions used in the cost estimate; a description of the method of assuring funds will be available for decommissioning; and a certification statement by the licensee that financial assurance has been provided in the amount of the cost estimate for decommissioning.

The cost estimate includes: a description of the facility where the SNM and source materials are used and stored; types and quantities of material; a description of how the materials are used; quantities of materials or waste accumulated prior to shipping or disposal; number and dimensions of facility components; labor costs for planning and preparation of the facility for decommissioning of the radioactive facility; final surveys; packaging, shipping, and disposal of radioactive wastes; equipment and supplies; and NRC oversight costs.

The DFP accounts for components and labor categories by major decommissioning task. The licensee states that a third party contractor will be used for decommissioning. The estimate does not take credit for salvage value from a potential sale of assets. A 25-percent contingency factor was added to the Decommissioning Cost Estimate (DCE). The total DCE is \$261,718. The DFP includes salary and labor rate data for the State of Pennsylvania obtained from the Bureau of Labor Statistics and Certified Health Physicist Salary Survey table. The DFP also includes non-labor costs for packing dry, liquid, and drum waste. The costs take into account the volume, number of containers, types of containers, and the container unit costs. Additionally, the DFP includes non-labor costs for shipping of waste.

In the LRA, PSU stated that all waste with less than or equal to 120-day half-life are held for decay for at least 10 half-lives, then surveyed and released as non-radioactive waste. Liquid waste with half-lives greater than 120 days are disposed via sanitary sewer by radiation protection staff to ensure legal release limits are not exceeded. Areas with subsurface contamination are not known to exist. Areas external to buildings where contamination has occurred are not known to exist.

By letter dated December 19, 2016 (ADAMS Accession Number ML16363A358) (Ref. 24), the licensee submitted a certification of financial assurance from its Associate Vice President for Finance and Corporate Controller stating that its SGA would provide financial assurance for the cost of decommissioning activities. The SGA provides that the guarantee made by PSU, a nonprofit university, organized under the laws of the Commonwealth of Pennsylvania, to the NRC, on behalf of the university as licensee. The SG agreement states both license numbers, SNM-95 (Docket 70-113) and R-2 (Docket 50-005), issued by the NRC. PSU has full authority and capacity to enter into this self-guarantee by the bylaws of the Trustees of the Pennsylvania State University. The SGA is signed by the Associate Vice President for Finance and Corporate Controller of PSU. The NRC staff has reviewed PSU's cost estimate and determined that the estimate reflects the costs to carry out all required decommissioning activities prior to license termination; assumes costs for an independent third party contractor; includes the costs of meeting the 10 CFR 20.1402 criteria for unrestricted use; includes a statement that there is no onsite subsurface material containing residual radioactivity that will require remediation; includes a contingency factor of 25 percent; identifies and justifies key assumptions; describes the methods of assuring funds through its cost estimate adjustments; and includes the previously submitted and approved certification statement that financial assurance has been provided in the amount of the cost estimate. Therefore, the NRC has determined that the licensee meets the requirements of 10 CFR 70.25(e)(1)(i)-(iv).

7.2.3 Key Assumptions in the Decommissioning Cost Estimate

The regulations in 10 CFR 70.25(e)(1)(ii) requires identification of and justification for using the key assumptions contained in the DCE. In the DFP submission, the licensee states that the costs for waste on-hand generated during decommissioning will be based on the prior 3 years of waste shipment data. The planning and preparation work days estimates are based on worst case values from Ecology Services, Inc. and Chase Environmental, Inc., for the particular activities.

The licensee identified several assumptions related to the number of rooms where materials would be located, waste disposal costs, and planning and preparation work day estimates. The assumptions were accompanied with justifications based upon current materials being used and their storage location, worst case scenario values from relevant industry developed figures, and past experience of actual site costs.

The cost estimate also clearly stated that it does not take credit for any salvage value that might be realized from the sale of potential assets.

The NRC staff determined that the key assumptions have been adequately justified because they meet the criteria in NUREG-1757, Volume 3 (Reference 22). Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 70.25(e)(1)(ii).

7.2.4 Financial Assurance Mechanism

10 CFR 70.25(e)(1)(v) requires that the DFP include a signed original, or, if allowed, a copy, of the financial instrument to be used to cover the decommissioning costs. In addition, 10 CFR 70.25(f)(2)(ii) requires that a standby trust agreement be established to receive funds from a surety method such as insurance if such a mechanism is used.

By letter dated December 19, 2016 (ADAMS Accession Number ML16363A358) (Ref. 24), the licensee submitted an update to the SGA as its method of assuring funds for decommissioning.

The SGA (Ref. 24) contained the required elements including an updated current cost estimate in the agreement provisions, Chief Financial Officer letter, auditor's special report, and audited financial statements; the NRC staff approved the SG agreement by letter dated June 21, 2017, (Ref. 25).

By letter dated June 21, 2017, the NRC staff approved (Ref. 25) the latest SG agreement. The STA is "evergreen" in that it continues until the NRC approves another trustee. The previously approved financial instruments continue to cover the cost estimate for decommissioning.

7.3 Evaluation Findings

The NRC staff has reviewed the SGA and the STA. Based on this review, the NRC staff has determined that the financial assurance mechanisms submitted by the licensee meet the criteria in NUREG-1757, Volume 3 (Reference 22) and are therefore adequate to ensure that sufficient funds will be available to carry out all required decommissioning activities prior to license termination.

8.0 Management Measures

8.1 Purpose of Review

10 CFR 70.22(8) requires that the applicant submit a description of the proposed procedures that will be used to protect health and minimize danger to life or property. Among those procedures are configuration control, maintenance, training, procedures, audits and assessments, and records management.

8.2 Staff Review and Analysis

The LRA contains the following elements:

- Procedures Review - The applicant commits to continuous improvement and performs a review of procedures, policies, and practices at least annually as part of the annual report to the UIC on the status of the radiation protection program. Experiences with SNM is used as opportunities to examine, and revise if needed, procedures, policies, practices, and training.
- Audits - All radioactive material use locations are inspected following license condition 15 by the RPO or laboratory staff. Audits include, but not limited to, checks of postings and labeling, waste handling, security, meters and instrumentation, training status, use of personal protective equipment, and general lab safety. Audits are reviewed and signed-off by the RSO.
- Records Management. All required records are maintained by the RPO or the Office of Research Protection, either electronically or hardcopy. Both electronic records and paper records are maintained. Back-ups and archives ensure the records will persist.

- Material Control and Accountability. Special nuclear material accountability is managed in compliance with 10 CFR 74 Subpart B through reactor Administrative Procedure AP-19 Special Nuclear Material (SNM) Control and Accounting.

8.3 Evaluation Findings

Management measures, as they pertain to 10 CFR Part 70, Subpart H, do not apply to PSU. (See section 3 of this SER). Nonetheless, Chapter 11 of the LRA commits the licensee to important aspects of safety. PSU commits to learning from experiences and modifying practices accordingly and has an audit program to ensure that safety aspects are reviewed.

9.0 Radioactive Waste Disposal

9.1 Purpose of Review

10 CFR 20.2001 requires a licensee to dispose of licensed material only by stated methods. A person must be specifically licensed to receive waste containing licensed material from other persons for disposal by stated methods.

