



**orano**

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September 26, 2018  
FS-18-0235

ATTN: Norma Garcia-Santos  
Mail Stop T4B34  
U. S. Nuclear Regulatory Commission  
11555 Rockville Pike  
Rockville, MD 20852-2746

**Subject:** Response to NRC Request for Additional Information, Letter  
Authorization for the BRR Package, Docket No. 71-9341  
(EPID No. L-2018-LLA-0117)

Dear Ms. Garcia-Santos:

By letter of July 6, 2018, NRC requested additional information (RAI) regarding the request of Orano Federal Services, LLC for a one-time authorization to ship certain PWR rod segments in the BEA Research Reactor Package (BRR). This one-time shipment authorization request was made in support of a DOE research project related to fuel fragmentation under high burnup conditions. The original request was dated April 19, 2018. The RAI and our response are as follows.

**Sh-1.** Provide the parameters used to calculate the gamma and neutron source terms.

In Section 4.2 of the BRR application, the applicant stated that the spent fuel payload source term is generated in two steps using the ORIGEN module of SCALE 6.2.1 code package. However, the applicant did not provide a description on how the parameters (i.e., burnup, enrichment) were used to calculate the gamma and neutron sources.

This information is needed to determine compliance with the regulations in 10 CFR 71.47.

***Response***

The two step process discussed in Section 4.2 of Attachment B of the original request of April 19, 2018 referred solely to the adjustment of customer-provided radioactive isotope sets to account for (1) increased cooling times and (2) increased fuel segment aggregate lengths. The two step process did not include initial modeling of the radioactive isotope sets detailed in Tables 4-1, 4-2, and 4-3.

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The radioactive isotope sets were generated by modeling performed prior to previous shipments of the respective fuel segments. The presented radioactive isotope sets are downscaled (linearly as a function of aggregate length) from calculated radioactive isotope sets for complete fuel rods. The parameters used to model the fuel segment radioactive isotope sets are summarized below:

Associated Fuel Segment Set	"605"	"616"	"649/650"
See Table:	4-1	4-2	4-3
Power Plant	H.B. Robinson Unit 2	TMI-1	North Anna Units 1 and 2
Fuel Type	PWR, 15x15	PWR, 15x15	PWR, 17x17
Discharge Date	4/28/1995	9/8/1995	5/2/2004
Complete Fuel Rod Length (in.)	144	141.8	144
Enrichment (wt.% U-235)	2.90	4.01	4.20
Fuel Mass per Fuel Rod (kg)	2.12	2.23	1.78
Burnup (MWd/mtu)	66,688	55,300	71,761

*(End of RAI Response)*

#### ***Redistribution of Rod Segments Within Containers***

A change to the manner in which the payload rod segments are encapsulated has been made to better serve the project needs. The original authorization request of April 19, 2018 ("original request") stated that some segments would be prepared with closed ends and some would be contained in closed-end tubes. Instead of closed ends, all segments will be contained in closed-end tubes. Closed end tubes take up more space. Instead of utilizing up to two payload containers, up to four containers will be needed. In this connection, note that there has been no change to the fuel rod segments, their quantity, their source activity, or their length, compared to the original request. Thus,

- There is no change to the shielding analysis (Attachment B of the original request)
- There is no change to the fissile material quantity (Attachment A of the original request)
- There is no change to the decay heat (Attachment A of the original request)

Furthermore, there is no change to the payload container, illustrated in Figure 1 of the original request. The only difference is that the same segments will be distributed differently between a larger number of payload containers. Since any payload container is bounded by a weight of approximately 20 lb (unchanged



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from Attachment A of the original request), this weight is still bounded by the maximum weight of 48 lb of each fuel element used in the square fuel basket, which is used to support the payload container. In conclusion, unless explicitly stated herein, all of the information in Attachment A of the original request is unchanged. Therefore there are no safety consequences of the different payload accommodation described above.

Because the change in potential quantity of payload containers will change the text of the operating procedure slightly, I have included here the revised *Package Operations* section (from page 7 of the original request) with changes shown with revision bars in the right margin. The only changes occur in steps 4 and 11.

*(Begin Package Operations)*

### **Package Operations**

The following steps shall be performed to load the payload container(s):

1. All operations shall observe ALARA principles and make use of a hot cell as required.
2. All operations shall be performed dry.
3. Remove the lid of the payload container assembly by removing four, ¼-20 UNC captured screws. Visually inspect the interior to verify that it is empty and clean.
4. Place the fuel rod segments into the container. Individual payload components (rod segments in end-capped tubes) may be stacked as necessary within the container.
5. When loading is complete, verify that no part of the payload will interfere with the lid when assembled.
6. Steel wool may be used to cushion and stabilize the contents. Carbon steel wool or stainless steel wool may be used. It is not necessary to pack or immobilize the segments with steel wool.
7. Verify the presence of the dust seal and install the lid using the four lid screws.
8. Install the extension tube into the socket beneath the lower plate, and install the quick release pin.
9. The payload container is now ready for placement into the BRR cask.

The cask shall be operated according to the procedure specified in Chapter 7 of Revision 10 of the BRR SAR. Prepare the BRR cask for loading according to



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Section 7.1.1 and steps 1 through 9 of Section 7.1.2.2 of the BRR SAR. The basket shall be the square fuel basket (Assembly A5 on SAR drawing 1910-01-03-SAR). No pedestal spacers shall be used.

The following steps replace steps 10 through 12 of Section 7.1.2.2. Other than these three steps, the procedural steps specified in Section 7.1.2.2 shall be followed as found in the BRR SAR.

10. Verify that the payload container(s) has been loaded and closed according to this procedure.
11. Place up to four payload containers into any four of the eight cavities in the square fuel basket.
12. Verify that the top of the pintle of each container is below the top surface of the basket.

Return to SAR Section 7.1.2.2, continuing with Step 13. Prepare the cask for transport according to Section 7.1.3 of the SAR. Unload the package according to Section 7.2 of the SAR.

*(End Package Operations)*

#### ***Approval Schedule***

Our DOE client has informed us that the shipping schedule has become uncertain due to concerns about shipping waste into Idaho. The shipment date may depend on negotiations at fairly high levels. This difficulty was not anticipated at the time we first requested the one-time approval. Thus, to ensure that the shipment approval is valid at the time of the shipment, Orano is requesting that the approval be valid for two years from date of issuance.

If you have any questions, please contact me at 253-552-1321 or [phil.noss@orano.group](mailto:phil.noss@orano.group).

Yours Truly,

Philip Noss  
Licensing Manager  
Orano Federal Services LLC



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