AREVA

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

Subject: **Report of Non-Compliance with Conditions in Certificate of Compliance USA/9319/B(U)F-96 for the Model MAP-12 Licensed Shipping Container (Cracking and Buckling of Base Spacer Weldments); AREVA Inc. Richland, WA Facility**

Attached please find information as required by 10 CFR 71.95(c) pursuant to shipments of enriched uranium-containing fuel assemblies in Model MAP-12 licensed shipping containers. Certain of the MAP-12 containers were discovered to have small cracks in, and minor buckling of, the base spacer weldments which support the package during transportation.

As discussed therein, the base spacer weldments are classified as Safety Category C items and the conditions are judged to be of low safety significance and not indicative of a component failure. The issue has been effectively managed within AREVA's formal corrective action program.

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

Very truly yours,

Robert E. Link, Manager
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Attachment

Event Information Required by 10 CFR 71.95(c) Relative to Shipments of MAP-12 Packages that had Cracks in Components of Minor Safety Significance that Violated the Requirements of 10 CFR 71.87(b)

(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.

On December 10, 2013, during the routine refurbishment inspection of MAP-12 packagings prior to use, an AREVA employee identified buckling of the outer sheet metal on a base spacer (bottom-half feet) of a MAP-12 packaging. Upon closer examination, the employee found that not only was the outer side plate buckled, there was also a small crack in the side plate near a weld that attaches the base spacer to the lower body of the MAP-12. An examination of other MAP-12 packagings found similar small cracks and buckling in the side plates of some of the base spacers. As a result of the discovery, a Condition Report was written and all 84 MAP-12 packagings (MP-002 through MP-085) were placed on hold (MP-001 has never been released).

On December 12, 2013, a campaign was started to inspect all 84 of the MAP-12 packagings that are normally released for use to determine the severity and extent of the condition. The visual inspection found that all of first 69 MAP-12 packagings that were manufactured by Nuweld and released for use had small cracks in some of the base spacer side plates and 45 of the 69 had excessive buckling in some of the base spacer side plates. The inspection also determined that the last 15 MAP-12 packagings (manufactured by CHT) had no visible cracks or excessive buckling in the base spacer side plates and all 15 were determined to be acceptable for use.

A total of 39 MAP-12 packages were needed to meet AREVA's December 2013 through February 2014 shipping commitments. In consultation with the certificate holder (AREVA TN), it was determined that AREVA Richland could weld rework the 24 MAP-12 packagings that had cracks only (by grinding out the cracks and welding the ground out areas on the base spacer side plates). This was done using an approved rework procedure and the 24 packagings were re-inspected, found to be acceptable relative to the license requirements and the requirements of 10 CFR 71.87, and then placed back in service until the completion of the current shipping campaigns. After consultation with AREVA TN again, it was determined that the 45 MAP-12 packagings with both cracks and excessive buckling would have to be reworked by CHT, who manufactured the 15 acceptable MAP-12 packagings. Sixteen of the 45 MAP-12 packagings have been shipped to the vendor and are currently being worked on.

The procedure for performing refurbishment inspections for the MAP-12 packagings has been revised to add visual inspections for cracks and excessive buckled metal on the base spacers.

The small cracks and buckling in the base spacer side plates have minor safety impact. The MAP-12 Component Safety Classification document lists the base spacer as a Category C item and states that failure of the component has no impact on criticality safety and/or containment.

For further discussion of corrective actions resulting from this event, see discussion under (4), below.

(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. 10 CFR 71.87 lists the routine determinations that must be made prior to each shipment of licensed material. 71.87 (b) states: "The package is in unimpaired physical condition except for superficial defects such as marks or dents". The small cracks and excessive buckling in the side plates of the base spacers appear to violate this requirement, in that shipments of MAP-12 packages were made while they were in this condition.

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

The affected MAP-12 packagings had base spacer side plates with small cracks (and some had excessive buckling) that violated the 10 CFR 71.87(b) unimpaired physical condition requirement. While the packages were not in an unimpaired condition, the condition did not create an adverse safety condition since the affected component has minor safety significance.

(ii) Dates and approximate times of occurrences;

The 69 affected MAP-12 packagings were manufactured in the 2008 – 2009 time frame and have been used multiple times to make fuel shipments from AREVA's Lynchburg, VA facility (2008 - 2010) and Richland, WA facility (2010 – 2013). It is unknown when the small cracks and the buckling actually began, so it is not known how many shipments were made using affected packagings.

