Enclosure 1:

License Amendment Request to Remove the Hammond Building from the License SNM-95

Outlines:

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1. Purpose

This request is to amend the Pennsylvania State University's (the University) Special Nuclear Material (SNM) License SNM-95 by removing the Hammond Building from the list of the Authorized Place of Use. Hammond Building is one of the three locations where SNMs are authorized to be used at the University Park campus. More specifically, Room 9 at the Hammond Building (Room 9) was the only lab in which SNMs were used after this building was authorized for the use of SNMs in 2014.

2. History of the use of SNMs in Room 9 at Hammond Building

Room 9 was commissioned for the use of alpha emitting radioactive materials, such as Np-237, U-nat, Th-nat for Dr. Jovanovic, the authorized Principle Investigator (PI) in February 2012. Dr. Jovanovic in the Nuclear and Mechanical Engineering department used these materials in his research and development of a new technique called Laser-Induced Breakdown Spectroscopy (LIBS) for nuclear forensics. In the LIBS ultra-short laser pulses were utilized to vaporize a minute amount of radioactive target, about 3×10^{-9} cm^3 per laser pulse. The resulting ionization of the vaporized materials was analyzed using an optical emission spectrometry to determine the elemental and isotopic composition of the materials.

To further expand the capabilities of the LIBS technique for nuclear forensics, SNMs (enriched U-235) were authorized to be used in this room after the License SNM-95 was amended in 2014 (see License Amendment Request dated February 4, 2014, TAC L33305). Detailed calculations indicated the potential radiation exposure from the use of SNMs in those experiments was minimal. In addition, contamination surveys and air sampling analysis indicated no surface contamination or airborne radioactivity were released into the room from the experiments.

Since SNMs were used in Room 9 in October 2014, only enriched U-235 (four Zr-U fuel plates at 93.2% U-235 for a total of [redacted] g U-235, two Pathfinder fuel pellets at 7.2% U-235 for a total of [redacted] g U-235, and one fission foil for a total of [redacted] g U-235) was stored and used in this room by Dr. Jovanovic's research group. The Zr-U fuel plates and the Pathfinder fuel pellets were transported back to the storage location at the Radiation Sciences and Engineering Center (RSEC), University Park in May 2015. The fission foil was transported back to the storage location at the RSEC in May 2016. Small quantities of radioactive waste (less than 5 pounds), including paper towels and gloves that were used to clean the interior wall of the vacuum chamber, which is part of the LIBS experimental setup, and HEPA filters that was used to remove potential contamination between the vacuum chamber and the mechanical pump, were properly removed from this room, and disposed of through the University's existing long-lived radioactive waste stream by the radiation

protection office at the beginning of June 2016. Since that time, no SNMs have been used or stored in this room.

3. Current status of radioactive material in Room 9

Dr. Jovanovic transferred his authorization for using radioactive materials in Room 9 to Dr. Flaska in February 2016 due to Dr. Jovanovic's pending departure from the University. Two of Dr. Jovanovic's former graduate students worked as radiation worker in this room under Dr. Flaska's authorization until June 2016. By that time, all SNMs in Room 9 were transferred back to the storage location at the RSEC, and the small quantity of waste with potential uranium contamination was removed and disposed of by the radiation protection office. Since none of the SNM sources used in Room 9 was disposed of or transferred to a different licensee, the NRC form 314, Certificate of Disposition of Material is not required for the decommissioning of this room.

As the current authorized PI for Room 9, Dr. Flaska has been only using sealed radioactive sources that are licensed under the University's broad scope License PA-100 in this room. Currently one sealed [redacted] (0.18 mCi) and one sealed [redacted] (0.05 mCi) are stored and used in this room.

4. Decommissioning Room 9 for the use of dispersible radioactive materials

A decommissioning survey of Room 9 for the use of dispersible radioactive materials including SNMs was conducted by the radiation protection office in December 2018. A brief summary of the decommissioning report is given below. The full report is attached as the Enclosure 2 to this request.

As mentioned above, Room 9 has been authorized to Dr. Jovanovic (2012 – 2016) and Dr. Flaska (2016 – present) for the use of radioactive materials. Dr. Jovanovic terminated his use of radioactive materials including SNMs in this room by the end of May 2016. As the currently authorized PI, Dr. Flaska has been only using sealed sources that are licensed under the University's broad scope License PA-100 in this room.

