November 30, 1999

MEMORANDUM TO: John A. Grobe, Director
Division of Reactor Safety, Region III

FROM: Suzanne C. Black, Deputy Director Original Signed By
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: TASK INTERFACE AGREEMENT (TIA) 98-009 - LOW ULTIMATE HEAT SINK LEVEL SAFE SHUTDOWN ISSUES - DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3 (TAC NOS. MA2427 AND MA2428)

By memorandum dated August 24, 1998, Region III requested NRR assistance in determining the license requirements concerning the safe shutdown capability of Dresden, Units 2 and 3, under the low ultimate heat sink levels that would result if the Dresden Dam failed. The attachment provides our response to the Region III request. This completes our efforts under TIA 98-009 and TAC Nos. MA2427 and MA2428.

Docket Nos. 50-237 and 50-249

Attachment: As stated

cc: W. Lanning, Region I
B. Mallett, Region II
A. Howell, Region IV

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CONTACTS: Larry Rossbach, NRR/LPD3
(301) 415-2863

David Shum, NRR/SPLB
(301) 415-2860

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RESPONSE TO TASK INTERFACE AGREEMENT (TIA) 98-009
CONCERNING LOW ULTIMATE HEAT SINK LEVEL SAFE SHUTDOWN ISSUES

1.0 INTRODUCTION

A Region III inspector identified several discrepancies in the Updated Final Safety Analysis Reports (UFSAR) for Dresden Nuclear Power Station, Units 2 and 3, and questioned several underlying assumptions and procedures involving the ability to safely shut down the plant following a failure of the Dresden Dam (References 1 and 2). Commonwealth Edison Company (ComEd, the licensee) responded to these findings and proposed corrective actions (References 4, 5, 6, 7, 8, and 9).

By memorandum dated August 24, 1998 (Reference 3), Region III requested assistance from NRR in determining the license requirements concerning the safe shutdown capability of Dresden Units 2 and 3 if the Dresden Dam were to fail.

In answering this TIA, we reviewed the relevant portions of the Dresden Units 2 and 3 UFSAR (Reference 11) and the Safety Evaluation Reports (SERs) (References 13, 15, and 24). We also reviewed the Systematic Evaluation Program (SEP) safety evaluation and technical evaluation report for SEP Topic II-3.C "Safety-Related Water Supply (Ultimate Heat Sink (UHS))" (References 18, 19, and 20), the history of the closeout of SEP Topic II-3.C, and numerous other documents related to the licensing of the ultimate heat sink (UHS) at Dresden. The Plant Systems Branch (SPLB) and the project manager prepared the following response to Region III's concerns. Sections 3.1 through 3.5 respond to the five basic questions in the TIA. Sections 3.6 and 3.7 discuss additional issues related to the TIA and the closeout of SEP Topic II-3.C that should also be considered in your follow-up inspection.

2.0 BACKGROUND

The UHS for Dresden Units 2 and 3 is provided by the Kankakee River, the Dresden Units 2 and 3 intake and discharge canals, and the Dresden Lock and Dam on the Illinois river located just downstream of the confluence of the Kankakee and Des Plains rivers. The UHS is designed to provide sufficient cooling water: (a) to permit simultaneous safe shutdowns of both units and to maintain them in a safe shutdown condition, and (b) to safely limit the effects of an accident in one unit, to permit a simultaneous safe shutdown of the remaining unit, and to maintain both units in a safe shutdown condition.

ComEd described how Dresden Units 2 and 3 would achieve safe shutdown or cope with an accident coincident with a failure of the Dresden Dam in Amendment Nos. 9 and 10 to the FSAR (Reference 10). This amendment was submitted during the Dresden Units 2 and 3 license review in response to Atomic Energy Commission (AEC) questions. These "coping scenarios" described the ability of Dresden Units 2 and 3 to cope with the dam failure caused by an earthquake: (a) during normal plant operation, and (b) coincident with a loss-of-coolant accident (LOCA). However, ComEd believes that the coping scenario of a dam failure coincident with a LOCA was beyond the Dresden design basis (References 4, 5, and 6).

ATTACHMENT

3.0 EVALUATION AND CONCLUSIONS

3.1 Question 1: Is a dam failure coincident with a LOCA beyond the design basis?

A dam failure coincident with a LOCA at Dresden Units 2 and 3 was not considered by ComEd in the original plant design, but it was discussed in the response to AEC questions. In the original licensing review, neither the staff nor the Advisory Committee on Reactor Safeguards (ACRS) used the coping capabilities of a dam failure coincident with a LOCA as a basis for the acceptability of the UHS or required such an event be considered in the UHS design (References 12, 13, 14, and 15). In addition, a dam failure coincident with a LOCA was not recommended or required by the SEP or the Dresden Unit 2 Full Term Operating License (FTOL) as one of the design criteria for the UHS (References 16 through 24).

