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Document Control Desk
Director, Spent Fuel Project Office
Office of Nuclear Material Safety and Safeguards, NMSS
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Ref: (1) H. Shamkhani, Duratek, to Director, Spent Fuel Project Office, US NRC, July 15, 2005, E&L-039-05
(2) P. Paquin to Director, Spent Fuel Project Office, US NRC, August 4, 2005, E&L-064-05
(3) P. Paquin to Director, Spent Fuel Project Office, US NRC, October 5, 2005, E&L-086-05

Dear Sirs:

SUBJ: 3RD SUPPLEMENTAL SUBMITTAL; REQUEST FOR AMENDMENT OF CERTIFICATE OF COMPLIANCE NO. 9196, REV. NO. 21, FOR THE MODEL NO. UX-30 PACKAGE

The Reference 1 application and two subsequent supplemental submittals (Refs. 2 and 3) have been made to allow transport of smaller than 30" diameter UF_6 cylinders from East Tennessee Technology Park (ETTP) to the Gaseous Diffusion Plant Environmental Restoration Facility (PORTS), located near Portsmouth, OH, using UX-30 overpacks. Enclosed is our third supplemental submittal for the July 15th application.

The primary purpose of this submittal is to substitute the Nuclear Criticality Safety Report (NCSR), NCSR-ET-CSY-0048, Rev. 1, for the previous version included with the July 15th application (Ref. 1). In addition, changes in the U^{235} mass limits have been made in various places in the application to be consistent with the new Rev. 1 of the NCSR. The table in Attachment 1 to this letter contains an index of the changes that should be made to the July 15th application. Attachment 2 contains the changed pages themselves.

If you have any questions concerning this application, please contact Mr. Charles Witt at (803)758-1890 or crwitt@duratekinc.com.

NMSS01

Sincerely,

Patrick L. Paquin
General Manager, Engineering & Licensing

Attach: (1) Index of Changes to Application for Amendment of Certificate of Compliance No. 9196, Rev. 21, for the Model No. UX-30 Overpack (as Supplemented).
(2) Changed Pages, Application for Amendment of Certificate of Compliance No. 9196, Rev. 21, for the Model No. UX-30 Overpack (as Supplemented).

cc: Mark Allen, BJC
Doc. Control

Attachment 1

Index of Changes to Application for Amendment of Certificate of Compliance No. 9196, Rev. 21, for the Model No. UX-30 Overpack (as Supplemented)

Index of Changes to Application for Amendment of Certificate of Compliance No. 9196, Rev. 21, for the Model No. UX-30 Overpack (as Supplemented)

Remove These Pages from July 15th Submittal (as Supplemented)	Insert These Pages from this Submittal
Attachment 1, page 1-3	Attachment 1, page 1-3, Rev. 1
Attachment 1, pages 6-1 thru 6-3	Attachment 1, pages 6-1 thru 6-3, Rev. 1
Attachment 1, page 8-6	Attachment 1, page 8-6, Rev. 1
Attachment 2, NCSR-ET-CSY-0048, Rev. 0	Attachment 2, NCSR-ET-CSY-0048, Rev. 1
Attachment 3, page 2 of 3	Attachment 3, page 2 of 3, Rev. 1

Attachment 2

Changed Pages for Application for Amendment of Certificate of Compliance No. 9196, Rev. 21, for the Model No. UX-30 Overpack (as Supplemented)

30ECV cylinder will be at least 2620 lbs less than a standard 30B cylinder. Most ETTP <30" cylinders weigh much less than the assumed maximum of 900 lbs shown.

The enrichment of ETTP <30" cylinders vary greatly up to a maximum of approximately 89%. In general, however, there are very few cylinders containing greater than 10% enrichment – and these are small-diameter cylinders that contain small masses of UF_6. Consequently, rather than limiting the contents of the 30ECV cylinder by enrichment percentage of UF_6, a maximum mass of U-235 isotope is specified. The mass of U-235 isotope permitted in the 30ECV cylinder is limited to the amounts in Table 1-2 below. This limit is derived by the criticality calculation in Chapter 6.

