UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 29, 2014

Mr. Paul Triska
Vice President, Operations
AREVA Inc.
7135 Minstrel Way, Ste. 300
Columbia, MD 21045

SUBJECT: REVISION NO. 2 OF CERTIFICATE OF COMPLIANCE NO. 9358, DOCKET NO. 71-9358

Dear Mr. Triska:

As requested by your application dated October 11, 2013, supplemented on December 13, 2013, and March 24, 2014, enclosed is Certificate of Compliance No. 9358, Revision No. 2, for the Model No. TN-LC transportation package. Changes made to the enclosed certificate are indicated by vertical lines in the margin. The staff's safety evaluation report is also enclosed.

AREVA Inc. is registered as the certificate holder for this package. The approval constitutes authority to use the package for shipment of radioactive material and for the package to be shipped in accordance with the provisions of 49 CFR 173.471.

If you have any questions regarding this certificate, please contact me or John Vera of my staff at (301) 287-9165.

Sincerely,

/RA/

Michele Sampson, Chief
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-9358
TAC No. L24804

Enclosures:
1. Certificate of Compliance No. 9358, Rev. No. 2
2. Safety Evaluation Report

cc w/encls 1 & 2: R. Boyle, Department of Transportation
J. Shuler, Department of Energy c/o L.F. Gelder

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ADAMS P8 Package No.: ML14119A161 **ADAMS P8 Letter No.: ML14119A169**

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION REPORT
Docket No. 71-9358
Model No. TN-LC
Certificate of Compliance No. 9358
Revision No. 2

SUMMARY

By letter dated October 11, 2013, supplemented on December 13, 2013, and March 24, 2014, AREVA Inc., requested an amendment to Certificate of Compliance No. 9358. The requested changes included a revised trunnion attachment block weld configuration, allowing equivalent alternate materials for some port elastomer seals and other metal components, a decrease of Criticality Safety Index (CSI) from 100 to 0 for the TRIGA, 1FA BWR, and 1FA 25 pin can baskets, as well as various updates to licensing drawings. The certificate has been updated to Revision No. 2 to reflect the changes.

EVALUATION

Structural Evaluation

The proposed amendment includes primarily updating licensing drawings to facilitate packaging manufacturing flexibility and improve drawing clarity. They have negligible effects on the structural performance and are acceptable. However, the revised trunnion attachment block weld configuration involves modified safety analyses for new load paths and stress acceptance criteria, which are evaluated as follows.

Drawing No. 65200-71-01, sheet 5, delineates the modified trunnion block-to-cask outer shell weld design. Due to potential inaccessibility for inspection and repair, the previously approved ¾" inner groove weld associated with the 4.01-inch diameter inner cavity is replaced with a seal weld. As such, no credit is taken for its load bearing capability, and only the ¾" groove welds on the outer perimeter of the 10.5-inch square attachment block to the cask are considered in analysis for demonstrating the trunnion lifting attachment performance for meeting the 10 CFR 71.45 requirements.

The applicant revised the trunnion analysis by adding Section 2.13.5.1.3, "Weld Analysis," to Appendix 2.13.5 of the application. As noted in Sections 2.1.2.1 and 2.5.1 of the application, although the trunnion is designed and fabricated based on ANSI N14.6, which meets the load factor and strength requirements of 10 CFR 71.45, it is also evaluated using the design-by-analysis methodology and stress criteria per the ASME Code, Division 1, Subsection NF, for the shell- and plate-type component support structures.

Table 2.13.5-7 of Appendix 2.13.5 of the application summarizes the calculated trunnion lifting attachment block tensile and shear stresses for the cask outer shell and trunnion block base metals, as well as the stress intensity in the connecting weld. Also, as summarized in Section 2.5.1 of the application, the stress results are all acceptable with positive margins to demonstrate adequate structural performance.

On the basis of the review above, the staff finds that the revised trunnion block-to-outer shell weld design will continue to demonstrate acceptable structural performance for the cask lifting function to meet the 10 CFR 71.45 requirements.

Materials Evaluation

On Drawing No. 65200-71-01, sheet 1, the part number was changed for item 3K (sealing washer) from “Parker 600-31 30-1/2” to “Parker 600-XX 30-1/2.” The “XX” (compound code) needed to be specified in the part number because the previous compound code “may not be available for an off-the-shelf item…and a provision for an alternate seal assembly design must be added.”

