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December 20, 2010

Christopher Ryder
Licensing Project Manager
U.S. Nuclear Regulatory Commission
Fuel Cycle Safety and Safeguards
Fuel Manufacturing Branch
Office of Nuclear Material Safety and Safeguards
Washington, DC, 20555-0001

Mail Stop EBB 2 C40M

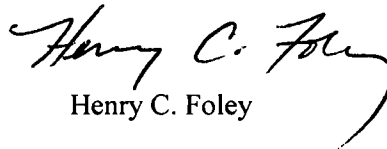
License: SNM-95
Docket: 70-113

Dear Mr. Ryder,

The Pennsylvania State University wishes to amend license SNM-95 to add plutonium and uranium radioisotopes to our license as part of a project investigating the properties of very small amounts of spent reactor fuel. NRC form 313 with supplemental information is attached.

Thank you for your prompt attention to this request.

Sincerely,



Henry C. Foley

cc: Eric Boeldt Radiation Safety Officer
Robert Paulson University Isotopes Committee Chair

KIMSSOI

12-20-10 3:02 PM

(3-2009)
10 CFR 30, 32, 33,
34, 35, 36, 39, and 40

Estimated burden per response to comply with this mandatory collection request: 4.3 hours. Submittal of the application is necessary to determine that the applicant is qualified and that adequate procedures exist to protect the public health and safety. Send comments regarding burden estimate to the Records and FOIA/Privacy Services Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0120), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

APPLICATION FOR MATERIALS LICENSE

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

OFFICE OF FEDERAL & STATE MATERIALS AND ENVIRONMENTAL MANAGEMENT PROGRAMS
DIVISION OF MATERIALS SAFETY AND STATE AGREEMENTS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOU ARE LOCATED IN:

ALABAMA, CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, FLORIDA, GEORGIA, KENTUCKY, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, NORTH CAROLINA, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, SOUTH CAROLINA, TENNESSEE, VERMONT, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

LICENSING ASSISTANCE TEAM
DIVISION OF NUCLEAR MATERIALS SAFETY
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, IL 60532-4352

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MISSISSIPPI, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH, WASHINGTON, OR WYOMING, SEND APPLICATIONS TO:

NUCLEAR MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
612 E. LAMAR BOULEVARD, SUITE 400
ARLINGTON, TX 76011-4125

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTIONS.

1. THIS IS AN APPLICATION FOR (Check appropriate item)

- A. NEW LICENSE
- B. AMENDMENT TO LICENSE NUMBER SNM - 95
- C. RENEWAL OF LICENSE NUMBER _____

2. NAME AND MAILING ADDRESS OF APPLICANT (include ZIP code)

The Pennsylvania State University
208 Old Main
University Park, PA 16802

3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

Radiation Science and Engineering Center
and Academic Projects Building
University Park, Pa 16802

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Eric Boeldt **ejb6@psu.edu**

TELEPHONE NUMBER

(814) 865-6391

SUBMIT ITEMS 5 THROUGH 11 ON 8-1/2 X 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
a. Element and mass number; b. chemical and/or physical form; and c. maximum amount which will be possessed at any one time.

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSE FEES (See 10 CFR 170 and Section 170.31)

FEE CATEGORY **exempt** AMOUNT ENCLOSED **\$ 0.00**

13. CERTIFICATION. (Must be completed by applicant) THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, 36, 39, AND 40, AND THAT ALL INFORMATION CONTAINED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

CERTIFYING OFFICER -- TYPED/PRINTED NAME AND TITLE
Henry Foley, VP for Research and Dean Graduate School

SIGNATURE
Henry C. Foley

DATE
122010

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED	CHECK NUMBER	COMMENTS
			\$		
APPROVED BY				DATE	

Item 5. Radioactive material to be added to license

Isotopes:

• Pu-236	0.1 uCi
• Pu-238	8 uCi
• Pu-239	2 uCi
• Pu-240	3 uCi
• Pu-241	60 uCi
• Pu-242	0.1 uCi
• Pu-243	0.1 uCi
• Pu-244	0.1 uCi
• Pu-246	0.1 uCi

Physical form: Material would arrive as liquid or as a non-dispersible solid.