9.2 Staff Review and Analysis

The LRA stated that waste is disposed of by EH&S personnel in accordance with in-house procedures. Radioactive waste is collected by researchers in labeled plastic, metal, or fiberboard containers. Short-lived waste (waste with a half-life of less than or equal to 120 days) is segregated from long-lived waste (waste with a half-life of greater than 120 days) by researchers. Waste containers are collected by, and transported to EH&S facilities in accordance with Pennsylvania and U.S. Department of Transportation (DOT) regulations where it is stored for processing or decay. Long-lived waste is stored in a secure area prior to transfer to a licensed broker for disposal. As such, laboratories and the storage facility is shielded. Waste is stored in areas equipped with an intrusion alarm and secure from unauthorized removal.

The LRA provides that radioactive waste which cannot be held for disposal by the decay-in-storage program is transferred to a facility licensed to receive, treat, and dispose of radioactive waste. The waste is packaged in accordance with broker instructions and the requirements of the final licensed disposal site prior to shipment.

The LRA further provides that facilities for storing and processing radioactive waste include a large shielded room in the APB. This room is used on an almost daily basis, resulting in regular observation of stored material. This room is equipped with an intrusion alarm and sprinkler system.

The RPO is responsible for the handling and disposal of radioactive waste in accordance with DOT regulations. Long-lived radioactive waste is transferred to a radioactive waste broker for disposal at a radioactive waste disposal facility. Greater than Class C concentrations of radioactive material will be returned to the U.S. Department of Energy for handling. Short-lived waste is held for decay (at least 10 half-lives), surveyed to ensure waste is indistinguishable from background, and then disposed as non-radioactive. The LRA states that at the current and

anticipated rate of waste production, sufficient storage exists for all anticipated volumes of waste for more than 20 years.

9.3 Evaluation Findings

The NRC staff has reviewed the applicant's radioactive waste disposal process and has determined that PSU has an established means of disposing of radioactive wastes for the following reasons. Facilities for storing and processing radioactive waste include a large shielded room [REDACTED], which is used on an almost daily basis, and facilitates regular observation of stored material; the room is equipped with an intrusion alarm and sprinkler system. The licensee has explicit criteria for deciding when waste is treated as being short-lived for disposal by decay or long-lived for disposal by a waste broker. The waste is transferred to a licensed waste broker in accordance with approved instructions. Therefore, the NRC staff has determined that the applicant has adequate measures to provide reasonable assurance that waste containing licensed materials can be disposed in a manner that meets the requirement of 10 CFR 20.2001.

9.4 *Alternate Means of Waste Disposal*

10 CFR 20.2002 states that a licensee may apply to the Commission for approval of proposed procedures, not otherwise authorized by regulations, to dispose of licensed material generated in the licensee's activities. The applicant did not propose an alternative radioactive disposal method other than that already approved.

9.5 *Disposal of Waste into Sanitary Sewerage*

9.5.1 Purpose of Review

10 CFR 20.2003 provides that a licensee may discharge licensed material into sanitary sewerage when specific criteria are met.

9.5.2 Staff Review and Analysis

The licensee stated that liquid waste may be discharged to the public sanitary sewer system in accordance with 10 CFR 20.2003 and 10 CFR 20.2007. Disposals are kept within the limits of 10 CFR 20.2003. Liquid waste that is not suitable for drain disposal, due to solubility considerations or hazardous chemical constituents, may be shipped to an outside vendor for final disposal. Alternatively, the liquid waste may be solidified and shipped for waste disposal. When radioactive waste cannot be disposed as such, the licensee has other means of disposing of wastes.

9.5.3 Evaluation Findings

The NRC staff has determined that the applicant has sufficient means and storage capacity to allow liquid wastes to decay beyond 7 half-lives, and ensure waste is indistinguishable from background, and thus treated as non-radioactive. Therefore, the NRC staff finds that PSU's disposal of waste into sanitary sewerage meets the requirements of 10 CFR 20.2003.

9.6 *Treatment of Waste by Incineration*

10 CFR 20.2004 provides the requirements under which a licensee may treat or dispose of licensed material by incineration. The LRA states that PSU will not process or dispose of radioactive material on site by means of incineration. The applicant did not propose to incinerate waste containing licensed material.

9.7 *Disposal of Specific Wastes*

9.7.1 Purpose of Review

10 CFR 20.2005 states that a licensee may dispose of the following licensed material as if it were not radioactive: (1) 0.05 microcurie (1.85 kBq), or less, of hydrogen-3 or carbon-14 per gram of medium used for liquid scintillation counting; (2) 0.05 microcurie (1.85 kBq), or less, of hydrogen-3 or carbon-14 per gram of animal tissue, averaged over the weight of the entire animal; as if it were not radioactive. (2)(b) A licensee may not dispose of tissue in a manner that would permit its use either as food for humans or as animal feed. A licensee shall maintain records in accordance with 10 CFR 20.2108.

9.7.2 Staff Review and Analysis

Liquid Scintillation Counting (LSC) waste is disposed in a manner commensurate with its chemical and radiological content. LSC waste with short-lived licensed-material of half-lives less than or equal to 120 days is held until it is no longer radioactive, then disposed of as non-radioactive liquid chemical waste through the chemical waste disposal program of the University. LSC waste containing licensed material with half-lives greater than 120 days is stored in a secure area prior to being transferred to a radioactive waste broker licensed to receive, treat, and/or dispose of radioactive waste. The waste is packaged in accordance with broker instructions and the requirements of the final licensed disposal site prior to shipment. The LRA describes PSU's commitment to not to not dispose of tissue in a manner that would permit its use either as food for humans or as animal feed. Additionally, PSU provides that maintenance of all records of radioactive waste disposal is, and will continue to be in accordance with 10 CFR 20.2108.

The LRA states that LSC waste is collected by and transported to EH&S facilities in accordance with the State of Pennsylvania and DOT regulations, and stored for processing or decay. In the response to questions regarding Subparts K and L implementation dated December 9, 2016, (ADAMS Accession Number ML16362A189) PSU states that they will treat LSC-containing licensed material waste as other radioactive waste. Additionally, PSU states that they will not dispose of licensed material in a manner so as to allow the LSC to enter human food in one way or another.

9.7.3 Evaluation Findings

The NRC staff has determined that PSU's process of disposal of specific waste satisfies the criteria provided in 10 CFR 20.2005. Therefore, the NRC concludes that the licensee meets 10 CFR 20.2005.

9.8 *Transfer for Disposal and Manifests*

9.8.1 Purpose of Review

10 CFR 20.2006 describes the requirements for shipping radioactive waste intended for ultimate disposal at a licensed land disposal facility. Any licensee shipping radioactive waste intended for ultimate disposal at a licensed land disposal facility must document the information on NRC's Uniform Low-Level Radioactive Waste Manifest and transfer this recorded manifest information to the intended consignee. Each shipment manifest must include a certification by the waste generator as specified in Section II of appendix G to 10 CFR Part 20. Each person involved in the transfer for disposal and disposal of waste must comply with Section III of Appendix G to 10 CFR Part 20. A licensee shipping byproduct material intended for ultimate disposal at a land disposal facility licensed under Part 61 must document the information required on the NRC's Uniform Low-Level Radioactive Waste Manifest and transfer this recorded manifest information to the intended consignee in accordance with 10 CFR Part 20, Appendix G.

