



September 18, 2015
TJT:15:029

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Director, Division of Spent Fuel Management
Office of Nuclear Material Safety and Safeguards
11555 Rockville Pike
One White Flint North
Rockville, MD 20852

Gentlemen:

Subject: Response to NRC Request for Additional Information for Review of Letter Authorization Request for the Model 51032-2 Shipping Container

- Ref. 1. Letter, TJ Tate to US Nuclear Regulatory Commission; "Docket 71-9252, Model 51032-2 Shipping Container; Request for Letter of Authorization for Approval for Shipment of Crystal River 3 Contaminated Fresh Fuel Assemblies;" June 30, 2015.
- Ref. 2. Letter, Huda Akhavannik to TJ Tate; Request for Additional Information for Review of the Model No. 51032-2; August 20, 2015.

Via Reference 1 AREVA Inc. (AREVA) submitted a request for a letter authorization to Certificate of Compliance No. 9252 to allow shipment of Crystal River 3 contaminated fresh fuel assemblies in the Model 51032-2 licensed shipping container. Via Reference 2 the NRC conveyed a Request for Additional Information (RAI) to request information to assist in its review of AREVA's submittal. AREVA's responses to the NRC's RAI are attached.

AREVA's responses to the criticality-related questions are supported by criticality analysis 502795-0600, Revision 1 (enclosed). The information in this analysis has been determined to be proprietary in nature. An affidavit requesting that this information be withheld from public disclosure in accordance with 10 CFR 2.390 is included with this submittal.

We appreciate the NRC's progress on its review of AREVA's letter authorization request. As previously communicated, AREVA and Duke Energy are requesting an NRC approval of the letter authorization request by November of this year. Please feel free to contact me at 509-375-8550 if you have questions or need additional information.

Sincerely,

A handwritten signature in cursive script that reads "T. J. Tate" followed by "for" and a flourish.

T. J. Tate, Manager
EHS&L

AREVA INC.

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

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USNRC
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c: Huda Akhavannik ✓
US Nuclear Regulatory Commission
NMSS/DSFM/SFLB
Two White Flint North – MS 4 B34
11545 Rockville Pike
Rockville, MD 20852-2738

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION ON AREVA LETTER OF
AUTHORIZATION REQUEST FOR THE MODEL 51032-2 PACKAGE

6.0 Criticality

- 6-1 Revise Section 8.2 of the application to provide an explicit validation of SCALE 6.0 and the ENDF/B-V cross section library for the Model No. 51032-2.

The letter authorization request includes new criticality calculations using SCALE 6.0. These calculations are not accompanied by an explicit code benchmarking analysis. Rather, these sections attempt to show applicability of the existing SCALE 4.4 validation to calculations using SCALE 6.0. ANS 8.24, Validation of Neutron Transport Methods for Nuclear Criticality Safety Calculations, states that: "The calculational methods and analysis techniques used to analyse the set of benchmarks shall be the same as those used to analyse the system or process to which the validation is applied." Code-to-code comparison is not considered an acceptable criticality safety method validation approach in industry standards, and is not considered acceptable by staff. Section 8.2 should be revised to include an explicit benchmarking analysis of SCALE 6.0 as used in the 51032-2 criticality analyses.

This information is needed to ensure that the Model No. 51032-2 package will continue to meet the criticality safety requirements of 10 CFR 71.55 and §71.59.

Response: Section 8.2 of Calculation 502795-0600 Revision 1 has been updated to indicate the SCALE 4.4 versus SCALE 6.0 runs have been performed with the sole purpose of demonstrating a comparison between the two codes. Section 8.3 has been updated to clarify that a specific benchmark evaluation is performed, utilizing SCALE 6.0, to determine the USL based on the 92 benchmark calculations. Additionally, Section 8.3 provides details of the USL calculation based on the SCALE 6.0 benchmark evaluation.

A revised Calculation 502795-0600 (Revision 1) is attached in support of this response and the other five criticality-related RAIs below.

- 6.2 Revise the application to clarify the boundary conditions for the normal conditions of transport and hypothetical accident conditions array models.

Section 2.0 of the application states: "For cases with reflective boundary condition, the model is effectively infinitely long". This statement is listed as a conservatism in the analysis. However, all of the array models described in the application appear to be finite. The application should be revised to clarify that the array models are finite.

This information is needed to ensure that the Model No. 51032-2 package will continue to meet the criticality safety requirements for package arrays in 10 CFR 71.59.

Response: The statement in question has been removed from Calculation 502795-0600 Revision 1. All of the array models are finite, utilizing either reflective boundary conditions for HAC arrays or discrete package modeling for NCT arrays.

6-3 Revise the application to clarify the modeling of the fuel assembly pellet diameter.