A LOCA and an earthquake which would cause a dam failure are two separate events. Standard Review Plan (SRP) Section 2.2.3 states that an event (such as a LOCA coincident with an earthquake) with an occurrence frequency of approximately 1.0E-07 per year or less need not be considered as a credible event. SRP Section 2.2.3 further states that it is acceptable to not postulate events for which the expected frequency of occurrence is 1.0E-06 per year if, when combined with reasonable qualitative arguments, the realistic probability can be shown to be lower. The licensee performed a probabilistic safety assessment (PSA) of a LOCA coincident with the Dresden Dam failure caused by an earthquake. Results of the PSA indicate that the frequency of occurrence of a LOCA coincident with an earthquake at Dresden Units 2 and 3 is 1.6E-07 per year (Reference 6). Therefore, a dam failure coincident with a LOCA at Dresden Units 2 and 3 is considered to be incredible and satisfies the guidance described in SRP Section 2.2.3 for exclusion from design consideration.

Based on our review of the licensee's rationale and information presented in the UFSARs and SERs, we conclude that an event of a dam failure coincident with a LOCA at Dresden Units 2 and 3 is beyond design basis.

3.2 Question 2: The licensee is changing the UFSAR to state that the coping scenario in UFSAR Section 9.2.5.3.2, "Dam Failure Coincident with a LOCA," is beyond design basis and that calculations are not needed to prove that beyond design basis requirements are met. Is it acceptable for the UFSAR to have coping scenarios with statements that are not supported by calculations?

Since a dam failure coincident with a LOCA is beyond the design basis of Dresden Units 2 and 3 calculations are not needed to support the coping scenarios described in the UFSAR Section 9.2.5.3.2, "Dam Failure Coincident with a LOCA." Also, we find that this proposed revision to the UFSAR is acceptable.

3.3 Question 3: Is it an unreviewed safety question (USQ) for the three million gallons (part of the water trapped in the intake and discharge canals to permit simultaneous safe shutdown of both units) to no longer be available?

In Section 2.3 of the SER regarding hydrology (Reference 13), the staff stated that: "The facility is designed so that sufficient water to assure safe shutdown will be impounded in the intake and discharge canals for cooling in the event of a failure of the Dresden Dam and a subsequent lowering of the pool elevation of the rivers."

In the evaluation of the SEP Safety Topic II-4.E, "Dam Integrity," (References 16 and 17), the staff concluded that the failure of the Dresden Lock and Dam would not adversely affect the safety of the plant, and that the dam need not, therefore, be classified as Category I.

FSAR Amendment Nos. 9 and 10 (Reference 10) and ComEd submittals during the SEP review of Dresden 2 (References 25 and 26) describe that, in the event the Dresden Dam fails, water in the discharge canal would fall to the 498 foot elevation and water in the intake canal would fall to 495 feet. The nine million gallons of water remaining below these elevations in the intake and discharge canals would allow a safe shutdown of Dresden Units 2 and 3. NRC recognized during the SEP review that the water trapped in the intake and discharge canals following a dam failure was not sufficient to provide a 30-day water supply as recommended in Regulatory Guide 1.27 for a plant safe shutdown. We accepted a less-than 30-day supply as adequate because, provided that adequate emergency procedures were in place, equipment available to Dresden Units 2 and 3 assured that the water supply could be replenished to ensure the continuous capability of the UHS to perform its safety functions (References 18 and 19).

The staff's conclusions in the above cited evaluations were based on information submitted by the licensee. Based on your inspection findings, we now know that some of this information was incorrect. Following a dam failure, the water level in the discharge canal would fall and equalize with the 495-foot level in the intake canal. This could occur due to any of the following scenarios: (1) leakage through the flow diverter gates in the discharge canal, (2) backflow through the circulating water system piping, and (3) opening of the deicing line. Three million of the nine million gallons impounded in the canals would be lost and not be available for safe shutdown cooling due to the water elevation in the discharge canal being 3 feet lower than previously assumed. We believe that the loss of three million gallons of the impounded water in the intake and discharge canals following a dam failure would have some impact on the plant safe shutdown cooling capability. Therefore, the licensee should ensure, by appropriate calculations or other studies, that the loss of three million gallons of the impounded water in the intake and discharge canals will not have an adverse effect on the safe shutdown cooling capability of Dresden Units 2 and 3 or result in a USQ. The guidance of Generic Letter 91-18 and its supplement and the requirements of 10 CFR 50.59 should be followed, if this is not the case.