9.8.2 Staff Review and Analysis

The LRA states that any radioactive waste unsuited for disposal by the decay-in-storage program is transferred to a facility licensed to receive, treat, or dispose of radioactive waste. The licensed radioactive waste broker generates the NRC's Uniform Low-Level Radioactive Waste Manifest prior to shipment. The licensee maintains copies of the NRC manifest in accordance with record retention requirements.

In the response to questions regarding Subparts K and L implementation dated December 9, 2016, (ADAMS Accession Number ML16362A189) PSU states that any radioactive waste unsuited for disposal by the decay-in-storage program is transferred to a facility licensed to receive, treat, or dispose of radioactive waste. The licensed radioactive waste broker generates the NRC's Uniform Low-Level Radioactive Waste Manifest prior to shipment. The LRA states that PSU maintains copies of the NRC manifest in accordance with record retention requirements.

9.8.3 Evaluation Findings

The NRC staff has determined that the licensee's process for shipping radioactive waste intended for ultimate disposal at a licensed land disposal facility is conducted in accordance with the requirements of 10 CFR 20.2006. Therefore, the NRC concludes that the licensee meets the requirement of 10 CFR 20.2006.

9.9 *Compliance With Environmental and Health Protection Regulations*

9.9.1 Purpose of Review

10 CFR 20.2007 states that nothing in this subpart relieves a licensee from complying with other applicable Federal, State, and local regulations governing any other toxic or hazardous properties of materials that may be disposed of under 10 CFR Part 20, Subpart K.

9.9.2 Staff Review and Analysis

The LRA states that the EH&S Office reviews and oversees the waste disposal program in accordance with all local, state, and federal regulations.

9.9.3 Evaluation Findings

NRC staff reviewed the LRA to confirm PSU's compliance with environmental and health protection regulations. The NRC staff determined that the licensee has two means of ensuring that all Federal, State, and local regulations are met. First, the EH&S Office maintains review and oversight functions. Second, the UIC reviews and approves all proposed uses of SNM (see section 1 and 2.2 of the LRA). Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 20.2007.

9.10 *Disposal of Certain Byproduct Material*

9.10.1 Purpose of Review

10 CFR 20.2008 states that certain byproduct material set forth in 10 CFR 20.1003 may be disposed of in accordance with 10 CFR Part 61, even though it is not defined as low-level radioactive waste. Therefore, any licensed byproduct material being disposed of at a facility, or transferred for ultimate disposal at a facility licensed under 10 CFR Part 61, must meet the requirements of 10 CFR 20.2006. Such byproduct material may be disposed of at an authorized facility in accordance with any Federal or State solid or hazardous waste law, including the Solid Waste Disposal Act, as authorized under the Energy Policy Act of 2005.

9.10.2 Staff Review and Analysis

PSU's LRA provides that any radioactive waste which cannot be held for disposal by the decay-in-storage program is transferred to a facility licensed to receive, treat, or dispose of radioactive waste. Long-lived waste is stored in a secure area prior to transfer to a licensed broker for disposal. The waste is packaged in accordance with broker instructions and the requirements of the final licensed disposal site prior to shipment.

9.10.3 Evaluation Findings

The NRC staff determined that the licensee has means of disposal of certain byproduct material. The LRA describes PSU's process of holding material with a relatively short half-life in storage to decay and transferring any material with a half-life that precludes decay as a means of dispositioning to a licensed facility. Therefore, the NRC concludes that the licensee meets the requirement of 10 CFR 20.2008.

10. **Incident Reporting**

10.1 Purpose of Review

10 CFR 20.2202 provides the requirements for immediate and 24-hour notifications. In the event of an incident, a report must be prepared so that names of individuals who have received exposure to radiation or radioactive material are stated in a separate and detachable part of the report, and filed with the Commission. Reports must be made by telephone to the NRC

Operations Center at (301) 816-5100. 10 CFR 70.74 provides reporting requirements to the NRC Operations Center.

10.2 Staff Review and Analysis

PSU's LRA provides that all PIs and users are instructed to notify the RPO of incidents involving radioactive material. Section 4.6.1 of the LRA states that the office maintains dedicated phone numbers that are monitored by the RPO and EH&S staff. Campus police are also available to receive incident notifications and will contact the EH&S. The EH&S staff will then notify the NRC as required. Notifications required by 10 CFR 20.2202 or 10 CFR 70.74 are made by the RSO, or designee, within the time limits specified by regulation.

10.3 Evaluation Findings

The NRC staff determined that the licensee has a communication system to notify cognizant individuals in EH&S, and appropriate authorities. Therefore, the NRC staff concluded that the licensee meets the requirements of 10 CFR 20.2202 and 10 CFR 70.74.

11. Chemical Process Safety

11.1 Purpose of Review

The NRC staff conducted the chemical process safety review to ensure that the licensee will adequately protect workers, the public, and the environment from chemical hazards of licensed material and hazardous chemicals produced from licensed material. The licensee must also protect against facility conditions or operator actions that could affect the safety of licensed materials and thus present an increased radiological risk. This section discusses the evaluation of the PSU program for identifying and managing chemical hazards that could arise from the activities it will conduct under License SNM-95. This review applies the requirements for approval of applications identified in 10 CFR 70.23 with a focus on those elements which facilitate the identification and management of the chemical hazards for activities that will be conducted under SNM-95. A Memorandum of Understanding between NRC and OSHA (Ref. 20) delineates areas of regulatory responsibility between both agencies and applied the general hazard management principles of NRC guidance for fuel cycle facilities (Ref. 16).

11.2 Staff Review and Analysis

The NRC staff examined PSU's LRA and responses to RAIs. The regulatory basis for this review is found in 10 CFR 70.22 and 10 CFR 70.23. These sections describe the required contents of the application and the requirements for NRC approval of applications. The review focused on those elements that address chemical safety. Section 6.4.3 of NUREG-1520 "Standard Review Plan for Fuel Cycle Facilities License Applications" (NRC, 2015) outlines the acceptance criteria for the NRC's review of chemical process safety of licensee's regulated under 10 CFR 70, Subpart H. The staff concluded that Subpart H does not apply to the activities covered by this license.

The staff's chemical safety review evaluated the chemical safety information in the application to ensure the specific requirements in 70.23 were met. Specifically, the staff evaluated (1) whether the applicant's personnel are qualified by training and experience to use the material for the purpose requested in accordance with the regulations in this chapter, (2) whether the

applicant's proposed equipment and facilities are adequate to protect health and minimize danger to life or property, and (3) whether the applicant's proposed procedures are adequate to protect health and to minimize danger to life or property.

11.2.1 Qualification of the applicant to use the material

PSU identified the activities to be conducted under the SNM license. Section 4.2.2 of the LRA describes specialized training for PIs. In addition to the general training, specialized training appropriate to the material used and for the hazards anticipated, will be provided by the PI and/or RSO. The LRA further provides that the need for specialized training is determined by the UIC during the review of the PIs authorization application.