Section 5.1.1 of the application states that the "fuel pellet is modeled with an outer diameter equal to the nominal diameter plus tolerance," resulting in the maximum pellet diameter. Section 6.0 states that the fuel pellet is modeled with the minimum diameter, and that "it has been established in Reference [1] that this is the most reactive condition". The application should be revised to clarify which condition of the pellet (i.e. maximum or minimum) has been modeled for this evaluation. Note that evaluations of the most reactive fuel assembly configuration typically find that maximum pellet diameter is more reactive.

This information is needed to ensure that the Model No. 51032-2 package will continue to meet the criticality safety requirements of 10 CFR 71.55 and §71.59.

Response: The pellet diameter selected for modelling the hypothetical accident conditions (HAC) cases in the analysis is 0.946912 cm (minimum pellet diameter), which had been shown to make the overall system the most reactive. This fact was deduced from one of the references for the calculation, namely: Table 6-2 of AREVA Inc. Engineering Information Record, "Application for Certificate of Compliance for the 51032-2 PWR Fuel Shipping Package Revision 7," 51-9092928-002 on Page 158. However, the same investigation has been repeated in 502795-0600 Revision 1 to confirm the earlier findings. The results of this evaluation are presented in Table 10-6 of the current calculation revision and confirm the minimum pellet diameter is more reactive for the HAC package array. The reduced pellet diameter allows increased moderation which increases the system reactivity.

It was also determined in the previous reference cited above that the maximum pellet diameter (0.95047 cm) was more reactive for the normal conditions of transport (NCT) packages. However, an evaluation was also performed in 502795-0600 Revision 1, to assess which case (maximum or minimum pellet diameter) makes the package array most reactive. The findings from this evaluation are shown in Table 10-7 of the document. These results show that the maximum pellet diameter is slightly more reactive for the NCT package array.

6-4 Revise the application to clarify what criticality safety index (CSI) will be applied to packages shipped under this letter authorization.

The criticality analysis in the application evaluates package arrays under normal conditions of transport and hypothetical accident conditions, but does not determine an

associated CSI. The CSI should be determined per the requirements for fissile material package arrays in 10 CFR 71.59. Note that the arrays currently considered in the criticality analysis are much larger than necessary to accomplish the shipping campaign described in the letter authorization request.

This information is needed to ensure that the Model No. 51032-2 package will continue to meet the criticality safety requirements for package arrays in 10 CFR 71.59.

Response: The CSI applicable to hypothetical accident conditions (HAC) and normal conditions of transport (NCT) packages is 0.4. The calculation of the CSI is added to Section 5.1 of Calculation 502795-0600, Revision 1.

- 6-5 Revise the application to consider high enrichment fuel assemblies closest to each other in adjacent packages in the array.

Although the criticality analysis of package arrays considers the location of the 4.95 weight percent enriched fuel assembly within a single package (i.e., left or right channel), it does not appear to consider situations where the 4.95 weight percent enriched fuel assemblies in adjacent packages are closest to each other (e.g., right channel in left package, and left channel in right package). Given the higher enrichment of these assemblies, closer placement within the array could increase neutron communication between the assemblies in the array if they are closer, particularly in the hypothetical accident conditions case where the strong-backs are shifted towards each other in adjacent packages.

This information is needed to ensure that the Model No. 51032-2 package will continue to meet the criticality safety requirements for package arrays in 10 CFR 71.59.

Response: The requested configuration of the higher enrichment (4.95 wt. % U-235) fuel assemblies in closest proximity for adjacent containers was modeled and analysed for criticality safety for interstitial moderator densities between 0 and 100%. A description of the arrangement is provided in Section 6.2 and the results of the analysis are presented in Table 10-19 of Calculation 502795-0600 Revision 1. It can be seen that the reactivity of this HAC array is below the USL.

- 6-6 Revise the application to provide single package criticality evaluations per the requirements of 10 CFR 71.55(b), (d), and (e).

The current criticality evaluation for this letter authorization request considers arrays of packages under both normal conditions of transport and hypothetical accident conditions. However, it does not provide analyses for: (1) a single package with water in-leakage per 10 CFR 71.55(b), (2) a single package under normal conditions of transport per §71.55(d) and a single package under hypothetical accident conditions per §71.55(e). The application should be revised to provide analyses demonstrating that a

single package is subcritical under these conditions.

This information is needed to ensure that the Model No. 51032-2 package will continue to meet the criticality safety requirements of 10 CFR 71.55.

Response: Calculation 502795-0600 Revision 1 includes criticality evaluations for (1) a single package with water in-leakage, (2) a single package under NCT and (3) a single package under HAC. A discussion of these single package evaluations is provided in Section 6.0 of calculation. Results of the analyses are presented in Table 10-8, Table 10-9, and Table 10-10 of the calculation.

