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## TRUPACT-III License Exemption Request

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### Abstract

The TRUPACT-III is a large, rectangular, Type B(U)F-96 shipping package licensed by the U.S. Nuclear Regulatory Commission (USNRC) for use in transporting large boxes of transuranic waste for the U.S. Department of Energy (USDOE) to the Waste Isolation Pilot Plant near Carlsbad, New Mexico. The package is authorized to transport up to 80W of decay heat. During decommissioning work at a major USDOE site, a tank was encountered that had been used to hold Pu-238 solutions. After cutting the tank in half, each half still held more than 80W of contamination, but because of the risk to personnel, it was decided to seek an exemption from the USNRC to ship the segments without further sectioning. The exemption request sought relief from two regulatory requirements: the authorized decay heat limit shown on the Certificate of Compliance (CoC), and the activity limit of  $10^5$  A<sub>2</sub> for packages not shown to meet the deep immersion test of 10 CFR 71.61. In the first case, it was only necessary to show that the extra decay heat did not affect the level of safety provided by the package. In the case of the A<sub>2</sub> limit, it was necessary to prepare an Environmental Report, because the limit was an explicit requirement of Part 71. This paper describes the purpose of the exemption, its justification, and how it was ultimately obtained.

### Introduction

During decommissioning operations at a large U.S. Department of Energy (USDOE) site, a Pu-238 recovery system was dismantled. The work included removal of a tank which had been used to hold Pu-238-bearing solutions. The tank assembly consisted of two slab tanks each having a narrow cross section standing vertically on their long edge and separated and enclosed by a sheet metal housing. This work was completed in 2012. The contaminated components were slated to be transported to the Waste Isolation Pilot Plant (WIPP), near Carlsbad, New Mexico, in the TRUPACT-III transport package. The TRUPACT-III is a large, rectangular, Type B(U)F-96 shipping package certified by the U.S. Nuclear Regulatory Commission (USNRC) for use in transporting large boxes of transuranic waste from USDOE cleanup sites to the WIPP facility.

The tank assembly was highly contaminated and was located in a contaminated area. The initial dismantling step was to cut through the metal housing to separate the two slab tanks. At this time it was noted that the level of contamination in the region within the housing, between the slab tanks, was higher than expected. Each slab tank contained more activity than allowed by the TRUPACT-III CoC. However, it was determined that to further reduce the components by cutting into the slab tanks would not be in accordance with ALARA (as low as reasonably achievable) principles. Consequently, each slab tank was loaded intact into a SLB2 (i.e., the inner container used within a TRUPACT-III), and a process was initiated to seek an exemption for the two shipments from the USNRC. A cross-section of

the slab tanks in their housing is shown in Figure 1, the SLB2 container is shown in Figure 2, and the TRUPACT-III is shown in Figure 3.

### **Seeking Exemption from Transport Regulations**

10 CFR 71.12 [1] provides for the USNRC to issue an exemption from the regulations if it determines that the action "...is authorized by law and will not endanger life or property nor the common defense and security." Such exemptions may be issued in cases where an alternative may be more effective in promoting the USNRC's primary goals than the published regulations. For the case in point, to reduce the slab tanks to the activity level stated in the TRUPACT-III CoC would require large expenditures, risk of release of contamination to the environment, and potentially significant exposures of personnel. Since Pu-238 is relatively benign when properly contained, the decision to seek an exemption from the regulations seemed the better approach.

The USDOE tanks presented two licensing issues. First, due to the relatively high specific activity of Pu-238, the decay heat of each slab tank was approximately twice as high as the decay heat allowed in the TRUPACT-III CoC. This issue was resolved by revising the original thermal analysis to show the effect of the increase in heat generation. The resulting maximum increase in temperature of any component of the packaging was very modest, amounting to about 6 °C. This increase had no significant effect on the TRUPACT-III's ability to meet all of the applicable requirements of 10 CFR Part 71.

The second issue presented a more complicated problem. Because of the relatively high specific activity of Pu-238, the total activity of the payload exceeded a quantity of  $10^5 A_2$ . According to 10 CFR 71.61 (also known as the *Deep Immersion Test*), "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 inleakage of water." The TRUPACT-III was not designed for a payload exceeding  $10^5 A_2$ , and this requirement was not included in its design specification. Due to the flat-sided configuration of the TRUPACT-III, it would be difficult or perhaps impossible to demonstrate compliance with this requirement. Consequently, an exemption from the requirements of 10 CFR 71.61 became necessary.

