Department of Energy
Washington, DC 20585

August 30, 2023

Mr. Heath Baldner
Director, Licensing
NAC International, Inc.
3930 East Jones Bridge Rd, Suite 200
Norcross, Georgia 30092

Dear Heath Baldner,

In response to an email request dated August 22, 2023, from Roy Lybarger, Sandia Field Office (SFO), to Dr. James Shuler of my staff, enclosed is Department of Energy (DOE) Certificate of Compliance (CoC) Number 9390, Revision 0, for the Model OPTIMUS®-L. DOE approval is based on endorsement of Nuclear Regulatory Commission CoC Number 9390, Revision 1, and its Safety Analysis Report (SAR), *NAC OPTIMUS®-L SAR*, Revision 0, November 2021.

The purpose of issuing this DOE CoC is to support a subsequent DOE CoC amendment request prepared by NAC for SFO to authorize use of the package for transport of the Degraded Core Coolability at the Sandia National Laboratories for disposal at the Nevada National Security Site.

This CoC is issued by DOE under the authority of 49 CFR 173.7(d) and is conditional upon fulfilling the applicable Operational and Quality requirements of 49 CFR Parts 100-199 and 10 CFR Part 71, and the conditions specified in Item 5 of the CoC.

The expiration date of Revision 0 is September 30, 2028.

If you have any questions, please contact me or Dr. Shuler at (301) 903 5513.

Sincerely,

JULIA SHENK
Digitally signed by JULIA SHENK
Date: 2023.08.30 10:11:43 -04'00'

Julia C. Shenk
Headquarters Certifying Official
Director
Office of Packaging and Transportation

Enclosure

cc: Roy Lybarger, SFO
Todd Erenstein, SNL
Jeffrey England, NAC
James Shuler, EM-4.24
Docket 23-35-9390

U.S. DEPARTMENT OF ENERGY

DOE Packaging Certification Program

CERTIFICATE OF COMPLIANCE
For Radioactive Materials Package

DOE F 5822.1
(5-85 Formerly EV-618)
Rev (9-2011)

1a. Certificate Number	1b. Revision No.	1c. Package Identification No.	1d. Page No.	e. Total No. Pages
9390	0	USA/9390/B(U)F-96 (DOE)	1	5

2. PREAMBLE

2a. This certificate is issued under the authority of 49 CFR Part 173.7(d).

2b. The packaging and contents described in item 5 below meet the safety standards set forth in subpart E, "Package Approval Standards" and subpart F, "Package, Special Form, and LSA-III Tests" Title 10, Code of Federal Regulations, Part 71.

2c. This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported.

3. This certificate is issued on the basis of a safety analysis report of the package design or application --

(1) Prepared by *(Name and address)*:	(2) Title and Identification of report or application:	(3) Date:
NAC International, Inc. 3930 East Jones Bridge Rd. Norcross, GA 30092	NAC OPTIMUS®-L SAR, Revision 0, November 2021.	November 2021

4. CONDITIONS

This certificate is conditional upon the fulfilling of the applicable Operational and Quality Assurance requirements of 49CFR parts 100-199 and 10CFR Part 71, and the conditions specified in item 5 below.

5. Description of Packaging and Authorized Contents, Model Number, Transport Index, Other Conditions, and References:

(a) Packaging

(1) Model: OPTIMUS®-L

(2) Description:

The OPTIMUS®-L packaging consists of (i) a Cask Containment Vessel (CCV), (ii) a CCV bottom support plate, (iii) an Outer Packaging (OP) assembly, and (iv) Shield Insert Assemblies (SIAs). The CCV bottom support plate is a free-standing coated carbon steel plate positioned at the bottom end of the CCV cavity below the contents. The CCV fits within the cavity of the OP. The packaging may also be configured with a Shield Insert Assembly (SIA) within the cavity of the CCV.

The CCV is the packaging containment system. It is a stainless-steel cylindrical vessel that includes a body weldment, bolted lid, bolted port cover, and elastomeric O ring seals. The CCV has an outer diameter of 34.5 in., which expands to 39.0 in. at the bolt flange and lid, and an overall height of approximately 51.4 in. The internal cavity of the CCV has a diameter of 32.5 in. and is 47.0 in. high. The CCV cylindrical shell and bottom plate have an identical thickness. The CCV lid is fastened to the CCV body by 1-in. diameter socket head cap screws. The CCV lid's inner plug fits inside the top opening of the CCV body.

6a. Date of Issuance: August 30, 2023	6b. Expiration Date: September 30, 2028

FOR THE U.S. DEPARTMENT OF ENERGY

7a. Address *(of DOE Issuing Office)*	7b. Signature, Name, and Title *(of DOE Approving Official)*
U.S. Department of Energy Office of Packaging and Transportation (EM-4.24) 1000 Independence Avenue, SW Washington, DC 20585	JULIA SHENK Digitally signed by JULIA SHENK Date: 2023.08.30 10:12:58 -04'00' Julia C. Shenk Headquarters Certifying Official Director Office of Packaging and Transportation

(2) Description (continued)

The CCV bottom support plate is a free-standing coated carbon steel plate that is positioned at the bottom end of the CCV cavity below the contents.

