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March 5, 1993

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attn: Document Control Desk

Subject: Dresden Nuclear Power Station Units 2 and 3
Usage of ANS 5.1-1979 and Other Inputs to Validate the Design Basis of the Containment Heat Removal System for Long-Term Cooling Using One Low Pressure Coolant Injection (LPCI) Pump and One Containment Cooling Service Water (CCSW) Pump
<u>NRC Docket Nos. 50-237 and 50-249</u>

References: (a) Enforcement Conference held between members of Commonwealth Edison (CECo) and the NRC Staff to discuss matters related to the CCSW System at Dresden Station, dated February 22, 1993.

(b) NRC Inspection Report, 50-237/92034, and 50-249/92034, dated February 11, 1993.

Dear Dr. Murley:

As discussed during the Reference (a) meeting, CECo is providing design input assumptions, supporting information, and analysis results to validate the design basis of the Containment Heat Removal System (CHRS) for long-term cooling as one LPCI pump and one CCSW pump. Major input parameters and output results from our re-analysis are summarized as follows:

	1 LPCI/1 CCSW	2 LPCI/2 CCSW
LPCI Flow (gpm)	3881	8916
CCSW Flow (gpm)	3071	4795
Torus Temp (°F)	186	171
Torus Pressure (psig max)	9.4	7.6
Torus Pressure (psig min)	5.9	4.4
Torus Design Temp (°F)	281	281
Torus Design Pressure (psig)	62	62
NPSH Required (ft)	25.7	26.9
NPSH Actual (ft)	39.72	40.3

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- The decay heat model was chosen to be more realistic than the original May-Witt curves. The ANS 5.1-1979 decay heat input was used and applied as described in the Attachments to this letters.

- The following additional conservatisms were then utilized to ensure overall conservative results of the analysis. (The conservatism is demonstrated by a comparison of the original FSAR peak temperature and pressure for the 2 LPCI/2 CCSW pump case with the revised analytical results in the 2 LPCI/2 CCSW pump case with nominal flows.

  All of the water in the Feedwater system which could contribute to a higher calculated pool temperature was added to the reactor pressure vessel (RPV) and containment system. In addition, a conservative calculation of the energy in the feedwater system piping, heaters and other metal structures is added to the RPV/containment system.

  The original FSAR analysis used an initial suppression pool temperature of 90°F. The current analysis used the Technical Specification maximum pool temperature of 95 °F.

  The heat removal capability was conservatively calculated using General Electric methodology. The heat removal capability calculations used LPCI/CCSW flows which were reduced to account for loop flow measurement inaccuracies. These conservatisms are documented in the Attachments to this letter.

  The FSAR Figure indicates a peak temperature of 165 °F and a pressure of 6.5 psig; the revised analysis results in a peak temperature of 168 °F and a pressure of 7.2 psig.

The inputs to the recent analysis were chosen to obtain analytical results which have sufficient conservatism to ensure adequate margin to safety. Where variable choices for input values were available, the value which would maximize the temperature and pressure response was chosen. The critical parameter which determine the pressure response were then adjusted to provide a minimum pressure value to be input in the NPSH calculations.

The three critical areas for ensuring acceptability of the LPCI/CCSW containment cooling system are temperature and pressure response which are bounded by the structural design limits for the Drywell and Suppression Chamber (including Mark I condensation stability transients), providing adequate NPSH for the LPCI and Core Spray pumps, and preventing radiological releases in excess of 10 CFR Part 100 limits. The pressure and temperature response are addressed above (below 62 psig and 281°F). NPSH is also addressed above (25.7 ft required, 39.72 ft actual). Atmospheric radiological releases are bounded by the original accident analysis results at the peak blowdown pressure of 47 psig. Effluent radiological releases are controlled by providing a leak tight heat exchanger and by ensuring a positive CCSW to LPCI differential discharge pressure at the heat exchanger (See Reference 16 of Attachment 2 for description).

This calculational information is provided for your Staff's review and concurrence for Dresden Nuclear Power Station. A complete summary of all information associated with the re-analysis is provided in Attachment 2 to this letter. The attached calculations have been reviewed by Dresden's On-Site Review in accordance with Station procedures.

The CHRS calculations were necessitated due to the inconsistencies discovered within the Updated Final Safety Analysis Report (FSAR) at Dresden Station related to the CHRS (CCSW). Several examples exist in Chapter 8 of the SAR that describe the electrical configuration of the Station (specifically, emergency diesel generator loading requirements) where a single CCSW pump is required for containment heat removal purposes. Chapter 5 of the SAR implies in some places that two CCSW pumps are required for long-term containment cooling purposes. There are other examples in Chapter 6 of the SAR that support either a single CCSW pump or a dual CCSW pump configuration. A summary of these inconsistencies is presented in Attachment 1 to this letter.