The staff sought clarification regarding this change. According to the “Parker Fastener and Fitting Seals” handbook, the “XX” compound code was 31 in the previous revision, which corresponds to the V720-75 Fluorocarbon seal compound material. This agrees with note 17 of the drawing, which states the sealing washer will be “Fluorocarbon per Parker Compound V1289-75.” However the compound code change to “XX” seemed to suggest that the sealing washer material could change from fluorocarbon to anything on the list of other seal compound materials (listed on page 6 of the “Parker Fastener and Fitting Seals” handbook). This issue was clarified to the staff with the following statement:

“The change in the part number call out from “31-30” to “XX30” on Drawing No. 65200-71-01, Revision 6, is to address the issue that the manufacturer was not able to provide the V1289-75 compound for the seal material of the 600-Series Stat-O-Seal line of products. The intent was to have this seal manufactured from compound V1289-75, as per note 17 on the same drawing, so that this seal compound would match the other containment boundary seals.”

However, even though Parker has been planning a 600-Series Stat-O-Seal with compound V1289-75, this product is not fully developed at this time. As a result, there is no compound code for V1289-75 in the 600-Series Stat-O-Seal normalized nomenclature, which is why the compound code in the part designation for item 3K in Drawing No. 65200-71-01, Revision 6, has been specified as “XX,” with an added reference to note 17 for the compound specification, as well as note 45 for a custom fastener and seal assembly option until this compound is available for the 600-Series product line. Until this product is available, the equivalent option offered in note 45 will be used on the TN-LC.

Given this explanation, it is made clear that the “XX” used was not to imply any other seal compound material can be used to “replace” the fluorocarbon seal. It is used as a placeholder until the fluorocarbon material desired (V1289-75, per note 17) will be used in the Stat-O-Seal design, which is not being produced yet. Until then, the fitting seals will be custom made with the V1289-75 material, along with an ASTM A240 Type 304 washer (alternative, per note 45 of the drawing).

This change was found to be acceptable by the staff because, although the part number was changed, the seal material specification is still controlled by note 17. Note 17, which states the material specification as “Fluorocarbon, per Parker compound V1289-75,” was approved by staff in the previous revision of the TN-LC Safety Analysis Report (SAR), and is still being used for item 3K in the current revision.

A reference to note 45 was also added to item 3K on Drawing No. 65200-71-01, sheet 2, stating, “Item 3K may be replaced with a washer/O-ring assembly. The O-ring is Parker

2-015 (material per note 17)." The washer is ASTM A240 Type 304, 0.050 thick, with an ID of 0.711 and a maximum OD of 1.00. Both O-ring and washer must have the same quality category and code criteria as item 3K. The reason for this change is that, "the original stat-O-seal may not be possible to procure in the required compound." The O-ring seal material is the same as previously required (controlled by note 17), and the retainer material is the same (304 stainless steel, corresponding to retainer code 30 in the "Parker Fastener and Fitting Seals" handbook part number designation), as all materials which were previously approved. Furthermore, "the required washer dimensions ensure that the seal is properly compressed." Given the equivalent option offered in note 45, this change is found to be acceptable by the staff.

The alloys ASTM A213 and A312 Type TP304 were added to the Bill of Materials of Drawing No. 65200-71-01, sheet 1. These alloys are listed as other possible materials for item 8B, the tube in the bottom plug component (option 1, see sheet 11). The 2010 ASME Boiler and Pressure Vessel Code (BPVC), Section II, Part D, verifies that the mechanical and physical properties of these alloys are in fact identical to the preexisting material, ASTM A240 Type 304, used for item 8B. Therefore, the staff finds the addition of these two materials for item 8B, as an alternative to ASTM A240 Type 304, acceptable.

Similarly, the change was made to the Bill of Materials of Drawing No. 65200-71-102, sheet 1, for items 1, 5, and 7A to allow the options of SA-213/SA-312/A213/A312 Type TP 304 as alternate materials for SA-240/A240 Type 304. The mechanical and physical properties of these alloys are equivalent to the material previously used, SA-240/A240 Type 304, according to the 2010 ASME BPVC, Section II, Part D. The staff also finds the addition of these two materials for items 1, 5, and 7A, as an alternative to SA-240/A240 Type 304, acceptable.

On Drawing No. 65200-71-20, sheet 1, the material of item 18 (the hoist rings of the impact limiter assembly) was revised to list "manufacturer's specification" as the material specification. The staff has confirmed that this change has no safety-significant effects, and is acceptable.

The designation "TP" was added to the material specifications of the following items:

- Drawing No. 65200-71-40, sheet 1, item 9
- Drawing No. 65200-71-50, sheet 1, item 1
- Drawing No. 65200-71-80, sheet 1, items 13 and 15

These changes were simply for consistency with how the materials are identified in Section II of the ASME BPVC. The staff finds these editorial changes acceptable.

On Drawing No. 65200-71-70, sheet 1, the position of (3/32) was moved to the left of the weld symbol. The dimension (size) of the weld should be located on the left of the weld symbol, according to Figure 3 of AWS A2.4, Standard Symbols for Welding, Brazing and Nondestructive Examination. This editorial change for consistency with the standard location of elements in a welding symbol is found to be acceptable by the staff.

