

SAFETY EVALUATION REPORT

Docket No. 71-9330
Model No. ATR-FFSC Package
Certificate of Compliance No. 9330
Revision No. 9

SUMMARY

By letter dated August 2, 2016, the Department of Energy (DOE or the applicant) requested a revision to Certificate of Compliance (CoC) No. 9330 for the Model No. ATR-FFSC package. DOE supplemented its application by letter dated August 12, 2016.

There were no changes to the packaging design, but DOE requested to add older Mark IV, V, and VI fuel elements and loose plates to the list of authorized contents for ground transport.

CoC No. 9330 has been amended based on the statements and representations in the application, and staff agrees that the changes do not affect the ability of the package to meet the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 71.

EVALUATION

The submittal was evaluated against the regulatory standards in 10 CFR Part 71, including the general standards for all packages, standards for fissile material packages, and performance standards under normal conditions of transport (NCT) and hypothetical accident conditions (HAC).

The current CoC Condition No. 5(b)(1) of the CoC authorizes “unirradiated Mark VII ATR fuel” and “ATR loose fuel plates” as one of the contents of the package.

In its August 2, 2016, letter, the applicant requested a modification to this CoC language to allow shipment of Mark IV, V, and VI fuel elements and loose plates. Currently, the ATR high enriched uranium (HEU) fuel elements are designated as Mark VII, while the Mark IV, V, and VI are older designs of ATR fuel elements.

By letter dated August 12, 2016, the applicant supplemented its request with a report titled “Criticality Safety Evaluation for the Advanced Test Reactor Enhanced Low Enriched Uranium Fuel Elements,” INL/EXT – 16-39590, Rev. 0, dated July 19, 2016.

Table 1 from this report shows that the plate dimensions are the same for all ATR HEU fuel element types. The fuel types have slightly different compositions. Mark IV elements are made from a mix of U_3O_8 , aluminum powder and boron carbide powder. Mark V and VI are made of UAl_x blended with aluminum powder and boron carbide. Mark VII are made of UAl_x which can have several configurations of incorporating borated plates; however, the boron is neglected in the criticality analyses for the ATR-FFSC as documented in the “Safety Analysis Report,

Advanced Test Reactor Fresh Fuel Shipping Container (ATR FFSC),” Revision 11, July 2016, Docket No. 71-9330 (ADAMS Accession No. ML16210A224, Redacted Version ML16215A469).

The Mark VII fuel also has higher amount of U-235 than the other ATR HEU fuel types. The U-235 content assumed within the criticality analysis, as documented in the safety analysis report (SAR), is higher and therefore conservative with respect to the Mark VII plates. Thus, it is bounding for all other ATR-HEU fuel types. The staff found that all other parametric evaluations used to determine the most reactive analytical assumptions are applicable to the other ATR HEU fuel types.

The model for the “loose plates” considers all of the 19 Mark VII plates and chooses the plate that produces the highest reactivity in its most reactive configuration within the loose plate basket. Although the determination of the most reactive configuration does not consider all of the possible plates from the Mark IV, V and VI designs, the NRC staff finds that, given the information from Tables 2, 3, and 4 from the INL report dated July 19, 2016, showing the various U-235 loadings for the designs, the analysis determining the most reactive loose plate configuration from section 6.5.1.2 of the SAR is applicable to that of the other designs, as it is based on the highest U-235 density and considering plate size (smaller plate) allowing more moderation.

In addition to the above, the maximum k_{eff} for the Mark VII plates, even considering conservative assumptions within the analyses, is well below the USL of 0.9209. The maximum k_{eff} is 0.8362. This is for the ATR fuel element payload in an array under NCT. This is higher than the calculated k_{eff} under HAC due to the larger array size and also higher than the loose plate payload due to the larger amount of fissile material. This gives the NRC staff further assurance since there is a significant margin to the USL that slight variations in the composition of the plates would not cause the ATR-FFSC to exceed the USL.

The NRC staff found the criticality analysis for the Mark VII ATR HEU fuel elements, as documented in the SAR, bounding and therefore applicable to Mark IV, V, and VI ATR HEU fuel elements, as described in the INL report.

Based on the statements and representations in the application, and the conditions listed in the CoC, the staff concludes that the design has been adequately described and evaluated, and meets the requirements of 10 CFR Part 71.

CONDITIONS

The following changes are included in Revision No. 9 to Certificate of Compliance No. 9330:

Condition No. 5(b)(1) has been revised to include “Unirradiated ATR Mark IV, V, VI, and VII fuel elements” and “ATR Mark IV, V, VI, and VII loose fuel plates”.

The expiration date of the certificate is not changed.

The August 2, 2016, amendment request letter is referenced in the Reference Section of this certificate.

CONCLUSION

Based on the statements and representations in the application, and the conditions listed above, the staff concludes that the Model No. ATR-FFSC package design has been adequately described and evaluated and 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. 9330, Revision No. 9,
on August 19, 2016.