



**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

A handwritten signature in blue ink, appearing to read "Bernard White", is positioned to the left of the signature line.

Signed by White,
on 01/10/22

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

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 (UF₆) enriched to 10 weight percent in the uranium-235 (²³⁵U) 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 UF₆ enriched up to 10 weight percent ²³⁵U 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.

CONTACT: Bernard White, NMSS/DFM
(301) 415-6577

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}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}U . NRC staff notes that International Standards Organization Standard No 7195, "Nuclear energy — Packaging of uranium hexafluoride (UF_6) for transport" also limits the maximum enrichment to 5 weight percent ^{235}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 UF_6 , which may be less than the maximum loading of 2277 kg of 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 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}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 UF_6 . UUSA reported that is maximum k_{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 2×15 array for the 5N array analyses. The 30B cylinders in the model were surrounded by a water layer that optimizes k_{eff} . The k_{eff} for this array is approximately 0.92. UUSA increased the array size to a 2×19 array, which increased k_{eff} to approximately 0.95.

For the array analyses after the tests for hypothetical accident conditions, UUSA modeled 14 packages in a 2×7 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 UF_6 . UUSA stated that the k_{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 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 UF₆ up to 20 weight percent ²³⁵U. 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

DISTRIBTION:

NRC Meeting Attendees
K. Jamerson, NMSS

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

OFFICE	NMSS/DFM	NMSS/DFM	NMSS/DFM
NAME	BWhite	SFigueroa	YDiaz-Sanabria
DATE	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

DISTRIBUTION:

BWhite, NMSS/DFM/STLB

MBartlett, NMSS/DFM/FFLB

ABarto, NMSS/DFM/NARAB

JCaverly, NMSS/REFS/ERMB

JQuintero, NMSS/REFS/ERMB

YDiaz-Sanabria, NMSS/DFM/CTCFB

PSaverot, NMSS/DFM/STLB

KJamerson, NMSS/MSST/MSEB

SFigueroa, NMSS/DFM/STLB

ADAMS Accession No.: ML22004A169; Memo ML22004A170

OFFICE	NMSS/DFM/STLB	NMSS/DFM/STLB	NMSS/DFM/CTCFB	NMSS/DFM/STLB
NAME	BWhite <i>BW</i>	SFigueroa <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

OFFICIAL RECORD COPY