

## TECHNICAL EVALUATION REPORT

DOCKET: 70-113  
LICENSE: SNM-95  
LICENSEE: The Pennsylvania State University  
SUBJECT: PENNSYLVANIA STATE UNIVERSITY – 2019 TRIENNIAL UPDATE TO DECOMMISSIONING FUNDING PLAN AND DECOMMISSIONING COST ESTIMATE, SPECIAL NUCLEAR MATERIAL LICENSE SNM-95, DOCKET 07000113 (CAC/EPID A38003/07000113/L-2019-DFA-0016)

### I. BACKGROUND

The Pennsylvania State University (PSU) submitted an updated Decommissioning Funding Plan (DFP) by letter dated December 12, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19350B163) for Special Nuclear Material (SNM) license SNM-95. In the cover letter of the submittal, the licensee stated that only the portion of the DFP addressing license SNM-95 (i.e., Appendix D) is enclosed. The PSU possesses agreement state licenses with the State of Pennsylvania which were not addressed by this submittal.

### II. REGULATORY AND REVIEW GUIDANCE

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Paragraph 70.25(e)(1), at the time of license renewal and at intervals not to exceed 3 years, the licensee must submit an updated DFP, with adjustments as necessary, to account for changes in costs and the extent of contamination.

The Nuclear Regulatory Commission (NRC) staff conducted the review of the DFP in accordance with Section 4 and Appendix A.3 of NUREG-1757, Vol. 3, Rev.1, "Consolidated Decommissioning Guidance: Financial Assurance, Recordkeeping, and Timeliness, Final Report" (ADAMS Accession No. ML12048A683).

### III. REVIEW AND EVALUATION

#### 1 Submit a Decommissioning Funding Plan

##### 1.1 Regulatory Requirements.

Paragraph 70.25(a)(2) of 10 CFR requires, in part, a DFP be submitted when a combination of isotopes is involved if  $R$  divided by  $10^5$  is greater than 1 (unity rule), where  $R$  is defined as the sum of the ratios of the quantity of each isotope to the applicable value in Appendix B, "Quantities of Licensed Material Requiring Labeling" to 10 CFR Part 30.

Paragraph 70.25(e)(2) of 10 CFR requires, in part, that at intervals not to exceed 3 years, the DFP must be resubmitted with adjustments as necessary to account for changes in costs and the extent of contamination.

## 1.2 Licensee Submittal

By letter dated December 12, 2019, the licensee submitted a DFP (ADAMS Accession No. ML19350B163).

## 1.3 NRC Staff Evaluations

### Need for A DFP

The need for a DFP is determined by the unity rule given in 10 CFR 70.25(a)(2). The unity rule can be expressed by Equation (1). The summation is done over all unsealed radionuclides. For decommissioning, the issue is the extent to which the form of the SNM is dispersible.

$$R = \sum_n \frac{x_n s_n}{B_n (10^{-6} \text{Ci}/\mu\text{Ci})} \quad (1)$$

where R = ratio

n = n<sup>th</sup> radionuclide

x<sub>n</sub> = mass of the nth unsealed radionuclide

s<sub>n</sub> = specific activity of the nth radionuclide in curies/unit mass

B<sub>n</sub> = value from Appendix B of 10 CFR Part 30 in microcuries (μCi). There are 10<sup>-6</sup> Curies (Ci) per μCi.

The NRC staff considers SNM in the form of foils, plates, and pellets as “sealed” sources because such forms are not readily dispersible. From the submittal, the possession limit of both Material A is █ grams of <sup>235</sup>U and Material B is █ grams of <sup>233</sup>U in any form. These are the materials that were considered in the unity rule calculation. Material C is a sealed source; this SNM is excluded from the unity rule calculation. Materials D and E are plutonium isotopes in non-dispersible solid or plated form of approximately █ μCi. Material F consists of fission product samples in “non-dispersible solid or liquid”; because the license application does not specifically state the form, the NRC staff considers the SNM as dispersible.

The specific activity of <sup>235</sup>U is taken to be 2.161x10<sup>-6</sup> Curies (Ci) per gram (gm), and that of <sup>233</sup>U is taken to be 9.8x10<sup>-3</sup> Ci/gm. Substituting the possession limits into Equation (1) indicates that the terms for <sup>235</sup>U and <sup>233</sup>U are much greater than the terms of the remaining radionuclides. Thus, Equation (1) is solved for only the <sup>235</sup>U and <sup>233</sup>U terms as shown in (2) and (3).

$$R = \frac{\overbrace{(\text{█ gm})(2.161 \times 10^{-6} \text{ Ci/gm})}^{235\text{U}}}{(0.01 \mu\text{Ci})(10^{-6} \text{ Ci}/\mu\text{Ci})} + \frac{\overbrace{(\text{█ gm})(9.8 \times 10^{-3} \text{ Ci/gm})}^{233\text{U}}}{(0.01 \mu\text{Ci})(10^{-6} \text{ Ci}/\mu\text{Ci})} = \quad (2)$$

$$\overbrace{\text{█} \times 10^4}^{235\text{U}} + \overbrace{\text{█} \times 10^6}^{233\text{U}} = \text{█} \times 10^6 \quad (3)$$

Dividing R by 10<sup>5</sup> per 10 CFR 70.25(a)(2) gives a value of █.

$$\frac{R}{10^5} = \frac{\text{█} \times 10^6}{10^5} = \text{█} \quad (4)$$

Therefore, a DFP is required.