Total activity 73 uCi of all isotopes of plutonium.

Materials used for this research consist mostly of Byproduct material rather than Special Nuclear Material. An application to the Pennsylvania Department of Environmental Protection, Bureau of Radiation Protection, has been filed for an amendment to license PA-100.

This minor addition to PSU's allowed inventory will have no effect on the funds necessary for decommissioning. The Class A waste generated by this project will be an insignificant increase in the amount of radioactive waste generated annually under this and other PSU licenses. At the end of this project, all equipment and facilities will be surveyed and decontaminated or released in accordance with page K-2 of NUREG-1556 volume 17. This process is identical to closeouts of other laboratories that had used radioactive materials. These closeouts are performed on a regular basis at PSU.

Equipment that cannot be decontaminated will be disposed as radioactive waste.

Records required for decommissioning will be retained as required by 10 CFR 70.25(g) in Environmental Health and Safety offices.

Item 6. Purposes for which material will be used.

Licensed material will be used for research, development, and student instruction.

The purpose of this research is to investigate the feasibility of utilizing a Compton Suppression System (CSS) in a novel reprocessing safeguards detection system called the Multi-Isotope Process (MIP) monitor. The goal of the MIP project is to detect subtle changes in the elements and their distribution in a reprocessing stream using the gamma ray spectra. This distribution can be correlated to process variables such as burn-up, acid concentration, organic ligand concentration, temperature, etc. The development of Penn State's trace isotope detection capabilities is important not only for this collaboration with Pacific Northwest National Laboratory, but for future nuclear forensics, safeguards and materials management research at this university.

The US Department of Energy has already selected PSU, MIT, and Texas A&M for the development of the Nuclear Security Education Program that includes the Nuclear Forensics and Radiochemistry Laboratory. Nuclear forensic attribution analysis deals with analyzing in great detail the pedigree of a piece of radioactive material to determine its origins, history of

processing, and connected parties. Forensics can be considered as tracking the "DNA" or the fingerprint of nuclear material. Although all reactor fuel may look alike and have the same long range of radioisotopes, due to the differences resulting from the day to day operation, the proportions of the isotopes will be slightly different.

1. Old radioactive spent fuel samples will be received at PSU for analysis. Each sample will have an activity of 0.1 - 10 uCi in about 20 grams of carrier. The major constituents and the approximate calculated percentage of activity will be about:

Cs-137	25%	Ba-137m	25%
Sr-90	14%	Y-90	14%
Pu-241	10%	Pu-238	1%
Am-241	4%	Cm-244	4%
U-all	<.01 %		

Multiple samples will be received.

When the Annual Limits of Intake (ALI) are analyzed, the plutonium will represent about 15% of the oral ingestion hazard and about 17% of the inhalation hazard in each sample.

2. Samples will be received as non-dispersible solids or as liquids.
3. Samples will be placed into small robust containers prior to analysis in the CSS.
4. The liquid samples may need to be subdivided into multiple samples prior to analysis.
5. After the samples have been analyzed, they will be disposed in accordance with 10 CFR 61 and waste vendor requirements.

Item 7. Individuals responsible for radiation safety program

The radiation safety officer is Eric Boeldt, CHP. Mr. Boeldt has been employed in university health physics for about 30 years. He has overseen students working with > 50 mCi of high energy beta emitters and the production of curie quantities of encapsulated solid, liquid, and gaseous photon emitters.

The Authorized User for this project is Kenan Unlu, PhD. Dr. Unlu is a professor of Nuclear Engineering and the Director of the Radiation Science and Engineering Center. He has been authorized to supervise use of radioactive material at PSU since 2004 and has had about 30 years overall experience working with radioactive material. He has supervised use of unsealed radioactive materials in a laboratory setting in mCi amounts of beta and photon emitters.

Item 8. Training for individuals working with this material

Each person working with this radioactive material will have completed PSU's standard training which is provided to all users of radioactive material as described in this license. Persons using this material will receive individual hands on training by the RSO on handling and surveying techniques. The radioactive material discussed in this application will not be used until non-radioactive dry and/or short lived isotope dry runs have been performed to the satisfaction of the RSO.