All sheets of Drawing No. 65200-71-102 went through a complete rewrite. All previously approved technical aspects of the drawing sheets are the same, content was simply shifted and rewritten slightly to improve the clarity of options. Therefore, the staff finds these minor changes acceptable under 10 CFR 71.33.

In Chapter 8 of the TN-LC SAR, Acceptance Tests and Maintenance Program, an American Welding Society (AWS) reference is added. The AWS Structural Welding Code—Stainless Steel is listed as reference 17 in the chapter and is added for clarification in addition to the ASME BPVC, Section III, for welding and visual weld inspection qualifications. This change is found to be acceptable by the staff according to 10 CFR 71.31(c).

Based on the changes and revisions made to the TN-LC SAR pages and drawings, the staff concludes that these changes do not affect the ability of the package to meet the requirements of 10 CFR Part 71.

Criticality Evaluation

The objective of the criticality review is to verify that the amendment to the TN-LC package design continues to satisfy the criticality safety requirements of 10 CFR Part 71, including performance under the normal conditions of transport (NCT) specified in 10 CFR 71.71 and the hypothetical accident conditions (HAC) specified in 10 CFR 71.73. The staff's review considered the criticality safety requirements of the radioactive material transportation regulations in 10 CFR Part 71, and the review guidance presented in NUREG-1617, "Standard Review Plan for Transportation Packages for Spent Nuclear Fuel" and NUREG-1609, "Standard Review Plan for Transportation Packages for Radioactive Material."

The applicant requests to reduce the CSI from 100 to 0 for the TN-LC-1FA basket (with BWR and 25-pin can contents) and the TN-LC-TRIGA basket. As a result of the reduction in CSI to 0 for the TN-LC-TRIGA basket, the applicant also requests to increase the boron content for the TN-LC-TRIGA basket neutron absorbing plates to an as-modeled B-10 areal density of 8 mg/cm^2. No increase of boron content is required in the TN-LC-1FA basket poison plates to achieve a CSI = 0 for the BWR and 25-pin can contents. In addition, no CSI change is requested for the TN-LC-NRUX, TN-LC-1FA (with PWR contents), and TN-LC-MTR baskets.

The applicant performed analyses for a single package as well as arrays of packages under conditions of 10 CFR 71.55(b), (d), and (e), and 10 CFR 71.59(a)(1) and (2). The results of these analyses are presented in Sections 6.10.3.4 through 6.10.3.6 of the SAR for the TN-LC-TRIGA basket, and Sections 6.10.4.4 through 6.10.4.6 of the SAR for the TN-LC-1FA basket with BWR and 25-Pin Can contents. No credit is taken for the impact limiters and neutron shield for spacing or material considerations in the applicant analyses. The TN-LC-TRIGA basket was modeled in an infinite lattice using MCNP5. The most reactive case for the TN-LC-TRIGA basket has a k_{eff} = 0.9075 with an Upper Safety Limit (USL) = 0.9301. The TN-LC-1FA basket was modeled in an infinite lattice using KENO-V.a. The most reactive case for the TN-LC-1FA basket with BRW contents has a k_{eff} = 0.8721 with a USL=0.9420. The most reactive for the TN-LC-1FA basket with 25-Pin Can contents has a k_{eff} = 0.5452 with a USL=0.9420.

The staff performed confirmatory analyses of the package using the CSAS6 sequence of the SCALE code system with the KENO VI three-dimensional Monte Carlo criticality transport program and continuous energy ENDF/B-VII cross sections. With assumptions similar to those used by the applicant under HAC conditions, the staff's confirmatory calculations resulted in a maximum k_{eff} similar to what was reported in the application for a CSI = 0. Therefore, the staff's analyses confirm that the package will meet the criticality safety requirements of 10 CFR Part 71.

Based on the review of the statements and representations in the application amendment, supplemental information supplied by the applicant, and staff confirmatory analyses, the staff has reasonable assurance that the nuclear criticality safety design has been adequately described and evaluated by the applicant and that the package meets the criticality safety requirements of 10 CFR Part 71.

CONDITIONS

The following changes have been made to the certificate of compliance:

Condition No. 5(a)(3) has been revised to reflect the new revision numbers for drawings.

Condition No. 5(b)(1), Tables 4 and 5, have been revised to add the maximum Hydrogen to Zirconium ratios for TRIGA element contents.

Condition No. 5(c) has been revised to reflect the new Criticality Safety Index for the different contents.

Condition No.11 now allows use of Revision No. 1 of the certificate until April 30, 2015.

The References section has been updated.

CONCLUSION

Based on the statements and representations in the amendment request, the staff finds that these changes do not affect the ability of the package to meet the requirements of 10 CFR Part 71.

Issued with Certificate of Compliance No. 9358, Revision No. 2.