



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

January 10, 2022

MEMORANDUM TO: Geoffrey Miller, Acting Deputy Director  
Division of Fuel Management  
Office of Nuclear Material  
Safety and Safeguards

FROM: Bernard White, Senior Project Manager  
Storage and Transportation Licensing Branch  
Division of Fuel Management  
Office of Nuclear Material  
Safety and Safeguards

SUBJECT: SUMMARY OF DECEMBER 13, 2021, MEETING WITH LOUISIANA  
ENERGY SERVICES TO DISCUSS A PROPOSED EXEMPTION FOR  
THE MODEL NO. DN30 PACKAGE

A handwritten signature in blue ink that reads "Bernard White".

Signed by White,  
on 01/10/22

Background

On December 13, 2021, a virtual meeting was held, at the request of the Louisiana Energy Services doing business as Urenco USA (UUSA) with the U.S. Nuclear Regulatory Commission (NRC) staff to discuss a proposed exemption for shipment of uranium hexafluoride (UF<sub>6</sub>) enriched to 10 weight percent in the uranium-235 (<sup>235</sup>U) in the Model No. DN30 package. The list of meeting attendees is provided as Enclosure 1. The presentation used in the meeting is provided as Enclosure 2.

UUSA requested the meeting to kick off discussion with the NRC on its approach for a potential exemption request. During the meeting UUSA discussed its approach to the criticality safety evaluation and the environmental report. UUSA stated that it intends to pursue an exemption to the regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) 71.55(g)(4) to the 5 weight percent limit on use of an exception to the single package criticality analysis in 10 CFR 71.55(b) to be able to transport UF<sub>6</sub> enriched up to 10 weight percent <sup>235</sup>U and an amendment to add the exemption to its facility license through new license conditions. In addition to the exemption, UUSA will be requesting the deviations from Certificate of Compliance No. 9362.

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## Discussion

In the exemption request, UUSA will not be requesting any changes to the design of the packaging, however it will be providing new criticality and shielding analyses to support the exemption and associated deviations from the certificate. UUSA said it will be requesting the following deviations from Certificate of Compliance No. 9362, for the Model No. DN30 package:

- increase the maximum enrichment from 5 to 10 weight percent  $^{235}\text{U}$ .
- revise the Condition No. 6 in the certificate which requires the 30B cylinder to conformance to American National Standards Institute (ANSI) N14.1, "Nuclear Materials — Uranium Hexafluoride – Packagings For Transport," which limits the maximum enrichment in 30B cylinders to 5 weight percent  $^{235}\text{U}$ . NRC staff notes that International Standards Organization Standard No 7195, "Nuclear energy — Packaging of uranium hexafluoride ( $\text{UF}_6$ ) for transport" also limits the maximum enrichment to 5 weight percent  $^{235}\text{U}$  and is reference in Condition No. 6.
- increase the criticality safety index.

In its discussion, UUSA provided an overview the criticality analysis it has performed to-date to support the exemption request, including analyses for a single package and arrays of packages. In discussing these analyses, UUSA stated that it will

- factor in the mass of  $\text{UF}_6$ , which may be less than the maximum loading of 2277 kg of  $\text{UF}_6$  in a cylinder,
- evaluate a more realistic representation of the hydrogenated uranium residue sphere, and
- consider a potential reduction of the 5 percent administrative margin on the upper subcritical limit.

UUSA plans on using Oak Ridge National Laboratory Report No. ORNL/TM-2021/2043, "Analysis of the 30B  $\text{UF}_6$  Container for Use with Increased Enrichment" for developing bounding conditions for the criticality analysis base case. UUSA performed its criticality analyses for the maximum enrichment of 10 weight percent  $^{235}\text{U}$ .

In its single package analysis, UUSA modeled the 30B cylinder with and without the DN30 overpack for its single package analyses for 10 CFR 71.55(b), (d), and (e). None of these models consider the hydrogenated uranium residue and were evaluate using the maximum loading of the 30B cylinder, 2277 kg  $\text{UF}_6$ . UUSA reported that is maximum  $k_{\text{eff}}$ , including uncertainty is approximately 0.7, with the model that omits the DN30 overpack being the most reactive.

