6.3 Emergency Core Cooling Systems

The information in this section of the reference ABWR DCD, including all subsections, tables, and figures, is incorporated by reference with the following departures and supplements.

STD DEP Admin

STD DEP T1 2.4-1

As required by Section IV.A.3 of the ABWR Design Certification Rule, the plant-specific DCD must physically include the proprietary and safeguards information referenced in the ABWR DCD. Section 6.3 in the reference ABWR DCD references proprietary information. That proprietary information is provided below, has finality in accordance with Section VI.B.2 of the ABWR Design Certification Rule, and does not constitute a supplement to or departure from the reference ABWR DCD.

6.3.2.2.4 Residual Heat Removal System (RHR)

STD DEP T1 2.4-1

In the shutdown cooling mode, with the pump suction being taken from the reactor pressure vessel (via the shutdown cooling lines), the pump discharge within these loops provides a flow path back to the reactor vessel via the core cooling discharge return lines, and feedwater line, or to the upper reactor well via the fuel cooling system ~~(on two loops only)~~.

With the pump suction being taken from the skimmer surge tanks of the fuel pool cooling system, the pump discharge is returned to the fuel pool ~~on two loops only~~.

For each loop, a minimum flow bypass line is also provided to return water to the suppression pool to prevent pump damage due to overheating when the injection valves on the main discharge lines are closed. The bypass line connects to the main discharge lines between the main pump and the discharge check valve. A motor-operated valve on the bypass line automatically closes when flow in the main discharge line is sufficient to provide the required pump cooling. A flow element in the main discharge line measures system flow rate during LOCA and test conditions and automatically controls the motor-operated valve on the bypass lines. The motor-operated valve does not receive an *automatic signal~~s~~* to open *unless the associate pump indicates a high discharge pressure.*

6.3.3.2 Acceptance Criteria for ECCS Performance

STD DEP Admin

Criterion 2: Maximum Cladding Oxidation
"The calculated total local oxidation of the cladding shall nowhere exceed 0.17 times the total cladding thickness before oxidation." Conformance to Criterion 2 is shown in ~~Figure 6.3-10 (Break Spectrum) and~~ Table 6.3-4 (Summary of LOCA Analysis Results) for the system response analysis. This limit will be assured for the limiting break. See Subsection 6.3.6 for COL license information.

Criterion 4: Coolable Geometry
"Calculated changes in core geometry shall be such that the core remains amenable to cooling." As described in Reference ~~6.2-1~~ 6.3-1, Section III.A, conformance to Criterion 4 is demonstrated by conformance to Criteria 1 and 2.

Criterion 5: Long-Term Cooling
"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." Conformance to Criterion 5 is demonstrated generically for GE BWRs in Reference ~~6.2-1~~ 6.3-1, Section III.A. Briefly summarized, for any LOCA, the water level can be restored to a level above the top of the core and maintained there indefinitely.

6.3.3.10 Severe Accident Considerations

STD DEP Admin

If the LPFL is not initiated in time to prevent core damage, LPFL injection is still beneficial *by enhancing cooling and preventing radioactive heating from the core debris. If injection is initiated prior to vessel failure, melt progression may be arrested in-vessel. However, if vessel failure occurs, debris will relocate from the vessel breach into the lower drywell. Water flowing into the lower drywell will cover the core debris and enhance debris cooling.*

6.3.6 COL License Information

6.3.6.1 ECCS Performance Results

The following site-specific supplement addresses COL License Information Item 6.6.

The exposure-dependent MAPLHGR, peak cladding temperature, and oxidation fraction for each initial core bundle design based on the limiting break size will be provided as an amendment to the FSAR in accordance with 10 CFR 50.71(e) at least one year prior to fuel load. The analysis will reflect the final fuel design for the initial core loading. (COM 6.3-1)

6.3.6.2 ECCS Testing Requirements

The following site-specific supplement addresses COL License Information Item 6.7.

In accordance with the Technical Specifications, a test will be performed every refueling outage in which each ECCS subsystem is actuated through the emergency operating sequence. The test procedure will be developed consistent with the plant operating procedure development plan, which was provided to the NRC in ABWR Licensing Topical Report NEDO-33297, "Advanced Boiling Water Reactor (ABWR) Procedures Development Plan," dated January 19, 2007. This will be developed and available for NRC review prior to fuel receipt. (COM 6.3-2)

6.3.6.3 Limiting Break Results

The following site-specific supplement addresses COL Information Item 6.7a.

The analysis results for the limiting break for each bundle design will be provided as an amendment to the FSAR in accordance with 10 CFR 50.71(e) at least one year prior to fuel load. The analysis will reflect the final fuel design for the initial core loading. (COM 6.3-3)