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January 28, 2014

ATTN: Document Control Desk
Director, Spent Fuel Project Office
Office of Nuclear Material Safety and Safeguards
U. S. Nuclear Regulatory Commission
Washington, DC20555-0001

SUBJECT: TRUPACT-III Docket No. 71-9305, Exemption Request per 10 CFR 71.12 for Transport of Standard Large Box 2 Waste Boxes with Wattage and A₂ Activity Exceeding Certificate Limits

Dear Ms. Akhavannik:

Nuclear Waste Partnership LLC (NWP), on behalf of the U.S. Department of Energy, Carlsbad Field Office and Savannah River Operations Office, hereby submits this request for specific exemption in accordance with 10 CFR 71.12 for transport of two Standard Large Box 2 (SLB2) waste boxes in the TRUPACT-III packaging that exceed the limits on package design wattage and A₂ quantity currently stated in the Certificate of Compliance (CofC). These two transports will not represent an increased risk to the public or to the environment. A description of the payload materials and a justification for this exemption request is given below. This exemption request applies only to the one-time transport of two specified SLB2 waste boxes (i.e., two total transports), and no change to the CofC is being requested.

Specific Exemption Request: NWP seeks an exemption from the design decay heat limit of the certificate of compliance for the TRUPACT-III package, NRC Docket 71-9305 Revision 8, of 80W, and exemption from the requirements of 10 CFR §71.61. This exemption is requested to accommodate the shipment of two SLB2 waste boxes, serial numbers SR21524413 and SR21524414, from the Savannah River Site (SRS) in Aiken, SC, to the Waste Isolation Pilot Plant (WIPP) near Carlsbad, NM.

Payload Material Description

The payload item is the "B-Line plutonium 238 recovery transfer tank" (hereinafter, the tank) installed at the Savannah River Site in the early 1970s. The tank was decommissioned in 2012. The tank has been sectioned down the middle into two approximately equal halves and placed

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into two SLB2 waste boxes. Each SLB2 contains one tank half-section, polyethylene plastic bags and sheeting, wood dunnage, and miscellaneous slings and metal parts. The tank was fabricated from ASTM Type 304L stainless steel. The radioactive contamination consists largely in deposits adhered to the inner wall of the dual-wall tank. Radioassay sheets for both SLB2 waste boxes (serial numbers SR21524413 and SR21524414) are provided in Attachment 1. From this data, it is clear that approximately 99% of the activity is due to Pu-238. The maximum wattage, including maximum uncertainty, is 187.3W for container SR21524413 and 142.0W for container SR21524414. The design wattage limit specified in Revision 8 of the CofC for the TRUPACT-III is 80W.

The radioassay sheets in Attachment 1 also indicate a maximum total activity, including maximum uncertainty, of 5,727 Ci for container SR21524413 and 4,346 Ci for container SR21524414. Because the vast majority of the activity is due to Pu-238, the A_2 quantity for Pu-238 of 0.027 Ci may conservatively be assumed for all radionuclides, resulting in $2.1 \times 10^5 A_2$ for container SR21524413 and $1.6 \times 10^5 A_2$ for container SR21524414. Although not mentioned explicitly in the TRUPACT-III CofC, 10 CFR §71.61 requires that: "A Type B package containing more than $10^5 A_2$ must be designed so that its undamaged containment system can withstand an external water pressure of 2 MPa (290 psi) for a period of not less than 1 hour without collapse, buckling, or leakage of water." The TRUPACT-III Safety Analysis Report (SAR), Section 2.7.7, states that, since the TRUPACT-III does not transport more than $1 \times 10^5 A_2$, this requirement does not apply. Consequently, no demonstration that the TRUPACT-III packaging could meet 10 CFR §71.61 has been performed, and none is planned.

All of the requirements of 10 CFR 71, the TRUPACT-III CofC, and the TRUPACT-III TRAMPAC, except the design wattage limit and the A_2 Limit in 10 CFR 71.61, are met by the two SLB2 waste boxes.

Justification for the Requested Exemption

1) Justification for transport of payload exceeding 80-W package design limit. A thermal analysis (Attachment 2) has been performed using the same software and TRUPACT-III package and SLB2 computer models as used in preparing the TRUPACT-III SAR. The SLB2 contents are modeled based on specific knowledge of the configurations of the waste inside the SLB2s. For the tank analysis, the physical form of the tank and configuration of the contents was modeled in detail with assistance from the Real Time Radiography (RTR) videos that were made at the time the tank sections were packaged. A conservative decay heat of 190W was applied to the inside surface of the inner tank wall. The results of the analysis show a maximum temperature at the tank surface under worst case Normal Conditions of Transport (NCT) of 110 °C, which is well below the 162.2 °C waste temperature shown in the SAR for the bounding waste box, and well below the 230 °C maximum allowable payload temperature. In the remainder of the TRUPACT-III package, the peak containment elastomer seal temperature increases by approximately 6 °C compared to the

SAR bounding case, leaving it well below the NCT maximum allowable temperature of 107 °C. The foam and balsa wood temperatures in the overpack regions increase by less than 2 °C, again remaining within the NCT maximum allowable temperatures. Further details are presented in Attachment 2. Thus, the transport of the subject SLB2 waste boxes will not increase the likelihood of exposure of the public or the environment to levels of radioactivity in excess of the limits established in 10 CFR 71, nor have a significant effect on the ability of the TRUPACT-III package to meet the requirements of 10 CFR 71 or to meet any of the requirements of the package CofC.

