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DOE Packaging Certification Program

**Safety Evaluation Report for
Certificate of Compliance No. 9980 Amendment for the
Model 9980 Package**

Docket No. 21-51-9980

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This Safety Evaluation Report (SER) documents the U.S. Department of Energy (DOE) Packaging Certification Program (PCP) independent technical review of the application and supplements submitted by the DOE Savannah River Operations Office (SR), the package Certificate Holder, to amend DOE Certificate of Compliance (CoC) 9980 to authorize changes to the content envelopes, drawings, and package operations procedures.

Summary

By application ^[1] dated February 15, 2022, superseded June 10, 2022 ^[2], the certificate holder, SR requested an amendment of DOE CoC 9980 for the Model 9980 package design to authorize changes to the Radiation Signature Training Device (RSTD) and Plutonium Puck (Pu-Puck) content envelopes, drawings, and changes to the package operations procedures (i.e., opening/closing instructions).

The applicant revised the 9980 Safety Analysis Report for Packaging (SARP), added a new shielding calculation for the RSTD and revised the calculation for the Pu-Puck, and four drawings to implement these changes. In addition, the applicant made many editorial changes/corrections/clarifications to the SARP and reduced its bulk by converting many SARP Appendices to references.

Based on the statements and representations in final SARP, Revision 4, DOE PCP staff independently confirmed that the package design has been adequately described and evaluated the aforementioned changes. Therefore, staff has reasonable assurance that the regulatory requirements of 10 CFR Part 71 have been met and recommends amendment of the CoC from Revision 4 to Revision 5 by the DOE Headquarters Certifying Official (HCO).

Evaluation

This SER documents the independent technical review by DOE PCP staff of the following safety basis documents to the requirements of 10 CFR Part 71 in support of the amendment to the CoC:

- *Safety Analysis Report for Packaging Model 9980 Type A Fissile*, S-SARP-G-00007, Rev. 4, June 2022 (hereinafter referred to as the “SARP” unless otherwise specified).
- *Shielding Analysis of Plutonium Puck Content for the 9980 Shipping Package SARP*, N-CLC-G-00157, Revision 4. This calculation was revised to expand the original plutonium puck isotopic limits and evaluate impurities specific to the plutonium puck.
- *Shielding Analysis of Radiation Signature Training Devices for the 9980 Shipping Package SARP*, N-CLC-G-00187, Revision 1. This new calculation was issued to support revised RSTD content envelope evaluation.

The initial application, SARP Rev 4a and its supporting shielding calculations N-CLC-G-00157, Revision 3 and N-CLC-G-00187, Revision 0, were reviewed by DOE PCP staff and subsequently revised and superseded by the final documents listed above in response to regulatory questions and comments identified from staff’s independent technical review and confirmatory analysis. ^[3, 4, 5]

1.0 General Information

1.1 Introduction

The purpose of the CoC amendment request is authorize and increase in the content envelopes for the Pu-Puck and RSTD configurations, and to improve the package closure process with a torque specification to replace a previous process involving aligning scribe marks.

In addition, the applicant made many editorial changes/corrections/clarifications to the SARP and reduced its bulk by converting many SARP Appendices to references.

1.2 Package Description

The Model 9980 package is a 10-gallon drum style packaging designed for shipments of Type A quantities of fissile uranium and plutonium in special and normal form. Currently, the only authorized contents are in special form. The package is used to ship a single special form capsule.

1.2.1 Packaging

The Packaging Assembly (R-R1-G-00052) consists of an Overpack Assembly (Drawing R-R1-G-00052), Carrier Assembly (R-R1-G-00053), and Top and Bottom Spacers (R-R4-G-00084). A Puck Holder (R-R4 G-00151) is only required for use with the Carrier Assembly to ship a Pu-Puck. The internal cavity of the Overpack Assembly is approximately 6 inches in diameter by 10 $\frac{3}{4}$ inches high, without Spacers installed and approximately 6 $\frac{1}{4}$ inches high with the Spacers installed.

There were no safety significant design changes to the primary packaging components and no changes to the general package weights described in the SARP and authorized in CoC, Table 1.

The following four drawings were revised from Rev. 2 to Rev. 3 to implement the changes discussed below.