11.2.2 Proposed equipment and facilities

In section 4.6.7 of the LRA, PSU describes the handling of the materials to be possessed under the license, as well as a credible accident scenario when in use. The form, quantity, and hazards of the material are addressed. Section 2.7 of the LRA describes the roles and functions of the RSO and the university HAZMAT Team. The RSO is the subject matter expert working closely with the HAZMAT Team to provide support for incidents.

11.2.3 Proposed procedures

In the LRA, PSU states that specific procedures for the use of licensed materials are established for each individual experiment, and approved by the RSO or UIC. PSU controls possession and use of radioactive materials in accordance with The Rules and Procedures, which outline the possession, use, and transfer of all licensed material on university-controlled property and presents the applicant's general procedures for conducting operations.

11.3 Evaluation Findings

The staff reviewed the information supplied in the LRA and the responses to RAIs. The staff finds that PSU provided descriptions of the equipment and facilities in sufficient detail for identifying and managing chemical safety issues related to its licensed activities, as required under 10 CFR Part 70.22. The staff reviewed this information against requirements of 10 CFR 70.23, "Requirements for the approval of applications" with a focus on chemical safety issues. The staff concludes that PSU's personnel is qualified by training and experience to manage the chemical hazards associated with the use of SNM. The staff further concludes that the applicant's processes and written procedures for evaluating laboratory facilities for specific activities are adequate to protect health and minimize danger to life or property from chemical hazards. The staff concludes that the applicant's procedures for identifying and managing chemical hazards associated with licensed activities are adequate to protect health and minimize danger to life or property from chemical hazards associated with licensed activities.

12. Emergency Management

12.1 Purpose of Review

Under 10 CFR 70.22(i)(1), an applicant seeking to possess enriched uranium or plutonium for which a criticality accident alarm system is required, uranium hexafluoride in excess of 50 kilograms in a single container or 1000 kilograms total, or in excess of 2 curies of plutonium in unsealed form or on foils or plated sources to have either: (i) An evaluation showing that the maximum dose to a member of the public offsite due to a release of radioactive materials would not exceed 1 rem effective dose equivalent or an intake of 2 milligrams of soluble uranium, or; (ii) An emergency plan for responding to the radiological hazards of an accidental release of SNM and to any associated chemical hazards directly incident thereto.

12.2 Staff Review and Analysis

The LRA does not request a quantity of material that exceeds any of the conditions in 10 CFR 70.22(i)(1).

12.3 Evaluation Findings

The NRC staff confirmed that PSU does not possess uranium hexafluoride in any quantity, is exempt from the requirement to possess a criticality alarm system and does not possess in excess of 2 curies of plutonium in unsealed form or on foils or plated sources. Therefore, this requirement is not applicable.

13. Environmental Review

The renewal of SNM-95 does not affect the scope or nature of the licensed activity and the licensed material will be used for research and development and for educational purposes. The renewal of SNM-95 is an action that is categorically excluded from the requirement to prepare an Environmental Assessment (EA) or Environmental Impact Statement (EIS), pursuant to 10 CFR 51.22(c)(14)(v).

14. Physical Security

14.1 Purpose of Review

10 CFR 73.40 requires that the licensee provide physical protection at a fixed site, or contiguous sites where licensed activities are conducted, against radiological sabotage, or against theft of SNM, or against both, in accordance with the applicable sections of this Part for each specific class of facility or material license. If applicable, the licensee shall establish and maintain physical security in accordance with security plans approved by the NRC.

10 CFR 73.67(a) requires that the licensee (1) establish and maintain a physical protection system that will achieve the following objectives: (i) Minimize the possibilities for unauthorized removal of SNM consistent with the potential consequences of such actions; and (ii) Facilitate the location and recovery of missing SNM. (2) To achieve these objectives, the physical protection system must provide: (i) Early detection and assessment of unauthorized access or activities by an external adversary within the controlled access area containing SNM; (ii) Early

detection of removal of SNM by an external adversary from a controlled access area; (iii) Assure proper placement and transfer of custody of SNM; and (iv) Respond to indications of an unauthorized removal of SNM and then notify the appropriate response forces of its removal in order to facilitate its recovery.

14.2 Staff Review and Analysis

The NRC staff reviewed PSU's PSP documents to determine if all requirements for fixed-site and in-transit physical protection requirements for SNM of low strategic significance (SNM-LSS) are adequately met. The staff completed its technical evaluation of PSU's PSP and found it is in compliance with the applicable regulations at 10 CFR 73.67(a) as described below.

14.2.1 Fixed-site Physical Protection Requirements

The applicable physical protection requirements specified in 10 CFR 73.67(f) provide the general performance objectives. "Fixed site requirements for special nuclear material of low strategic significance. Each licensee who possesses, stores, or uses special nuclear material of low strategic significance at a fixed site or contiguous sites, except those who are licensed to operate a nuclear power reactor pursuant to Part 50, shall:

- (1) Store or use the material only within a controlled access area;
- (2) Monitor with an intrusion alarm or other device or procedures the controlled access areas to detect unauthorized penetrations or activities;
- (3) Assure that a watchman or offsite response force will respond to all unauthorized penetrations or activities; and
- (4) Establish and maintain response procedures for dealing with threats of thefts or thefts of this material. The licensee shall retain a copy of the current response procedures as a record for three years after the close of period for which the licensee possesses the special nuclear material under each license for which the procedures were established. Copies of superseded material must be retained for three years after each change."

Store or use the material only within a controlled access area

SNM is usually stored in the [REDACTED]. The [REDACTED] is locked and alarmed, or attended, at all times. Access is limited to people that are deemed "trustworthy and reliable" and have the facility director's approval. All access points are monitored and alarmed to a central location in the reactor control room and at the campus police station. In addition to the physical security of the [REDACTED] building, most of the SNM is normally stored [REDACTED]. The NRC staff finds that PSU stores and uses the material only within a CAA. Therefore, the NRC concludes that PS meets the requirement of 10 CFR 73.67(f)(1).

Monitor with an intrusion alarm or other device or procedures the controlled access areas to detect unauthorized penetrations or activities

In addition to the [REDACTED] described above, use and storage locations are behind locked doors with unique key or electronic locks. In the LRA, the applicant confirmed that storage locations are equipped with intrusion detection and motion detection, and alarm capability. The balance is stored in locked hot cells. NRC finds that PSU monitors with an intrusion device to detect unauthorized penetrations or activities. Therefore, the NRC concludes that PSU meets the requirements of 10 CFR 73.67(f)(2).

Assure that a watchman or offsite response force will respond to all unauthorized penetrations or activities

PSU maintains a full sized campus police force trained and equipped to respond to radiological security incidents. The campus police coordinate responses with local fire and law enforcement agencies. NRC finds that PSU's process assures that campus police will respond to all unauthorized penetrations or activities. Therefore, the NRC concludes that PSU meets the requirement of 10 CFR 73.67(f)(3).

Establish and maintain response procedures for dealing with threats of thefts or thefts of this material.