As documented in TRUPACT-III TRAMPAC Section 5.4.3, for payloads with high wattage loadings, compliance with the 25-psig design pressure limit (or total gas generation rate limit) can be demonstrated by compliance with the flammable gas generation rate limit, established to ensure compliance with the TRUPACT-III TRAMPAC requirement that limits hydrogen generated to a molar quantity that would be no more than 5% by volume of the innermost layer of confinement. Because the primary mechanism for gas generation for both flammable and total gas for transuranic waste is radiolysis, compliance with the flammable gas generation rate limit implies actual gas generation potential (both flammable and total) that is much lower than that assumed in the theoretical analysis of design pressure. Therefore, compliance with the flammable gas generation rate limit, independent of wattage, will ensure compliance with the total gas generation rate limit. While the maximum wattage is 187.3W for container SR21524413 and 142.0W for container SR21524414, the headspace flammable gas (hydrogen/methane) measured is 26.13 ppmv (0.002613% [vol]) for container SR21524413 and 136 ppmv (0.0136% [vol]) for container SR21524414. Flammable gas analysis results for containers SR21524413 and SR21524414 are provided in Attachment 3. The headspace flammable gas measurement results for both SLB2 waste boxes correspond to innermost confinement layer hydrogen concentrations that are well below the 5% hydrogen concentration limit and easily meet the packaging-specific flammable gas generation rate limits for these SLB2s. Minimal headspace flammable gas generation is consistent with the contents of these two SLB2s because the wattage, although high, is largely present as contamination of the inner wall of the dual-wall tank comprised of inorganic material, which does not generate gas by radiolysis. In summary, compliance with the flammable gas generation rate limits for container SR21524413 and container SR21524414, and compliance with the total gas generation rate limits (corresponding to the 25-psig TRUPACT-III design pressure) are met for these two high-wattage SLB2s.

2) Justification for transport of a payload having more than $1 \times 10^5 A_2$ without having demonstrated the requirements of 10 CFR §71.61. As stated in the Federal Register, Volume 69, No. 16, page 3728, under the heading: *Issue 7. Deep Immersion Test*, “[t]he purpose of the deep immersion test is to ensure package recoverability. The basis for expanding the scope of the deep immersion test...was due to the fact that radioactive materials, such as plutonium and high-

level radioactive waste, are increasingly being transported by sea in large quantities.” The TRUPACT-III transport between the Savannah River Site and the Waste Isolation Pilot Plant follows a carefully chosen, fixed overland route, and does not travel by sea. The route does not encounter bodies of water having the great depths (200 m) that are the basis of the regulatory requirement. Based on the currently approved route for TRUPACT-III shipments from SRS to WIPP, the deepest body of water that the TRUPACT-III traverses is ≈ 45 feet at the Mississippi River crossing at Vicksburg, Mississippi. Thus, the recoverability of the package, should a severe accident occur, would not be significantly impacted by immersion.

In addition, NWP notes that packages designated as “-85” may still be used as long as the fabrication was completed by December 31, 2006. At the time such packages were certified, the requirement for the deep immersion test was limited to irradiated nuclear fuel with an activity greater than 1×10^6 Ci. Irradiated nuclear fuel imposes significant containment, shielding, and criticality requirements on the shipping package, along with significant amounts of decay heat. The subject SLB2 waste boxes, in contrast, have no need for shielding and negligible decay heat, and contain only up to 5,727 Ci. Therefore, since the NRC has determined (see the Federal Register, Volume 69, No. 16, page 3730, under the heading: *Issue 8. Grandfathering Previously Approved Packages*) that packages designated -85 that are transporting up to 1×10^6 Ci of irradiated nuclear fuel do not pose any undue risk to the public for the foreseeable future, it seems reasonable to assert that the TRUPACT-III, transporting the subject SLB2 waste boxes with less than 6,000 Ci may also be transported without concern.

Summary

After careful consideration of all available options and evaluation of the SRS worker radiation exposure consequences in further size-reducing the transfer tank halves to meet the current TRUPACT-III CofC requirements, a specific exemption under 10 CFR 71.12 is requested as the alternative that is most appropriate to protect public health and to minimize danger to life or property. For the specific payload requested, it is demonstrated that an increase in decay heat to 190W will result in no reduction in the effectiveness of the packaging. Additionally, the maximum requested A_2 quantity is over 150 times less than that currently authorized for grandfathered irradiated nuclear fuel packages, where the TRUPACT-III package recoverability and no increased public risk due to a 290 psi external water pressure is ensured by the transport route.

