REQUEST FOR ADDITIONAL INFORMATION 303-2329 REVISION 1

4/2/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 15.02.01-15.02.05 - Loss of External Load; Turbine Trip; Loss of Condenser Vacuum; Closure of Main Steam Isolation Valve (BWR); and Steam Pressure Regulator Failure (Closed)
Application Section: 15.2.1 - 15.2.5

QUESTIONS for Reactor System, Nuclear Performance and Code Review (SRSB)

15.02.01-15.02.05-1

Question 15.2-1

SRP Sections15.2.1-5 and 15.2.7 state, “For new applications, LOOP should not be considered a single failure; [all AOOs] should be analyzed with and without LOOP in combination with a single active failure.” In compliance with this requirement, provide the results of calculations that include the occurrence of a LOOP unless otherwise exempted by the NRC staff. If exempted by the NRC, provide documentation of the exemption.

15.02.01-15.02.05-2

Question 15.2-2

In DCD Section 15.2.1, Loss of External Load, the direct reactor trip on turbine trip is not credited in the analysis. Instead, the reactor trip is initiated at 8.5 seconds after turbine trip for the DNBR analysis and 8.7 seconds after turbine trip for the RCS analysis, following the receipt of the high pressurizer pressure signal. Minimum DNBR is calculated to occur one second later in both analyses. It appears from the results presented that the RCPs continue to operate for the duration of the transient. Explain the logic as to why the turbine trip does not result in a trip and coast down of the RCPs. What would be the results if the RCPs coasted down following the turbine trip as proposed in DCD Section 15.0.0.7?

15.02.01-15.02.05-3

Question 15.2-3

In DCD Section 15.2.1, Loss of External Load, explain why a LOOP does not occur three seconds after the turbine trip?

15.02.01-15.02.05-4

Question 15.2-4

In DCD Section 15.2.2, Turbine Trip, the argument is made that this event is similar to the loss of external load transient and is bounded by the results for DCD Section 15.2.1, except that the steam flow following a turbine trip transient would be isolated by closure of the main turbine stop valves rather than the main turbine control valves (as in the case for DCD Section 15.2.1). Provide quantitative justification for why DCD Section 15.2.2-15.2.4 events are bounded by the analysis presented in DCD Section 15.2.1.

15.02.01-15.02.05-5

Question 15.2-5

Provide a comparative sensitivity analysis for the minimum DNBR for a limiting AOO, varying the assumed time delay between turbine trip and RCP coast down following the turbine trip from zero to three seconds. Also provide confirmation that the minimum DNBR occurs during this 3-second time window for all AOOs, prior to the coast down of the RCPs.

15.02.01-15.02.05-6

Question 15.2-6

Provide the transient curve for RCS pressure verses time in the analysis for Loss of Load event in Section 15.2.1.

15.02.01-15.02.05-7

Question 15.2-7

Provide a more detailed quantitative assessment to support the conclusion that the consequences from all transients analyzed in Section 15.2, “Decrease of Heat Removal from Secondary System” are bounded by the Loss of Load event.

15.02.01-15.02.05-8

Question 15.2-8

Section 15.2.1 indicates that the radiological consequences of the loss of load event are bounded by the main steam line break analysis described in Section 15.1.5. The approach of comparing one event to another in a different event type (heat up transients vs. cooldown transients) requires more justification since the assumptions, initial conditions and other plant conditions for different types of events will not provide the same base line for comparisons. For each event type, identify the most limiting case (with respect to all acceptance criteria) within the group of transients in the same event type.