



EM Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

DOE Packaging Certification Program

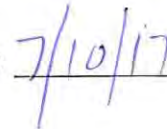
**Safety Evaluation Report for
Content Amendment to Increase the Enrichment of HEU
Metal or Alloy Turnings, Fines, or Powders in the Model
ES-3100 Package for Air Transport**

Docket No. 17-31-9315

Prepared by:



Date:

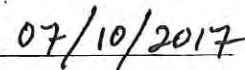


James M. Shuler
Manager, Packaging Certification Program
Office of Packaging and Transportation

Approved by:



Date:



Joanne D. Lorence
Headquarters Certifying Official
Director
Office of Packaging and Transportation

SER for Content Amendment Increase the Enrichment of HEU Metal or Alloy Turnings, Fines or Powders in the Model ES-3100 Package for Air Transport
Docket 17-31-9315

This Safety Evaluation Report (SER) documents the U.S. Department of Energy (DOE) Packaging Certification Program (PCP) independent technical review of the application submitted by the National Nuclear Security Administration (NNSA) Office of Material Management and Minimization (NA-23) to amend DOE Certificate of Compliance (CoC) Number 9315 to authorize increasing the maximum enrichment of “[Highly Enriched Uranium] HEU Metal or Alloy Turnings, Fines or Powders” in the Model ES-3100 Package from 80% to 100%, for air transport.

Summary

By letter ^[1] dated June 21, 2017, as supplemented ^[2], NNSA NA-23 requested that the DOE PCP authorize a content amendment to DOE CoC Number 9315, Revision 11, to increase the allowable enrichment from 80% to 100% for the material category "HEU metal or alloy turnings, fines, or powders", for air transport.

The applicant (NA-23) submitted SARP Rev. 2 Page Change 1 ^[2] to Revision 2 of the ES-3100 Safety Analysis Report for Packaging (SARP) ^[3] in support of this request. The increased enrichment does not affect the packaging design or operational features.

On the basis of the statements and representations in the SARP, Revision 2, as supplemented by Page Change 1, and PCP staff's confirmatory evaluation as summarized in this SER, staff finds this content amendment in the Model ES-3100 package acceptable, and will provide reasonable assurance that the regulatory requirements of 10 CFR Part 71 have been met.

This SER will hereafter refer to SARP Rev. 2 Page Change 1 as “Page Change 1” and SARP Revision 2 as the “SARP” as, unless otherwise specified.

Evaluation

Revision 11 of DOE CoC 9315 authorized enrichment of “HEU Metal or Alloy Turnings, Fines or Powders” in the Model ES-3100 package, up to 100% for ground transport. The applicant needed the package authorized for air shipment of this content and submitted a Page Change 1 to the SARP in support of the request for a content amendment to the CoC.

PCP staff reviewed the criticality evaluation in the SARP and Page Change 1 and performed confirmatory criticality analyses for the increase in allowable enrichment for air transport. Table 1 below shows the maximum $k_{eff} + 2\sigma$ listed in Table 6.9.11.50 of the SARP, and staff’s confirmatory analyses results with various amounts of cladding from 0.0 to 5.0 liters in volume for air transport with 7 kilograms ^{235}U and 5,443.1 grams of H_2O (designated as Model 5 in the SARP Rev. 2). Model 5 is described in Section 6.3.1.4 of the SARP and the maximum amount of free water from wet Kaolite is set to 5,443.1 grams (Section 6.7.3 of the SARP).

Table 1 - SARP and Staff’s Criticality Analysis Results for broken metal or alloy turnings, fines or powders with water

Vol (L)	Maximum $k_{eff} + 2\sigma^a$							
	SS304		Aluminum		Zirconium		Nickel	
	SARP (SCALE 6.1)	Staff (MCNP5)	SARP (SCALE 6.1)	Staff (MCNP5)	SARP (SCALE 6.1)	Staff (MCNP5)	SARP (SCALE 6.1)	Staff (MCNP5)
0.0	0.90343	0.90673	N/A	N/A	N/A	N/A	N/A	N/A
0.5	0.88909	0.89188	0.88024	0.88503	0.88704	0.88797	0.89217	0.89704
1.0	0.87536	0.87770	0.85880	0.86187	0.87092	0.87256	0.88068	0.88264
2.0	0.84699	0.85006	0.82210	0.82510	0.84181	0.84309	0.85351	0.85600
3.0	0.81892	0.82285	0.78912	0.79335	0.81784	0.81966	0.82650	0.82555
4.0	0.79552	0.80078	0.75989	0.76706	0.79505	0.79528	0.80099	0.79933
5.0	0.77264	0.77571	0.73837	0.74316	0.77521	0.77643	0.77475	0.77212

^a The upper subcritical limit (USL) is 0.935 (see Appendix 6.9.11, Section 6.9.11.4 of the SARP)

PCP staff also reviewed other chapters of the SARP Rev. 2 and Page Change 1 and found the increase of the allowable enrichment of “HEU Metal or Alloy Turnings, Fines or Powders” from 80% to 100% for air transport does not affect the evaluation of structural, thermal, containment, shielding, package operations, acceptance tests and maintenance program, and quality assurance program.

On the basis of the statements and representations in the SARP, Page Change 1, and the PCP staff’s confirmatory evaluation as summarized in this SER, staff finds the request to increase the allowable enrichment of “HEU metal or alloy turnings, fines or powder” from 80% to 100% for air transport acceptable, and will provide reasonable assurance that the regulatory requirements of 10 CFR Part 71 have been met.

Conditions of Approval

The following changes to the CoC are required to implement the conditions in this SER.

- Content 5.(b), Table 1.3b was revised to authorize enrichments for “HEU metal or alloy turnings, fines, or powders” from $\leq 80\%$ to ≤ 100 .
- Condition 5.(d)(13) was revised to authorize the use of Revision 11 of the certificate until December 31, 2017.
- Supplement 5.(e)(2) was added for this application, “*Safety Analysis Report for Packaging, Y-12 National Security Complex, Model ES-3100 Package with Bulk HEU Contents*, SP-PKG-801940-A001 Revision 2, Page Change 1, dated June 26, 2017.”

Conclusion

Based on the statements and representations in the SARP, Page Change 1, and PCP staff’s confirmatory evaluation, staff finds the request to increase the allowable enrichment of “HEU metal or alloy turnings, fines or powder” from 80% to 100% for air transport acceptable, and will provide reasonable assurance that the regulatory requirements of 10 CFR Part 71 have been met, subject to the Conditions in the CoC and listed above.

References

- [1] *Request to Amend DOE Certificate of Compliance Number 9315, Revision 11, to Authorize Air Transport of HEU Metal or Alloy Turnings, Fines, or Powders up to 100% Enrichment, Docket 17-31-9315*, from William E. Kilmartin to James Shuler, June 21, 2017.
- [2] *Safety Analysis Report for Packaging, Y-12 National Security Complex, Model ES-3100 Package with Bulk HEU Contents*, SP-PKG-801940-A001, Rev. 2, Page Change 1, Consolidated Nuclear Security, LLC, June 26, 2017.
- [3] *Safety Analysis Report for Packaging, Y-12 National Security Complex, Model ES-3100 Package with Bulk HEU Contents*, SP-PKG-801940-A001 Revision 2, Consolidated Nuclear Security, LLC, September 8, 2016.