The RPO and RSO maintain procedures for responding to radiological security events. The LRA commits to the use of Administrative Procedure AP-19, *Special Nuclear Material Control and Accounting* for response and reporting activities. NRC finds that the licensee has established and maintains response procedures for dealing with threats of thefts or thefts of material. Therefore, the NRC concludes that PSU meets the requirement of 10 CFR 73.67(f)(4).

The NRC staff reviewed the physical protection program for fixed sites submitted with the renewal application. PSU described the fixed site features, and electronic and human monitoring provisions for the controlled access areas. In addition, PSU described the responses of university and local law enforcement assets, in the event of an unauthorized penetration. Additionally, PSU describes the combination of detection, assessment and response provisions. Therefore, the NRC concludes that the physical security program satisfies the general performance objectives for fixed site security specified in 10 CFR 73.40 and 73.67.

14.2.2 In-Transit Physical Performance Objectives

The physical protection requirements of 10 CFR 73.67(g), "In-transit requirements for special nuclear material of low strategic significance" are applicable because of the amount of material PSU is authorized to possess in materials license SNM-95.

The physical protection requirements of 10 CFR 73.67(g), "In-transit requirements for special nuclear material of low strategic significance" are applicable because of the amount of material PSU is authorized to possess in materials license SNM-95.

10 CFR 73.67(g), provides that each licensee who transports or who delivers to a carrier for transport special nuclear material of low strategic significance shall:

(i) provide advance notification to the receiver of any planned shipments specifying the mode of transport, estimated time of arrival, location of the nuclear material transfer point, name of carrier and transport identification;

PSU's Special Nuclear Materials Shipping and Transportation Security Plan describes the notification requirements for senders, shippers, and receiving personnel.

(ii) receive confirmation from the receiver prior to commencement of the planned shipment that the receiver will be ready to accept the shipment at the planned time and location and acknowledges the specified mode of transport;

Sections F and G of PSU's Special Nuclear Materials Shipping and Transportation Security Plan describes the requirements for coordination of schedules and receipt confirmation for shipments.

(iii) transport the material in a tamper indicating sealed container;

Section G of PSU's Special Nuclear Materials Shipping and Transportation Security Plan describes the requirements for packaging, labeling, installation of tamper-indicating devices, and steps to verify that tamper-indicating devices are intact.

(iv) check the integrity of the containers and seals prior to shipment; and

Section G of PSU's Special Nuclear Materials Shipping and Transportation Security Plan describes the requirements and responsible parties for packaging, labeling, installation of tamper-indicating devices, and steps to verify that tamper-indicating devices are intact.

(v) arrange for the in-transit physical protection of the material in accordance with the requirements of § 73.67(g)(3) of this part, unless the receiver is a licensee and has agreed in writing to arrange for the in-transit physical protection.

PSU's Special Nuclear Materials Shipping and Transportation Security Plan describes the requirements for physical protection of shipments.

14.3 Evaluation Findings

In the LRA, PSU described the processes and procedures for the transportation of licensed material. In addition, PSU described the responses and notifications for events encountered during shipment. The combination of protection, and response provisions are accurately presented. The NRC staff reviewed the PSU LRA and subsequent submittals for SNM license SNM-95, and finds that the applicable requirements in 10 CFR 73.67 are met. In addition, the PSU LRA adequately addressed the applicable requirements in 10 CFR 73.71 and the staff finds these requirements are met.

In the LRA, PSU described the processes and procedures for packaging of licensed material the transportation. In addition, PSU described the responses and notifications for events encountered during shipment. The combination of protection, and response provisions are accurately presented. The NRC staff finds that the physical security program satisfies the performance objectives, capabilities, packaging and transportation procedures and reporting requirements specified in 10 CFR 73.40, 73.67, and 73.71.

15. Material Control and Accounting

15.1 Purpose of Review

The purpose of this review was to determine whether PSU's MC&A practices are adequate to detect and protect against the loss, theft, or diversion of SNM that the licensee possesses, stores, and utilizes at its facility, and to comply with the applicable regulatory requirements in 10 CFR Part 74, "Material Control and Accounting of Special Nuclear Material." Licensees who possess or transfer SNM in a quantity of 1 gram or more of contained ²³⁵U, ²³³U, or plutonium are subject to the general reporting and recordkeeping requirements of 10 CFR Part 74.

15.2 Staff Review and Analysis

In Section 11.4, “Material Control and Accountability,” of the LRA, the licensee stated that SNM accountability under license SNM-95 is managed by the RSO and RSEC through administrative procedure AP-19, “Special Nuclear Material (SNM) Control and Accounting.” Procedure AP-19 provides the process for the control and accounting of the SNM under materials license SNM-95. The procedure delineates the authority and responsibilities of the MC&A program to specific licensee personnel, as well as describes the activities with respect to internal control, inventory, calculations, and security of SNM.

The following discussion identifies each of the applicable MC&A requirements and summarizes the NRC staff’s evaluation as to whether the information provided in the PSU’s LRA meets the requirement.

15.2.1 Reports of loss or theft of attempted theft

10 CFR 74.11(a) requires each licensee who possesses 1 gram or more of contained ²³⁵U, ²³³U or plutonium to notify the NRC Operations Center within 1 hour of discovery of any loss or theft or other unlawful diversion of SNM which the licensee is licensed to possess, or any incident in which an attempt has been made to commit a theft or unlawful diversion of SNM.

In PSU’s response letter to an RAI, dated August 5, 2015 (Ref. 3), the licensee stated that procedures are in place which require reporting of the loss or theft of material to onsite, State, and Federal authorities. These procedures delineate the responsibility for making notifications required by State and Federal regulations, including the notification of the NRC Operations Center within 1 hour of discovery of any loss, theft, or other unlawful diversion of SNM. The process for reporting loss, theft, or attempted theft is discussed in Response 3 of the response letter, dated June 17, 2015 (Ref. 1). Furthermore, the licensee stated in the Attachment 1 to the June 17, 2015, response letter (Ref. 2), any incidents involving loss, theft or missing packages containing SNM during off-campus shipping require the same 1-hour notification of the NRC Operations Center.

The NRC staff reviewed the description of PSU’s process for notifying the NRC of loss or theft of SNM. The licensee provided a description of the actions that are taken if a loss, theft, or diversion of SNM is discovered or suspected. Those actions included meeting the applicable reporting requirements of 10 CFR 74.11. On the basis of the review, the NRC staff has determined that the licensee’s MC&A measures include adequate procedures to ensure that NRC is notified in a timely manner in the event of a loss or theft or attempted theft of SNM. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 74.11.

15.2.2 Material Status Reports (10 CFR 74.13)

10 CFR 74.13 requires each licensee possessing SNM in a quantity totaling one gram or more of contained ²³⁵U, ²³³U, or plutonium to complete and submit, in computer-readable format Material Balance Reports concerning SNM that the licensee has received, produced, possessed, transferred, consumed, disposed, or lost. The Physical Inventory Listing Report must be submitted with each Material Balance Report. Each licensee shall prepare and submit the reports as specified in the instructions in NUREG/BR-007.