## Timely Renewal

The licensee submitted a revised version of the DFP on December 14, 2019. The previous DFP update was submitted by letter dated December 14, 2016 (ADAMS Accession No. ML16355A178). The NRC staff determined that the updated DFP was submitted at least every 3 years as required.

### 1.4 NRC Staff Finding

As discussed in their preceding evaluation, the NRC staff reviewed both the need for a DFP and the timing of the DFP. On the basis of the review, the NRC staff has determined that the licensee is required to submit a DFP, and as required, submitted a DFP in a timely manner. Therefore, the NRC staff finds that the licensee meets the requirements of 10 CFR 70.25(a)(2) and 10 CFR 70.25(e)(2).

## 2 Detailed Cost Estimate

### 2.1 Regulatory Requirements

Paragraph 70.25(e)(1)(i) of 10 CFR requires a detailed cost estimate (DCE) for decommissioning, in an amount reflecting the cost of an independent contractor to perform all decommissioning activities, the cost of meeting the 10 CFR 20.1402 criteria for unrestricted use provided that, if the applicant or licensee can demonstrate its ability to meet the provisions of 10 CFR 20.1403, the cost estimate may be based on meeting the 10 CFR 20.1403 criteria, the volume of onsite subsurface material containing residual radioactivity that will require remediation; and an adequate contingency factor.

### 2.2 Licensee Submittal

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 contractors will have to familiarize themselves with the facility and define the scope of work. The estimate does not take credit for salvage value from a potential sale of assets. A 25 percent contingency factor was added to the DCE. The total DCE is \$287,710.

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. These rates include costs for nuclear technicians, construction managers, office administrative support, construction laborers, and certified health physicists. Separate line items itemize the labor cost components by salary, fringe benefits, overhead and profit, and travel costs.

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. The costs take into account unit volume, number of containers, total volume, and the number of standard 40-foot semi-trucks needed. The volume of a 40-foot semi-truck per standardized rate is 3,083 cubic feet (ft<sup>3</sup>). The DFP includes non-labor costs for waste disposal. The costs take into account total weight in pounds, unit cost per pound, and surcharges.

The PSU described the types of licensed materials and quantities allowed under SNM-95 and described how the materials are used. In its description, the licensee discusses how SNM is used for research and teaching, including use in operation of the Radiation Science and Engineering Center Breazeale Nuclear Reactor Facility (Breazeale Facility). The majority of materials are in secure storage at the Breazeale Facility. Routine surveys are performed by radiation protection staff once per calendar quarter to assure safe working conditions are maintained. The surveys show no removable contamination background on surfaces and equipment using liquid scintillation counting and Geiger meters.

Research under license SNM-95 takes place in five laboratories within three buildings at the University Park campus. The buildings are the Academic Projects Building, the Breazeale Facility, and the Hammond Building. These buildings share educational and research missions or are designed as research laboratory buildings. Radioactive material could be in many or just a few locations within these buildings. In the DFP, these areas are taken into account by defining a "typical" laboratory, known as a *reference laboratory* to simplify the task of estimating and documenting decommissioning costs. Actual room sizes vary between 100 square feet (ft<sup>2</sup>) to 1,500 ft<sup>2</sup>; the reference laboratory taken to be 600 ft<sup>2</sup>.

The licensee 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. Long-lived wastes are shipped to an appropriate waste disposal facility. Areas with subsurface contamination are not known to exist. Areas external to buildings where contamination has occurred are not known to exist.

The licensee stated that they own enough dry and liquid waste containers to handle all waste on-hand and residual liquid and dry collection beyond the normal waste generation volume. Labor costs associated with the collection of waste containers from a given laboratory, documenting of shipment, and packing, the truck are described in tables within the DFP. Shipping costs were provided by Ecology Services, Inc. Radioactive waste is normally shipped to Energy Solutions in Oak Ridge, Tennessee.

