Safety Evaluation Report for Revision of Content Envelop C.8, Neptunium Oxide, in the 9975 Certificate of Compliance

Docket No. 13-21-9975

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Summary

By request dated March 27, 2013 [1] and application dated July 2014 [2], the Department of Energy (DOE) Packaging Certification Program (PCP) reviewed and evaluated the application to revise Content Envelop C.8 (Neptunium Oxide) in DOE Certificate of Compliance (CoC) Number 9975, Revision 10 [3] to permanently add neptunium oxide as defined in DOE Letter of Authorization dated January 24, 2007 (expired January 31, 2008). [4] This letter authorized a one-time shipment of up to 60 Model 9975 packages from the Savannah River Site to the Idaho National Laboratory (INL), with no return shipment planned, or requested. Shipments under the letter of authorization were completed in December 2008 and material has been stored at INL in the existing containment vessels since that time. The DOE Office of Space and Defense Powers Systems now needs the neptunium oxide content defined in the letter of authorization to be permanently included in the CoC as part of their plan to re-establish domestic reproduction of Pu-238.

Evaluation

PCP staff reviewed the previous letter of authorization, Safety Evaluation Report (SER) [5], and application and determined that the documentation was adequate and complete. The application evaluated concentrations of Pu-239 and non-radioactive impurities higher than those authorized in the CoC. These changes do not affect the ability of the package to meet the requirements of 10 CFR Part 71, as PCP staff documented in the 2007 SER.

The previous letter of authorization was implemented in the application; therefore, the SER remains valid for the neptunium oxide content. In addition, since the materials have been in storage since 2008 and the containers have not been opened, PCP staff reconfirmed that the buildup of daughter products was taken into account and the source terms used for the analyses were bounding.[6]

Conditions

The following conditions of approval from the SER and application shall be included in the CoC for Content Envelop C.8:

- A total of 100 grams of plastic may be present as low-density polyethylene bags or nylon bagging and polyvinyl chloride tape,
- The use of the PCV sleeve is prohibited,
- The use of aluminum foil packing material is prohibited,
- Metal mass of food-pack cans is restricted to 1,000 grams,
- The neptunium oxide must be produced by a method in compliance with that described in WSRC-TR-2003-00388,
- The Pu-240 content must be greater than the Pu-241 content,
- The measured Loss on Ignition (LOI) of the product must be less than 0.24 wt. %,

- The Neptunium Oxide content must have a measured assay of at least 86.2 wt. % neptunium, which corresponds to at least 97.5% neptunium of the total radioactive material,
- The total plutonium content must not exceed 611 micrograms per gram of neptunium,
- The total plutonium α (alpha) activity must not exceed 8,580 microcuries per gram of neptunium,
- The total non-radioactive impurities must be less than 2.2 wt% of the oxide mass, and
- All containers (food-pack cans, PCV, and SCV) shall be inerted with argon, such that oxygen content in all void spaces is no greater than 3% by volume at closure.

Conclusion

Based on the statements and representations in the application, PCP staff concludes that the changes indicated do not affect the ability of the package to meet the requirements of 10 CFR Part 71.

References

[1] *Request for Revision of DOE Certificate of Compliance for 9975 Packaging*, Memorandum from Office of Space and Defense Power Systems, Lowe to Shuler, March 27, 2013

[2] *Safety Analysis Report for Packaging Model 9975*, S-SARP-G-00003, Revision 3, July 2014

[3] United States Department of Energy, *Certificate of Compliance Number 9975*, Revision 10, issued July 26, 2013 (expires June 30, 2018)

[4] *Authorization for Shipment of Neptunium Oxide in the 9975,* Memorandum from Headquarters Certifying Official, Chung to Allison, January 24, 2007

[5] *Safety Evaluation Report for the Justification for Shipment of Neptunium Oxide in the 9975 Packaging—S-TRT-A-00003, Revision 0, December 2006*, SER for Docket 07-14-9975, January 24, 2007

[6] Email from B. Anderson to Docket Manager, RE: 9975 SARP REVISION for Np Oxide shipment (Docket 13-21-9975), January 17, 2014