The LRA stated that AP-19 requires compliance with 10 CFR 74.13(a), where Material Balance Reports are submitted within 60 days of the physical inventory. The renewal application commits to complete reports submit them in accordance with NUREG/BR-007 (Refs. 26 and 27).

The NRC reviewed the licensee's description of reporting material status reports, to be submitted pursuant to 10 CFR 74.13. The licensee provided a description of the actions that are taken concerning material balance reports and inventory listing reports. On the basis of the review, the NRC staff has determined that the licensee's MC&A program includes adequate procedures to ensure that material balances and physical inventory listings are reported as required. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 74.13(a).

15.2.3 Nuclear Material Transaction Reports (10 CFR 74.15)

10 CFR 74.15 requires each licensee who transfers or receives SNM in a quantity of 1 gram or more of contained ^{235}U , ^{233}U , or plutonium to complete, in computer-readable format, a Nuclear Material Transaction Report. In addition, each licensee who adjusts the inventory in any manner, other than for transfers and receipts, shall submit a Nuclear Material Transaction Report, in computer-readable format, to coincide with the submission of the Material Balance report. Each licensee who transfers SNM shall submit a Nuclear Material Transaction Report no later than the close of business the next working day. Each licensee who receives SNM shall submit a Nuclear Material Transaction Report within 10 days after the material is received.

The LRA states that AP-19 requires Nuclear Material Transaction Reports to be completed and submitted in accordance with NRC guidance (Ref. 28). For shipments, the Nuclear Material Transaction Reports are completed by the close of the next business day, and for receipts, within 10 days of receipt.

The NRC staff reviewed the MC&A practices that PSU follows in preparing nuclear material transaction reports. PSU has provided a description of the actions that are taken concerning Nuclear Material Transaction Reports. The description included the positions responsible for SNM accountancy and completion of all material transaction reports for receipts and shipments of SNM. On the basis of the review, the NRC staff determined that the licensee's MC&A program includes adequate procedures to ensure that transfers of SNM are reported through Nuclear Material Transaction Reports as required. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 74.15(a).

15.2.4 Recordkeeping

10 CFR 74.19(a) requires a licensee to keep records showing the receipt, inventory (including location and unique identity), acquisition, transfer, and disposal of all SNM in its possession regardless of its origin or method of acquisition. Each record relating to material control or material accounting must be maintained and retained for the period specified by the appropriate regulation or license condition. Each record of receipt, acquisition, or physical inventory of SNM must be retained as long as the licensee retains possession of the material and for 3 years following transfer or disposal of the material. Each record of transfer of SNM to other persons must be retained by the licensee who transferred the material until the Commission terminates the license authorizing the licensee's possession of the material.

The LRA stated that administrative procedure AP-19 describes the responsibilities of the positions responsible for maintaining the SNM inventory database, completing all of material balance and inventory reports, and all Material Transaction Reports. Procedure AP-19 documents the recordkeeping requirements of 10 CFR 74.19(a)(1) through 74.19(a)(4).

The NRC staff reviewed the licensee's description of completing and maintaining certain MC&A records. On the basis of the review, the NRC staff has determined that the licensee's MC&A program includes adequate procedures to ensure MC&A records are completed and maintained. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 74.19(a)(1) through 74.19(a)(4).

15.2.5 Physical Inventory

10 CFR 74.19(c) requires certain licensees who are authorized to possess SNM in a quantity greater than 350 grams of contained 235U, 233U, or plutonium, to conduct a physical inventory of all SNM in its possession under license at intervals not to exceed 12 months. The results of these physical inventories shall be retained in records by the licensee until the Commission terminates the license authorizing the possession of the material.

The LRA stated that AP-19 requires compliance with 10 CFR 74.19(c), where a physical inventory of all SNM shall be conducted at intervals not to exceed 12 months. The material balance and inventory listing reports are completed and submitted in accordance with NRC guidance (Refs. 26, 27, and 28). For accountability, inventory verification occurs monthly to ensure that material is present at the expected location.

The NRC staff reviewed the licensee's description of the actions that are taken concerning physical inventory of its SNM. The description included the minimum inventory frequency and completion and submittal of all required material balance and inventory listing reports. On the basis of the review, the NRC staff has determined that the licensee's MC&A program includes adequate procedures to ensure physical inventories of its SNM are completed at the required frequency and the results are reported. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 74.19(c).

15.3 Evaluation Findings

Based on the review of the LRA and subsequent submittals, the NRC finds that the licensee's MC&A practices as described provides assurance that the licensee will satisfy the applicable requirements found in 10 CFR 74.11, 74.13, 74.15, and 74.19 during the renewed license term. Therefore, the NRC staff finds that the licensee's MC&A practices are acceptable.

III. LICENSE CONDITIONS

Self-Guarantee As Financial Assurance of Decommissioning

Existing Safety Condition S-21 (Ref. 29) states that notwithstanding 10 CFR Part 30, Appendix E, Section II.C.2, the annual certification of financial assurance is to be dated and post-marked, by first class mail, no later than 180 days after the close of the fiscal year.

PSU uses the self-guarantee as financial assurance of decommissioning. By 10 CFR Part 30, Appendix E, Section II.C.(2), a licensee is required to demonstrate continued eligibility to use the self-guarantee 90 days after the close of the fiscal year. For reasons discussed in Reference 30, PSU is unable to obtain and submit the required documentation as such within 90 days after the close of the fiscal year. By letter dated September 23, 2013 (Ref. 31), PSU submitted a request to be exempt from the 90 day requirement, instead, submitting the required documentation within 180 days of the close of the fiscal year. By letter dated October 23, 2014 (Ref. 30), the NRC staff approved the exemption request, allowing PSU to submit the required documentation within 180 days of the close of the fiscal year.

PSU continues to use the self-guarantee as financial assurance of decommissioning and continues to need the exemption because of the reasons discussed in Reference 14. Therefore, the NRC staff includes the exemption to 10 CFR Part 30, Appendix E, Section II.C.(2) as Safety Condition S-3, as follows:

- S-3. Notwithstanding the requirements in 10 CFR Part 30, Appendix E, Section II.C.(2), The Pennsylvania State University shall demonstrate its continued eligibility to use the self-guarantee within 180 days of the close of the fiscal year. This exemption remains in effect until either: (i) The Pennsylvania State University ceases to use a self-guarantee; (ii) The Pennsylvania State University fails to qualify for a self-guarantee; or (iii) the NRC's regulations in 10 CFR Part 30, Appendix E, Section II.C.(2) are revised. If the submittal is sent by mail, The Pennsylvania State University is to use first class or overnight mail, postmarked no later than the date corresponding to the 180-day milestone.

Authorization by the UIC

Existing Safety Condition S-12 (Ref. 29) states authorizations to use the radioactive materials, issued by the UIC, shall be granted for a three-year period. For continuing work, a new request is to be approved by the UIC prior to the expiration of an existing authorization. In the amended license renewal application (Ref. 5) the applicant requested that this condition be removed. Additional justification was provided in the response to a request for additional information (Ref. 8).