As part of CECo's attempts to resolve the noted inconsistencies associated with CHRS as it relates to CCSW, a design basis reconstitution effort was undertaken to fully define all open issues. A summary of more notable discrepancies is noted in Attachment 1 to this letter. CECo concluded that confirmatory calculations using state-of-the art methodology were appropriate and proper in validating the design basis of CHRS (1 LPCI/1 CCSW pump). This is further evidenced by the calculational results provided in Attachment 2.

CECo requests NRR concurrence of the analysis. Following NRR concurrence, it is Dresden's intention to modify the FSAR to remove inconsistencies. The revisions include clarifications of discrepancies pertaining to references made in various descriptions on the definition of the most limiting design basis LPCI/CCSW configuration.

To the best of my knowledge and belief, the statements contained above are true and correct. In some respect these statements are not based on my personal knowledge, but obtained information furnished by other Commonwealth Edison employees, contractor employees, and consultants. Such information has been reviewed in accordance with company practice, and I believe it to be reliable.

If there are any questions related to this issue, please contact this office.

Sincerely,

Peter L. Piet
Nuclear Licensing Administrator

Attachments: 1. Summary of Design Basis Information Related to the CCSW System at Dresden Station

2. CECo Calculational Information for Validating the Design Basis for the Containment Heat Removal System to be One LPCI Pump and One CCSW Pump

cc: A. Bert Davis, Regional Administrator-RIII
J. Stang, NRR Project Manager-Dresden
P. Hiland, RIII
M. Leach, Senior Resident Inspector-Dresden
Office of Nuclear Facility Safety-IDNS

ATTACHMENT 1

Summary of Design Basis Information For CCSW at Dresden Station

1 LPCI/2 CCSW Pumps	1 LPCI/1 CCSW Pump
SAR Table 6.2.4: "2 [pumps, emergency service water] required to provide required cooling capacity." Secondary side flow (river water) = 7000 gpm	SAR Section 6.2.7.3: "After a period not greater than two hours two of the LPCI pumps can be shut down and one or two containment cooling service water pumps put into service to cool the suppression pool."
SAR Page 6.2-17: "Two LPCI/containment cooling service water pumps will deliver cooling water to each heat exchanger."	SAR Section 8, EDG Loading Table : "Containment Cooling Water Pump #2 (Manual) 600 BHP (if within the capability of the diesel generator)."
SAR Page 5.2-20: "d. Operation of only one of the two core spray cooling system loops and one-half of one containment cooling loop. Namely one LPCI pump and 2 service water pumps."	SAR Figure 5.2.11 - Curve 'd' is labeled: "1/2 cont. cooling loop - 1 core spray." The shape of curve d corresponds to resultant affects with 1/1 pump operation.
NRC SER for Dresden Amendments Nos. 8/6 to DPR-19/25 (Change Nos. 34/23), dated 5/16/75: "Two CCSW pumps provide adequate cooling capacity."	SAR Table 8.2.1: "After a period not exceeding 2 hours the operator can manually stop one LPCI pump and start a containment cooling water pump (460 bhp). This would achieve the containment cooling capability as specified in Section 5.2.3.3."
Original TSB for 3.5.B: "Loss of one containment cooling service water pump does not seriously jeopardize the containment cooling capability as any 2 of the remaining three pumps can satisfy the cooling requirements. Since there is some redundancy left a 30-day repair period is adequate.	Original SR 4.5.B.2: "When it is determined that one CCSW pump is inoperable, the remaining components of that subsystem and the other containment cooling subsystem shall be demonstrated to be operable immediately and daily thereafter". [Note: Implies 2 of 3 remaining pumps as stated in original TSB 3.5.B, is for the affected containment cooling subsystem].
	Current TSB for 3.5.B: "Loss of one containment cooling service water pump or one LPCI pump does not seriously jeopardize the containment cooling capability as any 2 of the remaining three pumps can satisfy the cooling requirements. Since there is some redundancy left, a 30-day repair period is adequate."
Special Report No. 33 - "Each unit at the Dresden Station has four CCSW pumps, any two of which will provide the required containment cooling. Each unit will have two of the above pumps in an isolated vault."	Special Report No. 33 - "There are three other possible sources of flood water in the condensate pump room. They are: 1. The three contaminated condensate storage tanks. 2. The condenser hotwell and condensate piping to the condensate pumps. 3. The CCSW system piping to the CCSW pumps.
	SR 4.5.B.1: "Each containment cooling water pump shall deliver at least 3500 gpm against a pressure of 180 psig." [no corresponding SR for 7000 gpm]
	SAR Page 5.2-22 states: "The containment pressure and temperature and shown as curve 'd', Figures 5.2.11 and 5.2.12 respectively. It is shown that, following the initiation of the single containment cooling pump and its associated heat exchanger, the containment pressure decreases initially then slowly increases to the maximum shown in Table 5.2.5 due to decay-energy addition to the containment. Thereafter, energy removal by the single containment spray cooling pump and heat exchanger exceeds the addition rate from all sources, resulting in decreasing containment pressure."
	QCS 9/1/89 SER: "...one RHR pump and one RHR Service Water pump will provide adequate containment cooling following a loss of coolant accident."