Item 9. Facilities and equipment:

This material will be used at the Radiation Science and Engineering Center and the Academic Projects Building at University Park, PA 16802. These buildings have laboratories that include benches, scales, exhaust hoods, sinks, and counting equipment well suited to the needs of this work. No new facilities beyond those currently licensed are expected. No specific laboratory has yet been authorized for this work.

The Authorized User has adequate detection equipment and safety equipment to handle this material. Surveying equipment includes portable GM counters with alpha probes, portable GM counters with pancake beta probes, a liquid scintillation counter, and multichannel analyzers for isotope identification.

Each sample will contain less total activity than a commercially available exempt check source. No shielding will be necessary for this work. All work will be performed in areas authorized by the PSU's Radiation Safety Committee.

Item 10. Radiation Safety Program

Radiation Monitoring Instruments

Penn State University's Environmental Health and Safety has sufficient detection equipment for the use of this material. EHS's available surveying equipment includes portable GM counters with alpha probes, portable GM counters with pancake beta probes, a liquid scintillation counter, and a multichannel analyzer for isotope identification. The Nuclear Engineering program has equipment for alpha spectrometry. The Authorized User's available equipment includes a portable GM counter with an alpha probe, many portable GM counters with pancake beta probes, a liquid scintillation counter, multiple multichannel analyzers for isotope identification, and gas flow proportional counters.

Material Receipt and Accountability

PSU has developed, implemented, and will maintain, written procedures for safely opening packages that meet the requirements in 10 CFR 20.1906. PSU has developed, implemented, and will maintain written procedures for licensed material accountability and control to ensure that:

- License possession limits are not exceeded;
- Licensed material in storage is secured from unauthorized access or removal;
- Licensed material not in storage is maintained under constant control; and
- Records of receipt, transfer, and disposal of licensed material are maintained.

Occupational Exposure

Since the total activity of each of these samples is less than that of an exempt cesium check source, no radiation worker is likely to receive an external radiation exposure in excess of 10% of the allowable limits in 10 CFR Part 20.

Monitoring for internal exposure will be performed for individuals likely to ingest or inhale an amount of radioactive material greater than 10% of the sum of the fractions of the applicable ALIs.

The sum of the fractions of the Annual Limits on Intake (ALI) of each sample is about 1.2 ALI for ingestion and about 134 ALI for inhalation. This is based upon a nominal sample of 10 uCi total activity. Each sample has a mass of about 20 grams. Ingestion or inhalation of even one gram is very unlikely so no regular bioassay program is planned at this time.

Surveys

Laboratory workers will perform a contamination survey of their work area after each use of radioactive material. The surveys will be performed with alpha/beta portable survey meters to locate areas of contamination. Areas of contamination will be immediately cleaned if the

material is removable. Fixed contamination will be promptly reported to EHS for determination of whether the area is to be left contaminated for the duration of this project or disposed.

EHS will make periodic confirmatory surveys to ensure laboratory staff perform their required surveys adequately and in a timely manner.

Contamination levels will be maintained as low as reasonably achievable and less than the levels found in Appendix K of NUREG-1556 volume 17.

Table from NUREG-1556 volume 17 page K-2	Beta -gamma emitters (dpm/100 cm ²)		Alpha emitters (dpm/100 cm ²)	
	Removable	Fixed	Removable	Fixed
Unrestricted areas or personal clothing	200	2,000	20	1,000
Restricted areas or protective clothing used only in restricted areas	2,000	20,000	200	10,000

Contamination survey meter efficiency will be determined by using alpha sources and beta sources.

Potentially contaminated equipment or areas that are to be released for unrestricted use will have contamination less than that listed in Row 1 of the above table. Surface contamination surveys will be conducted for both removable and fixed contamination before facilities or equipment are released. To the extent practicable, areas and equipment will be decontaminated to below these levels.

Item 11. Waste management

PSU will ensure that all licensed radioactive material shall be disposed of in accordance with the requirements of 10 CFR Part 20 Subpart K.

***** end of application*****