### 2.3 NRC Staff Evaluation

The DFP includes a site-specific cost estimate that describes the license number, quantities, and types of materials that are authorized by license SNM-95. The cost estimate accounts for all phases of decommissioning such as planning and preparation; decontamination and dismantling; final radiation survey, site stabilization; packaging; shipping and disposal of wastes; equipment and supplies; laboratory costs; and other miscellaneous costs. The cost estimate also includes a contingency factor of 25 percent of the sum of all decommissioning costs. PSU provided this information in a format consistent with NRC guidance in NUREG-1757.

The NRC staff determined that the accounting for the laboratories with a reference laboratory is an acceptable practice. The quantity of SNM stated to be in any form amounts to less than 200 grams. While the area of the laboratories vary, the equipment (e.g., ventilated hoods, tables, ventilation ducts) is similar.

### 2.4 NRC Findings.

The NRC staff reviewed the detail in the DCE, and on the basis of the review, the NRC staff has determined that the submittal provides sufficient detail to ensure that all relevant costs have

been taken into account. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 70.25(e)(1)(i).

### 3 Key Assumptions

#### 3.1 Regulatory Requirements

Paragraph 70.25(e)(1)(ii) of 10 CFR requires an identification of and justification for using the key assumptions contained in the DCE.

#### 3.2 Licensee Submittal

In the DFP submission, the licensee assumes that the current number of individual rooms with materials covered by this license is five, on the basis that nearly all of the SNM is in secure storage at the Breazeale Facility. The licensee also states that the costs for waste on-hand generated during decommissioning will be based on the prior 3 years of waste shipment data. Moreover, the licensee assumes that radiological conditions are already within release criteria based on its *no contamination* policy and review of past surveys showing no contamination in its labs. Furthermore, the licensee assumes that for the reference laboratory, one dry box of waste and 1 gallon of liquid waste per laboratory will be generated. This is based on historical costs per pound, which have been more consistent year-to-year to estimate disposal costs as opposed to volume. The licensee states that historically each box is assumed to weigh 100 pounds, each 30 gallon drum of liquids is assumed to weigh 175 pounds, and each 55 gallon drum of SNM is assumed to weigh 175 pounds.

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's submission also states that no credit for salvage value has been taken in developing the cost estimate.

#### 3.3 NRC Staff Evaluation

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.

#### 3.4 NRC Staff Finding

As discussed in their preceding evaluation, the NRC staff reviewed key assumptions that the licensee asserted in the DFP. On the basis of the review, the NRC staff has determined that the key assumptions have been adequately justified. The key assumptions are reasonable to protect health and minimize danger to life or property. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 70.25(e)(1)(ii).

## 4 Method For Assuring Funds

### 4.1 Regulatory Requirements

Paragraph 70.25(e)(1)(iii) of 10 CFR requires a description of the method of assuring funds for decommissioning, including means for adjusting cost estimates, and associated funding levels periodically over the life of the facility.

Appendix E.II.C.(1) of 10 CFR Part 30, requires the independent certified public accountant of the licensee to compare the data used by the licensee in the financial test, which is derived from the independently audited, year-end financial statements for the latest fiscal year, with the amounts in such financial statement. The accountant must evaluate the licensee's off-balance sheet transactions and provide an opinion on whether those transactions could materially adversely affect the licensee's ability to pay for decommissioning costs. The accountant must verify that a bond rating, if used to demonstrate passage of the financial test, meets the applicable requirements. In connection with the auditing procedure, the licensee must inform the NRC within 90 days of any matters coming to the auditor's attention which cause the auditor to believe that the data specified in the financial test should be adjusted and that the licensee no longer passes the test.

Appendix E.III.D of 10 CFR Part 30, requires a licensee to provide to the Commission a written guarantee (a written commitment by a corporate officer or officer of the institution), which states that the licensee will fund and carry out the required decommissioning activities in the amount of the current cost estimates for decommissioning.

### 4.2 Licensee Submittal

By letter dated December 19, 2019 (ADAMS Accession No. ML19357A042), the licensee submitted an update to the Self-Guarantee (SG) Agreement as its method of assuring funds for decommissioning. The means for adjusting the cost estimate is via triennial update to the DFP using recent standardized rates for labor and non-labor costs. The cost estimate has adjustments for inflation based on the consumer price index. Historical costs from the site over the previous 3 years was also considered. The estimate also took into consideration operational events on site of the past 3 years that may have led to additional adjustments to the estimate.

### 4.3 NRC Staff Evaluation

The SG agreement contained the required elements including the updating the 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 May 11, 2020, (ADAMS Accession No. ML20118C219). The licensee used the DFP submittal as the means to adjust the costs for inflation, recent standardized industry rates, and historical costs prices. The DFP submittal also included evaluations of operational events such as potential subsurface contamination and potential increases to waste inventory, determining that no such contamination or increase to waste was found.