The Overpack Assembly (R-R1-G-00052) Notes were revised to delete the radial scribe-mark method of closure and to add closing instructions to torque the Overpack Plug to 60 \pm 10 ft-lb. with a calibrated torque wrench. The drawings for the Overpack Plug (R-R2-G-00073) and Overpack Subassembly (R-R2-G-00077) were also revised to remove application of scribe mark requirements on these components. These changes were made as a corrective action to eliminate chronic non-conformance issues with the scribe-line closure method identified during annual maintenance of the packaging.

The Puck Holder Detail drawing (R-R4 G-00151) Notes were revised to allow the fabricator to sand the 3-D printed parts for fit-up.

1.2.2 Contents

The package is certified for shipment of Type A quantities of fissile uranium and plutonium in special or normal form. The only authorized contents for the package are two special form capsule designs certified by the U.S Department of Transportation (DOT):

- *U.S. Department of Energy 10 kg HEU Equivalent Radiological Signature Training Device*, Certificate USA/0783/S-96, Revision 0 (a.k.a., RSTD).
- *Pacific Northwest National Laboratory ANSI 96E66646 PSS MOD 0 Plutonium Series Sealed Source*, Certificate USA/0784/S-96, Revision 2 (a.k.a., Pu-Puck)

The SARP was revised to add *U.S. Department of Energy Highly Enriched Uranium (HEU) Test Object*, Certificate USA/0782/S-96, Revision 3, which is a 2.5 kg HEU equivalent version of the RSTD.

The radioactive contents of the RSTD (2.5 kg and 10 kg HEU equivalents) are solid uranium metal and for the Pu-Puck metal or oxide form.

The SARP Tables 1-2 *RSTD Content Material Descriptions*, 1-3 *RSTD Content Envelope Limits*, and 1-5 *Puck Content Envelope Limits* were revised to clarify/simplify the information presented in these tables.

SARP Table 1.3 was also revised to:

- Increase the mass limits for all isotopes.
- Decrease the total isotope mass limit in the U/Al Shell from 161.3 to 150 g and increase it in the DU Core from 799 to 810 g.
- Decrease the radioactive material total mass limit from 960.3 to 960 g.
- Identify integral non-radioactive materials (Be, B, F, Li, Mg, Na) not previously listed in the table.

The RSTD total mass (3,558.3 g) was unchanged.

SARP Table 1.5 was also revised to:

- Increase the mass limits for all isotopes
- Add Np-237 (0.5 g).
- Identify integral non-radioactive materials (Be, Al, B, F, Li, Mg, Na, and other impurities) not previously listed in the table.
- Increase the Pu-Puck total mass (including capsule material) from 1,378 to 1,400 g.
- Increase the maximum decay to from 0.5 to 0.65 watts.

The Pu-Puck Radioactive & Integral Impurities Limit (200 g) was unchanged.

The SARP table changes are consistent with the current revisions of the DOT Special Form Certificates: USA/0782/S-96, Revision 3, USA/0783/S-96, Revision 2 (issued to extend the expiration date), and USA/0784/S-96, Revision 3.

Since the package contains Pu in excess of 0.74 TBq (20 Ci) its contents (2.56 TBq for the Pu-Puck) must be in any solid form to meet the requirements §71.63.

1.3 Evaluation Findings

Based on review of the statements and representations in the SARP, DOE PCP staff concludes that the package in support of the CoC amendment request has been described in sufficient detail to provide an adequate basis for staff to evaluation it for compliance with 10 CFR Part 71.

2.0 Structural Evaluation

The objective of this structural evaluation is to determine that the information presented in the SARP, including the description of the packaging, design and fabrication criteria, structural material properties, and structural performance of the package design for the tests under NCT and HAC, is complete and meets the requirements of 10 CFR Part 71.

There are no safety significant changes to the package structural design.

DOE PCP staff confirmed the following by document review.

The marginal mass increase of the Pu-Puck from 1,378 to 1,400 g (3.1 lb.) is still bounded by the content weight limit of 8.3 lb. (SARP Table 2-5): 3.1 lb. (wt. of Pu-Puck) + 2 lb. (wt. of Puck Holder) = 5.1 lb.