Table 1-2
U-235 Mass Limits for the 30ECV Cylinder

Highest Enrichment (w/o) per Cylinder*	Maximum U-235 (grams) per Shipment	CSI
5	1600	0
15	1000	0
100	800	0

*Enrichment of the most highly enriched cylinder in a 30ECV shipment. Interpolation not permitted; use instead the mass limit per shipment and CSI for the most highly enriched cylinder in the 30ECV shipment.

This application includes information and analyses supporting the safety of transporting the 30ECV cylinders, and the ETTP <30" cylinders inside the 30ECV cylinders, with a UX-30 overpack. In the standard, licensed transport configuration, the UX-30 overpack provides structural and thermal protection for a UF_6 cylinder while the cylinder itself provides the necessary containment protection against dispersion of the UF_6. The UX-30 Safety Analysis Report (SAR) (Ref. 1.2) demonstrates that the UX-30 with a standard 30B or 30C cylinder can safely perform these functions and meet the applicable regulatory requirements. The intent of this application is to show that UX-30/30ECV configuration can perform these same safety functions as well. Since the 30ECV cylinder is similar to the standard 30B cylinder, and therefore will not affect the thermal and structural functions of the UX-30, this application does not include analyses of the UX-30 itself. The intent of the analyses in this application is to show that the 30ECV cylin-

Chapter 6
CRITICALITY EVALUATION

A criticality analysis has been performed on the ETTP <30" cylinders in the 30ECV and UX-30 based on the maximum enrichment of any of them. Details of this analysis is included in Attachment 2, Nuclear Criticality Safety Report. The following is a summary of the results.

Normal conditions of transport and hypothetical accident conditions have been demonstrated subcritical by keff calculations for infinite arrays of UX-30 packages containing a 30 ECV with one or more less than 30" UF_6 cylinders at various ^{235}U enrichment/mass combinations. All calculation results were shown to be subcritical with $k_{eff} + 2\sigma$ values less than the applicable upper subcritical limits established in Section 2. The enrichment/mass combinations allowed in the UX-30 are shown below.

^{235}U Enrichment Limit(%)	^{235}U Mass Limit (grams)	CSI
5	1600	0
15	1000	0
100	800	0

Measurement uncertainties in the enrichment and mass values must be considered when determining the loading of individual UF_6 cylinders into the packages.

The 30 ECV ASME pressure vessel (including the steel/foam insert and exterior foam, with dimensions as shown in References 5, 6, and 7 (Attachment 2) and the UX-30 over pack (with dimensions as shown in Reference 8 (Attachment 2) are credited as design features in this analysis. Dimensional tolerances have been discussed and will not significantly affect reactivity of the packages. Other manufacturing tolerances (e.g., composition of foam) have been addressed in the calculations, and shown not to have a significant impact.

Since an infinite array of cylinders has been shown subcritical under all normal conditions of transport and hypothetical accident conditions, the value "N" as specified in 10CFR71.59 is ef-

fectively equal to infinity, and the CSI is zero (0) in accordance with that regulation. Based on this CSI, UX-30 packages, each containing a 30 ECV with one or more less than 30" UF_6 cylinders limited to a total ^{235}U mass based on the highest ^{235}U enrichment in any loaded cylinder per the table above, may be shipped in a nonexclusive use conveyance as allowed by 10CFR71.59.

Fissionable Isotopes Other Than U-235 in UF6 Cylinders

Individual UF6 cylinders may contain small quantities of fissionable isotopes other than 235U. To account for these other isotopes, the Fissionable Equivalent Mass (FEM) factors given in Bechtel Jacobs Company (BJC) procedure BJC-NS-1003, Revision 7, will be used (see table below for a list of fissionable isotopes and their corresponding FEM factors).

