Enclosure 1

MFN 09-023

Response to Portion of NRC Request for Additional Information Letter No. 270 Related to ESBWR Design Certification Application

Containment Systems

RAI Numbers 6.2-140 S03 and 6.2-185 S01

NRC RAI 6.2-140 S03:

GEH's response to RAI 6.2-140 S02 is acceptable. Update the ESBWR DCD to include the response to part (A) of the RAI.

GEH Response:

DCD Tier 2, Subsection 6.2.1.1.3.5.1, will be revised as requested to include the RAI 6.2-140 S02 response, part (A), including the corresponding containment pressure and temperature figures as new DCD Tier 2, Figure 6.2-14e5a and Figure 6.2-14e6a.

DCD Impact:

DCD Tier 2, Subsection 6.2.1.1.3.5.1, will be revised, and DCD Tier 2, Figure 6.2-14e5a and Figure 6.2-14e6a will be added, as noted in the attached markup.

NRC RAI 6.2-185 S01:

ESBWR DCD Appendix I Revision 5 states the following:

"This appendix presents the results of the containment design basis calculations with suppression pool bypass leakage assumption of 1 cm^2 (1.08 E-03 ft^2). This ties the results presented in Section 6.2 with 2 cm^2 (2.16 E-03 ft^2) DW to WW bypass leakage to 1 cm^2 (1.08 E-03 ft^2) calculations on the same bases. The Appendix 6I 1 cm^2 (1.08 E-03 ft^2) cases in turn tie-back to previous documented ESBWR results."

However, DCD Revision 5 Figure 6I-1a1 is different from DCD Revision 4 Figure 6.2-14a1, indicating possible changes to the TRACG model from Revision 4 to Revision 5. Explain these changes.

GEH Response:

The pressure results indicated in DCD Tier 2, Revision 5, Figure 6I-1a1 are slightly different than those indicated in DCD Tier 2, Revision 4, Figure 6.2-14a1. These slight pressure differences are an indication of design changes and TRACG code improvements that have occurred since the submittal of DCD Tier 2, Revision 4, to the NRC. The following paragraphs explain these major changes due to design changes and TRACG code improvements.

Major Design Changes

The major design changes implemented between DCD Tier 2, Revision 4, and DCD Tier 2, Revision 5, are explained in the response to RAI 21.6-98 (MFN 08-545, dated August 29, 2008), Table 1, titled “Major Design Changes from Pre-Application Review Design to DCD Rev. 5”, items 20 and 23. Item 20 describes the safety relief valve (SRV) capacity changes. Item 23 describes the main steam line changes (i.e., change of nominal diameter and all eight depressurization valves (DPVs) attached to the isolation condenser (IC) steam lines.

Other changes considered in this RAI response not included in the Table 1 in the response to RAI 21.6-98, but implemented after DCD Tier 2, Revision 4, are provided in Table 6.2-185 S01-1:

Table 6.2-185 S01-1

Item	Parameter	Reason for Change	Impact on Loss-of-Coolant Accident (LOCA) Analysis	Justification for the Applicability of TRACG
1	Vacuum Breakers	The area available from the vacuum breakers assumed available for LOCA was reduced to minimize operability requirements including their numbers, reduced from 2 to 1.	The results of the parametric cases performed indicate insignificant impact on key parameters like minimum chimney level and maximum drywell pressure.	No new phenomena introduced. TRACG code applicable.
2	IC Steam Line Elevation	The IC steam supply line was modified in order to comply with the reactor pressure vessel design in DCD Tier 2, Revision 5.	Minimal impact on Containment LOCA.	No new phenomena introduced. TRACG code applicable.

TRACG04P Code Improvements

DCD Tier 2, Revision 4, Figure 6.2-14a1 resulted from the analyses performed using TRACG04xP 20050929-53, and DCD Tier 2, Revision 5, Figure 6I-1a1 resulted from using TRACG04xP 20080415-5704. The main code changes between these two code versions are explained in the response to RAI 21.6-109 (MFN 08-710, dated September 22, 2008), Table 21.6-109, titled “Summary of TRACG04P Code Changes since TRACG04A Level 2.”

