

November 12, 2012
REL:12:048



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

Gentlemen:

Subject: 10 CFR 71.95 - Related Information Involving Shipments of Uranium Dioxide Powder to Japan in Model TNF-XI Packagings that Violated Requirements of DOT Competent Authority Certificate USA/0653/AF-96 Revision 6.

On September 13, 2012 AREVA NP Inc. (AREVA) discovered, through information provided by its AREVA affiliate Transnuclear Inc. (TN Inc.), that the majority of its past shipments of UO₂ powder to a Japanese customer utilizing the TNF-XI packaging did not fully comply with the payload restrictions in U.S. Department of Transportation (USDOT) Competent Authority Certificate (CAC) USA/0653/AF-96. The USDOT CAC is primarily a revalidation of the French Certificate F/381/AF-96(Bc). The exception is the table specifying the material loading limits, which is based on the criticality safety analysis underlying the NRC Certificate of Compliance for the TNF-XI (COC USA/9301/AF-85). Although not specifically called out in the USDOT CAC, the criticality safety analysis underlying the payload limits in the CAC imposes a maximum particle diameter limit above which powder must be shipped under the more limiting payload restrictions for "Heterogeneous UO₂ Material (Pellet and Scrap)". UO₂ powder produced in Richland for this customer exceeds the specified particle diameter limit.

Lacking knowledge of this particle size criterion, AREVA and its Japanese customer (which owns the TNF-XI packagings) had considered the powder supplied by AREVA to be covered under the "Homogeneous UO₂ Powder" loading criteria in the CAC. For enrichments above 4.05 weight % U-235, the homogeneous UO₂ powder loading limits are less restrictive than those for heterogeneous UO₂ material (pellet and scrap). The majority of AREVA's shipments to this customer exceeded 4.05 wt. % U-235 and were loaded in excess of the more restrictive heterogeneous material limits. AREVA is currently complying with the CAC by maintaining its pail loading limits as before but only loading two pails plus one empty pail in each of the four cavities of the TNF-XI.

The reportability of this event under 10 CFR 71.95 is somewhat unclear in that the USDOT CAC is a revalidation of a foreign certificate as opposed to an NRC COC. Nonetheless AREVA is conservatively providing this report to meet the information requirements specified in 10 CFR 71.95(c). As noted in the attachment, AREVA considers the safety consequences/implications of this event to be low.

Two copies of the 71.95(c) information are attached (one proprietary and one redacted). Please note that the one copy contains proprietary information and AREVA requests that

AREVA NP INC.

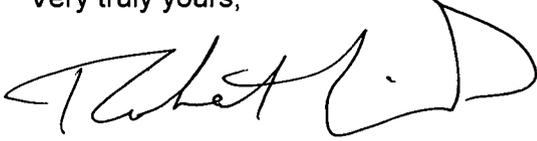
2101 Horn Rapids Road, Richland, WA 99354
Tel.: 509 375 8100 - www.aveva.com

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it be withheld from the public under Title 10 of the Code of Federal Regulations, Section 2.390. One copy has been redacted and constitutes the public version of the information.

If you have questions or require additional information, please feel free to contact me at 509-375-8409.

Very truly yours,

A handwritten signature in black ink, appearing to read "R. E. Link". The signature is stylized with a large, looped initial "R" and a distinct "L".

R. E. Link, Manager
Environmental, Health, Safety, & Licensing

cc: Mary Thomas
Fuel Facility Inspection Branch 3
Division of Fuel Facility Inspection
USNRC Region II
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/mah

10 CFR 71.95(c) - Related Information Relative to Shipments of Uranium Dioxide Powder Not Fully Complying with USDOT CAC USA/0653/AF-96 for the Model TNF-XI Packaging 10 CFR 71.95(c)

(1) A brief abstract describing the major occurrences during the event, including all component or system failures that contributed to the event and significant corrective action taken or planned to prevent recurrence.

Shipments of low-enriched uranium dioxide powder are routinely made from AREVA NP Inc.'s (AREVA's) Richland, Washington fuel fabrication plant (NRC License No. SNM-1227) to Nuclear Fuel Industries' (NFI's) fuel fabrication plants in Tokai, Japan and Kumatori, Japan. The shipments are made using Model TNF-XI fissile radioactive material packages owned by NFI and licensed under U.S. Department of Transportation (USDOT) Competent Authority Certification USA/0653/AF-96. These shipments routinely ship from the Port of Oakland, CA or the Port of Everett, WA to Tokyo, Japan.

