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ComEd

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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington D.C. 20555

Subject: Response to Request for Additional Information for Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions"
Dresden Nuclear Power Station, Units 2 and 3
NRC Docket Nos. 50-237 and 50-249

References:
a) Request for Additional Information (RAI) For Generic Letter 96-06 For Dresden Nuclear Power Station, Units 2 and 3 (TAC Nos. M96806 and M96807)," dated June 10, 1998

b) J. Hosmer letter to NRC, ComEd Response to Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design Basis Accident Conditions," Dated January 28, 1997

c) J. S. Perry Letter to NRC, Dresden Nuclear Power Station Units 2 and 3 Supplemental response to Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design Basis Accident Conditions," Dated March 28, 1997

d) J. S. Perry letter to NRC, Dresden NuclearPower Station Units 2 and 3 Supplement Response to Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design Basis Accident Conditions," Dated May 30, 1997

The purpose of this letter is to provide the Commonwealth Edison (ComEd) Company response to the Request for Additional Information (RAI) in reference a. ComEd has revised its post accident operating procedure DOA 3700-01, "Loss Of Cooling By Reactor Building Closed Cooling Water (RBCCW) System," to isolate the RBCCW system if a LOCA has occurred AND drywell pressure is greater than 2 psig. This should preclude the operation of the RBCCW system in scenarios of water hammer and two-phase flow.

Please direct any questions regarding this matter to Mr. Frank Spangenberg, Dresden Regulatory Assurance Manager at (815) 942-2920 extension 3800.

Sincerely,

J.M. Heffley
Site Vice President
Dresden Station

Attachment

cc: Dr. Carl Paperiello, Regional Administrator, Region III
Mark A. Ring, Branch Chief, Division of Reactor Projects, Region III
L. Rossbach, Project Manager, NRR (Unit 2/3)
K. R. Riemer, Senior Resident Inspector, Dresden
Office of Nuclear Safety – IDNS
File: Numerical

Attachment
Response to Request for Additional Information
Dresden Station Units 2 and 3
50-237, 50-249

Background

Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions," dated September 30, 1996, included a request for licensees to evaluate cooling water systems that serve containment air coolers to assure that they are not vulnerable to water hammer and two-phase flow conditions. Commonwealth Edison Company (the licensee) provided its assessment for Dresden Station, Units 2 and 3 in References b), c), and d). Dresden's response indicates that the Drywell Cooling System is not safety-related and is not assumed to operate under postulated accident conditions. However, the Reactor Building Closed Cooling System (RBCCW), which provides cooling water to the drywell coolers, is not automatically isolated during a loss-of-coolant accident (LOCA) or a main steam line break and water continues to flow through the drywell units until RBCCW is manually isolated from the control room due to RBCCW pump trip or low RBCCW expansion tank water level. The following three scenarios were discussed in our response:

a) The RBCCW system continues to operate. Heat will be removed by the RBCCW system following the accident and steam pockets should not form.

b) The RBCCW system isolation valves are manually closed by control room operators following the accident. Water hammer is not a concern unless RBCCW flow is reinitiated. For this scenario, the licensee indicated that all applicable post accident operating procedures would be reviewed and updated as needed to include a warning on the potential for water hammer in the RBCCW system if cooling water flow is reinitiated after a LOCA.

c) The RBCCW pumps trip during the initial phase of the accident and the isolation valves are not manually closed. The licensee expects that steam formation would be minimal because the RBCCW system is a closed loop system and the expansion tank is at least 50 feet above the RBCCW piping in the drywell.

Technical Discussion

Dresden Station has completed their review of applicable post accident operating procedures as identified in scenario b) above. As a result, Dresden Abnormal Operating Procedure DOA 3700-01, "Loss Of Cooling By Reactor Building Closed Cooling Water (RBCCW) System," has been revised. Revision 15 to DOA 3700-01 included the following as step C.3:

> If a LOCA has occurred AND Drywell pressure is greater than 2 psig, Then isolate Drywell RBCCW by closing the following (923-1 panel):
>
> a. 2(3) –3702, U2(3) DW supply valve
> b. 2(3) –3703, U2(3) DW return valve
> c. 2(3) –3706, U2(3) DW return valve

Also a CAUTION statement has been added preceding the aforementioned step. The statement states " Do not re-establish RBCCW flow to Drywell following performance of the next step." This caution statement has been properly annotated as a commitment to Generic Letter 96-06. As such, the caution statement can not be deleted without prior evaluation of the commitment previously made to the NRC through the review of the post accident operating procedures identified in scenario b) above.