ATTACHMENT 2

CECo Calculational Information for Validating the Design Basis for the Containment Heat Removal System to be One LPCI Pump and One CCSW Pump

INDEX AND DESCRIPTION FOR REFERENCES ON LPCI/CCSW CONTAINMENT COOLING SYSTEM POST LOCA LONG TERM COOLING ANALYSIS

1. GE Report GENE-770-26-1092, dated November 1992. Provides the summary results of the General Electric Analysis for Post LOCA Long Term Containment heat up with detailed descriptions of inputs and assumptions.

2. UFSAR Update and Supporting 10 CFR 50.59. Consists of mark-ups of the UFSAR pages for revision with 10 CFR 50.59 Evaluation.

3. Calculation NED-M-MSD-43, Revisions 0 and 1 on NPSH for LPCI and Core Spray Pumps. This calculation provided input for the UFSAR update in Reference 2.

4. Calculation NED-M-MSD-49, Revision 0 on NPSH for LPCI and Core Spray Pumps. This calculation provides the documentation for stating that the use of overpressure is not required to provide adequate NPSH for the nominal pump configuration of 2 LPCI and 2 CCSW pumps.

5. Letter from T. Rieck to C.W. Schroeder dated November 24, 1992 with Recommendations for Tube Replacement versus Plugging on LPCI Heat Exchangers. The directions provided in this transmittal were utilized to revise the maintenance procedure used for performing heat exchanger retubing.

6. Letter, C. R. Parker to S. Eldridge , "LOCA Long Term Containment Response Analysis K-Values for LPCI/Containment Cooling System Heat Exchangers Dresden Nuclear, Units 2 & 3, " October 6, 1992. (Reference 2 of GENE-770-26-1092). Transmittal of proposed K values to be used as input for the GE analysis for CECo concurrence. Concurrence was provided verbally on October 13, 1992 with reference to Reference 7.

7. Memo to file dated October 13, 1992, K. Ramsden NFS-CECo. Provides verification of the GE calculated K values to be used in the Long Term Containment Post LOCA analysis.

8. Letter, S. L. Eldridge/B. M. Viehl to T. Allen, "Inputs for Heat Exchanger Parameters for CCSW Flow Issue, Dresden Units 2 & 3," August 31, 1992. (Reference 3 of GENE-770-26-1092) Provides the flows to be used in the calculation of heat exchanger duty for input into the GE analysis.

9. Letter, C. R. Parker to S. Eldridge, "LOCA Long Term Containment Response Analysis Input Parameters Dresden Nuclear Power Station, Units 2 & 3 (Final Values, September 21, 1992 (With CECo Approval Letter dated September 9, 1992) (Reference 7 of GENE-770-26-1092). Provides CECo approval of the input parameters to be used in the GE Containment analysis.

10. LPCI Containment Cooling System Process Diagram, GE Drawing 729E583, Rev 1, February 24, 1969. (Reference 10 of GENE-770-26-1092). Provides system design input information which resulted from the original containment analysis.

11. Letter from S. Eldridge to C. Schroeder on "Submergence of LPCI Discharge Line Post LOCA Dresden Units 2 & 3" dated September 29, 1992. (Reference 3 of NED-M-MSD-43 Calculation on NPSH). Provided suppression pool water level information for use in calculation of the NPSH available for the LPCI and Core Spray pumps.

12. "Dresden LPCI/Containment Cooling System," GE Nuclear Energy letter From S. Mintz to T. L. Chapman dated January 25, 1993. (Reference 2 of NED-M-MSD-49 Calculation on NPSH). Provide additional information on water level to be assumed in the suppression pool during containment cooling mode.

13. Summary of Input Parameters used in comparison with those used in the original FSAR analysis. This summary provides a discussion of the justification and/or source for the input parameters used in the Reference 1 analysis.

14. Letter from B. M. Viehl to C. W. Schroeder on CCSW Reduce Flow Issues, dated May 15, 1992 includes the results of the General Electric reconstituted heat exchanger duty

calculations. This letter also provides the justification used to authorize use of ANS 5.1 for the containment re-analysis.

15. Letter from S. Mintz (GE) to S. Eldridge (CECo) dated February 17, 1993, describing the use of ANS 5.1 in the Containment analysis. A technical description of the application of the decay heat from ANS 5.1-1979 for the Dresden Post LOCA Long Term Containment Cooling analysis provided.

16. Control of Effluent Releases, provides a discussion of the protection against effluent releases which would violate 10 CFR 100 release limits.