71-9315

**Department of Energy**
Washington, DC 20585

SEP 08 2008

Attn: Document Control Desk
Director, Spent Fuel Project Office
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

In a letter dated August 26, 2008, the U. S. Department of Energy (DOE) submitted responses to Requests for Additional Information for Amendment 9 of the ES-3100 shipping container, Docket No. 71-9315, USA/9315/B(U)F-96. This submittal included a response document and change pages to the ES-3100 Safety Analysis Report (SAR).

In the SAR change pages, page 6-30 was inadvertently left out. By this letter, DOE is sending the missing page. Also, in order to make the SAR accurate, the revision log page xxiii was also changed to add page 6-30. By this letter, DOE is sending a new page xxiii for Volumes 1 and 2 of the SAR.

The original of this letter, with attachments is being sent to the Document Control Desk. Ten copies of this letter with attachments are being delivered to Kimberly J. Hardin, Project Manager, Licensing Branch, Division of Spent Fuel Storage and Transportation, Office of Nuclear Material Safety and Safeguards shortly after this letter is sent.

NMSS01

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If you have any questions, please contact me at 301-903-5513.

Sincerely,

James M. Shuler

Dr. James M. Shuler
Manager, Packaging Certification Program
Office of Packaging and Transportation
Office of Environmental Management

Enclosure

cc with enclosure:
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## REVISION LOG

| Date | SAR Revision No. | Description | Affected Pages |
|---|---|---|---|
| 8/28/08 | 2, Page Change 2 | Revised SAR in response to RAIs dated April 28, 2008 for review of CoC 9315, Revision 8 | i, vi, viii, xii, xxiii, xxiv, 1-10, 1-14 through 1-16, 1-22, 2-1, 2-25 through 2-28, 2-894, 3-15, 3-16, 3-165 through 3-290, 4-1, 4-2, 6-1 through 6-3, 6-20 through 6-28, 6-30 6-32 through 6-34, 6-68 through 6-70, 6-70a, 6-70b, 6-75 through 6-77, 6-77a, 6-77b, 6-78, 6-81 through 6-83, 6-85, 6-86, 6-101 through 6-103, 6-103a through 6-103j, 6-104, 6-123 through 6-126, 6-167 through 6-170, 6-177, 6-177a, 6-177b, 6-218a through 6-218f, 6-219 through 6-234, 6-303 through 6-305, 6-331, 6-332, 6-332a, 6-332b, 6-333, 6-394 through 6-398, 6-501, 6-502, 6-502a through 6-502dd |