Therefore if a LOCA occurs and drywell pressure has reached 2 psig (which is indicative of a steam leak) RBCCW flow to equipment in the drywell is isolated and procedurally prohibited from being restored.

Question #1

The scenarios that were discussed do not specifically include LOCA with loss of offsite power, unless (c) above is meant to be representative of this case. Explain.

ComEd Response

The scenario for LOCA with loss of offsite Power (LOOP) is the same as for LOCA alone since the isolation valves are ultimately powered by emergency diesel generator power. Therefore the operator will be able to isolate the drywell RBCCW system by closing the RBCCW isolation valves.

Question #2

For the scenario discussed in (b), above, explain under what specific circumstances operators will be allowed to reinitiate flow through the RBCCW system and how this will be accomplished such that complications due to water hammer and two-phase flow are avoided.

ComEd Response

As stated above in the Technical Discussion, Dresden Abnormal Operating Procedure DOA 3700-01, "Loss Of Cooling By Reactor Building Closed Cooling Water (RBCCW) System," has been revised. The operator will not be allowed to reinitiate flow through the RBCCW system to the drywell Cooler. Therefore, water hammer and two-phase flow will be avoided.

Question # 3

Confirm that a complete failure modes and effects analysis (FMEA) for all components (including electrical and pneumatic failures) that could impact performance of the RBCCW system has been performed for the various scenarios and confirm that these FMEAs are documented and available for review, or explain why complete and fully documented FMEAs were not performed. Confirm that these scenarios remain valid even when "worst-case" conditions and failure modes are assumed.

ComEd Response

Since the flow through the RBCCW system to the drywell coolers will not be initiated after it is isolated as required by DOA 3700-01, water hammer and two-phase flow will be avoided. Therefore, documentation of the FMEAs is not required.

Question #4

For all scenarios that include the possibility of water hammer or two-phase flow, provide the following additional information:

a) If a methodology other than that discussed in NUREG/CR-5220, "Diagnosis of Condensation-Induced Water Hammer," was used in evaluating the effects of water hammer, describe this alternate methodology in detail. Also explain why this methodology is applicable and gives conservative results for Dresden units (typically accomplished through rigorous plant-specific modeling, testing, and analysis).

b) Identify any computer codes that were used in the water hammer and two-phase flow analyses and describe the methods used to bench mark the codes for the specific loading conditions involved (see Standard Review Plan Section 3.9.1).

c) Describe and justify all assumptions and input parameters (including those used in any computer codes) such as amplifications due to fluid structure interaction, cushioning, speed of sound, force reductions, and mesh sizes, and explain why the values selected give conservative results. Also, provide justification for omitting any effects that may be relevant to the analysis (e.g., fluid structure interaction, flow induced vibration, erosion).

d) Provide a detailed description of the "worst case" scenarios for water hammer and two-phase flow, taking into consideration the complete range of event possibilities, system configurations, and parameters. For example, all water hammer types and water slug scenarios should be considered, as well as temperatures, pressures, flow rates, load combinations, and potential component failures. Additional examples include:

   - The consequences of steam formation, transport, and accumulation;
   - Cavitation, resonance, and fatigue effects; and
   - Erosion considerations.

   Licensees may find NUREG/CR-6031, "Cavitation Guide for Control Valves," helpful in addressing some aspects of the two-phase flow analyses.

a) Determine the uncertainty in the water hammer and two-phase flow analyses, explain how the uncertainty was determined, and how it was accounted for in the analyses to assure conservative results for the Dresden units.

b) Confirm that the water hammer and two-phase flow loading conditions do not exceed any design specifications or recommended service conditions for the piping system and components, including those stated by equipment vendors; and confirm that the system will continue to perform its design-basis functions as assumed in the safety analysis report to the facility.

c) Explain and justify all uses of "engineering judgement."

ComEd Response

Since the flow through the RBCCW system to the drywell coolers will not be initiated after it is isolated as required by DOA 3700-01, water hammer and two-phase flow will be avoided. Therefore, discussion of these scenarios is not required.

Question 5

Provide a simplified diagram of the RBCCW system, showing major components, active components, relative elevations, lengths of piping runs, and the location of any orifices and flow restrictions.

ComEd Response

Since the flow through the RBCCW system to the drywell coolers will not be initiated after it is isolated as required by DOA 3700-01, water hammer and two-phase flow will be avoided. Therefore, a simplified diagram to identify potential areas of concern is not required.