The OP assembly consists of a base and lid assembly with a closed-cell polyurethane foam sealed inside the stainless-steel inner and outer shells. An insulation is bonded to the inner surface of the OP lid outer end plate to minimize heating of the OP lid foam from insolation. The OP has an outside diameter of 49.0 in. and is 70 in. high. The OP lid is secured to the OP base by high-strength steel bolts.

The SIA is a coated carbon steel container, placed inside the CCV cavity, which provides additional gamma shielding. The SIA configurations used in the OPTIMUS®-L packaging are either 1-in. thick or 2¼-in. thick. The internal cavity of the SIA has a diameter of 24.0 in. and is 35.25 in. high. The 1-in. thick SIA is used inside the CCV cavity. The 2¼-in. thick SIA used in the CCV cavity requires an annular spacer plate placed underneath the bottom of the 2¼-in. thick SIA to position it near the top of the CCV cavity to facilitate loading operations.

The cavity of the package has a diameter of 32.5 in. and is 47 in. long. The outer diameter (excluding tiedown arms) of the OPTIMUS®-L package is 49 in. and the outer height (excluding lifting lugs) is 70 in. The maximum weight of the contents (including the CCV bottom support plate, SIA, and dunnage or shoring) is 3,500 lb. and the maximum gross weight of the package is approximately 9,200 lb.

(3) Drawings:

The packaging is constructed and assembled in accordance with the following NAC International Drawing Numbers

Drawing No.	Rev	Title/Notes
70000.14-502	1	Packaging Assembly – OPTIMUS-L
70000.14-510	6	CCV Assembly - OPTIMUS
70000.14-511	9	CCV Body Weldment - OPTIMUS
70000.14-512	8	CCV Lid - OPTIMUS
70000.14-513	3	Port Cover - OPTIMUS
70000.14-514	2	CCV Bottom Support Plate – OPTIMUS-L
70000.14-540	1	Outer Packaging Assembly – OPTIMUS-L
70000.14-541	5	Outer Packaging Base – OPTIMUS-L
70000.14-542	4	Outer Packaging Lid – OPTIMUS-L
70000.14-550	4	1-inch Shield Insert Assembly (SIA) - OPTIMUS
70000.14-551	5	2 ¼ -Inch Shield Insert Assembly (SIA) - OPTIMUS
70000.14-553	2	2 ¼ -Inch SIA Annular Spacer Plate – OPTIMUS-L

(b) Contents:

(1) Type and Form of Material:

(i) Byproduct, source, special nuclear material, non-fissile or fissile-excepted, as special form or non-special form in the form of process solids or resins, either dewatered, solid, or solidified waste.

(ii) Dewatered, solid, or solidified transuranic-containing wastes (TRU), fissile, non-fissile, or fissile-excepted;

(1) Type and Form of Material (continued)

(iii) Neutron activated metals or metal oxides in solid form, in secondary containers;

(iv) Miscellaneous radioactive solid waste materials, including special form material;

(v) Irradiated fuel waste (IFW) consisting of low-enriched uranium (LEU) fuel and activated metal structural components (e.g., cladding, liners, baskets, etc.).

(2) Maximum Quantity of Material per Package

(i) Maximum weight of contents: 3,500 pounds including radioactive waste, secondary containers, CCV bottom support plate, SIA, and shoring.

(ii) Maximum decay heat: 50 watts.

(iii) Fissile contents must not exceed the fissile gram equivalents (FGE) in Table 1 for the specified criticality configuration limits. Plutonium contents in quantities greater than 0.74 TBq (20 Ci) must be in solid form.

Table 1 - TRU Waste FGE Limits

Config. ID	FGE Criticality Configuration Description			FGE Limit (1) ^{239}Pu (^{235}U)
	Machine Compacted (2)	Weight % Special Reflector (3)	Minimum ^{240}Pu Credit	
FGE-1	-	≤ 1	-	340 (528) g
FGE-2a	-	≤ 1	≥ 5 g	350 (544) g
FGE-2b	-	≤ 1	≥ 15 g	375 (583) g
FGE-2c	-	≤ 1	≥ 25 g	395 (614) g
FGE-3	-	> 1	-	121 (188) g
FGE-5	x	≤ 1	-	250 (388) g

(1) FGE conversion based on a ratio of subcritical mass limits in ANSI/ANS-8.1, Section 5.2 of 0.7 kg (1.5 lb.) for ^{235}U and 0.45 kg (1.0 lb.) for ^{239}Pu. FGE equivalents determined using SAR Table 7-1.

(2) For uncompacted or manually compacted TRU waste, materials with hydrogen density up to that of water (0.1117 g/cm^3) are unlimited, but materials with hydrogen density greater than water are limited to the hydrogen density of polyethylene (0.1336 g/cm^3) and may not exceed 15% of the total contents by volume. For machine compacted contents, hydrogenous materials in the contents are limited to the hydrogen density of polyethylene (0.1336 g/cm^3) in an unlimited quantity.