### 4.4 NRC Staff Finding

The NRC staff reviewed the method for assuring funds for decommissioning and the means for adjusting costs. On the basis of the review, the NRC staff has determined that the licensee has

given the NRC staff adequate assurance that funds will be available for decommissioning. Reasonable assurance has been provided that funds will be available to decommission the SNM in a manner to protect health and minimize danger to life or property. Therefore, the NRC staff finds that the licensee meets the requirements of 10 CFR 70.25(e)(1)(iii), 10 CFR Part 30, Appendix E.II.C.(1), and 10 CFR Part 30, Appendix E.III.D.

## 5 Certification of Funds

### 5.1 Regulatory Requirements

Paragraph 70.25(e)(1)(iv) 10 CFR requires a certification by the licensee that financial assurance for decommissioning has been provided in the amount of the cost estimate for decommissioning.

### 5.2 Licensee Submittal

By letter dated December 19, 2019 (ADAMS Accession No. ML19357A042), the licensee submitted a certification of financial assurance from its Associate Vice President for Finance and Corporate Controller stating that its SG agreement would provide financial assurance for the cost of decommissioning activities. The statement was followed by the Controller's signature.

### 5.3 NRC Staff Evaluation

The licensee's certification statement included language from an authorized official of the licensee, stating that financial assurance would be provided through its SG agreement for the cost of its decommissioning activities.

### 5.4 NRC Staff Finding

The NRC staff reviewed the certification of funds and has determined that the licensee has adequate certification to ensure that sufficient decommissioning funds will be available. As such, decommissioning is to be done in a manner to protect health and minimize danger to life or property. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 70.25(e)(1)(iv).

## 6 Financial Instrument

### 6.1 Regulatory Requirements

Paragraph 70.25(e)(1)(v) 10 CFR requires a signed original, or, if permitted, a copy, of the financial instrument (unless a previously submitted and accepted financial instrument continues to cover the cost estimate for decommissioning).

### 6.2 Licensee Submittal

By letter dated December 19, 2019 (ADAMS Accession No. ML19357A042), PSU submitted its Standby Trust Agreement (STA) and Self-Guarantee (SG) agreement. The SG agreement is an originally signed duplicate financial instrument that covers the total decommissioning costs. The standby trust has been established, for NRC's benefit, to receive funds from PSU for NRC to direct funds to the appropriate decommissioning activities.

Section 16 of the STA states that the trust is irrevocable and shall continue until terminated at the written agreement of the Grantor and the Trustee, and approved by NRC, or by the Trustee and NRC if the Grantor ceases to exist. Upon termination of the trust, all remaining trust property, less final trust administration expenses, shall be delivered to the Grantor or its successor.

### 6.3 NRC Staff Evaluation

By letter dated May 11, 2020 (ADAMS Accession No. ML20118C219), the NRC staff approved the latest SG agreement. The SG agreement included an agreement consistent with the model language from NRC guidance in NUREG-1757. It also included the required financial test and the latest audited financial statements. Additionally, on May 25, 2016, the NRC staff had previously approved the STA (ADAMS Accession No. ML16144A740) as part of license renewal, completed April 24, 2018 (ADAMS Accession No. ML16336A201). Schedule A of the STA was updated on June 21, 2019 (ADAMS Accession No. ML19177A297), to reflect the current estimated costs of decommissioning the SNM-95 license. The STA is “evergreen” in that it continues until the NRC approves another trustee.

### 6.4 NRC Staff Finding

The NRC staff reviewed the financial instrument. On the basis of the review, the NRC staff has determined that the licensee has an adequate financial instrument to ensure that sufficient decommission funds will be available. As such, decommissioning is to be done in a manner to protect health and minimize danger to life or property. Therefore, the NRC staff finds that the licensee meets the requirement of 10 CFR 70.25(e)(1)(v).

## IV. ENVIRONMENTAL REVIEW

Section 51.22 of 10 CFR states criterion for categorical exclusion actions not requiring environmental review. Paragraph 51.22(c)(10)(i) of 10 CFR states that changes in surety, insurance and/or indemnity are a categorical exclusion. The NRC staff determined that the triennial update to the DFP is an update to financial assurance of decommissioning. The DFP is an estimate of the amount of funds that are needed to decommission. The DFP was submitted to meet the requirement of 10 CFR 51.22(c)(10)(i).

## V. CONCLUSION

Based on the preceding review of the DFP dated December 12, 2019, the NRC staff has reasonable assurance that PSU will have adequate funds to decommission the PSU facilities where SNM has been used for unrestricted use. Approval of the DFP will not constitute an undue risk to public health and safety. The NRC staff finds that the December 2019 DFP meets the requirements of 10 CFR 70.25. The NRC staff concludes that the DFP dated December 22, 2019, should be approved for the amount of \$286,710, which includes a 25 percent contingency factor.

## VI. PRINCIPLE CONTRIBUTOR

Shawn Harwell, Technical Reviewer