Insertion of Source or SNM into a Nuclear Reactor

Existing Safety Condition S-11 (Ref. 29) states that insertion of source or SNM (SNM) covered by this license into a nuclear reactor is not authorized. This condition was approved in the previous renewal of license SNM-95 (Ref. 1). The applicant did not request in the LRA (Reference 3) that this condition be removed from the license. The NRC staff determined that this license condition should be incorporated into the subject renewed license as Safety Condition S-5, which reads as follows:

- S-5. Insertion of source or SNM (SNM) covered by this license into a nuclear reactor is not authorized.

Unencapsulated SNM

Existing Safety Condition S-13 (Ref. 29) states that suitable clothing (lab coats, gloves, etc.) specific to the job shall be required for work with unencapsulated SNM. Hands, feet, and clothing, shall be monitored when leaving an area where the material is used. Except by approval of the University Health Physicist, persons shall not exit an area if personal clothing and/or skin are contaminated above background levels. This condition was approved in the previous renewal of license SNM-95 (Ref. 1). The applicant did not request that this condition be removed from the license. (See Ref. 6) The NRC staff determined that this license condition should be incorporated into the subject renewed license as Safety Condition S-6, which reads as follows:

- S-6. Suitable clothing (lab coats, gloves, etc.) specific to the job shall be required for work with unencapsulated SNM. Hands, feet, and clothing, shall be monitored when leaving an area where the material is used. Except by approval of the University Health Physicist, persons shall not exit an area if personal clothing and/or skin are contaminated above background levels.

Pu-Be Neutron Source

Existing Safety Condition S-14 (Ref. 29) states that the maximum “start-up” or “driving force” used in conjunction with the subcritical assembly shall not exceed that of a 5 curie Pu-Be neutron source. This condition was approved in the previous renewal of license SNM-95 (Ref. 1). The applicant did not request that this condition be removed from the license. (See Ref. 6) The NRC staff determined that this license condition should be incorporated into the subject renewed license as Safety Condition S-7, which reads as follows:

- S-7. The maximum “start-up” or “driving force” used in conjunction with the subcritical assembly shall not exceed that of a 5 curie Pu-Be neutron source.

Surface Contamination Surveys

Existing Safety Condition S-15 (Ref. 29) states that surface contamination surveys in laboratories shall be conducted daily when unencapsulated SNM or spent fuel samples are used. Routine radiation surveys shall be conducted monthly in areas where radioactive materials are used and/or stored. This condition was approved in the previous renewal of license SNM-95 (Ref. 1). The applicant did not request that this condition be removed from the license. (See Ref. 6) The NRC staff determined that this license condition should be incorporated into the subject renewed license as Safety Condition S-8, which reads as follows:

- S-8. Surface contamination surveys in laboratories shall be conducted daily when unencapsulated SNM or spent fuel samples are used. Routine radiation surveys shall be conducted monthly in areas where radioactive materials are used and/or stored.

Release to Unrestricted Areas

Existing Safety Condition S-16 (Ref. 29) states that the release of equipment, facilities, or packages, to the unrestricted area or to uncontrolled areas onsite shall be in accordance with the attached, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material," dated April 1993. This condition was approved in the previous renewal of license SNM-95 (Ref. 1). The applicant did not request that this condition be removed from the license. (See Ref. 6) The NRC staff determined that this license condition should be incorporated into the subject renewed license, which reads as follows:

- S-9. Release of equipment, facilities, or packages, to the unrestricted area or to uncontrolled areas onsite shall be in accordance, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material," dated April 1993.

Leak Testing Sealed Plutonium Sources

Existing Safety Condition S-17 (Ref. 29) states that sealed plutonium sources shall be subject to the leak testing and actions specified in the attached, "License Condition for Leak Testing Sealed Plutonium Sources," dated April 1993. This condition was approved in the previous renewal of license SNM-95 (Ref. 1). The applicant did not request that this condition be removed from the license. (See Ref. 6) The NRC staff determined that this license condition should be incorporated into the subject renewed license as Safety Condition S-10, which reads as follows:

- S-10. Sealed plutonium sources shall be subject to the leak testing and actions specified in the attached, "License Condition for Leak Testing Sealed Plutonium Sources," dated April 1993.

Plutonium Alpha Sources

Existing Safety Condition S-18 (Ref. 29) states that plutonium alpha sources shall be subject to the actions specified in a "License Condition for Plutonium Alpha Sources" dated April 1993. This condition was approved in the previous renewal of license SNM-95 (Ref. 1). The NRC staff determined that this license condition should be incorporated into the subject renewed license as Safety Condition S-11, which reads as follows:

- S-11 Plutonium alpha sources shall be subject to the actions specified in the attached, "License Condition for Plutonium Alpha Sources," dated April 1993.

Packaging and Transportation

Existing Safety Condition S-19 (Ref. 29) requires the licensee to comply with 10 CFR Part 71 for packaging and transportation of radioactive material. This condition was approved in the previous renewal of license SNM-95 (Ref. 1). The applicant did not request that this condition be removed from the license. (See Ref. 6) The NRC staff determined that this license condition should be incorporated into the subject renewed license as Safety Condition S-12, which reads as follows:

- S-12. The licensee shall comply with 10 CFR Part 71 for packaging and transportation of radioactive material.

IV. NATIONAL ENVIRONMENTAL POLICY ACT REVIEW

As discussed in section 1.2 of this SER, PSU's license authorizes research and development activities under Parts 30 and 70 of the NRC's regulations. In accordance with 10 CFR 51.22(a), licensing, regulatory, and administrative actions eligible for categorical exclusion are those actions that belong to a category of actions which the Commission, by rule or regulation, has declared to be a categorical exclusion, after first finding that the category of actions does not individually or cumulatively have a significant effect on the human environment. 10 CFR 51.22(c)(14)(v) provides a categorical exclusion for the category actions under the PSU license. The NRC has determined that the renewal of materials licenses issued under 10 CFR Parts 30 or 70, for research and development and for educational purposes, does not individually or cumulatively have a significant effect on the human environment.

Therefore, because the PSU license renewal is a categorically excluded action, the preparation of an EA or EIS is not required.

V. CONCLUSION

The NRC concludes that the information in PSU's LRA and subsequent submittals, provide reasonable assurance that an adequate level of safety will be maintained for operations during the proposed license renewal term. The staff concludes that the LRA meets the requirements of 10 CFR 70.23, "Requirements for the Approval of Applications." The staff also finds that the proposed operations at PSU will not have an adverse impact on the public health and safety, the common defense and security, or the environment. The NRC staff concludes that PSU will continue to meet the applicable requirements in 10 CFR Parts 19, 20, 70, 73, and 74, as discussed in this SER.

The NRC finds that the license for PSU should be renewed for a 10-year term in accordance with the statements, representations, and conditions in the license renewal application dated November 5, 2014, as amended, subject to the identified license conditions detailed in this SER. The NRC approves the PSU request to renew the SNM license for a 10 year period, in accordance with the commitments and subject to the license conditions specified in this SER. PSU agreed to and the NRC staff incorporated these commitments and conditions in the renewed license.