The USDOT Competent Authority Certification USA/0653/AF-96 Revision 6 is a revalidation of French Competent Authority Certificate F/381/AF-96 (Cf). An exception is that the "type and form of material" and "maximum quantity of material" in the CAC are based on the criticality analysis conducted by Transnuclear Inc. in support of NRC Certificate of Compliance USA/9301/AF-85. This was necessitated by the fact that the NRC does not currently recognize the criticality calculation codes supporting the French certificate and that the NRC provides the criticality safety review for DOT CACs. Tables 1 and 2 of the CAC list the authorized contents in two different categories, column 2 "Homogeneous UO₂ Powder" and column 3 "Heterogeneous UO₂ Material (Pellet and Scrap)". For enrichments above 4.05 weight % U-235, the maximum mass of heterogeneous UO₂ material allowed in a TNF-XI is less than the maximum allowable mass of homogeneous UO₂ powder and the differences become greater as the enrichment increases up to 5 weight % U-235. NFI and AREVA always considered the UO₂ powder made by AREVA and shipped to NFI in the TNF-XI to fall under the category of "Homogeneous UO₂ Powder", and that is how it has always been shipped. On August 20, 2012, NFI asked Transnuclear International (TNI) for clarification regarding the description of the granulated UO₂ in the underlying US criticality safety analysis, the granulated powder being defined in the French certificate. TNI consulted Transnuclear Inc. (TN Inc.) for technical support on this question. After reviewing the TNF-XI criticality safety analysis and documentation that supported the USDOT CAC application, TN Inc. concluded that the granulated powder should be covered by the heterogeneous material content criticality analysis rather than the homogeneous content analysis. TN Inc. determined that the UO₂ particle size cutoff between homogeneous and heterogeneous UO₂ was a diameter of 0.5 mm. The UO₂ powder made by AREVA NP Richland has a particle diameter of [REDACTED]. TN Inc. informed AREVA NP Richland of their finding on September 13, 2012. The TN Inc. notification also pointed out the following statement from the criticality analysis: "It is expected that the fissile material will be divided evenly among the four cavities. Therefore, no cavity may exceed one quarter of the total UO₂ mass limit of the entire package." Upon notification of the situation, all loading of NFI powder pails into TNF-XIs was stopped at AREVA NP Richland.

After it was determined that restricting the number of loaded pails to two per TNF-XI cavity (plus one empty pail) would meet the mass restrictions for heterogeneous UO₂ material greater than 4.05 weight % U-235, all loaded TNF-XIs (which all had UO₂ powder that was enriched to 4.8%) at Richland were downloaded and then reloaded so

as to have two loaded and one empty pail per cavity, or a total of eight loaded pails per TNF-XI. The loading of empty TNF-XIs was then resumed at Richland using the same technique.

(2) A clear, specific, narrative description of the event that occurred so that knowledgeable readers conversant with the requirements of Part 71, but not familiar with the design of the packaging, can understand the complete event. The narrative description must include the following specific information as appropriate for the particular event.

A narrative of the event was provided under (1), above. The event is not related to the physical design of the TNF-XI packaging. Additional information related to the event is provided in (i) – (ix), below.

(i) Status of components that were inoperable at the start of the event and that contributed to the event;

As described in (1) above, the event involved the misclassifying the UO₂ powder as homogeneous UO₂ powder instead of heterogeneous UO₂ material. The event did not involve any system or component failures with the containers themselves.

(ii) Dates and approximate times of occurrences;

Since November 2003, AREVA has made [REDACTED] shipments of uranium dioxide powder to Japan using the TNF-XI packages. Rather than listing all [REDACTED] dates for the shipments, the table below summarizes the shipments by year, with the total number of TNF-XIs shipped in each year. It should be noted that not all of the shipments were in non-compliance with the criticality analysis since the enrichments of some the material in the shipments were equal to or less than 4.05 weight % U-235. But the majority of the shipments were of UO₂ powder with enrichments greater than 4.05 weight % U-235.

