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

SAFETY EVALUATION REPORT

DOCKET No. 72-1032
HI-STORM FW MPC Storage System
Holtec International, Inc.
Certificate of Compliance No. 1032
Revision No. 1 to Amendment No. 1

1 SUMMARY

By application dated July 31, 2013, and as supplemented November 5, 2013, Holtec International, Inc. (Holtec, the applicant) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to revise Amendment No. 1 to the HI-STORM Flood/Wind (FW) Mutipurpose Canister (MPC) Storage System Certificate of Compliance (CoC) No. 1032 under 10 CFR 72 Subpart K, General License for Storage of Spent Fuel at Power Reactor Sites. The applicant requested the following changes to Amendment No. 1 to CoC No. 1032:

A. Revise parameters of the 14X14B class fuel assembly, and,

B. Update the testing requirements for Metamic-HT.

This safety evaluation report (SER) documents the review and evaluation of the proposed revision. The NRC staff (staff) followed the guidance of NUREG-1536, Revision 1, "Standard Review Plan for Dry Cask Storage Systems," Interim Staff Guidance (ISG) -11 "Cladding Considerations for the Transportation and Storage of Spent Fuel," and ISG-21 "Use of Computational Modeling Software" in performing its regulatory evaluation.

The staff's assessment is to determine that CoC No. 1032, Amendment No. 1, as revised, continues to meet the applicable requirements of 10 CFR Part 72 for independent storage of spent fuel and of 10 CFR Part 20 for radiation protection.

2 PRINCIPAL DESIGN CRITERIAL EVALUATION

There were no requested changes requiring evaluation of the principal design criteria related to the structures, systems, and components (SSCs) important to safety to ensure compliance with the relevant general criteria established in 10 CFR Part 72. Technical changes (i.e., thermal, structural, etc.) were evaluated as described in the following sections.

3 STRUCTURAL EVALUATION

The staff determined there were no requested changes requiring structural evaluation to ensure compliance with the relevant general criteria established in 10 CFR Part 72. The revised parameter that affects the structural performance for this design is the fuel assembly weight. Since the maximum weight considered in previously approved versions of this design exceed

those for this amendment request, the weights considered for this revision are bounded by that previously determined to be acceptable by the staff.

The testing requirements of Metamic HT cited for this amendment request have no bearing on the structural performance of this design.

3.1 Evaluation Findings

The staff concludes that the structural properties of the structures, systems, and components of the HI-STORM FW remain in compliance with 10 CFR Part 72, and that the applicable design and acceptance criteria have been satisfied. The evaluation of the structural properties provides reasonable assurance that the HI-STORM FW will continue to allow safe storage of spent nuclear fuel. This finding is reached on the basis of a review that considered the regulation itself, appropriate regulatory guides, applicable codes and standards, and accepted engineering practices.

4 HI- STORM FW SYSTEM THERMAL EVALUATION

For HI-STORM FW storage system, the applicant is proposing to change the fuel cladding internal diameter, the fuel pellet diameter and the fuel rod pitch of assembly class 14 x 14 B. This resulted in a volumetric increase of 0.6% of the fuel and a reduction of 0.13 % of the original flow area. However, the 14 x 14 B reduced flow area is still larger than the 17 x 17 assembly flow area used as the bounding scenario in the thermal analysis. As a result, the flow resistance factor is still less restrictive than the one used in the bounding scenario and the passive decay heat removal of the proposed 14 x 14 B assembly is still conservative.

The applicant is also proposing to remove fabrication testing requirements for the thermal expansion coefficient and thermal conductivity. The applicant is proposing to remove fabrication testing as these properties have little variability in Metamic HT when fabricated according to the manufacturing manual. The applicant indicated that because these thermal properties are stable, they will follow the practice used in ASME codes and treat them as “invariant” and listed the invariant values of thermal conductivity, emissivity, nominal specific gravity, average thermal expansion coefficient and specific heat in final safety analysis report (FSAR) Table 1.2.8b. The applicant indicated that variations in specific gravity and specific heat have a minor effect on thermal transient analyses because the cask basket has a small thermal inertia compare with other components in the cask. In response to staff’s request for additional information (RAI), the applicant provided thermal analysis results that demonstrated the changes in the thermal properties have no impact on the transient results of a blocked vent accident. The applicant confirmed the low impact of the values used in the analysis and thus justified referring to them as invariant properties for the range of proposed variation.