VI. PRINCIPAL CONTRIBUTORS

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VII. REFERENCES

1. Letter to E. Pell, Pennsylvania State University, “SNM-95 License Renewal (TAC No. L31756)”, October 27, 2003. ADAMS Accession Number ML033000581.
2. Letter from J. Leavey, Pennsylvania State University, “License Renewal Request for License SNM-95 (Docket: 070-0113)”, September 23, 2013. ADAMS Accession Number ML13273A207.
3. J. Leavey, Pennsylvania State University (PSU), “Resubmittal Of License Renewal Application Originally Dated 09/23/13 In Reply To NRC Letter Dated November 18, 2014 (TAC L33248)”, August 1, 2014. ADAMS Accession Number ML14219A483.
4. J. Leavey, Pennsylvania State University (PSU), “Correction To PSU License Renewal Application Dated 08/1/14”, August 26, 2014. ADAMS Accession Number ML14251A327.
5. J. Leavey, Pennsylvania State University (PSU), “Amendments to PSU license renewal application dated August 1, 2014”, November 5, 2014. ADAMS Accession Number ML14314A040.
6. J. Leavey, Pennsylvania State University (PSU), “Changes To Selected Pages In PSU License Renewal Application Originally Dated August 1, 2014 And Previously Amended In Its Entirety Dated November 5, 2014 (TAC L33343)”, June 17, 2015. ADAMS Accession Number ML15173A112.
7. Letter from C. Ryder, U.S. Nuclear Regulatory Commission, to J. Leavey, Pennsylvania State University (PSU), “Acceptance for Technical Review: License SNM-95 Renewal (Technical Assignment Control Number L33343)”, November 19, 2014. ADAMS Accession Number ML14259A467.
8. Letter from J. Leavey, Pennsylvania State University (PSU), “Penn State University Response to NRC Request for Additional Information (TAC L33343), August 5, 2015. ADAMS Accession Number ML15224A812.

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9. Letter from C. Ryder, U.S. Nuclear Regulatory Commission, to J. Leavey, Pennsylvania State University (PSU), "Request for Additional Information: License Renewal", July 16, 2015. ADAMS Accession Number ML15183A349.
10. Letter from J. Leavey, Pennsylvania State University (PSU), "Resubmittal Of Penn State University Decommissioning Funding Plan Previously Submitted In PSU Letter Dated December 19, 2013", October 1, 2015. ADAMS Accession Number ML15280A395.
11. Letter from M. Linsley, Pennsylvania State University, "Response to Questions Regarding Subparts K and L Implementation", December 9, 2016. ADAMS Accession Number ML16362A189.
12. Letter from J. Leavey, Pennsylvania State University, "Decommissioning Funding Plan for Penn State University", December 19, 2013. ADAMS Accession Number ML13358A287.
13. M. Linsley, Pennsylvania State University, "Decommissioning Funding Plan for Penn State University", December 14, 2016. Letter from ADAMS Accession Number ML16355A178.
14. Letter to R. Segura, Pennsylvania State University, "Approval Of Decommissioning Funding Plan Dated December 14, 2016 (Cost Activity Code LU0174)", July 3, 2017. ADAMS Accession Number ML17170A291.
15. Federal Register. Vol. 80, No. 21, pages 5580 – 5583. February 2, 2015.
16. U.S. Nuclear Regulatory Commission, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility", NUREG-1520, Rev 1, May 2010. ADAMS Accession Number ML101390110.
17. U.S. Nuclear Regulatory Commission, "Consolidated Guidance about Materials Licenses: Program-Specific Guidance about Academic, Research and Development, and Other Licenses of Limited Scope Including Electron Capture Devices And X-Ray Fluorescence Analyzers", NUREG 1556, Vol. 7, Rev. 1, January 2014. ADAMS Accession Number ML14015A110.
18. American National Standards Institute, "Practices for Respiratory Protection," ANSI Z88.2-1992.
19. U.S. Nuclear Regulatory Commission, Branch Technical Position, "License Condition for Leak-Testing Sealed Plutonium Sources," April 1993. ADAMS Accession Number ML061980584.
20. Memorandum from C. Haney, Director, Office of Nuclear Material Safety and Safeguards, to R.W. Borchardt, Executive Director for Operations, "Memorandum Of Understanding Between The U.S. Nuclear Regulatory Commission And The Occupational Safety And Health Administration", July 11, 2013. ADAMS Accession Number ML11354A411

~~OFFICIAL USE ONLY – SECURITY – RELATED INFORMATION~~

21. Letter from R. Johnson, U.S. Nuclear Regulatory Commission, "Approval Of Amendment 5 – Pennsylvania State University, Use Of Special Nuclear Material At An Alternate Location (Technical Assignment Control Number L33305)", September 18, 2014. ADAMS Accession Number ML14114A298.
22. U.S. NRC, "Consolidated Decommissioning Guidance: Financial Assurance, Recordkeeping, and Timeliness, Final Report" NUREG-1757, Vol. 3, Rev. 1, February 2012. ADAMS Accession Number ML12048A683.
23. Letter from J. Leavey, Pennsylvania State University (PSU), "Decommissioning Funding Plan for Penn State University", December 19, 2013. ADAMS Accession Number ML13358A287.
24. Letter from J. Doncsecz, Pennsylvania State University (PSU), "Audited Financial Statements -Fiscal Year Ending June 30, 2016 and Self-Guarantee Agreement", December 19, 2016. ADAMS Accession Number ML16363A358.
25. Letter to J. Doncsecz, Pennsylvania State University (PSU), "Approval of Annual Certification of Financial Assurance for Fiscal Year 2016: Pennsylvania State University (Cost Activity Code LU0172)", June 21, 2017. ADAMS Accession Number ML17137A137.
26. U.S. Nuclear Regulatory Commission, "Instructions for the Preparation and Distribution of Material Status Reports (DOE/NRC Forms 742 and 742C) - Effective Date: January 1, 2009", NUREG/BR-0007, Rev. 6, December 2008. ADAMS Accession Number ML090120288.
27. U.S. Nuclear Regulatory Commission, "Errata for Instructions for the Preparation and Distribution of Material Status Reports (DOE/NRC Forms 742 and 742C)", NUREG/BR-0007 Rev 6, April 2014. ADAMS Accession Number ML14097A321.
28. U.S. Nuclear Regulatory Commission, "Instructions for Completing Nuclear Material Transaction Reports (DOE/NRC Forms 741 and 740M) - Effective Date: January 1, 2009", NUREG/BR-0006, Rev. 7, June 2008. ADAMS Accession Number ML111740924.
29. Letter to J. Leavey, Pennsylvania State University, "Approval of Amendment 5 – Pennsylvania State University, Use of Special Nuclear Material at an Alternate Location (Technical Assignment Control Number L33305)", September 18, 2014. ADAMS Accession Number ML14114A300.
30. Letter to J. Leavey, Pennsylvania State University, "Approval Of Pennsylvania State University Exemption From Title 10 Of The Code Of Federal Regulations Part 30, Appendix E, Section li.C.(2)", October 23, 2014. ADAMS Accession Number ML13325A031.
31. Letter from J. Leavey, Pennsylvania State University, "License Number SNM-95 (Docket Number 070-0113)", September 23, 2013. ADAMS Accession Number ML13273A208.