Mr. John McKirgan, Chief  
Spent Fuel Licensing Branch  
U.S. Nuclear Regulatory Commission  
Office of Nuclear Material Safety and Safeguards  
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November 30, 2018  

Dear John McKirgan:  

The U.S. Department of Energy (DOE) requests renewal and simple amendment of NRC Certificate of Compliance (CoC) 9330 for the Model ATR FFSC (NRC Docket 71-9330), no later than January 11, 2019. An amendment to the CoC is necessary to add the fuel element for the Greek GRR-1 reactor to the list of authorized contents.  

The GRR-1 reactor facility in Greece is in the process of decommissioning. The reactor is an open-pool materials test reactor (MTR) using aluminum plate fuel. The facility is in possession of 13 unirradiated plate fuel elements of the same type as the approved contents of the ATR FFSC. Each element contains up to 223 g U-235, enriched up to 20 weight percent. The fissile material is uranium silicide (U₃Si₂) dispersed in aluminum powder. The element has 18 fuel plates held in place by two aluminum side plates and end fittings. Each fuel plate consists of the central “meat” of fissile uranium silicide nominally 0.02 inches thick. The cladding is nominally 0.02 inches thick and is made from aluminum alloy AG3NE.  

The GRR-1 fuel falls into the Small Quantity Payload (SQ) category as described in Section 1.2.2.4 of the ATR FFSC Safety Analysis Report (SAR), Revision 14. The SQ payload category includes a class of research and development plate-type fuels with U-235 as the fissile isotope. The bounding U-235 quantity is ≤ 400 g with an enrichment of ≤ 94%. The Rhode Island Nuclear Science Center (RINSC) fuel element is a SQ payload as discussed in the SAR, Section 1.2.2.4.1. The table below shows that the GRR-1 fuel element is bounded with respect to reactivity and U-235 content by the RINSC fuel element, and therefore qualifies as a SQ payload.

<table>
<thead>
<tr>
<th>Fuel Element Property</th>
<th>RINSC Fuel Element</th>
<th>GRR-1 Fuel Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>U-235 quantity (max.)</td>
<td>283 g</td>
<td>223 g</td>
</tr>
<tr>
<td>Enrichment (max.)</td>
<td>20.0%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Fuel Meat</td>
<td>U₃Si₂</td>
<td>U₃Si₂</td>
</tr>
<tr>
<td>Number plates</td>
<td>22</td>
<td>18</td>
</tr>
<tr>
<td>Channel thickness</td>
<td>0.096”</td>
<td>0.124”</td>
</tr>
<tr>
<td>Dimensions, L x W x H</td>
<td>39.75” x 3.10” x 3.10”</td>
<td>34.37” x 3.00” x 3.15”</td>
</tr>
<tr>
<td>Weight</td>
<td>17 lb.</td>
<td>13 lb.</td>
</tr>
</tbody>
</table>
As shown in Section 6.11 of the SAR, the SQ category criticality analysis conservatively uses a fissile slurry, and does not depend on channel thickness or fuel element dimensions. The GRR-1 fuel element is bounded by the RINSC fuel element, which is an approved SQ payload in the package. Therefore the GRR-1 fuel element can be added to CoC 9330 without additional specific structural, thermal, shielding, or criticality analyses.

The GRR-1 fuel element shall be shipped in the SQ fuel handling enclosure (SQFHE) shown on SAR drawing number 60501-70. The GRR 1 fuel elements shall be loaded into the SQFHE according to the procedural steps of Section 7.1.5 of the SAR. The package shall be loaded, closed, and prepared for transport according to the procedural steps of Chapter 7 of the SAR. According to the analysis in Section 6.7 of the SAR, the GRR-1 fuel may be shipped by air transport.

Specifically, DOE requests the following changes to Revision 11 of CoC 9330:

- 5.(b)(1), fifth paragraph, change the first line to read: “Small Quantity Payloads (RINSC fuel elements, GRR-1 fuel elements, ATR Full-size plate in Flux Trap Position...”
- 5.(b)(1), add a new paragraph between the two paragraphs beginning, respectively, "Unirradiated RINSC fuel element..." and "AFIP fuel element..." as follows:

"Unirradiated GRR-1 fuel element. The GRR-1 fuel material is composed of uranium silicide (U$_3$Si$_2$) dispersed in aluminum powder. The uranium is enriched to a maximum of 20 weight percent U-235. Each GRR-1 fuel element contains 18 flat plates fitted within aluminum alloy side plates and the maximum channel thickness between fuel plates is 0.124 inch. The fuel meat thickness is a nominal 0.02 inch for all 18 plates. The maximum mass of U-235 per intact GRR-1 fuel element is 223 grams. The GRR-1 fuel element must be contained within the Small Quantity Payload Fuel Handling Enclosure, as specified in 5.(a)(3)."

Due to the simple nature of this change, DOE requests CoC 9330 be renewed and amended based on this letter and in lieu of a revision to the SAR.

The January 11, 2019 need date is based on the shipping schedule of the GRR-1 fuel elements from Greece to the USA and/or Canada and the time needed by the various Competent Authorities to authorize use of the package for export/import.

If you have any questions or need more details please call at 301-903-5513 or james.shuler@em.doe.gov.

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