The applicant indicated that the heat load limits are not affected by the revised dimensions of the 14 x 14 B fuel assembly and that the previous thermal analysis performed for the MPC-37 bound the proposed new dimensions of the 14 x 14 B assembly. The staff revised the previous thermal analysis of the MPC-37, which is performed for a 17 x 17 assembly. By comparing this flow area with the proposed reduced 14 x 14 B flow area, the staff concluded that the reduced area is still larger than the bounding scenario and that the resulting flow resistance factors are conservative and bounded by the previous thermal analysis. For that reason the staff finds this proposed change to be acceptable.

4.1 Evaluation Findings

F4.1 CoC No. 1032 continues to be designed with a heat-removal capability having verifiability and reliability consistent with its importance to safety. The cask is designed to provide adequate heat removal capacity without active cooling systems.

F4.2 The spent fuel cladding continues to be protected against degradation leading to gross ruptures under long-term storage by maintaining cladding temperatures below 752°F (400°C). Protection of the cladding against degradation is expected to allow ready retrieval of spent fuel for further processing or disposal.

F4.3 The spent fuel cladding continues to be protected against degradation leading to gross ruptures under off-normal and accident conditions by maintaining cladding temperatures below 1058°F (570°C). Protection of the cladding against degradation is expected to allow ready retrieval of spent fuel for further processing or disposal.

F4.4 The staff finds that the thermal design of CoC No. 1032 remains in compliance with 10 CFR Part 72 and that the applicable design and acceptance criteria have been satisfied. The evaluation of the thermal design provides reasonable assurance that CoC No. 1032 will continue to provide safe storage of spent nuclear fuel. This finding is reached on the basis of a review that considered the regulation itself, appropriate regulatory guides, applicable codes and standards, and accepted engineering practices.

5 CONFINEMENT EVALUATION

The applicant did not propose any changes that affect the staff's confinement evaluation provided in the SER supporting CoC No. 1032, Amendment No. 1, issued April 28, 2014. Therefore, the staff determined that a new evaluation was not required.

6 SHIELDING EVALUATION

The applicant did not propose any changes that affect the staff's shielding evaluation provided in the SER supporting CoC No. 1032, Amendment No. 1, issued April 28, 2014. Therefore, the staff determined that a new evaluation was not required.

7 CRITICALITY EVALUATION

The applicant requested a revision to the fuel clad inner diameter, fuel pellet diameter and fuel rod pitch for the 14x14B assembly to cover a larger range of fuel assemblies under that class. The revised fuel parameters are provided in proposed Appendix B of CoC, Table 2.1-2. The analysis and model of the packaging are similar to those used previously by the applicant. The changes to each assembly type were modeled explicitly. Revised results are documented in Chapter 6 of the submitted revised FSAR pages. The applicant showed that these revised fuel assembly parameter limits do not change the bounding fuel assembly array/class for the PWR.

7.1 Criticality Evaluation Summary

The applicant performed all criticality analyses using MCNP5, a three-dimensional, continuous-energy, Monte Carlo N-Particle code. The MCNP5 calculations used the continuous-energy cross-section data distributed with the code. The MCNP5 code and the cross sections used by the applicant are widely used in these types of applications and the staff finds it is appropriate

for this application. The staff reviewed the revised fuel specifications considered in the criticality analyses and performed independent confirmatory analyses using explicit models. The staff performed its independent criticality analyses using KENO VI with ENDF/B-VII continuous energy cross sections in the SCALE 6.1 code package. The staff calculated k_{eff} values comparable to the applicant's results.

Based on the applicant's criticality evaluation, as confirmed by the staff, the staff concludes that the changes to the cask and the contents of the HI-STORM FW Cask System do not affect the ability of the cask to meet the criticality safety requirements of 10 CFR Part 72.