**Table 6.2a. HEU fissile material mass loading limits (case name) for surface-only modes of transportation**

| Solid HEU metal of specified geometric shapes | | | | | | |
|---|---|---|---|---|---|---|
| **Transport index based on nuclear criticality control** | **cylinders (d ≤ 3.24 in.)** | **cylinders (3.24 in. < d ≤ 4.25 in.)** | **bars** | **slugs [a] enr. ≤ 95%** | **slugs [b] 80% < enr. ≤ 95%** | **slugs [b] enr. ≤ 80%** |
| **No can spacers** | | | | | | |
| CSI = 0.0 | 18,000 g $^{235}$U (nciacyt11_18_1_3) | 15,000 g $^{235}$U (nciacyct11_15_1_3) | 30,000 g $^{235}$U (hciasqt12_30_1_3) | 17,374 g $^{235}$U (ncia5st11_1_1_7_3) | - | - |
| **With can spacers** | | | | | | |
| CSI = 0.0 | 30,000 g $^{235}$U (nciacyt11_30_2_3) | 25,000 g $^{235}$U (nciacyct11_25_2_3) | 36,000 g $^{235}$U (nciasqt11_36_2_3) | - | 24,324 g $^{235}$U (hcia70st12_2_7_3) | 29,318 g $^{235}$U (ncia5est11_2_2_5_3) |
| CSI = 0.4 | - | - | - | - | 34,749 g $^{235}$U [b] (ncf15est12_2_2_7_3) | 29,318 g $^{235}$U (ncf15est11_2_2_5_3) |
| **Solid HEU metal of unspecified geometric shapes characterized as broken metal** | | | | | | |
| **Transport index based on nuclear criticality control** | **95% < enr. ≤ 100%** | **90% < enr. ≤95%** | **80% < enr. ≤90%** | **70% < enr. ≤80%** | **60% < enr. ≤70%** | **enr. ≤60%** |
| **No can spacers** | | | | | | |
| CSI = 0.0 | can spacers required | can spacers required | can spacers required | 2,967 g $^{235}$U (hciabmt12_4_1_5_3) | 3,249 g $^{235}$U (hciabmt12_5_1_4_3) | 5,576 g Uranium (nciabmt11_6_1_3_3) |
| CSI = 0.4 | can spacers required | can spacers required | can spacers required | 5,192 g $^{235}$U (ncf1bmt11_7_1_5_3) | 5,848 g $^{235}$U (ncf1bmt11_9_1_4_3) | 14,872 g Uranium (ncf1bmt11_15_1_3_3) |
| CSI = 0.8 | can spacers required | can spacers required | can spacers required | 8,900 g $^{235}$U (ncf2bmt11_12_1_5_3) | 13,646 g $^{235}$U (ncf2bmt11_20_1_4_3) | 28,814 g Uranium (ncf2bmt11_29_1_3_3) |
| CSI = 2.0 | can spacers required | can spacers required | can spacers required | 17,059 g $^{235}$U (ncf3bmt11_22_1_5_3) | 21,444 g $^{235}$U (ncf3bmt11_31_1_4_3) | 35,320 g Uranium (ncf3bmt11_36_1_3_3) |
| CSI = 3.2 | can spacers required | can spacers required | can spacers required | 27,692 g $^{235}$U (ncf5bmt11_35_1_5_3) | 24,692 g $^{235}$U (ncf5bmt11_36_1_4_3) | 35,320 g Uranium (ncf5bmt11_36_1_3_3) |
| **With can spacers** | | | | | | |
| CSI = 0.0 | 2,774 g $^{235}$U (hciabmt12_3_2_8_3) | 3,516 g $^{235}$U (hciabmt12_4_2_7_3) | 3,333 g $^{235}$U (hciabmt12_4_2_6_3) | 4,450 g $^{235}$U (hciabmt12_6_2_5_3) | 5,198 g $^{235}$U (nciabmt11_8_2_4_3) | 11,154 g Uranium (hciabmt12_12_2_3_3) |
| CSI = 0.4 | 5,549 g $^{235}$U (ncf1bmt11_6_2_8_3) | 6,154 g $^{235}$U (ncf1bmt11_7_2_7_3) | 7,500 g $^{235}$U (ncf1bmt11_9_2_6_3) | 8,900 g $^{235}$U (ncf1bmt11_12_2_5_3) | 12,996 g $^{235}$U (ncf1bmt11_19_2_4_3) | 28,813 g Uranium (ncf1bmt11_29_2_3_3) |
| CSI = 0.8 | 9,248 g $^{235}$U (ncf2bmt11_10_2_8_3) | 10,549 g $^{235}$U (ncf2bmt11_12_2_7_3) | 12,500 g $^{235}$U (ncf2bmt11_14_2_6_3) | 16,317 g $^{235}$U (ncf2bmt11_21_2_5_3) | 20,793 g $^{235}$U (ncf2bmt11_30_2_4_3) | 35,320 g Uranium (ncf2bmt11_36_2_3_3) |
| CSI = 2.0 | 13,872 g $^{235}$U (ncf3bmt11_14_2_8_3) | 18,461 g $^{235}$U (ncf3bmt11_20_2_7_3) | 20,000 g $^{235}$U (ncf3bmt11_23_2_6_3) | 25,218 g $^{235}$U (ncf3bmt11_32_2_5_3) | 24,692 g $^{235}$U (ncf3bmt11_36_2_4_3) | 35,320 g Uranium (ncf3bmt11_36_2_3_3) |
| CSI = 3.2 | 24,969 g $^{235}$U (ncf5bmt11_25_2_8_3) | 26,373 g $^{235}$U (ncf5bmt11_28_2_7_3) | 28,334 g $^{235}$U (ncf5bmt11_35_2_6_3) | 28,184 g $^{235}$U (ncf5bmt11_36_2_5_3) | 24,692 g $^{235}$U (ncf5bmt11_36_2_4_3) | 35,320 g Uranium (ncf5bmt11_36_2_3_3) |