For its array analysis for normal conditions of transport, it considered 30 packages in  $2 \times 15$  array for the 5N array analyses. The 30B cylinders in the model were surrounded by a water layer that optimizes  $k_{\text{eff}}$ . The  $k_{\text{eff}}$  for this array is approximately 0.92. UUSA increased the array size to a  $2 \times 19$  array, which increased  $k_{\text{eff}}$  to approximately 0.95.

For the array analyses after the tests for hypothetical accident conditions, UUSA modeled 14 packages in a  $2 \times 7$  array which included the hydrogenated uranium residue. UUSA modeled the hydrogenated uranium residue as an 11.4 kg sphere in the form of  $\text{UO}_2\text{F}_2 \cdot 2\text{H}_2\text{O} \cdot 2\text{HF}$ , with the hydrogen fluoride (HF) mixed homogenously in the  $\text{UF}_6$ . UUSA stated that the  $k_{\text{eff}}$  for this array is approximately 0.90. Based on 2 papers it cited, UUSA proposed to not model a HF spherical shell around the hydrogenated uranium residue and used a bounding H/U ratio of 6. UUSA stated that is also considering requesting a lower maximum authorized mass of  $\text{UF}_6$  to reduce the criticality safety index.

UUSA briefly discussed its proposal to use an upper subcritical limit of 0.948, which corresponds to an administrative margin on 0.4. NRC guidance in NUREG-2216, "Standard Review Plan for Transportation Packages for Spent Fuel and Radioactive Material: Final Report," states that NRC accepts an administrative margin of 0.5. While this is a deviation from guidance, NRC told UUSA that it will need to provide justification for its reduced administrative margin. NRC further stated that there are not a lot of critical experiments that can be used to benchmark this criticality analysis, therefore it might be difficult to justify a reduction in the administrative margin.

Finally, UUSA described, at a very high level, the items it proposes for the environmental report. In the discussion of alternatives, the NRC stated that it would expect UUSA to discuss the use of the Model No. DN30-X (Docket No. 71-9388) as an alternative. The package design for the Model No. DN30-X (Docket No. 71-9388) is under review by the NRC for transport of UF<sub>6</sub> up to 20 weight percent <sup>235</sup>U. NRC stated that based on the proposed schedule, the DN30-X package could be approved before NRC receives an exemption request from UUSA.

NRC asked UUSA about its proposed schedule for requesting the exemption. UUSA stated that it was considering a December 2022 submittal date.

Docket Nos. 70-3103 and 71-9362  
EPID No. L-2021-LRM-0119

Enclosure:

1. Meeting Attendees
2. Meeting Presentation

SUBJECT: SUMMARY OF DECEMBER 13, 2021, MEETING WITH LOUISIANA ENERGY SERVICES TO DISCUSS A PROPOSED EXEMPTION FOR THE MODEL NO. DN30 PACKAGE. DOCUMENT DATE: January 10, 2022

**DISTRIBUTION:**

NRC Meeting Attendees  
K. Jamerson, NMSS

**ADAMS** Accession No.ML22004A169 ML22004A170 (Memo) ML22004A171(Enc1)  
ML22004A172 (Enc2)

<b>OFFICE</b>	NMSS/DFM	NMSS/DFM	NMSS/DFM
<b>NAME</b>	BWhite	SFigueroa	YDiaz-Sanabria
<b>DATE</b>	1/10/2022	1/5/2022	1/6/2022

Summary of December 13, 2021 meeting with LES to discuss exemption for DN30 package DATE January 10, 2022

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NAME	BWhite <i>BW</i>	SFiguroa <i>SF</i>	YDiaz-Sanabria <i>YD</i>	BWhite <i>BW</i>
DATE	Jan 4, 2022	Jan 6, 2022	Jan 6, 2022	Jan 10, 2022

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