February 24, 2009

MEMORANDUM TO: Michael Scott, Acting Deputy Director
Licensing and Inspection Directorate
Division of Spent Fuel Storage and Transportation, NMSS

FROM: Pierre Saverot, Project Manager **/RA/**
Licensing Branch
Division of Spent Fuel Storage and Transportation, NMSS

SUBJECT: SUMMARY OF FEBRUARY 11, 2009, MEETING WITH HOLTEC INTERNATIONAL REGARDING THE HI-STAR 180 PACKAGE APPLICATION

Summary

On February 11, 2009, Holtec International, Inc. (Holtec) met with staff to present clarifications and detailed answers to questions raised by staff during the January 21, 2009, pre-application meeting. The discussion focused on burnup verification issues and the Metamic-HT qualification tests. Staff said that no regulatory decision will be made during the meeting and that it can provide only indirect guidance through good discussions with the applicant.

Holtec stated that a complete justification for not performing burnup measurements based exclusively on misloading analyses would be difficult and that the identification of conservative or bounding combinations would be time-consuming. Instead, Holtec is proposing an approach that includes additional administrative controls as an alternative to burnup measurements: (i) visual inspection requirements would ensure that misloading of fresh fuel assemblies would be considered a non-credible event (an assembly is "discolored" after insertion in the reactor core); and (ii) all assemblies below a specified burnup would have to be accounted for in the spent fuel pool before and after cask loading so that misloading of an under-burned assembly would also be considered a non-credible event.

Holtec is proposing two independent administrative barriers against misloading with the verification that the correct assemblies are loaded per the usual procedure and the verification that no incorrect assemblies are loaded per the additional controls above. The misloading analyses are retained as a supplemental defense-in-depth, similar to the fuel damage analyses performed for moderator exclusion. Holtec has now analyzed all 42 possible misloading configurations for one single fresh fuel assembly and found that the maximum K_{eff} for all of these configurations is 0.9601. For under-burned misloading assemblies conditions, the analyses considered only the replacement of the burned assemblies, in each configuration, by the under-burned assembly.

In answering staff's questions, Holtec indicated that (i) the number of misloading conditions, i.e., 42, was due to the symmetry of the loading patterns, (ii) analyses were done with actinide only credit, (iii) there is a bias of about 1% in the results, (iv) for as-loaded conditions, the k_{eff} should be about 1.5% higher than the maximum k_{eff} of 0.9601, (v) the key assumption used was to replace one spent fuel assembly by one fresh fuel assembly, (vi) the maximum K_{eff} was 1.007

with all fresh fuel assemblies loaded and including all uncertainties, while it is below 0.99 for a burnup of 12 GWD/MTU and below 0.975 for a 20 GWD/MTU burnup, and (vii) low burnup fuel is not visually distinguishable from high burnup fuel in a pool or a cask.

Staff also questioned the meaning of the word “small” in the following sentence: “the number of assemblies in the pool that are at or below the minimum required value would be small.” Holtec answered that this may represent 30 to 40 fuel assemblies and that this number is still small compared to the total number of assemblies that would need to be measured. Holtec also stated that this sentence is just an argument, that it does not really rely on it because administrative procedures do verify the presence of assemblies that are still in the pool and that could have created misloads. Staff also asked what was the uncertainty on burnup and if a 12GWD/MTU burnup is still bounding. Holtec answered that the burnup uncertainty is generally about 5% and that any assembly below the minimum required burnup would be treated as a fresh assembly.

Staff mentioned that this package application is treated as a “generic” submittal and not “site-specific.” Although a utility/reactor owner knows what’s in the pool, staff said that a system of “check and balances” for the fuel locations must be effectively implemented for a number of reasons, including the following: (i) an assembly may not have the assumed characteristics (there may be miscalculations or human errors), (ii) the correctness of reactor records must be checked both for the data itself e.g., data tracking, fuel movements, etc., and (iii) the potential transposition of errors or the recording of the wrong data for an assembly.

Staff explained that (i) it had internally worked on and discussed the application of misloading analyses in a generic sense, (ii) Holtec can demonstrate that the cask is not as sensitive as other designs, (iii) one can always argue about 12GWD/MTU as being a conservative burnup for an under-burned assembly, (iv) Holtec has shown the bounds of misloads with respect to fresh fuel, and (v) it would be helpful for the reviewer if the applicant would determine the k_{eff} for a cask completely loaded with 12 GWD/MTU fuel assemblies as well as quantify estimates of reactivity margin for fission products, as recommended by the ISG.

Regarding administrative controls proposed by Holtec, staff suggested that Holtec should explore the potential to account for a lot of assemblies with a single burnup and a high enrichment. Staff also observed that one of the sentences on the proposed administrative controls, i.e., “a misloading event would be inconsequential since PWR spent fuel pools require a substantial amount of soluble boron,” is really not needed nor applicable in the review per 10 CFR 71.55. Staff concluded this portion of the meeting on burnup measurements by stating that it believes the message has come across to the applicant that “more information is better”, “assumptions shall all be documented,” and “a robust SAR that goes into details should eliminate a majority of questions from staff.”

The on-going Metamic-HT testing program was presented by Holtec. Holtec’s testing program involved approximately 500 test coupons. Some creep test samples and tests for thermal and radiation effects are ongoing. Most of the ongoing test results are expected to be reported in the coming months. Some creep test samples will continue longer.

Staff cautioned Holtec on several topics including creep rate versus creep rupture tests and the uncertainty of predicting creep performance beyond the longest test period.

In answering staff's question on the strength level required by the design, Holtec stated that all structural calculations are based on an acceptable stress of 60% of the Minimum Guaranteed Value (MGV). The MGV will be derived from the Holtec test results.

With respect to extended service life beyond the normal 5-year license period, staff suggested that the amount of time the transport canister is actually loaded with fuel could be the determining factor regarding the remaining creep life of the Metamic HT. The staff suggested that a linear fraction rule seems to be reasonable, but would require record-keeping on the part of owners/users. Holtec mentioned that it will insert a statement into the CoC in reference to additional creep tests to better answer additional licensing periods.

The staff closed the meeting by asking if Holtec was aware of any literature which made a useful comparison between Metamic HT and oxide dispersion strengthened (ODS) nickel.

The enclosures are the list of meeting attendees, a copy of the graph "burnup versus enrichment data" presented by staff during the meeting, and a copy of the slides Holtec presented at the meeting.

Docket No. 71-9325
TAC No. L24304

Enclosures:
1. List of Meeting Attendees
2. Burnup versus enrichment data for a 14x14 PWR fuel assembly
3. Holtec Slides

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Distribution: NRC Attendees

OFC	SFST	C	SFST	C	SFST			
NAME	PSaverot		MDeBose		EJBenner			
DATE	02/23/2009		02/24/2009		02/24/2009			

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Meeting Between HOLTEC International and the
Nuclear Regulatory Commission
February 11, 2009
Meeting Attendees

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