3.4 Question 4: To show that water would be immediately available for isolation condenser (IC) makeup, the licensee is changing the UFSAR to state that a portable pump could take suction from the Dresden, Units 2 and 3, intake canal and discharge into the fire protection system and that the Dresden Station, Unit 1, diesel-driven fire pump (DFP) will also provide immediate IC makeup from the Dresden, Unit 1, intake canal. Is a portable pump discharging to the fire protection system from the Dresden, Units 2 and 3, intake canal or the Dresden, Unit 1, DFP taking suction from the Dresden, Unit 1, intake canal an acceptable source for immediate IC makeup?

The current UFSAR Section 9.2.5.3.1 states, in part, that following a dam failure during normal operation, preferred makeup water to the IC is from the clean demineralized water storage tank via two diesel-driven makeup pumps or the clean demineralized water pumps. With this water source unavailable, river water would be pumped to the ICs by DFPs or by the service water (SW) pumps pumping into the fire system. The licensee proposed (References 4 and 8) a statement, "it is also possible to obtain a portable engine-driven pump which would draw suction from the intake canal and discharge to the fire protection system," be added to the UFSAR Section 9.2.5.3.1.

The use of a portable pump taking suction from the intake canal and discharging to the fire protection system is an acceptable alternate method to provide long-term makeup water to the ICs. The licensee should have adequate provisions in the appropriate procedures to ensure that following a dam failure these pumps will be aligned in a timely manner to provide IC makeup. This is consistent with our acceptance during the SEP review of the use of portable low head, high volume, engine-driven pumps to replenish the loss of impounded river water. Also, the staff has accepted the use of portable pumps as an alternate method to provide makeup fluids at other plants for certain conditions (e.g., makeup water to a spent fuel pool in an event of complete loss of spent fuel pool cooling; the use portable pumps or tanker-trucks to provide makeup fuel oil supply for emergency diesel generators; etc.). However, it is not obvious that the licensee could demonstrate that the use of portable pumps is an acceptable alternative for immediate makeup. During the SEP review, we only considered portable pumps for long-term makeup because of the time needed to relocate them and install them (Reference 18). If the licensee wants to credit the use of portable pumps for immediate makeup then they should show that these pumps will be available when needed and that they have adequate procedures to ensure that following a dam failure these pumps will be aligned in the time needed to provide immediate makeup water to the ICs (References 18 and 20).

It is acceptable to use the unit 1 DFP as an IC makeup source since we credited the unit 1 DFP as a possible source of makeup during original licensing and during the SEP review (References 10, 23, and 27).

Whether the licensee assumes the use of portable pumps, or DFPs, or both, discharging to the fire protection system, our acceptance of the fire protection system for IC makeup was based on the licensee's statements (Reference 10) that they could isolate non-seismic portions of the fire protection system from the portions that can meet the requirements of a Class I system (References 14, 15, 18, and 20). To credit the fire protection system as a source of IC makeup ComEd should show that, following a seismic event, they can sectionalize the fire protection

system to isolate the failed parts in the time needed to provide IC makeup and that they have adequate procedures to do this.

3.5 Question 5: Is it acceptable for the licensee to take credit for the service water (SW) pumps when the extent of performance degradation is unknown?

The SW system is designed to provide cooling water for removal of heat from plant auxiliaries (e.g., the reactor closed cooling water and turbine building closed cooling water system heat exchangers, emergency core cooling system (ECCS) room coolers, standby coolant supply system, etc.). As indicated in the above response to Question 4, following a dam failure during normal operation, SW pumps may be used as an alternate method to provide makeup water to the IC via the fire system.

The suctions of the SW pumps are located just below the elevation of 495'-0". Following a dam failure, vortices will occur at the suctions of the SW pumps and cause SW pump performance degradation or SW pump failure. Therefore, it is not acceptable for the licensee to take credit for the SW pumps when the extent of pump performance degradation and/or pump failure is unknown.

The licensee stated that they are working with the pump manufacturer to determine ways to maximize the output of the pumps when the submergence is less than recommended and that they have entered the need to resolve the degraded SW pump issue into their corrective action system (Reference 7). The licensee must ensure that the design basis is still satisfied and should follow the guidelines of Generic Letter 91-18 and its supplement and the requirements of 10 CFR 50.59, as appropriate.