| Year | Number of Shipments | Total Number TNF-XIs Shipped |
|-------------|----------------------------|-------------------------------------|
| 2003 | [REDACTED] | [REDACTED] |
| 2004 | [REDACTED] | [REDACTED] |
| 2005 | [REDACTED] | [REDACTED] |
| 2006 | [REDACTED] | [REDACTED] |
| 2007 | [REDACTED] | [REDACTED] |
| 2008 | [REDACTED] | [REDACTED] |
| 2009 | [REDACTED] | [REDACTED] |
| 2010 | [REDACTED] | [REDACTED] |
| 2011 | [REDACTED] | [REDACTED] |
| 2012 | [REDACTED] | [REDACTED] |

(iii) The cause of each component or system failure or personnel error, if known;

There were no TNF-XI component or system failures associated with this event. The cause appears to be that the 0.5 mm UO₂ particle diameter limit in the criticality analysis between homogeneous UO₂ powder and heterogeneous UO₂ material was not formally listed in the USDOT CAC for the TNF-XI so that both NFI and AREVA believed that the

UO₂ powder being shipped in the TNF-XI met the requirements of homogeneous UO₂ powder.

- (iv) The failure mode, mechanism, and effect of each failed component, if known;

No failed components were involved in this event.

- (v) A list of systems or secondary functions that were also affected for failures of components with multiple functions;

There were no component failures associated with this event.

- (vi) The method of discovery of each component failure or procedural error.

There were no component or system failures associated with this event.

As stated in (1) above, Transnuclear Inc. informed AREVA NP of the requirement for UO₂ powder with a diameter greater than 0.5 mm to be classified as heterogeneous UO₂ material and packed in TNF-XIs accordingly .

- (vii) For each human performance-related root cause, a discussion of the causes and circumstances;

The human performance deficiency for the apparent cause appears to be that NFI and AREVA NP personnel lacked the information that a 0.5 mm particle diameter was the cutoff size between homogeneous UO₂ powder and heterogeneous UO₂ material. Also, the 0.5 mm diameter limit for homogeneous UO₂ powder is not explicitly stated in USDOT CAC USA/0653/AF-96 Revision 6.

- (viii) The manufacturer and model number (or other identification) of each component that failed during the event;

There were no component failures associated with this event.

- (ix) For events during the use of a packaging, the quantities and chemical and physical forms(s) of the package contents;

The large number of shipments make it difficult to list the individual quantities of each shipment, but any shipments of UO₂ powder enriched to more than 4.05 weight percent U-235 likely exceeded the mass limits for heterogeneous UO₂ material listed in the USDOT CAC USA/0653/AF-96 Section 2 in effect at the time of the shipment. The shipments consisted of solid uranium dioxide powder enriched to more than 4.05 and less than 5.0 weight percent U-235.

- (3) An assessment of the safety consequences and implications of the event. This assessment must include the availability of other systems or components that could have performed the same function as the components and systems that failed during the event.

The actual safety consequences and implications of this event are considered to be low. The shipments were not involved in any events that challenged the criticality safety provisions of the packages. More importantly, the loading limit tables used at AREVA to

load the TNF-XI containers are generally conservative with respect to the limits in the current French certificate for the more reactive heterogeneous material. (The AREVA loading tables are more conservative at all enrichments of 4.35 wt. % or below and for six of the ten listed enrichments from 4.45 – 4.95 wt. %. Of the four non-conservative loading limits, the range of differences from the French certificate was 0.3 to 1.14%). The occurrences did not result in the exposure of individuals to radiation or radioactive materials. No components or systems failed.

(4) A description of any corrective actions planned as a result of the event, including the means employed to repair any defects, actions taken to reduce the probability of similar events occurring in the future;

The short term corrective action is to restrict the number of loaded pails in TNF-XIs for UO₂ powder enriched to greater than 4.05 weight % U-235 to two (2) per TNF-XI cavity and eight (8) per TNF-XI, with the void space being filled by empty pails. No long term solution has yet been determined.

(5) Reference to any previous similar events involving the same packaging that are known to the licensee or certificate holder.

An event involving the unauthorized use of polyethylene bags in the TNF-XIs was reported to the NRC in October 2010 by AREVA NP.

(6) The name and telephone number of the person with the licensee's organization who is knowledgeable about the event and can provide additional information.

*Robert E. Link, Manager
Environmental, Health, Safety, & Licensing
AREVA Richland Fuel Fabrication Plant
(509) 375-8409*

(7) The extent of exposure to individuals to radiation or radioactive materials without identification of individuals by name.

This event did not involve the exposure of individuals to radiation or radioactive materials.