RAI 6.3-64, Supplement No. 1 (MFN 07-218, 5/15/07)

The original RAI 6.3-64 is repeated below for reference:

"*Show plots of the core level demonstrating that the core remains covered for 72 hours for the limiting break. Justify that the input deck assumptions used for calculating long term core level are conservative*."

GE's response, MFN 07-269 dated 5/14/07, is repeated below (except for the figure) for reference:

"TRACG prediction of the collapsed level in chimney for Gravity Driven Cooling System (GDCS) line break with 1 depressurization valve (DPV) failure is shown in Figure 6.3-64-1. The predictions show that the core remains covered for 72 hours. The assumptions used to develop the core model of TRACG input for the 72 hour analysis are the same as the assumptions used for Emergency Core Cooling Systems (ECCS) performance analysis (nominal case) reported in DCD Tier 2, Revision 3, Section 6.3."

Staff's Followup

Staff requested that the applicant demonstrate the core remains covered for 72 hours for the limiting break. GE's response infers (it was not directly stated) that TRACG predicted the most limiting break for long term cooling is a GDCS line break with 1 DPV failure.

DCD, Section 6.3.3.7.9, with results displayed in Table 6.3-5, states that "the GDCS injection line break with a GDCS injection valve failure results in the lowest minimum chimney static head above vessel zero." Thus, the Staff would have expected that the RAI response provided plots of this limiting break. GE provided no explanation in the RAI response.

A. Explain how GE came to the conclusion that the GDCS injection line break with 1 DPV failure (nominal case) is the most limiting break given the information provided in Table 6.3-5. Staff is also unclear why GE provided a plot of the nominal conditions rather than the bounding conditions for the GDCS Line break with 1 DPV failure. Include the appropriate information in the DCD.

B. Concerning the input deck assumptions, where are the non-condensible gases during the life of the transient? Staff is not convinced TRACG can accurately calculate the movement of non-condensible gases (reference RAI 21.6-96). Therefore, explain, and include in the DCD additional information regarding the treatment of non-condensible gases. Demonstrate that the treatment of non-condensible gases are conservative for long-term PCCS operation. Provide plots that show PCCS power versus time and, on the same plots, decay heat versus time.

C. Provide a qualitative discussion and results of the ESBWR long-term core cooling system response similar to that submitted in MFN 05-105 (Reference 1) in the DCD. The collapsed chimney level response shown in Figure 6.3-64-1 in MFN 07-269 for the GDL line break is different from that shown in Figure 7 in MFN 05-105 (Reference 1). Provide a discussion of the differences.

D. Concerning the input deck assumptions, there may be steam condensation on drywell surfaces that will cause steam to condense and not return to the vessel via the PCCS. Provide a discussion on how this is accounted for or, if not accounted for, justify that the calculation is still conservative without this consideration.

Reference:

1. Letter from D.H. Hinds (GE) to NRC, MFN 05-105, Letter from David H. Hinds to U.S. Nuclear Regulatory Commission, TRACG LOCA SER Confirmatory Items (TAC # MC868), Enclosure 2, Reactor Pressure Vessel (RPV) Level Response for the Long Term PCCS Period, Phenomena Identification and Ranking Table, and Major Design Changes from Pre-Application Review Design to DCD Design, October 6, 2005. (ADAMS Accession No. ML053140223)

Regulatory Justifcation

10 CFR 50.46 states in part that the “emergency core cooling system (ECCS) … must be designed so that its calculated cooling performance following postulated loss-of-coolant accidents conforms to the criteria set forth in paragraph (b) of this section.” Paragraph (b)(5) states requirements for Long-term cooling. It states: “After any calculated successful initial operation of the ECCS, the calculated core temperature shall be maintained at an acceptably low value and decay heat shall be removed for the extended period of time required by the long-lived radioactivity remaining in the core.”

Commission Paper SECY-94-084 “Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems in Passive Plant Designs” states that “passive systems should be able to perform their safety functions, independent of operator action or offsite support, for 72 hours after an initiating event.”

RAI 6.3-65, Supplement No. 1 (MFN 07-218, 5/15/07)

This RAI asked GE to evaluate the consequences of the standby liquid control system line break. The response states that the break flow was at least an order of magnitude smaller than the isolation condenser (IC) flow into the vessel. well under that of the isolation condenser system (ICS) and that none of the other emergency core cooling systems actuate.

How many isolation condensers (ICs) were available during the analysis of this event? Since the passive containment cooling sytems does not operate, describe the long-term (i.e. 72 hour) plant response for this event. What happens after the ICS drains? Is the break size small enough for the reactor water cleanup to provide sufficient make-up?

RAI 21.6- 57, Supplement No. 1 (MFN 07-008, 1/26/07)

In response to Part B of this question, GE states that:

the analysis delay time envelopes the control rod scram time requirements criteria that this duration (the maximum delay time between deenergizing of scram solenoids to start control rod motion) be less than or equal to ….

Justify the amount of time established for the control rod scram time requirements criteria.