7.0 Operating Procedures

- 7-1 Revise the application to provide additional operating procedures needed for loading the fuel to be shipped under this letter authorization request.

Although the Crystal River fuel was never critical, it will be contaminated from having been in the core. The current operating procedures for the Model No. 51032-2 only consider loading of fresh, dry, uncontaminated fuel. Additional procedures should include steps for decontamination and drying of fuel assemblies. Note that, since this is a Type AF package, decontamination of this fuel should ensure that any remaining radioisotopes do not exceed an A_2 quantity.

This information is needed to ensure that the package complies with 10 CFR 71.43(f) and §71.87.

Response: AREVA recognizes and will comply with the requirement for the contents of the Model 51032-2 container to not exceed an A_2 quantity of radionuclides. Additional incentives for providing decontamination of the fuel assemblies include minimizing doses to personnel subsequently handling the assemblies as well as minimizing the potential for contaminating the 51032-2 containers themselves. In conjunction with their removal from the spent fuel pool, all of the assemblies will have undergone a decontamination procedure and then be allowed to dry in an interim storage location. Prior to their actual placement in the shipping containers, the assemblies will be verified to meet a dose rate limit conservatively calculated to assure that the sum of the activities of the contamination on the assemblies and the radioactive material within the two assemblies themselves is less than an A_2 quantity. Only if the assemblies fail to meet this dose rate limit will additional decontamination be undertaken. The calculation underlying the dose rate limit will be fully documented and retained as part of the project file. The fully loaded packages will also be surveyed to document compliance with USDOT dose and contamination limits prior to shipment.

AFFIDAVIT

STATE OF WASHINGTON)

ss:

COUNTY OF BENTON)

1. My name is Loren J. Maas. I am the Manager, Licensing and Compliance for AREVA Inc. ("AREVA") at AREVA's Richland, Washington facility and as such I am authorized to execute this Affidavit.

2. I am familiar with the criteria applied by AREVA to determine whether certain AREVA information is proprietary. I am familiar with the policies established by AREVA to ensure the proper application of these criteria.

3. I am familiar with the AREVA information contained in Calculation 502795-0600, Revision 1 conveyed via T. J. Tate's letter TJT:15:029, "Response to NRC Request for Additional Information for Review of Letter Authorization Request for the Model 51032-2 Shipping Container" and referred to herein as "Document". Information contained in this document is considered by AREVA as proprietary in accordance with the policies established by AREVA.

4. This Document contains information of a proprietary and confidential nature and of the type customarily held in confidence by AREVA and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in this Document as proprietary and confidential.

5. This Document has been made available to the U.S. Nuclear Regulatory Commission in confidence with the request that the information identified and contained in this Document be withheld from public disclosure. The request for withholding of proprietary information is made in accordance with 10 CFR 2.390. The information for which withholding from disclosure is requested qualifies under 10 CFR 2.390(a)(4) "Trade secrets and commercial or financial information".

6. The following criteria are customarily applied by AREVA to determine whether information should be classified as proprietary:

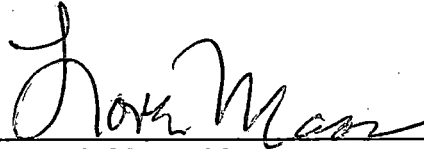
- (a) The information reveals details of AREVA's processes, equipment, or products.
- (b) Use of the information by a competitor could permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market similar products, equipment, or processes.
- (c) The information reveals certain distinguishing aspects of equipment and products, the exclusive use of which provides a competitive advantage for AREVA in product optimization or marketability.
- (d) The information is vital to a competitive advantage held by AREVA, would be helpful to competitors to AREVA, and would likely cause substantial harm to the competitive position of AREVA.

The information identified in this Document is considered proprietary for the reasons set forth above. In particular, AREVA has expended considerable sums of money to develop the products and/or associated evaluations described in this document. The release of this AREVA Document would allow a competitor to develop similar products and/or evaluations without incurring the significant expense of having to develop these products and/or associated evaluations.

7. In accordance with AREVA's policies governing the protection and control of information, proprietary information contained in this Document has been made available, on a limited basis, to others outside AREVA only as required and under suitable agreements providing for nondisclosure and limited use of the information.

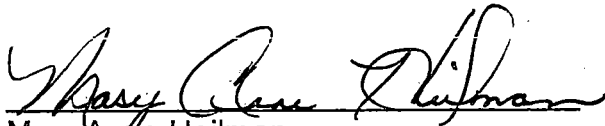
8. AREVA policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.



Loren J. Maas, Manager
Licensing and Compliance
AREVA Inc.

SUBSCRIBED before me this 18th day of September, 2015.



Mary Anne Heilman
NOTARY PUBLIC, STATE OF WASHINGTON
MY COMMISSION EXPIRES: June 6, 2016