DCD Impact:

No DCD changes will be made in response to this RAI.

Enclosure 2

MFN 09-023

Response to Portion of NRC Request for Additional Information Letter No. 270 Related to ESBWR Design Certification Application

Containment Systems

RAI Number 6.2-140 S03

DCD Markups

temperature to a level where there is acceptable margin, and then to maintain these conditions indefinitely:

(1) SSCs to refill the IC/PCC pools;

(2) PCCS Vent Fans;

(3) Passive Autocatalytic Recombiner System (PARS); and

(4) Power supplies to the PCCS Vent Fans and the IC/PCC pool refill pumps.

Once a state of safe, stable reactor shutdown is reached, ~~and~~ containment pressure and temperature are maintained with sufficient margin to containment design limits for a long period of time (Figure 6.2-14e1 through Figure 6.2-14e10) to allow the use of other non-safety related, non-RTNSS SSCs to be placed in service to~~at acceptably low values with no increasing trend, other nonsafety-related SSCs are relied upon to~~ bring the reactor to cold shutdown conditions and to further reduce the containment pressure and temperature. These SSCs include the FAPCS as the preferred method, and the RWCU/Shutdown Cooling (SDC) system in the unlikely event there is fuel damage (Subsections 9.1.3 and 5.4.8, respectively). In the unlikely event of fuel damage, where the RWCU/SDC system is used, the Reactor Building HVAC Accident Exhaust Filter Units are ~~system is~~ a required support system for limiting onsite and offsite dose.~~ The containment pressure and temperature response due to these nonsafety-related SSCs is shown in Figures 6.2-14e1 through 6.2-14e10.~~

Containment pressure and temperature responses which represent a postulated accident recovery evolution, with RWCU/SDC (fuel damage assumed) providing the cold shutdown function are shown in Figures 6.2-14e11 and 6.2-14e12. These response curves are based on the RWCU/SDC operating in suppression pool cooling mode for 24 hours, beginning seven days after a LOCA, followed by vessel injection via the normal RWCU/SDC midvessel suction line, with suction from the suppression pool. The heat removal for this mode of RWCU/SDC operation is provided by the non-regenerative heat exchanger (NRHX). A conservative heat exchanger capacity was assumed which is well within the capability of the RWCU/SDC NRHX. Table 6.2-48 lists the RWCU/SDC NRHX data used in the analysis. There is no requirement to start the recovery actions at seven days, since the reactor is already in a safe stable shutdown condition, and containment pressure and temperature are in a non-upward trending state, with sufficient margin to containment design limits.

The accident recovery analysis shows that after being in suppression pool cooling for 24 hours and then injecting into the reactor vessel for approximately 10 hours, the suppression pool has equilibrated with the reactor bulk water temperature at cold shutdown conditions.

6.2.1.1.4 Negative Pressure Design Evaluation

During normal plant operation, the inerted WW and the DW volumes remain at a pressure slightly above atmospheric conditions. However, certain events could lead to a depressurization transient that can produce a negative pressure differential in the containment. A DW depressurization results in a negative pressure differential across the DW walls, vent wall, and diaphragm floor. A negative pressure differential across the DW and WW walls means that the RB pressure is greater than the DW and WW pressures, and a negative pressure differential across the diaphragm floor and vent wall means that the WW pressure is greater than the DW pressure. If not mitigated, the negative pressure differential can damage the containment steel