These two issues are related to the same property of the payload – its high  $A_2$  value – but are very different in nature. The heat generation is limited by a provision in the packaging's CoC which is neither a regulatory limit nor a physical limit of the packaging design. As shown by thermal analysis, a much higher heat generation is possible while meeting all of the regulatory requirements. On the other hand, the  $A_2$  quantity runs up against an explicit limit in the regulations. Because of the different nature of the issues, they required two different solution approaches. The necessary increase in heat generation could be addressed by the USNRC issuing a straightforward one-time shipment authorization. The  $A_2$  limit issue required a relatively difficult exemption from the regulations. The exemption procedure made possible by the provision of 10 CFR 71.12 is an important and valuable means to solve otherwise intractable problems in radioactive materials transport. However, it is no panacea. The user of this approach must not expect any kind of "quick fix". As will be seen, the documentation effort and elapsed time was comparable to that of a full packaging approval application.

### **Environmental Report**

The USNRC received the request on January 28, 2014, and notified the applicant on May 20, 2014 that while there were no technical questions regarding the thermal analysis supporting the request for

increased decay heat, an environmental report would be required in connection with the exemption request. The reason for this is as follows.

The National Environmental Policy Act (NEPA) [2] entered into U.S. law in 1970. This act has been called the “environmental Magna Carta”, and requires that all executive federal agencies (such as the USNRC) identify the potential environmental effects of proposed agency actions. An evaluation of these effects must be documented in an environmental assessment (EA), or for major actions, in an environmental impact statement (EIS). An exception to this requirement occurs when the proposed action is contained within the agency’s categorical exclusion (CATX). This is a category of actions which have been previously determined not to have a significant effect on the environment. For the USNRC, the CATX includes issuance of a CoC to a radioactive materials transport packaging which meets the regulations contained in 10 CFR Part 71. This means that the transport of radioactive materials in a package which meets all of the relevant provisions of 10 CFR Part 71 also meets all of the relevant provisions of NEPA, and a separate EA does not need to be prepared for any package certificate issued by the USNRC. The request to be exempt from the deep immersion test, however, was not covered by the USNRC’s CATX, and consequently an EA would be required.

The request for additional information from the USNRC stated, in part, *“Approval of package designs for packages to be used for the transportation of licensed materials is an NRC action that typically is categorically excluded pursuant to 10 CFR 51.22(c)(13). The applicant’s request, however, involves an exemption from the requirements in 10 CFR Part 71 and the categorical exclusion that normally applies to transportation package design approvals does not apply when an approval is issued via an exemption to the regulations.”* This introduction was followed by a request for an environmental report (ER), which would inform the EA to be prepared by the USNRC.

The requested report was to be based on 10 CFR Part 51, *Environmental Protection Regulations For Domestic Licensing And Related Regulatory Functions* [3], specifically 10 CFR 51.30, *Environmental Assessment*, and 10 CFR 51.45, *Environmental Report*. Additional guidance was found in NUREG-1748, *Environmental Review Guidance for Licensing Actions Associated with NMSS Programs* [4]. Specifically, the USNRC requested the applicant to include the following information in the ER:

1. A description of the proposed action (e.g., planned activities, location, duration, maps showing location and facilities, as applicable).
2. A discussion of the purpose and need for the proposed action (why the proposed action and subsequent transport is needed).
3. A description of the alternatives considered, including but not limited to the no-action alternative (i.e., status quo). This description should discuss the alternatives that could accomplish the need for the proposed action. For example, alternatives should include evaluation of:
  - a. status quo (i.e., not making the shipment and storing the sections of the recovery transfer tank onsite),
  - b. further segmentation of the recovery transfer tank to reduce the package contents to below  $10^5 A_2$  for transport in TRUPACT-III, or
  - c. transport of the sectioned recovery transfer tank in another package that has been evaluated against the requirements in 10 CFR 71 .61 .

These evaluations should describe the circumstances as to why an existing, approved package cannot be used, explaining the alternatives considered, why each option above is not viable, and how USNRC's regulations to maintain doses as low as reasonably achievable were considered.

4. Describe any operational controls that will be used to compensate for using a package that does not meet all of the transportation package performance standards.
5. Identify the applicable regulatory requirements and permits. The information provided should identify the issuing agency, describe the type of license, permit or approval needed, and provide the status of securing the license, permit or approval.
6. Description of the affected environment. The description of the affected environment focuses on the baseline conditions, which are used to assess the environmental impacts.
7. Discussion of the environmental impacts of the proposed action and alternatives including but not limited to the following environmental resources: public and occupational health impacts, transportation impacts (e.g., doses to workers and public, traffic impacts), air quality impacts, water quality impacts, noise impacts, waste management impacts, potential impacts to historic and cultural resources and threatened and endangered species or critical habitats. The discussion should clearly state which resources are affected by the proposed action and those that would not be affected and an explanation of the determination that the impacts are significant or not significant. The discussion should focus on issues of significance; it may not be necessary for every resource to receive the same level of detail.