Prior to the decommissioning survey, all dispersible radioactive materials including SNMs were removed from Room 9. Small quantities of waste with potential uranium contamination, including paper towels, gloves and HEPA filters were properly removed and disposed of by the radiation protection office. No radioactive waste was generated during the decommissioning survey.

The experimental chamber used for the LIBS was cleaned and surveyed by a hand-held alpha probe after each use of radioactive material. Before the vacuum chamber was released for unrestricted use, it was surveyed by the radiation protection office using both portable survey instruments and smears analyzed by liquid scintillation counting. No contamination was detected by either survey technique. Room 9 was also routinely surveyed by the radiation protection office before the decommissioning survey was conducted. Any contamination identified during a routine survey would be cleaned and resurveyed in accordance with University policy. Based on the contamination survey history of this room, no contamination was ever detected in this room.

Calibrated hand-held survey instruments - one with a Geiger-Muller (GM) probe and one with an alpha-sensitive scintillation probe - were used during the decommissioning survey. More than 40 smear wipes were collected and counted by a calibrated liquid scintillation counter for removable contamination detection. Neither fixed nor removable contamination was detected. In addition, the radiation level in this room was measured and found to be no greater than ambient,

background levels. The two sealed sources ([redacted]) in this room were relocated as needed during the survey.

As a conclusion, Room 9 has been properly surveyed and decommissioned for the use of dispersible radioactive materials including SNMs. It will be suitable to be released for unrestricted use in accordance 10 CFR Part 20 Subpart E after the sealed sources ([redacted]) are removed from this room.

5. Timeline for the decommissioning of Room 9 and the Hammond Building

Room 9 has been authorized for the use of both byproduct radioactive materials under the State broad scope License PA-100 and SNMs under the NRC License SNM-95. Two sealed sources licensed under the License PA-100 are currently stored and used in this room. Thus, a multiple-step process would be involved in the decommissioning of Room 9 at Hammond Building. A tentative timeline for the decommissioning process is suggested below:

i. Room 9 was decommissioned for the use of dispersible radioactive materials including SNMs in December 2018 according to internal, Penn State University EHS procedures.

ii. A License amendment request to remove the Hammond Building from License SNM-95 is submitted to the NRC for review in September 2020.

iii. Sealed sources ([redacted]) that are currently present in Room 9 are relocated from Room 9 to Dr. Flaska's new lab in a different building (Hallowell) when it is ready for use. A close-out survey of Room 9 will be conducted after the sealed sources are relocated. This might take place in next two to three months upon the completion of the renovation of the lab at Hallowell Building.

iv. NRC approval of the license amendment request submitted in item ii is received around the beginning of December 2020.

v. The radiation protection office submits a building decommissioning report for the Hammond Building to the Pennsylvania Department of Environmental Protection (PA DEP) for review. The scope of the report will include all labs in the building that were previously authorized for radioactive material work. Meanwhile the University will schedule a confirmatory survey with the PA DEP Decommissioning Office to complete the decommissioning process for this building.

vi. The building will be released for unrestricted use by the PA DEP after it is confirmed to meet the release criteria for unrestricted use.

6. Conclusion

SNMs were stored and used in Room 9 from October 2014 to May 2016. All SNMs stored or used in this room were transported back to the storage location at the RSEC by the end of May 2016. No SNM is currently stored or used in any room of the Hammond Building.

Based on the decommissioning timeline above, Room 9 and the Hammond Building must be removed from the University's License SNM-95 before the next step in the building decommissioning process can be initiated. Moreover, the decommissioning survey of Room 9 indicted that no fixed or removable contamination was present in this room, and it will be suitable to be released for unrestricted use when the sealed non-SNM sources are removed. Therefore, the University requests to amend the License SNM-95 to remove the Hammond Building.

With the approval for the removal of the Hammond Building from the License SNM-95, the University will update its Decommissioning Funding Plan (DFP) dated December 12, 2019 accordingly to reflect the change of the Place of Use in its next DFP submittal.

References:

a. License Amendment Request Letter Dated February 4, 2014
b. Letter for Approval of Amendment 5 Dated September 18, 2014
c. Submittal of Decommissioning Funding Plan for License SNM-95 Dated December 12, 2019