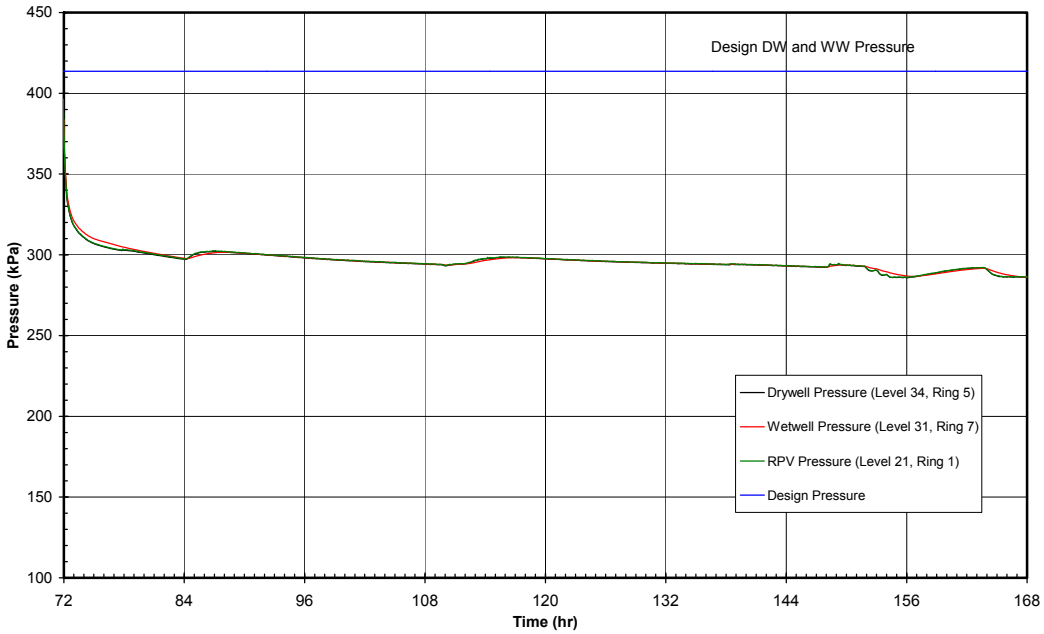

Figure 6.2-14e5. Drywell, Wetwell and RPV Pressures

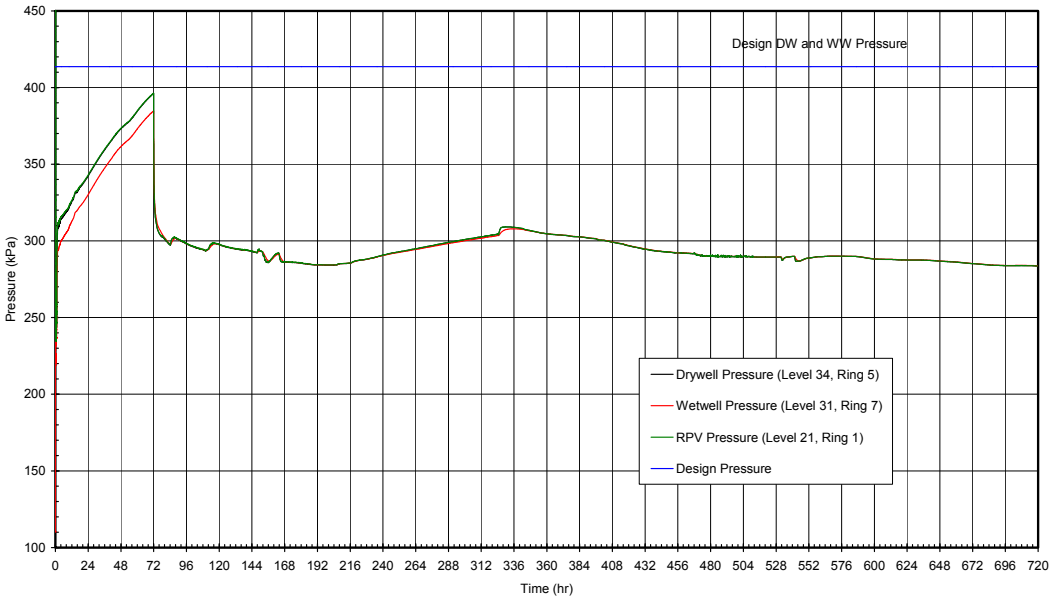

Figure 6.2-14e5a. Drywell, Wetwell and RPV Pressures (720 hr)