7.2 Evaluation Findings

F7.1 The staff finds that the criticality evaluation of CoC No. 1032 remains in compliance with 10 CFR Part 72 and that the applicable design and acceptance criteria have been satisfied. The evaluation of the criticality design provides reasonable assurance that CoC No. 1032 will continue to provide safe storage of spent nuclear fuel. This finding is reached on the basis of a review that considered the regulation itself, appropriate regulatory guides, applicable codes and standards, and accepted engineering practices.

8 MATERIALS EVALUATION

The applicant did not propose any changes that affect the staff's materials evaluation provided in the SER supporting CoC No. 1032, Amendment No. 1, issued April 28, 2014. Therefore, the staff determined that a new evaluation was not required.

9 OPERATING PROCEDURES EVALUATION

The applicant did not propose any changes that affect the staff's operating procedures evaluation provided in the SER supporting CoC No. 1032, Amendment No. 1, issued April 28, 2014. Therefore, the staff determined that a new evaluation was not required.

10 ACCEPTANCE TESTS AND MAINTENANCE PROGRAM

The applicant did not propose any changes that affect the staff's acceptance tests and maintenance program evaluation provided in the SER supporting CoC No. 1032, Amendment No. 1, issued April 28, 2014. Therefore, the staff determined that a new evaluation was not required.

11 RADIATION PROTECTION

The applicant did not propose any changes that affect the staff's acceptance radiation protection evaluation provided in the SER supporting CoC No. 1032, Amendment No. 1, issued April 28, 2014. Therefore, the staff determined that a new evaluation was not required.

12 ACCIDENT ANALYSIS EVALUATION

The applicant did not propose any changes that affect the staff's accident analysis evaluation provided evaluation provided in the SER supporting CoC No. 1032, Amendment No. 1, issued April 28, 2014. Therefore, the staff determined that a new evaluation was not required.

13 TECHNICAL SPECIFICATIONS AND OPERATING CONTROLS AND LIMITS EVALUATION

13.1 Objective

The review of the TS, and it's operating controls and limits, ensures that the operating controls and limits of the TS, including their bases and justification, meet the requirements of 10 CFR Part 72. The evaluation is based on information provided by the applicant in the HI-STORM FW FSAR Chapter 13 as well as accepted practices and any commitments discussed in other chapters of the FSAR or other subsequent correspondence.

The applicant proposed TS revisions are:

A. CoC No. 1032, Appendix B, Table 2.1-2; PWR Fuel Assembly Characteristics: Updated the Fuel Clad I.D, Fuel Pellet Diameter and Fuel Rod Pitch for 14x14B assembly.

B. CoC No. 1032, Appendix B: Section 3.2.3: Neutron Absorber Tests: Removed reference to Section 10.1.6.3 of the HI-STORM FW FSAR and added revised testing requirements in section 3.2.3.

The staff reviewed the proposed TS revisions against the applicant's proposed changes and determined that they are consistent and accurately reflect the proposed revisions.

13.2 Evaluation Findings

F13.1 The staff concludes that the conditions for use of the HI-STORM FW system identify necessary TS to satisfy 10 CFR Part 72 and that the applicable acceptance criteria have been satisfied. The TS provide reasonable assurance that the system will continue to provide for safe storage of spent fuel. This finding is reached on the basis of a review that considered the regulation itself, appropriate regulatory guides, applicable codes and standards, and accepted practices.

14 QUALITY ASSURANCE EVALUATION

The applicant did not propose any changes that affect the staff's quality assurance evaluation provided in the SER supporting CoC No. 1032 issued June 13, 2011. Therefore, the staff determined that a new evaluation was not required.

15 CONCLUSION

Based on its review of revision request No. 1 to CoC No. 1032, Amendment No. 1, the staff has determined that there is reasonable assurance that: (i) the activities authorized by the revised certificate can be conducted without endangering the health and safety of the public and (ii) these activities will be conducted in compliance with the applicable regulations of 10 CFR Part 72. The staff has further determined that the issuance of the amendment will not be inimical to the common defense and security. Therefore, the revision should be approved.

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