(3) Special reflector materials are defined as beryllium, beryllium oxide, carbon (graphite), heavy water, magnesium oxide, and depleted uranium. The weight% of the special reflector materials is calculated as the mass of all special reflector materials present divided by the total mass of all waste material contents inside the secondary container. For FGE-3, these materials are unlimited.

(2) Maximum Quantity of Material per Package (continued)

(iv) IFW contents shall not exceed the Fissile Equivalent Mass (FEM) limits from Table 2 for the specified criticality configuration limits.

Table 2 - IFW Waste FEM Limits

Config. ID (1)	LEU Waste Criticality Configuration Description		
	Weight % Special Reflector (2)	Enrichment Limit (wt.% ^{235}U)	Uranium Mass Limit lb. (kg)
FEM-1	≤ 1	≤ 0.90 wt.%	2500 (1134)

(1) IFW contents must be non-machine compacted. Materials with hydrogen density up to that of water (0.1117 g/cm3) are unlimited, but materials with hydrogen density greater than water are limited to the hydrogen density of polyethylene (0.1336 g/cm3) and may not exceed 15% of the total contents by volume.

(2) Special reflector materials are defined as beryllium, beryllium oxide, carbon (graphite), heavy water, magnesium oxide, and depleted uranium. The weight% of the special reflector materials is calculated as the mass of all special reflector materials present divided by the total mass of all waste material contents inside the secondary container.

(v) Contents shall not exceed the maximum activity limits in SAR Tables 7.5-1 and 7.5-2 using the procedure described in SAR Attachment 7.5-1. SAR Table 7.5-2 applies to packages centered on the trailer and correspond to loadings with either no SIA, 1-inch SIA, or 2 ¼ inch SIA. Sample maximum loadings for key nuclides are in Table 3 for a package centered on the trailer.

Table 3 - TRU Waste and IFW Activity Limits for Key Isotopes

Isotope	Activity Limits (Ci) per package configuration		
	No SIA inside the CCV cavity	1-inch SIA inside the CCV cavity	2¼-inch SIA inside the CCV cavity
Co-60	8.197×10^{-2}	1.632×10^{-1}	4.284×10^{-1}
Cs-137	2.527×10^{2}	1.299×10^{3}	9.245×10^{3}
Ba-137m	3.846×10^{-1}	1.018	3.995
Cf-252	1.217×10^{-2}	1.289×10^{-2}	1.469×10^{-2}
Cm-244	3.819×10^{2}	4.074×10^{2}	4.654×10^{2}

(vi) Explosives, corrosives, non-radioactive pyrophorics, and sealed items containing compressed and/or flammable gas (e.g., aerosol cans, lecture bottles, etc.) are prohibited. Pyrophoric radionuclides may be present only in residual amounts less than 1 wt.%. All nonradioactive pyrophoric material be reacted (or oxidized) and/or otherwise rendered nonreactive prior to placement in a secondary container (e.g., drum).

(vii) Free liquids shall not exceed 1% of the CCV cavity volume.

(c) Criticality Safety Index: 5.0

(d) Conditions:

(1) In addition to the requirements of Subparts G and H of 10 CFR Part 71, each packaging must be fabricated, acceptance tested, operated, and maintained in accordance with the Operating Procedures requirements of Chapter 7 and Acceptance Tests and Maintenance Program requirements of Chapter 8 of the SAR, as supplemented.

(2) The package must be transported under exclusive use.

(3) Shoring must be placed between loose fitting contents and the CCV cavity to prevent excessive movement during transport. The shoring material must not react negatively with the packaging materials or contents and should have a melting temperature above 300°F to ensure shoring maintains its geometry under routine and normal conditions of transport.

(4) All radioactive contents must be packaged in secondary container(s) (e.g., drums, liners, specialty bags, etc.). Each secondary container and each confinement boundary of the contents must have one or more venting mechanisms (e.g., filter, vent, permeable membrane, etc.) that satisfies the minimum hydrogen diffusivity rates in SAR Table 4.5-3.

(5) Hydrogen must be limited to a molar quantity that would be no more than 5% by the volume of the innermost layer of confinement during transport. The port of the CCV lid shall be plugged. Compliance with the hydrogen and other flammable gas limit must be demonstrated for each shipment.

(6) Transport by air is prohibited.

(7) Only DOE elements or persons working under contract to DOE elements shall consign the package for domestic transport.

(8) Nuclear Regulatory Commission (NRC) or Agreement State licensees shall not consign a DOE certified package for domestic transport but can transfer the material on-site to DOE elements or persons working under contract to DOE elements for consignment of the package.

(9) Prior to use of this packaging for transport of TRU waste, the DOE element must obtain an alternative agreement between DOE and affected States or Tribes in accordance with DOE Order 460.2B, *Departmental Materials Transportation Management*.

(10) This certificate is based on DOE endorsement of NRC CoC 9390 Rev 1 and its SAR.

(e) Supplements

None