There were revisions to the package closing methods in SARP Section 2.4.3 *Positive Closure* where the previous method of using upper and lower scribe marks (which were originally based on torque values of 100 and 20 ft-lb., respectively) was replaced with a torque specification of 60 ± 10 ft-lb. This proposed torque range is bounded by the existing structural calculations (SARP, Section 2.13, Ref. 11). The package closure continues to meet §71.43(c).

2.1 Evaluation Findings

Based on review of the statements and representations in the SARP, DOE PCP staff has reasonable assurance that the package structural design continues to meet the requirements of 10 CFR Part 71.

3.0 Thermal Evaluation

The objective of this thermal review is to verify that the thermal performance of the package has been adequately evaluated for the tests specified under NCT and HAC and that the package design satisfies the thermal requirements of 10 CFR Part 71.

There were no changes to the package thermal design.

The changes to the RSTD and Pu-Puck contents were updated in SARP Appendix 4.1 to recalculate the decay heat values. DOE PCP staff confirmed by document review that the maximum decay heat increases of the RSTD from 0.326 to 0.354 milliwatts and Pu-Puck from 0.5 to 0.65 watts are still bounded by the maximum package decay heat of 3.5 watts.

3.1 Evaluation Findings

Based on review of the statements and representations in the SARP, DOE PCP staff has reasonable assurance that the thermal design of the package continues to meet the requirements of 10 CFR Part 71.

4.0 Containment Evaluation

The objective of this containment review is to verify that the package design satisfies the containment requirements of 10 CFR Part 71 under NCT and HAC.

There were no changes to the package containment design (for Type A).

DOE PCP staff confirmed the following by document review.

The authorized contents are special form capsule designs certified by DOT in accordance with 49 CFR 173.476 *Approval of special form Class 7 (radioactive) materials* and the regulations of the International Atomic Energy Agency, *Regulations for the Safe Transport of Radioactive Material, 2012 Edition, No. SSR-6*.

The changes to the RSTD and Pu-Puck contents were updated in SARP Appendix 4.1 to recalculate the A_1 values. The A_1 values for the RSTD mixture increased from 9.96E-06 to 1.08E-05 and from 0.5 to 0.12 for the Pu-Puck. Neither of these contents exceed A_1 unity (effective $A_1 < 1$) and thus still represent a Type A quantity of radioactive material.

4.1 Evaluation Findings

Based on review of the statements and representations in the SARP, DOE PCP staff has reasonable assurance that the containment design of the package continues to meet the requirements of 10 CFR Part 71.

5.0 Shielding Evaluation

The purpose of the shielding review is to confirm that the package (the packaging together with its contents) meet the external radiation requirements in 10 CFR Part 71.

There were no changes to the package shielding design. The shielding evaluation in SARP Chapter 5 was updated, due to the increased masses in the RSTD and Pu-Puck, by the following calculations:

Shielding Analysis of Radiation Signature Training Devices for the 9980 Shipping Package SARP, N-CLC-G-00187, Revision 1. This new calculation was issued to support the revised RSTD (2.5 and 10 kg HEU equivalent) content envelope evaluation. The applicant used the MCNP6.1 code to perform these dose rate calculations which were previously estimated using the 6CE rule-of-thumb expression (Radiological Health Handbook, 1970, <https://www.osti.gov/servlets/purl/4708654>).

Shielding Analysis of Plutonium Puck Content for the 9980 Shipping Package SARP, N-CLC-G-00157, Revision 4. This calculation was revised to expand the original plutonium puck isotopic limits and evaluate impurities specific to the plutonium puck.

DOE PCP staff confirmed the following by document review and confirmatory analysis.

RSTD Contents

The 2.5 kg and 10 kg Equivalent RSTD are special form capsule designs are certified by DOT. The new mass limits of the actinides in the U/Al shell and the depleted uranium core that are active parts of the nested shells of the RSTD are shown in SARP Table 1.3. In addition, there are light element impurities (Be, B, F, Li, Mg, Na) with a combined mass of 2 g as well as 1,100 g of Al. With the presence of U-233, 40 ppb of U-232 was also included for analysis. The RSTD is loaded in the Carrier Assembly prior to loading in the packaging.