**Table 6.2a. HEU fissile material mass loading limits (case name) for surface-only modes of transportation**

| HEU oxide and UNX crystals | | | | | |
|---|---|---|---|---|---|
| **Transport index based on nuclear criticality control** | **HEU product oxide, no can spacers** | **HEU skull oxide, no can spacers** | **UNX crystals, no can spacers** | **unirradiated TRIGA fuel elements, no can spacers [c]** | |
| | | | | 20% enrichment | 70% enrichment |
| CSI = 0.0 | 21,125 g $^{235}$U (nciaoxt11_1_24_1_3) | 15,673 g $^{235}$U and 921 g C (nciask_9_15) | 3,297 g $^{235}$U (nciapunhct11_7_3) | 921 g $^{235}$U (nciatriga_1_15_3) | 408 g $^{235}$U (nciatriga70_1_15_3) |
| CSI = 0.4 | - | - | 11,303 g $^{235}$U (ncf1punhct11_24_3) | - | - |

[a] When can spacers **are not** used, the mass limit = 17,374 g $^{235}$U.

[b] When can spacers are used, a greater fissile mass limit is permissible based on enrichment. For CSI=0 and enrichments above 80 wt%, the fissile mass must be reduced below the volumetric limit. For CSI=0.4, fissile mass is volumetrically limited by the size of the slugs. Note that within a fixed volume, the HEU mass increases slightly with deceasing enrichment.

[c] For ground transport, TRIGA reactor fuel element content will be limited to three fuel sections ("meats") per loaded convenience can and up to three loaded cans per package. The TRIGA fuel content may also be configured as clad fuel rods, each rod derived from a single TRIGA fuel element. A ~15 inch long rod consists of the three fuel pellets and an exterior sheath of clad, where protruding clad at each end has been crimped in. Clad fuel rods will be packed into convenience cans, with a maximum of three fuel rods per loaded convenience can and one loaded can per containment vessel.

**Table 6.2b. HEU fissile material mass loading limits for air transport mode of transportation**

| Solid HEU metal of specified geometric shapes | | | | | |
|---|---|---|---|---|---|
| **One per convenience can** | **cylinders (d = 3.24 in.)** | **cylinders (3.24 < d ≤ 4.25 in.)** | **bars** | **slugs** | |
| | 500g $^{235}$U | 500g $^{235}$U | 500g $^{235}$U | 500g $^{235}$U | |
| **Solid HEU metal of unspecified geometric shapes characterized as broken metal [a]** | | | | | |
| | **enr. ≤ 20%** | | **20% < enr. ≤ 100%** | | |
| | 700g $^{235}$U | | 500g $^{235}$U | | |
| **HEU oxide, UNX crystals, unirradiated TRIGA fuel elements [b]** | | | | | |
| | **HEU product oxide** | **HEU skull oxide** | **UNX crystals** | **unirradiated TRIGA [c]** | |
| | | | | **20% enrichment** | **70% enrichment** |
| | **not allowed** | **not allowed** | **not allowed** | 716g $^{235}$U | 408g $^{235}$U |

[a] Research reactor related contents of uranium metal or U-Al alloy are packaged for air transport under these specified limits.

[b] Research reactor related contents of $U_3O_8$, $U_3O_8$-Al, $UO_2$, or $UO_2$-Mg are packaged for air transport under limits specified for unirradiated TRIGA fuel elements. Per package limits for these items are a maximum of 716 g $^{235}$U at enrichments not exceeding 20 wt% and a maximum of 408 g $^{235}$U for content enrichments greater than 20 wt%.

[c] For air transport, TRIGA reactor fuel element content will be limited to fuel sections or clad fuel rods as described for surface-only modes of transportation in footnote "c" of Table 6.2a and the fissile mass limit specified herein, whichever is more limiting.