3.6 Additional UHS Considerations

During our review for this TIA response, we identified issues with maintaining diverse sources of IC makeup, ownership of portable pumps, and findings from our IPEEE review that relate to the UHS concerns of this TIA.

The acceptability of the Dresden UHS is based, in part, on the availability of diverse sources of IC makeup. Both the Dresden Units 2 and 3 DFP and the SW pumps were among the IC makeup sources assumed to be available in our previous reviews (References 18, 20, 23, and 27). However, your inspections have shown that the Units 2 and 3 DFP will lose suction when the water elevation in the intake falls to 495 feet and that the SW pumps are degraded under these conditions. The licensee should ensure that they still have diverse sources of IC makeup available and should follow the guidelines of Generic Letter 91-18 and its supplement and the requirements of 10 CFR 50.59, as appropriate

The portable pumps to refill the intake canal credited in our previous safety evaluations were located at ComEd's fossil fueled power plants. ComEd expects to complete the sale of these fossil fueled power plants by the end of 1999 and the future availability of these pumps is unknown. If the licensee wants to continue to credit the use of portable pumps then they should show that these pumps will be available when needed (References 18 and 20).

In response to your inspection findings, ComEd stated that they would "evaluate developing a seismically qualified or verified path to obtain water from the UHS and deliver it to the shell of the IC of each unit" (Reference 6). We questioned the availability of IC makeup following a seismic event that fails the Dresden Dam during our review of the Independent Examination of External Events (IPEEE) (Reference 28). In response to our IPEEE request for additional information, ComEd stated that: "Dresden developed several alternatives to resolve the Dresden Lock and Dam failure issue. A conceptual design to cross-tie two systems was determined to be the most cost-effective alternative. This design is currently under review to determine its feasibility. The design for the modification is currently scheduled for completion by July 2000. The seismic modification installation work will be completed within the time frame required to comply with SQUG commitments" (Reference 9). It could, therefore, take another four years before a permanent fix is installed. Until this is accomplished, the licensee should ensure that their existing IC makeup capability is adequate and follow the guidance of Generic Letter 91-18 and its supplement and the requirements of 10 CFR 50.59 as appropriate.

3.7 SEP Topic II-3.C, Safety-Related Water Supply (Ultimate Heat Sink (UHS)) Issues

Our safety evaluation for SEP Topic II-3.C (Reference 20) and the accompanying technical evaluation report (Reference 18) raised several issues about the ability of the UHS to cope with a seismic event that fails the Dresden Dam. That evaluation found that the Dresden UHS partially complied with the SEP review criteria and concluded that: "The acceptability of the UHS for Dresden is dependent on the acceptability of . . . an emergency plan to mitigate the loss of water supply due to seismic events and associated Technical Specifications." Additionally, it is stated that: "The acceptability of the UHS is contingent on the development of appropriate and acceptable emergency procedures and technical specifications to cover . . . seismic scenarios that fail the Dresden Island Lock and Dam and deicing line" (Reference 20).

The UHS technical specification (TS) was completed when TS 3.8.C was added during the TS upgrade program. This TS requires a minimum river water level of 501.5 feet and an average UHS water temperature of less than or equal to 95 degrees Fahrenheit.

We have been unable to verify that the SEP conclusion on the need to develop emergency procedures to cover seismic scenarios that fail the Dresden Dam was ever followed up.

The SEP review of Topic II-3.C was combined with other hydrologic topics into one safety evaluation (Reference 19). ComEd commented on NRC's letter that transmitted the hydrology topics' safety evaluation but only addressed issues involving flooding (Reference 30). The Dresden Integrated SEP (Reference 22) does not discuss a resolution of the low UHS level issues from Topic II-3.C, although the other hydrologic topics are discussed. Topic II-3.C was not among those SEP issues analyzed for importance to risk in Appendix D to the Dresden Integrated SEP. Region III inspected procedures resolving Integrated SEP issues but none of the Dresden SEP follow-up inspections we are aware of (References 31, 32, 33, and 34) addressed procedures to resolve Topic II-3.C.

We request that your follow-up of the UHS issues of your TIA include an inspection to determine if acceptable procedures are in place to mitigate the loss of water supply due to seismic events that fail the Dresden dam.