Pu-Puck Contents

The Pu-Puck is a special form capsule design certified by DOT. The new Pu mass limits are shown in SARP Table 1.5, with 0.5 g of Np-237 added. The Pu-Puck is a cylindrical double encapsulation made of Type 316 stainless steel (ASTM SA-240) and seal welded with an inner liner, cup, and covers made of tantalum (ASTM B708). The Pu-Puck is loaded in a Puck Holder which is a 3-D printed polyphenylsulfone sphere that has a cut-out sized to hold one puck. The Puck Holder is loaded in the Carrier Assembly prior to loading in the packaging.

MCNP Models and Source Terms

DOE PCP Staff reviewed the models used by the applicant to estimate dose rates using MCNP Version 6.1 with source terms generated by the ORIGEN-ARP Version SCALE 6.1.

Models

The applicant's models are a good representation of the package with some simplifying assumptions that will have minimal impact on the external dose rates. For example, the applicant represented the 10-gallon drum with a 20-gauge wall thickness, instead of 18-gauge, which will make the analytical model conservative. In addition, the Carrier Assembly is modeled as a cylinder and the Liner Shelf (*Liner Weldment*, R-R3-G-00060) is omitted in the model. The use of a thinner drum wall and the lack of the liner shelf

make the applicant's model conservative. Consequently, DOE PCP staff has no issues with these differences in the model used for analyses by the applicant.

The MCNP models for the 2.5 kg-equivalent and the 10 kg-equivalent RSTD contents were modeled separately with their Al spacers. Air gaps were ignored in the applicant's models. DOE PCP staff agrees that these approximations will not have any significant impact on the external dose estimates.

The MCNP model for the Pu-Puck has the puck centered in the Puck Holder sphere whereas it is inserted in a slit that opens to the side of the sphere and is thus off center. This model also uses aluminum foam and DOW foam for the Puck Holder material, instead of polyphenylsulfone.

Source Term

The source terms for the neutron and gamma contents were developed based on the maximum content in the RSTD.

The source terms for both the neutron and gamma radiation from all the contents, RSTD and Pu-Puck, were determined using a 47-energy group structure with the masses of the various isotopes present in the Pu-Puck accurately represented. The sources were decayed to 100 years to include the effect of daughter isotopes. The applicant picked the maximum source for each group over the 100-year decay period and developed a conservative composite source spectrum. However, if high energy peaks exist in certain sources, caution must be exercised in using this approach since more important high energy groups may become under sampled by potentially increasing the importance of lower energy groups. Quality of the source maybe overshadowed by quantity, potentially lowering the dose rate leading to non-conservatism of the results. DOE PCP staff found this approach to be acceptable in this application by independently establishing both the gamma and neutron source spectra. Staff generated source data and the source spectra that compared well with the SARP data.

The applicant modeled the Pu-Puck as pure Pu-239 at its theoretical density to enhance the contribution to the source from subcritical multiplication in the Pu for the neutron analyses. With the given dimensions of the puck and the density used in the calculations by the applicant, 19.84 g/cc, would give a conservative mass of 223 g of Pu compared with the actual mass of 208 g of total actinides.

RSTD Dose Rate Analyses

The applicant developed separate models to account for the source being present both in the DU core and Al/U shell, for both the 2.5 kg and 10 kg cases. In addition, the applicant made extremely conservative estimates for each of these contents by voiding out the materials outside the RSTD. Dose rates were obtained at distances that represented the drum outer surface and 1 meter from it. The dimensions used by the applicant for the two RSTD source assemblies differed from the drawings since some of

the spaces between layers was omitted. DOE PCP staff found that this small change will not have an appreciable effect on the final dose rate estimates.

DOE PCP staff performed independent calculations for the package with the 10 kg source and the voided 10 kg model. In addition, staff modeled the 2.5 kg voided case. Staff did not void out the carrier like the applicant has done and obtained a lower dose rate on the surface of the package than did the applicant in the 2.5 kg and the 10 kg void models. Staff found that the applicant had initially used the wrong radius for the source sampling in the DU voided run and overestimated the dose rate. This error led to a bounding side surface dose rate of 12.43 mrem/hr. compared to a dose rate closer to an expected value of 9 mrem/hr. This error was corrected by the applicant in their final calculation (N-CLC-G-00187, Revision 1) which produced a dose rate of approximately 9.22 mrem/hr. compared to 8.6 mrem/hr. obtained by staff. In the 10 kg case, the SARP dose rate was estimated to be 7.95 mrem/hr. compared to 7.34 mrem/hr. obtained by staff. The TI calculated by the applicant was 0.3 compared to 0.2 obtained by staff.

