



72-1008
72-1014

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MESSAGE

Discussion info for non-fuel hardware
Dockets 72-1008, 72-1014.

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Background

The approved HI-STAR CoC and the about to be approved HI-STORM CoC specify burnups and decay heat values for assemblies as a function of cooling times. Prior to loading a cask, the user must demonstrate that the fuel assembly to be loaded is in compliance with both limits.

The permissible decay heat values were calculated in the thermal evaluation to represent the total decay heat emitted by the fuel assembly from all sources (i.e. fuel and non-fuel hardware). The burnups for the assemblies were specified by calculating the burnup in the shielding evaluation, for the design basis fuel assemblies, at which the decay heat from the assembly is equivalent to or less than the decay heat specified from the thermal evaluation.

Current Amendment Under Review

In the Part 72 HI-STAR amendment request under review by the NRC, Holtec has included BPRAs and TPDs. Separate burnup and cooling time curves are provided for the BPRAs and TPDs. These curves ensure that the bounding radiation source used in the analysis in the shielding chapter will not be exceeded by ensuring that the allowable radiation source from BPRAs and TPDs is uniform regardless of burnup (by varying the cooling time).

Holtec also proposed a separate set of burnups and cooling times for assemblies that contain BPRAs. As a result, Holtec proposed two allowable burnup and cooling time tables: one for assemblies without BPRAs and one for assemblies with BPRAs. The burnups from the latter were lower than the former. The burnups for the latter condition were calculated by subtracting the BPRAs decay heat (calculated based on the BPRAs burnup and cooling time) from the allowable decay heat per assembly in the CoC and then recalculating the burnup that would achieve this new decay heat.

The shielding evaluation in the amendment demonstrated that the dose rate from assemblies with BPRAs is less than the dose rate from the design basis fuel. Conservatively, the burnup and cooling times used for the analysis bounded the burnup and cooling times for assemblies with and without BPRAs.

Proposed Revised CoC Approach

Holtec is currently working on another amendment for HI-STAR and HI-STORM and has had an opportunity to rethink the approach taken in the previous amendment and believes it to be overly restrictive and cumbersome. This is of particular concern since the upcoming amendment request will include additional non-fuel hardware in the form of CRAs and APSRs and will also include regionalized loading patterns of different burnups and cooling times.

Therefore Holtec proposes that the following requirements be placed in the CoC.

1. Burnups and cooling times for fuel assemblies calculated with non-fuel hardware excluded. This limit would be applicable to all assemblies regardless of whether or not the assembly contains non-fuel hardware.

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2. A burnup and cooling time for non-fuel hardware (based on radiation dose calculations in the shielding analysis).
3. A decay heat limit for assemblies as a function of cooling time. This would be applicable to assemblies with or without non-fuel hardware.

This approach removes the additional burnup and cooling time for assemblies with BPRAs which was proposed in the amendment currently under review. This additional burnup and cooling time is unnecessarily restrictive and cumbersome for users to implement without providing a substantial increase in safety.

This revised approach is acceptable because both the thermal and shielding analyses are bounding and the proposed new requirements (items 1-3 above) are consistent with the analyses. The thermal analysis is based on a maximum heat load for each assembly, regardless of where the heat is generated (fuel versus non-fuel hardware), and the shielding analysis conservatively bounds fuel with and without non-fuel hardware.

Demonstrating compliance with the decay heat limit in the CoC assures that a fuel assembly being stored, including any non-fuel hardware, is acceptable from a thermal perspective. Demonstrating compliance with the burnup and cooling time limits for the assembly and demonstrating compliance with the non-fuel hardware burnup and cooling time limits provides assurance that the dose rates from the cask will be less than the design basis values presented in the TSAR. Therefore, an additional burnup and cooling time requirement for assemblies with non-fuel hardware is unnecessary as the safety of the system is already assured through the CoC requirements outlined above (items 1-3 above).

Other Cask Systems

The proposed new approach is also consistent with other vendors. The TN-32 draft CoC contains the following requirements.

1. A single decay heat limit for all assemblies that does not vary as a function of cooling time. This limit is applicable to assemblies with and without non-fuel hardware.
2. Burnup and cooling time curves for all assemblies. This limit is applicable to assemblies with and without non-fuel hardware.
3. Burnup and cooling time curves for BPRAs and TPAs.

Therefore, the proposed revised CoC approach is consistent with other vendors.