Nuclide	f_{35} **(mass factor for ^{235}U FEM)**
^{233}U	1.4
^{235}U	1
^{236}Np	140
^{237}Np	0.035
^{238}Pu	0.23
^{239}Pu	1.56
^{240}Pu	0.047
^{241}Pu	3.5
^{242}Pu	0.018
^{241}Am	0.044
^{242m}Am	54
^{243}Am	0.028
^{243}Cm	7.8
^{244}Cm	0.23
^{245}Cm	23
^{247}Cm	0.78
^{249}Cf	70
^{251}Cf	140

The FEM factors correlate a fissionable nuclide mass to a corresponding ^{235}U mass for various fissionable nuclides. To determine the equivalent ^{235}U mass (i.e., FEM) when a fissionable isotope other than ^{235}U is present, the mass of the other fissionable isotope is multiplied by the corresponding FEM factor. The equivalent ^{235}U masses from the other fissionable isotopes present

in a cylinder are then summed with the mass of ^{235}U in the cylinder to determine the total ^{235}U FEM for that cylinder. The equation is as follows:

$$^{235}U\,FEM = M_{235_U} + \sum_{i=1}^{x} M_i * (f_{35})_i$$

Where:

M_{235_U} = Mass of ^{235}U

M_i = Mass of other fissionable isotope i

$(f_{35})_i$ = FEM factor for other fissionable isotope i

x = The number of other fissionable isotopes present

The calculated ^{235}U FEM must be less than or equal to the ^{235}U mass limit for transportation of the UF_6 cylinders. The limits for less than 30" cylinders are 1600 grams ^{235}U at ^{235}U enrichments up to 5%, 1000 grams ^{235}U at ^{235}U enrichments up to 15%, or 800 grams ^{235}U at ^{235}U enrichments up to 100%.

ANSI N14.1 Criteria	Paragraph	Summary of Requirements for 30B Cylinders	Compliance of 30ECV Cylinders
		Max. Enrichment = 5% Max. Fill = 5020 lb	Max. Enrichment: Max. U-235 per shipment: Max. Enrichment: 5, 15, 100 — Max. U-235 per 30ECV: 1600, 1000, 800 Max. Fill = 1600 lbs (Insert, UF_6 cylinders, dunnage)
Cylinders	6	Requirements for UF6 cylinders	See subparagraphs below
Design & Fabrication	6.1	General requirements for design & fabrication	See subparagraphs below
General	6.1.1	Design conditions and specified materials for pressure retaining portions of the cylinders shall be adhered to. More than 1 valve or plug are allowed, provided they are installed in accordance with ANSI N14.1.	Design, fabrication, inspection, testing and cleaning of the 30ECV comply with most requirements of ANSI N14.1for a 30B cylinder. Valves are not provided. One plug is provided for hydrostatic pressure test.
Reports/Certification/Records	6.1.2	Cylinder owner shall retain Manufacturer Data Report, As Built Drawings, certifications and radiographs. Manufacturer must measure cylinder water weight and tare weight.	Manufacturer Data Report, As Built Drawings and certifications for the 30ECV will be provided to the owner. Vessel tare weight will be determined by the manufacturer. In order to avoid water entrapment in the vessel foam the water weight will be calculated.
Cleanliness	6.2	Cleanliness reqmts for UF_6 cylinders	See subparagraphs below
New Cylinders	6.2.1	Cleanliness reqmts for new cylinders	Cleanliness requirements will be adhered to by the vessel manufacturer. See section 6.10 for details.
In-Service Cylinders	6.2.2	Cleanliness reqmts for in-service cylinders	Cleanliness requirements will be adhered to.
Cylinder Outer Surfaces	6.2.3	Surfaces shall be monitored & cleaned when reqd	The external surfaces of the 30ECV will be cleaned as necessary.
Services Inspections, Tests and Maintenance	6.3	Requirements for UF_6 cylinders inspections, tests and maintenance	See subparagraphs below
Routine Operational Inspections	6.3.1	Routine examination of cylinders for leaks, cracks, broken valves or other conditions affecting safety	Routine inspections of the 30ECV cylinders will be performed.