Given the large margins to the regulatory limits, there are no safety issues related to any of the approximations made to the model or source. In conclusion, the DOE PCP staff found that the applicant's analyses have adequately demonstrated compliance with the limits set forth in the regulations for the two RSTD contents.

Pu-Puck Dose Rate Analyses

DOE PCP staff confirmed that the DOW foam or aluminum foam material used for the puck holder in the MCNP model by the applicant produced virtually no differences in the dose rates when compared to the as-built material, polyphenylsulfone. Thus, these deviations from the as-built specifications in the applicant's model are acceptable and will not lead to noncompliance of the external radiation limits prescribed by 10 CFR Part 71. In any event, the dose rates are low enough to have very large margins to the limits, and deviations caused by use of different dimensions and materials in the applicant's models lead to differences that will not result in noncompliance. In the current revision, the applicant used aluminum for the holder and the NCT dose rates presented reflect the use of this model. In addition, the applicant used an approximate carrier model made of aluminum. The neutron source term used was the bounding one based on including all impurities in the source calculations.

DOE PCP staff used a more accurate model of the puck, holder, and carrier to perform confirmatory calculations. Staff obtained a maximum NCT dose rate of 1.68 mrem/hr. at the bottom surface of the package compared with 1.88 mem/hr. that the applicant calculated at the bottom surface. The more accurate model used by staff for the carrier provides more shielding than the model used by the applicant leading to the higher dose rate values in the SARP. The applicant's maximum NCT dose rate at 1 m was 0.08 mrem/hr. and located from at the top of the package; consequently, the estimated transport index (TI) is 0.1. Staff's 1 m dose rate values were lower consistent with the surface dose rate and rounded up to a TI of 0.1. The applicant and staff's calculated

HAC dose rates were consistent, though as in the 1 m case, the applicant's maximum dose rate (0.159 mrem/hr.) was located from the top of the package whereas staff's maximum dose rate was at the bottom of the package. The HAC values rounded up to 0.2 mrem/hr. obtained by the applicant and staff are well below the regulatory limit (1,000 mrem/hr.).

The applicant modeled the Pu-Puck as pure Pu-239 at its theoretical density that will enhance the contribution to the source from subcritical multiplication in the plutonium for the neutron analyses. As stated earlier, the density of 19.84 g/cc combined with the dimensions of the puck would give a conservative mass of 223 g of Pu. The higher density while increasing the neutron contribution to the dose rate, would also increase the self-shielding of the gammas lowering their contribution to the total dose rate. However, with the conservative assumption that all the light element impurities are present, the neutron dose rate increase will likely offset any decrease in the gamma contribution, leading to conservative estimates of the external dose rates.

Given the large margins to the regulatory limits, there are no safety issues related to any of the approximations made to the model or source. In conclusion, DOE PCP staff found that the applicant's analyses have adequately demonstrated compliance with the limits set forth in the regulations for the Pu-Puck contents.

5.1 Evaluation Findings

Based on review of the statements and representations in the SARP and its supporting calculations, DOE PCP staff has reasonable assurance that the package shielding design continues to meet the requirements of 10 CFR Part 71.

6.0 Criticality Evaluation

The purpose of the criticality review is to confirm that the package together with its contents meet the requirements in 10 CFR Part 71 for nuclear criticality safety (NCS).

There were no changes to the package criticality design. Nuclear criticality safety is provided by mass and geometry control of the contents.

DOE PCP staff confirmed by document review that the existing NCS evaluations in the SARP are bounding for the proposed revisions to the RSTD and Plutonium Puck content envelopes and configurations (i.e., no change to fissile mass limits or criticality safety indexes).

6.1 Evaluation Findings

Based on review of the statements and representations in the SARP, DOE PCP staff has reasonable assurance that the package criticality design continues to meet the requirements of 10 CFR Part 71.