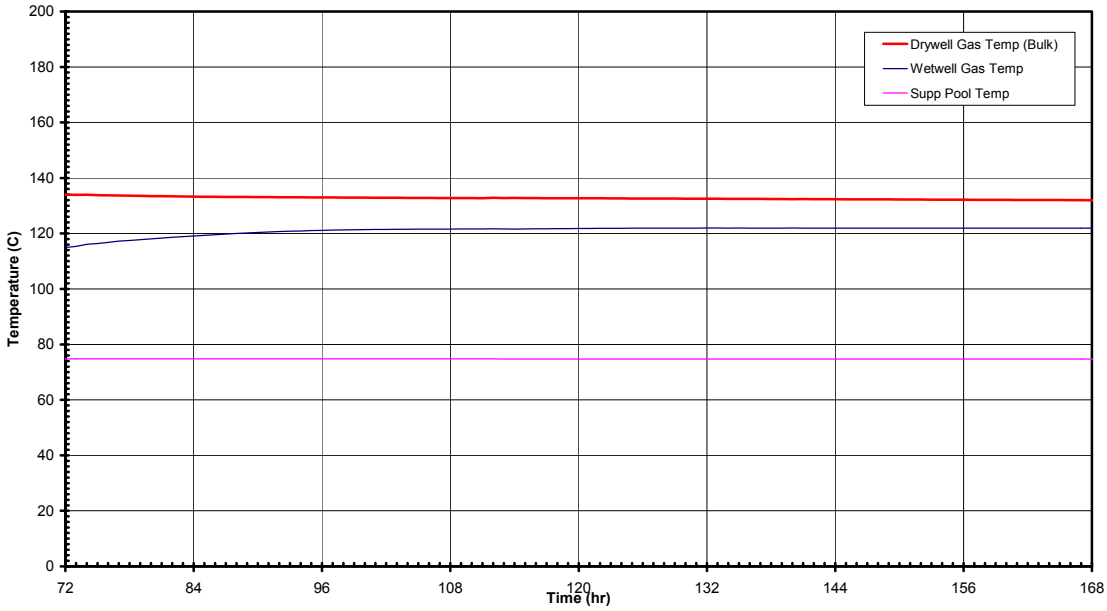

Figure 6.2-14e6. Drywell, Wetwell and Suppression Pool Temperatures

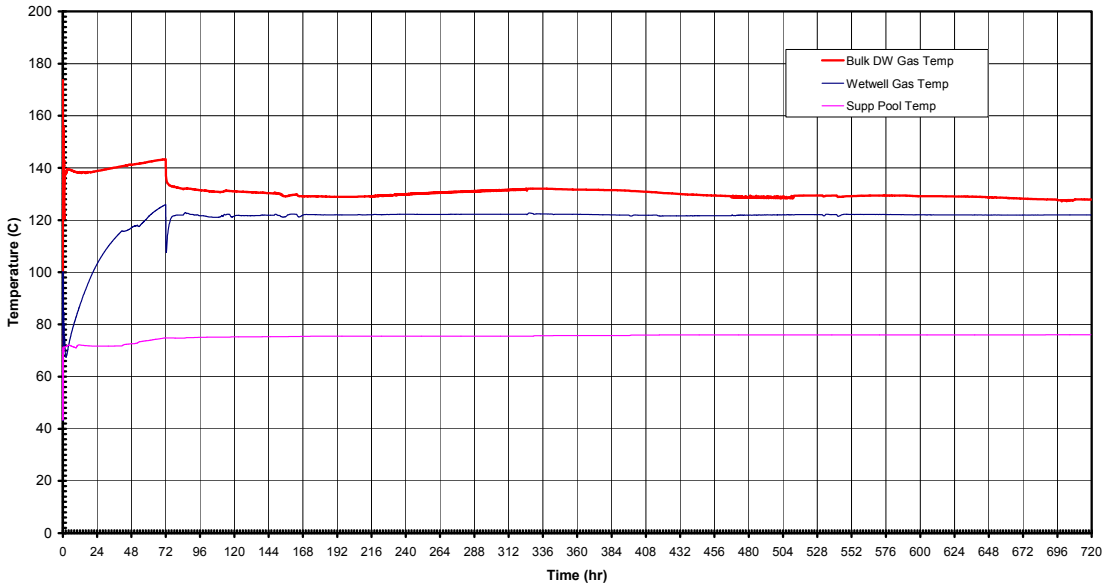

Figure 6.2-14e6a. Drywell, Wetwell and Suppression Pool Temperatures (720 hr)