



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

SAFETY EVALUATION REPORT

Docket No. 71-9330
Model No. ATR-FFSC Package
Certificate of Compliance No. 9330
Revision No. 12

SUMMARY

By letter dated November 30, 2018, the Department of Energy (DOE or the applicant) requested both a renewal and an amendment of the Certificate of Compliance (CoC) No. 9330 for the Model No. ATR-FFSC package.

The applicant requested the addition of GRR-1 fuel elements as authorized contents of the package, as a Small Quantity (SQ) payload, to be shipped in the SQ fuel handling enclosure (SQFHE).

The applicant did not request any change to the currently approved loading procedures to load the GRR-1 fuel elements into the SQFHE.

The submittal was evaluated against the regulatory standards in Title 10 of the *Code of Federal Regulations* (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 certificate has been renewed for a 5 year term and amended based on the statements and representations in the application. The staff agrees that the changes do not affect the ability of the package to meet the requirements of 10 CFR Part 71.

EVALUATION

The GRR-1 reactor is an open-pool materials test reactor (MTR) using aluminum plate fuel. The GRR-1 fuel element contains up to 223 g U-235, enriched up to 20 weight percent. The fissile material is uranium silicide (U_3Si_2) 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.

The applicant explained that, for surface transport, a conservative model (i.e., fissile slurry) of the payload meets the requirements of 10 CFR 71.55(d) and (e) while, for air transport, a conservative model of the payload (i.e., the package is assumed to be destroyed, so a sphere is used) meets 10 CFR 71.55(f).

The applicant's models are conservative. For surface transport, the SQ payloads will remain "largely intact" under NCT and HAC, and the "fissile slurry" model is a modeling conservatism to

make it possible to include a range of fuels without having to know exactly their physical configuration. In an air transport accident, the package is assumed to be destroyed, the payloads will be damaged and a sphere is used as a conservative model. The air transport payload was set at 2,000g of U-235, i.e., much larger than any actual payload that would be approved under 10 CFR 71.55(d) and (e), in order not have to change the air transport analysis for any new contents to be authorized.

The Small Quantity (SQ) payload covers a variety of fuels and fuel plates, including research fuels, loose plates, and full elements. The GRR-1 fuel, with 223 g U-235, enriched up to 20 weight percent, falls into the SQ payload category, as described in Section 1.2.2.4 of the application, which includes plate-type fuels with a bounding U-235 quantity of 400 g, and a maximum enrichment of 94%.

The applicant compared, in the table below, the Rhode Island Nuclear Science Center (RINSC) fuel element, i.e., an authorized content of the package, with the GRR-1 fuel element.

Fuel Element Property	RINSC Fuel Element	GRR-1 Fuel Element
U-235 quantity (max.)	283 g	223 g
Enrichment (max.)	20.0%	20.0%
Fuel Meat	U ₃ Si ₂	U ₃ Si ₂
Number plates	22	18
Channel thickness	0.096"	0.124"
Dimensions, L x W x H	39.75" x 3.10" x 3.10"	34.37" x 3.00" x 3.15"
Weight	17 lb.	13 lb.

As shown above, the GRR-1 fuel element is bounded, with respect to reactivity and U-235 content, by the RINSC fuel element, which is an approved SQ payload in the package.

Because the SQ category criticality analysis does not depend on channel thickness or fuel element dimensions, the GRR-1 fuel element can be added as authorized content of the package without additional specific structural, thermal, shielding, or criticality analyses.

Conclusion

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 will continue to meet the requirements of 10 CFR Part 71 with the transport of GRR-1 fuel elements within the Small Quantity Payload Fuel Handling Enclosure.

CONDITIONS

The following changes are included in Revision No. 12 to Certificate of Compliance No. 9330:

Condition No. 5(b)(1) has been revised to include the GRR-1 fuel elements as authorized contents of the Small Quantity Payloads.

Condition No. 11 authorizes the use of Revision No. 11 of this certificate for approximately one year.

Condition No. 12 has been changed to include the new expiration date of the certificate.

The Revision No. 14 of the application, dated May 2017, and the renewal and amendment requests dated November 30, 2018, are 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. 12,
on December 21, 2018.