4.0 REFERENCES

1. NRC Inspection Report 50-237 and 50-249 97021, dated March 6, 1998.
2. NRC Inspection Report 50-237 and 50-249 98007, dated April 14, 1998.
3. Memorandum from J. Grobe to E. Adensam, "Request for Technical Assistance - Dresden Station Shutdown Capability After a Catastrophic Failure of the Dresden Dam," August 24, 1998.
4. Dresden 10 CFR 50.59 Safety Evaluation, Revision 1, dated November 6, 1997.
5. Letter from ComEd to NRC, "Design Basis Initiative Program," dated March 13, 1998.
6. Letter from ComEd to NRC, "Design Basis Initiative Program - Containment Cooling Service Water and Failure of the Dresden Dam," dated March 31, 1998.
7. Letter from ComEd to NRC, "Reply to Unresolved Inspection Items," dated June 25, 1998.
8. Letter from ComEd to NRC, "Failure of the Dresden Lock and Dam," dated September 9, 1998.
9. Letter from ComEd to NRC, "RAI for IPEEE," dated September 30, 1999.
10. Amendment Nos. 9 and 10 to the Applications for Construction Permits and Operating Licenses for Dresden, Units 2 and 3, submitted February 28, 1969.
11. Dresden, Units 2 and 3, Updated Final Safety Analysis Report (Sections: 2.4.4, Dresden Lock and Dam Failure; 3.7.1, Seismic Design Parameters; 5.4.6, Isolation Condenser; 5.4.7, Reactor Shutdown Cooling System; 6.2.1.3.2.2, Containment Short-Term Response to a LOCA; 6.2.1.3.2.2, Containment Long-Term Response to a Design Basis Accident; 6.2.2, Containment Heat removal System; and 9.2, Water Systems.)
12. Letter from ACRS to G. Seaborg, "Report on Dresden Nuclear Power Station Unit 2," dated September 10, 1969.
13. Safety Evaluation for Dresden, Unit 2, dated October 17, 1969.
14. Report to AEC Regulatory Staff by N. Newmark, "Adequacy of the Structural Design for Dresden 2/3," dated November 17, 1969.
15. Safety Evaluation for Dresden, Unit 3, dated November 18, 1970.
16. Memorandum from G. Lear to W. Russell, "Evaluation of Safety Assessment Report - SEP Topic II-4.E, Dam Integrity," dated January 22, 1982.
17. Letters from P. O'Connor to ComEd, "SEP Safety Topic II-4.E, Dam Integrity," dated January 22, 1982, and February 9, 1982.

18. TER-C5257-421, "Hydrological Consideration - Dresden 2," by Brookhaven National Laboratory, dated May 7, 1982.

19. Memorandum from G. Lear to W. Russell. "Hydrology Engineering Safety Evaluation Report - SEP Topics II-3.A, B, B.1 and C," dated June 11, 1982.

20. Letter from P. O'Connor to ComEd, "Safety Evaluation of SEP Topics II-3.A, II-3.B, II-3.B.1, and II-3.C," dated June 21, 1982.

21. Letter from Brookhaven National Laboratory to C. Grimes, "Integrated Plant Safety Assessment - Dresden 2 Systematic Evaluation Program," dated November 29, 1982.

22. NUREG-0823, "Integrated Plant Safety Assessment - Dresden 2 Systematic Evaluation Program," dated February, 1983.

23. NUREG-0823, Supplement 1, dated October 1989.

24. NUREG-1403, "Safety Evaluation Report Related to the Full-Term Operating License for Dresden 2," dated October, 1990.

25. Letter from ComEd to P. O'Connor, "Dresden 2 SEP Redirection," dated December 8, 1981.

26. Letter from ComEd to D. Crutchfield, "Dresden 2 SEP Topics II-3.A, II-3.B, II-3.B1, II-3.C," dated January 4, 1982.

27. ComEd letter to P. O'Connor, NRC, "Requested Information on SEP Topic IX-3," dated November 29, 1979.

28. Letter from NRC to ComEd, "Request for Additional Information (RAI) Regarding the Individual Plant Examination of External Events (IPEEE)," dated December 14, 1998.

29. Letter from P. O'Connor, NRC, to L. DelGeorge, ComEd, "SEP Hydrology Topics," dated September 16, 1982.

30. ComEd letter to P. O'Connor, NRC, "Response to NRC Letter Dated June 21, 1982 on SEP Hydrology Topics," dated November 17, 1982.

31. NRC Inspection Report for Dresden 2 and 3, Report Nos. 83-32 and 30, dated February 1, 1984.

32. NRC Inspection Report for Dresden 2 and 3, Report Nos. 85-30 and 26, dated November 15, 1985.

33. NRC Inspection Report for Dresden 2 and 3, Report Nos. 89-19 and 18, dated October 30, 1989.

34. NRC Inspection Report for Dresden 2 and 3, Report Nos. 90-27 and 26, dated January 17, 1991.