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

The fabrication drawing for the MAP-12 Base Spacer (AREVA drawing 02-9047034-003) requires a continuous fillet weld on the outside joint between the side plates (Item 2 on drawing 02-9047034-003) and the outer base spacer plate (Item 1 on drawing 02-9047034-003) and intermittent fillet welds 1" long on 6" centers on the inside joint between the side plates and the outer base spacer plate. The base (and lid) spacers on the MAP-12s manufactured by Nuweld do not meet the requirements of the fabrication drawing in that they have 1" long on 6" center intermittent fillet welds on both sides of the outer joint, instead of a continuous fillet weld on the outside of the outer joint. It appears that Nuweld misinterpreted the weld symbol for the outer weld joint welds on the lid and base spacer weldments to mean double sided intermittent fillet welds 1" long on 6" centers, when the symbol actually meant that the outside weld was to be a continuous fillet weld and only the inside welds were intermittent fillet welds 1" long on 6" centers. The base and lid spacers on the MAP Certified Test Units and the last 15 MAP-12 packagings (all made by CHT) were made to the requirements of fabrication drawing 02-

9047034-003 and have a continuous fillet weld on the outside surface of the outer joint. (It should be noted that the outer base spacer welds in question are not shown on the license drawings.) AREVA believes that the lack of a continuous weld on the outside joint of the spacer plate led to the base spacers being weaker than designed which after many shipments led to the formation of small fatigue cracks and the buckling in the side plates.

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

The small cracks in the MAP-12 base spacers appear to be caused by fatigue and were initiated at a high stress area of the base spacer side plate either in the weld or weld heat-affected zone. The buckling in the side plates appears to have occurred because the side plates are not properly restrained by the outside intermittent fillet welds, which should have been continuous fillet welds. Neither condition actually led the component to fail; in all cases the base spacers continued to perform their function of supporting the package during shipment.

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

The small cracks and buckling in the base spacer side plates did not cause the base spacers to fail and they were still able to perform their function of supporting the package during transportation.

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

The condition was found during a routine visual inspection of the MAP-12 packagings during the refurbishment process. The condition had never been identified during any previous refurbishment inspections.

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

The human error appears to have been a misinterpretation of information in that the vendor (Nuweld) misinterpreted the weld symbol for the outer joint welds on the lid and base spacer weldments to mean double sided intermittent fillet welds 1" long on 6" centers, when the symbol actually meant that the outside weld was to be a continuous fillet weld and only the inside welds were intermittent fillet welds 1" long on 6" centers. The human error appears to have persisted due to a programmatic deficiency of an inadequate self-verification process in that the vendor's fabrication and quality groups failed to recognize that the outer lid and base spacer welds did not meet the MAP-12 fabrication drawings. It should also be noted that AREVA's receipt inspection of the Nuweld-manufactured MAP-12 packagings also failed to identify the fabrication non-conformance.

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

There were no package component failures associated with this event (as noted above the small cracks and buckling in the base spacers did not constitute component failures).

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

For each shipment, each MAP-12 package contained one or two PWR fuel assemblies of various designs containing fuel rods with solid uranium oxide pellets enriched to ≤ 5 weight % 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 base spacers are of minor safety significance and are classified as Category C items by AREVA. The condition did not hinder the base spacers' ability to perform their function of supporting the package during transportation.

(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;

All of the cracked base spacers will be reworked to remove the cracks by grinding and welding; this has been completed on the 24 crack-only MAP-12 packagings. These 24 packagings meet the requirements of the MAP-12 certificate and the pre-shipment requirements of 10 CFR 71.87 and they will be used in this condition for the 2013-2014 winter shipment campaign. The 45 MAP-12 packagings with cracked and excessively buckled base spacers will have the affected side plates straightened and the cracks removed by grinding and welding by CHT. Also, a continuous fillet weld will be added by CHT to the outside joint starting at the top continuing down through the bottom curved area of the base spacers. The horizontal section of the outside joint will not have a continuous fillet weld added, since it is felt that it is not needed to correct to the problem. After the completion of the winter-spring 2014 MAP-12 shipment campaign, the 24 crack-only packagings (which have had the cracks completely reworked and now meet all license requirements) will undergo additional rework as preventative action to reduce the likelihood of cracking and buckling in the future. The 24 packagings will be shipped to CHT to have the continuous fillet weld added to the vertical outside outer joint of the base spacers,

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

There have been six previous 10 CFR 71.95 reports submitted to the NRC on the MAP-12 package by AREVA; the previous reports were dated March 26, 2009; June 26, 2009; November 18, 2009; September 13, 2010, January 2, 2012, and February 10, 2012. The first report dealt with making a shipment using a non-compliant ball lock pin. The second report dealt with discrepancies between the MAP-12 fabrication drawings and the license drawings. The third report dealt with shipping a MAP-12 package with a missing ball lock pin. The fourth report dealt with some minor errors in the actual license drawings which had to be revised. The fifth report dealt with missing non-safety related washers on five MAP-12 packagings. The sixth report dealt with a partial fillet weld

length on a packaging. The first four previously reported events are not considered to be similar to this event. The fifth and sixth reports are somewhat similar to this event in that they involved non-compliances missed during inspections.

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

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(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.