NWP, on behalf of DOE, is requesting approval of this one time only exemption for shipment of these two SLB2 waste boxes in the TRUPACT-III by March 1, 2014.

If you have any questions or require additional information regarding this request, please contact me at (575) 234-7396.

Sincerely,

A handwritten signature in black ink, appearing to read "T.E. Sellmer". The signature is fluid and cursive, with a long horizontal stroke at the end.

T.E. Sellmer, Manager
Transportation Packaging
Central Characterization Program

cc: G. Hellstrom, CBFO
T. Morgan, CBFO
J. C. Rhoades
J. R. Stroble, CBFO
P. W. Noss, AFS

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January, 282014

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***** Radioassay Data Sheet *****

Engine Version: TMU Gamma 1.5

Count Sequence Number: 14750 Batch Number: SRLBC0994
 Assay Instrument: WSRS Box Counter Location: SRS, E Area
 Analysis Method: CCP-TP-189 v 3 Software Version: NDA 2000 V.5.2
 Item ID: SR21524413 Analysis Date: 7/17/2013

Net Weight 790300.0 g
 Pu mass 3.43E+002 +- 6.96E+001 g
 TRU Alpha Activity 4.51E+003 +- 1.16E+003 Ci
 TRU Activity Concentration 5.71E+006 +- 1.46E+006 nCi/g
 Pu-239 Equivalent Activity 4.10E+003 +- 1.05E+003 Ci
 Pu-239 FGE 1.01E+002 +- 1.95E+001 g
 Decay heat 1.49E+002 +- 3.83E+001 W

Nuclide	Mass g,	Activity Ci	Activity Uncert. Ci	MDA Ci
SR90	1.05E-007	1.45E-005	9.82E-007	0.00E+000
CS137	1.65E-007	1.45E-005	9.82E-007	7.41E-006
U233	<LLD	<LLD	0.00E+000	2.43E-002
U234	1.26E+002	7.96E-001	2.05E-001	0.00E+000
U235	2.38E+000	5.22E-006	8.85E-007	4.86E-006
NP237	2.30E-001	1.64E-004	8.73E-006	1.89E-005
PU238	2.60E+002	4.50E+003	1.16E+003	4.46E-001
U238	<LLD	<LLD	0.00E+000	2.49E-004
PU239	6.89E+001	4.34E+000	1.13E+000	4.30E-004
PU240	1.21E+001	2.79E+000	1.58E+000	2.76E-004
AM241	1.44E+000	5.01E+000	1.39E+000	4.97E-004
PU241	3.78E-001	3.93E+001	1.03E+001	3.89E-003
PU242	1.58E+000	6.29E-003	3.75E-003	0.00E+000

Errors quoted at 1.000 sigma

Operator: Michael Schroeder Date: 7/23/13

ITR: Tim Carlton Date: 7/23/13

Radioassay Data for SR21524414 7/18/2013 12:50:18 PM Page 6

***** Radioassay Data Sheet *****

Engine Version: TMU Gamma 1.5

Count Sequence Number: 14749 Batch Number: SRLBC0994
 Assay Instrument: WSRS Box Counter Location: SRS, E Area
 Analysis Method: CCP-TP-189 v 3 Software Version: NDA 2000 V.5.2
 Item ID: SR21524414 Analysis Date: 7/17/2013

Net Weight 820300.0 g
 Pu mass 2.54E+002 +- 5.24E+001 g
 TRU Alpha Activity 3.42E+003 +- 8.77E+002 Ci
 TRU Activity Concentration 4.17E+006 +- 1.07E+006 nCi/g
 Pu-239 Equivalent Activity 3.11E+003 +- 7.97E+002 Ci
 Pu-239 FGE 7.23E+001 +- 1.39E+001 g
 Decay heat 1.13E+002 +- 2.90E+001 W

Nuclide	Mass g,	Activity Ci	Activity Uncert. Ci	MDA Ci
SR90	8.46E-008	1.17E-005	8.43E-007	0.00E+000
CS137	1.33E-007	1.17E-005	8.43E-007	2.71E-006
U233	<LLD	<LLD	0.00E+000	2.29E-002
U234	9.55E+001	6.03E-001	1.55E-001	0.00E+000
U235	3.87E+000	8.48E-006	1.34E-006	5.08E-006
NP237	1.54E+000	1.10E-003	5.69E-005	1.84E-005
PU238	1.97E+002	3.41E+003	8.77E+002	4.35E-001
U238	<LLD	<LLD	0.00E+000	2.51E-004
PU239	4.65E+001	2.93E+000	7.94E-001	3.73E-004
PU240	8.97E+000	2.06E+000	7.94E-001	2.63E-004
AM241	1.01E+000	3.52E+000	9.37E-001	4.49E-004
PU241	3.59E-001	3.74E+001	9.76E+000	4.77E-003
PU242	1.44E+000	5.71E-003	2.54E-003	0.00E+000

Errors quoted at 1.000 sigma

Operator: Michael Schneider Date: 7/23/13ITR: Tim Carlton Date: 7/23/13