7.0 Operating Procedures

The SARP provides a description of package operations, including package loading and unloading operations, and the preparation of an empty package for shipment. Loading and unloading procedures show a general approach to perform operational activities because site-specific conditions may require the use of different equipment and loading or unloading steps.

The closing instructions in SARP Section 7.1.3 were revised to note the obsolescence of the scribe marks on the packaging, if present, and new instructions were added to include information on torque requirements.

DOE PCP staff confirmed by document review there were no other significant changes to Chapter 7 of the SARP.

7.1 Evaluation Findings

Based on review of the statements and representations in the SARP, DOE PCP staff concludes that the combination of the engineered safety features of the package and the operating procedures provide adequate measures and reasonable assurance for safe operation of the package in accordance with 10 CFR Part 71.

8.0 Acceptance Tests and Maintenance Program

The objective of this review is to verify that the acceptance tests for the packaging meet the requirements of 10 CFR Part 71 and that the maintenance program is adequate to assure packaging performance during its service life.

The applicant deleted the periodic maintenance procedure for the scribe line closure process in SARP Section 8.2.3 and the option to buff out scribe lines on the packaging. The intention of aligning scribe marks on the Overpack Assembly and Overpack Plug was to provide a method to close the Overpack Assembly without the need of a torque wrench. This process was unsuccessful in the field and was therefore abandoned.

DOE PCP staff confirmed by document review there were no other significant changes to Chapter 8 of the SARP.

8.1 Evaluation Findings

Based on the review of the statements and representations in the SARP, DOE PCP staff concludes that the acceptance tests for the packaging meet the requirements of 10 CFR Part 71, and that the maintenance program is adequate to assure packaging performance during its service life.

9.0 Quality Assurance

The objective of this review is to verify that the SARP, as supplemented by the Addendum demonstrates that the applicant's Quality Assurance (QA) program

description and package specific QA requirements comply with the requirements of 10 CFR Part 71, Subpart H, Quality Assurance.

The applicant's 10 CFR 71 Subpart H Quality Assurance Program (QAP) is approved by DOE (https://rampac.energy.gov/docs/default-source/qa/approval_0035_r0.pdf).

The applicant revised SARP Chapter 9 to reflect a change in the management and operating contractor of the Savannah River National Laboratory from Savannah River Nuclear Solutions, LLC (SRNS) to the Battelle Savannah River Alliance, LLC (BSRA). BSRA is working under the same SRNS QA program approved by the DOE Headquarters Certifying Official.

DOE PCP staff confirmed by document review there were no significant changes to Chapter 9 of the SARP

9.1 Evaluation Findings

Based on review of the statements and representations in the SARP, DOE PCP staff has reasonable assurance that the package-specific requirements are consistent with their DOE approved QAP, meet the requirements of 10 CFR 71 Subpart H, and are therefore adequate to assure the package will be operated in a manner consistent with its evaluation for approval.

Conditions of Approval

The following conditions of approval are required to amend the CoC.

5.a.(2) Packaging Description:

- Clarified that the contents "... are limited to an A₁ mixture of special form radioactive material."
- Overpack – Added internal cavity dimensions "... The internal cavity of the overpack is approximately 6 inches in diameter by 10 ¾ inches high, without Spacers installed."
- Spacers – Added spacer dimensions "... each approximately 5 ¾ inches in diameter by 2 ¼ inches tall,..."

5.a.(3) Drawing revision updates:

- R-R1-G-00052, Rev 2 to Rev 3, Overpack Assembly
- R-R2-G-00073, Rev 2 to Rev 3, Overpack Plug
- R-R2-G-00077, Rev 2 to Rev 3, Overpack Subassembly
- R-R4-G-00151, Rev 2 to Rev 3, Puck Holder Details

5.b. Contents – Section reorganized for clarity, removed special form Figures 2 and 3, and added 2.5 kg equivalent RSTD:

- 5.b.(1) Type and form of material: (revised for clarity and added HEU Test Object a.k.a., 2.5 kg equivalent RSTD)
- (i) Solid uranium metal in special form capsule design USA/0782/S-96, Revision 3, U.S. Department of Energy Highly Enriched Uranium (HEU) Test Object.
 - (ii) Solid uranium metal in special form capsule design USA/0783/S-96, Revision 2, U.S. Department of Energy 10 kg HEU Equivalent Radiological Signature Training Device (RSTD).
 - (iii) Solid plutonium, americium, and neptunium metal in special form capsule design USA/0784/S 96, Revision 3, Pacific Northwest National Laboratory ANSI 96E66646 PSS MOD 0 Plutonium Series Sealed Source (Pu-Puck).
- 5.b.(2) Maximum quantity of material per package (revised for clarity and added HEU Test Object a.k.a., 2.5 kg equivalent RSTD):
- Maximum quantity of material per package: 8.3 lb.
 - One special form capsule per package.
 - Contents not to exceed an A₁ for the mixture, per package, and the mass limits in the tables below.
- (i) HEU Test Object: The HEU Test Object capsule design is essentially identical to the RSTD, but with less uranium in its Shell and Core; therefore, its mass limits are bounded by Table 2 below and its maximum radionuclide activities must not exceed the limits authorized in USA/0782/S-96, Revision 3.
 - (ii) RSTD: The RSTD gross weight is approximately 7.8 lb. (3.56 kg.). The radioisotopes and their mass limits and non-radioactive elements and their mass limits for the RSTD are listed in Table 2 (ref. SARP Table 1.3).
 - Replace Table 2, *RSTD Content Envelope Limits* with SARP Table 1.3.
 - (iii) Pu-Puck: The Pu-Puck gross weight is approximately 3.1 lb. (1.4 kg.). The radioisotopes and their mass limits and non-radioactive elemental impurities and their mass limits for the Pu-Puck are listed in Table 3 (ref. SARP Table 1.5).
 - Replace Table 3, *Pu Puck Content Envelope Limits* with SARP Table 1.5.
- 5.b.(3) Maximum decay heat per package (new Section to consolidate information, clarify the HEU Test Object decay heat is bounded by the RSTD, and update decay heat for Pu-Puck due to isotope changes):
- Maximum decay heat per package: 3.5 watts
- (i) Decay heat of the RSTD (bounding for the HEU Test Object): 0.4 milliwatt
 - (ii) Decay heat of the Pu-Puck: 0.65 watt (revised from 0.5 watt)

- 5.c. Criticality Safety Index (clarify the CSI for the HEU Test Object is bounded by the RSTD):
- The Criticality Safety Index for the RSTD (bounding for the HEU Test Object) = 0.8
- 5.d. Conditions (updated)
- (1) Deleted previous Conditions (1) (redundancy) and (6) (not relevant due to SARP change). New condition (1), previously condition (2), is “Transport of the HEU Test Object or RSTD contents by ground and air within the United States is authorized.” (HEU Test Object added). The remaining conditions are renumbered.
 - (4) Revised previous Condition (5) to “Revision 4 of this certificate may be used until June 30, 2023.”
 - (7) Added “(7) Special Form capsules fabricated to later revisions than USA/0782/S-96 Rev. 3, USA/0783/S-96 Rev. 2, or USA/0784/S-96 Rev.3, are authorized under this certificate only if they were issued to extend the certificate expiration date.”
- 5.e. Supplements
- (3) Added “*Safety Analysis Report for Packaging Model 9980 Type A Fissile, S-SARP-G-00007, Revision 4, June 9, 2022*”

Conclusion

Based on the statements and representations contained in the SARP and the conditions listed above, DOE PCP staff concludes that the package design has been adequately described and evaluated, and the Model 9980 package continues to meet the requirements of 10 CFR Part 71, and recommends amendment of the CoC by the DOE Headquarters Certifying Official (HCO).

References

- [1] Safety Analysis Report for Packaging Model 9980 Type A Fissile, S-SARP-G-00007, Rev 4a, February 2022 (submitted February 15, 2022).
- [2] Safety Analysis Report for Packaging Model 9980 Type A Fissile, S-SARP-G-00007, Rev 4, June 2022 (submitted June 10, 2022).
- [3] *Completeness Review of Document Submittals for Docket 21-51-9980*, Shuler to Sobus, Memorandum, April 6, 2022.
- [4] *Q1 Comments from Review of Document Submittals for Docket 21-51-9980*, Shuler to Sobus, Memorandum, May 10, 2022.
- [5] *Docket 21-51-9980 Technical Review Complete*, Shuler to Sobus, Memorandum, June 8, 2022.