In response to this request, an ER was prepared by NWP which concluded that 1) there were no viable alternatives to transport of the tanks in the TRUPACT-III, and 2) any environmental consequences would be negligible.

### **USNRC Grants the Exemption**

The USNRC used the ER to create an EA [5]. Regarding environmental impacts, the USNRC notes, *“The potential impacts from granting the exemption would only be radiological...since they would only be realized in an accident scenario. Any nonradiological impacts (direct, indirect, or cumulative) would be no greater than those for the transport of any other TRUPACT-III package...”* The EA goes on to review the background for the deep immersion test:

*“The purpose of the deep water immersion test in 10 CFR 71.61 is to ensure package recoverability, since radioactive materials such as plutonium and high-level radioactive waste are increasingly being transported by sea in large quantities. The deep water immersion test external pressure of 2 MPa (290 psi) is equivalent to being submerged in 200-meter (660-ft) water depth and roughly corresponds to the continental shelf and to depths that the studies indicated radiological impacts could be important.”*

Since the TRUPACT-III was shown to meet the requirements of 10 CFR 71.73(c)(6) for immersion in up to 15 m of water, it was only necessary to stipulate that the transport of the two shipments not traverse any bodies of water deeper than 15 m, or 50 ft. None of the rivers crossed on the standard route between the USDOE site and WIPP are normally that deep, although they could become so in flooding conditions. By checking the weather and river conditions ahead of the planned shipment, this stipulation could be readily met. Thus, the USNRC EA concludes: *“...this exemption will not have a significant*

*effect on the human environment. Accordingly, NRC has determined that a Finding of No Significant Impact (FONSI) is appropriate and an EIS is not warranted.”* With this as a basis, the USNRC issued an authorization to make the two shipments before the end of 2019, and the process was at an end.

## **Timeline**

The exemption process happened to coincide with the temporary closure of WIPP, so there was little incentive to move quickly. The initial application for exemption was dated January 28, 2014. The USNRC letter granting the request was dated June 29, 2016, or an elapsed time of nearly 2½ years. There is no doubt that this timeline could have been compressed under a sense of urgency, but would have remained very significant. The cost to the public was commensurate with the time expended.

## **Summary and Lessons Learned**

In summary, a tank was encountered during cleanup of a USDOE site that could not be reasonably reduced to the payload decay heat and A<sub>2</sub> limits of the TRUPACT-III without excessive personnel exposure and cost. An exemption from the regulations regarding A<sub>2</sub> was sought from the USNRC for two shipments between the USDOE site and the WIPP site. A thermal analysis showed that the extra decay heat could be safely accommodated, and an environmental report demonstrated that the package could be safely transported over any bodies of water it was likely to encounter during transport. However, the process was a long and difficult road and should not be considered unless all alternatives have been exhausted.

Some lessons learned from the process are:

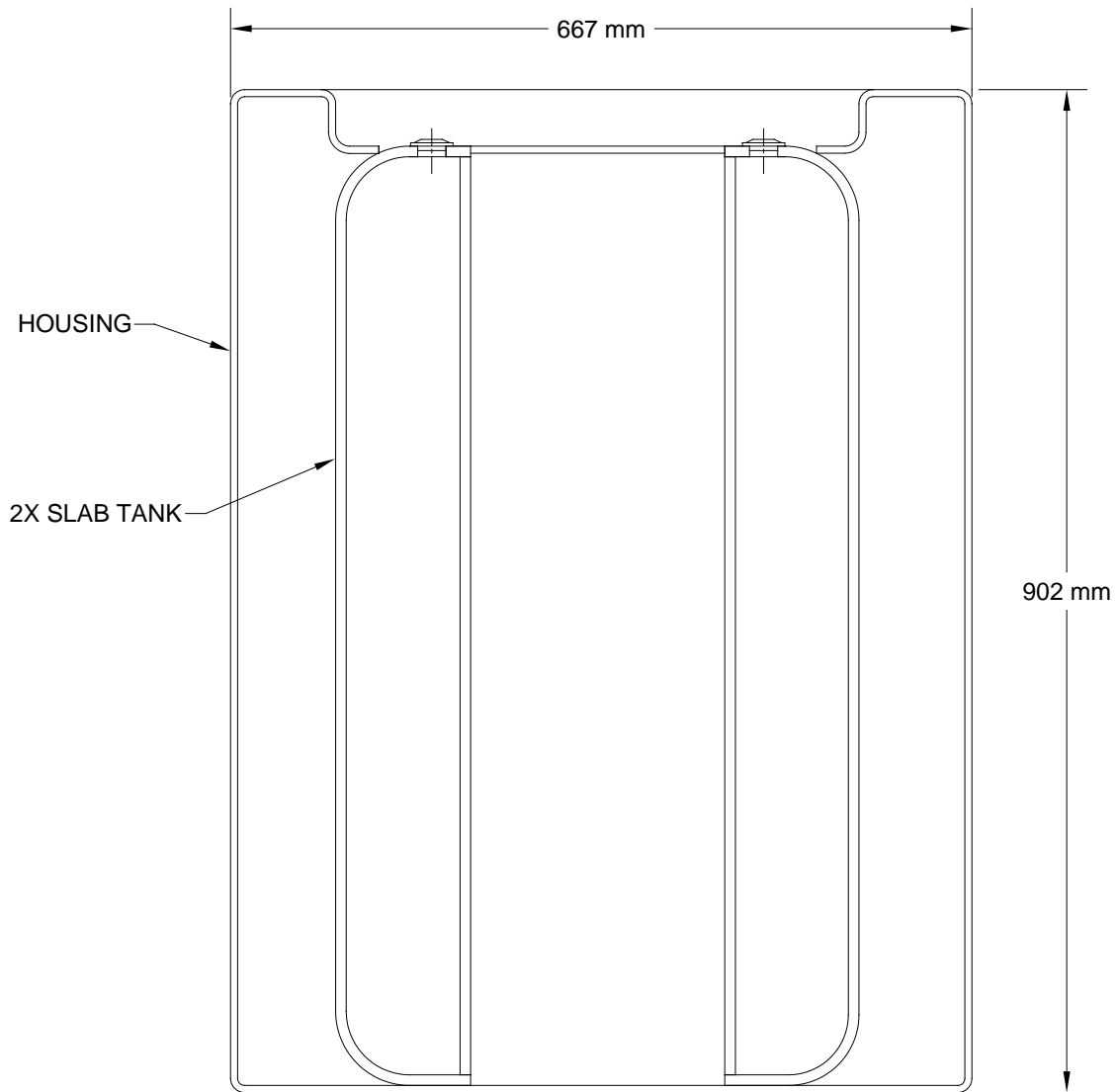
- Requests to the USNRC for exemption from the regulations have been rare, and typically involve significant effort on the part of both the applicant and the regulators. They are not a “get out of jail free” card for failure to meet the transport regulations. They should only be considered in special cases where there is no viable alternative.
- An exemption request should not ask the regulators to simply “toss out” a regulatory requirement, but should demonstrate both a sound technical resolution and that the overall level of safety in transport for the shipment of the radioactive material would not be compromised. In the case described, the applicant successfully showed that the deep immersion requirement was not needed for safety, since the package was demonstrated to be safe for the deepest water to be traversed.
- For an exemption request, the applicant should be prepared to write an environmental report with full technical justification for the action, and to encounter expenses and elapsed time which compare to the approval of a new package.
- For relief from the provisions of a specific CoC, an amendment should be used. The amendment would need to demonstrate compliance with the regulations and could become part of the certificate, or be issued as a time-limited authorization.

## References

1. Code of Federal Regulations, Title 10, Part 71 (10 CFR 71), *Packaging and Transportation of Radioactive Material*.
2. National Environmental Policy Act, 42 U.S.C. §4331 et seq.
3. Code of Federal Regulations, Title 10, Part 51 (10 CFR 51), *Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions*.
4. NUREG-1748, *Environmental Review Guidance for Licensing Actions Associated with NMSS Programs*, USNRC, August 2003 (ADAMS Accession No. ML032450279).
5. *Final Environmental Assessment for an Exemption From Requirement of 10 CFR 71.61 for Two TRUPACT-III Packages*, USNRC, May 2016 (ADAMS Accession No. ML16119A075).

## Acronyms

ALARA	As Low As Reasonably Achievable
CATX	Categorical Exclusion
CFR	Code of Federal Regulations
CoC	Certificate of Compliance
EA	Environmental Assessment
EIR	Environmental Impact Statement
ER	Environmental Report
FONSI	Finding of No Significant Impact
NEPA	National Environmental Policy Act
USDOE	U.S. Department of Energy
USNRC	U.S. Nuclear Regulatory Commission
WIPP	Waste Isolation Pilot Plant



**Figure 1. Slab Tanks in Outer Housing**



**Figure 2. SLB2 Container**



**Figure 3. TRUPACT-III in Transport Mode**