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March 5, 1990

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

Subject: Dresden Station Units 2 and 3
Supplemental Response to
NRC Bulletin 80-11
<u>NRC Docket Nos. 50-237 and 50-249</u>

References:
(a) I.E. Bulletin 80-11, dated May 8, 1980.
(b) J. Wojnarowski (CECo) letter to H. Denton (NRC), dated October 6, 1986.
(c) J. Zwolinski (NRC) letter to D. Farrar (CECo), dated December 4, 1986.
(d) B. Siegel (NRC) letter to T. Kovach (CECo) dated July 20, 1989.
(e) M. Richter (CECo) letter to T. Murley (NRC), dated September 26, 1989.
(f) M. Richter (CECo) letter to T. Murley (NRC), dated November 30, 1989.
(g) "Analysis of Effects of Pipe Break Outside the Primary Containment," Special Report No. 37, dated February 1975.
(h) NUREG-0823, Integrated Plant Safety Assessment Systematic Evaluation Program for Dresden Nuclear Power Station Unit 2, dated February 1983.

Dear Dr. Murley:

Reference (a) requested licensees to perform a re-evaluation of the design adequacy of safety-related masonry walls under postulated loads. In Reference (b), Commonwealth Edison Company (CECo) submitted documentation supporting the use of the leak-before-break concept for establishing the acceptability of the masonry walls associated with the Reactor Water Cleanup System (RWCS) for Dresden Station Units 2 and 3. With Reference (c), the NRC staff issued a safety evaluation for Dresden Station Units 2 and 3. However, the safety evaluation indicated that the concept of leak-before-break was under review as a broad-scope rulemaking issue, and that the adequacy of its application to the RWCS piping would be addressed at a later date. The NRC informed CECo, in Reference (d), that the leak-before-break approach was not acceptable for the RWCS piping at Dresden Station since the piping material was subject to an active degradation mechanism (intergranular stress corrosion cracking). Additionally, the NRC requested CECo to submit proposed actions which would resolve the staff's concerns with the masonry wall design for Dresden Station. In Reference (e), CECo indicated a study was being performed to evaluate the feasibility of demonstrating that the masonry walls can withstand the consequences of a postulated RWCS full area break. In Reference (f), CECo apprised the NRC on the results of the initial phase of the study. This letter presents an overview of the masonry walls in the vicinity of the high energy RWCS piping, the results of the final phase of the study, and the actions being considered to resolve the concerns with the masonry wall design.

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At the time of the NRC notification (Reference (d)), credit was taken for the leak-before-break concept only in the context of masonry wall design. The consequences of RWCS pipe break events on plant systems, structures, and components have already been considered. More specifically, the consequences of postulated pipe break dynamic effects (e.g., jet impingement and pipe whip) on safety-related plant equipment were analyzed in Reference (g). In addition, CECo has environmentally qualified the equipment necessary to mitigate RWCS pipe breaks for the environment resulting from such events. Therefore, the current analysis is limited to the effects of pressure transients on specific masonry walls.

Overview

There are ten masonry walls in the vicinity of high energy RWCS piping. These walls are shown on Attachment A. Eight of the ten walls form part of the entrance labyrinths for the four RWCS heat exchanger compartments. The remaining two walls provide shielding for the entrances to the rooms adjacent to the RWCS heat exchanger compartments.

Of these ten walls, five are designated safety-related, and five are designated nonsafety-related. A masonry wall is considered safety-related when wall failure could damage safety-related equipment that is attached to the wall or in proximity of the wall. There are three safety-related walls in Unit 2 (Walls 31, 32 and 33) and two safety-related walls in Unit 3 (Walls 34 and 38) as shown on Attachment A.

Four of the safety-related walls have been eliminated from consideration, for the following reasons.

Walls 31 and 34 - The pipe break pressure which the walls are expected to experience as a result of an RWCS line break is at most 0.1 psi differential, and the walls have been judged capable of withstanding this pressure.

Wall 32 - A walkdown of this wall was performed, and it was determined that none of the equipment located on or near the wall was necessary to mitigate the consequences of a RWCS pipe break event, or to shut down the plant after this event.

Wall 33 - This wall is considered safety-related because a two-inch safety-related conduit passes near the north side of the wall. However, in a postulated pipe break event, the pressure load would be expected to push the wall away from the conduit. If the wall were to fail, an unacceptable interaction is considered to be extremely unlikely. Furthermore, it was determined that the equipment associated with this conduit was not necessary to mitigate the consequences of a RWCS pipe break event, or to shut down the plant after this event.

Therefore, only one safety-related masonry wall, Wall 38 (Unit 3), needed further evaluation relative to the effects of a high energy line break in the RWCS.

Pressure Transient Analysis for Wall 38

The final phase of the study, which was discussed in Reference (f), included more precise blowdown modeling to account for friction (during a high energy RWCS line break), using the thermal hydraulic computer code RELAP5. Through this improved modeling the blowdown was reduced, and as a result, the peak calculated pressure on Wall 38 was reduced from approximately 30 psi differential to 10 psi differential (assuming wall failure does not increase vent area). Additionally, lower peak pressures were determined to be achievable by increasing the vent area from the compartment.

The final phase of the study also included determining the differential pressures which Wall 38 can be expected to withstand. It was determined that the existing wall can withstand 0.5 psi differential, but that with minor reinforcement modifications at the boundaries of the wall, it can be made to withstand approximately 3 psi differential. The differential pressure to which the walls would be subjected could be reduced from 10 psi to 3 psi by providing additional vent area from the compartment.

Safety Significance Evaluation for Wall 38

A walkdown of Wall 38 (Unit 3) was performed, and all of the equipment attached to or located in the proximity of the wall was identified. For Wall 38, it was determined that safety-related power and control cables to valve MO-3-1201-2 were located on the wall, and could be impacted by the RWCS pipe break event, should the wall fail. This valve is the Unit 3 RWCS outboard containment isolation valve. In the event of an RWCS pipe break event, either this valve or the inboard containment isolation valve (MO-3-1201-1) would be used to isolate the break. This potential interaction could be eliminated by relocating the conduit, cables, and pull box, so that they would not be damaged by a masonry wall failure initiated by the RWCS pipe break event. A discussion of the safety significance of such an event follows.

The Systematic Evaluation Program (SEP) for Dresden Unit 2, NUREG-0823 (Reference (h)), contains a limited risk assessment of the importance of various postulated pipe breaks as unisolatable LOCAs. In the SEP review, it was determined that the LOCA frequencies associated with certain RWCS pipe breaks were less than 2×10^{-7} per Reactor year (Ryr), since both a pipe break outside containment and the failure of an isolation valve inside containment would be necessary for this sequence. It was further determined that even if all these events led to core melt with release, the higher frequencies of other core melt sequences (on the order of 10^{-5}/Ryr) makes these LOCAs negligible from a risk perspective. Therefore, the probabilistic risk assessment (PRA) rated the importance to risk of pipe breaks between the containment penetration and the first pipe restraint beyond the containment isolation valve as low.

The methodology and postulated conditions employed in the NUREG-0823 limited risk assessment were used to estimate the frequency of an unisolatable LOCA caused by a pipe break in the RWCS between the outboard containment isolation valve and the inlet to the RWCS heat exchangers. This analysis was performed for Unit 3 and is described in greater detail in Attachment B. In brief, the analysis yielded the same conclusion as that found in NUREG-0823, namely, that the risk of core melt from an unisolatable RWCS pipe break is extremely low and is not significantly increased by the consequences of the coincident failure of Wall 38. This conclusion supports continued plant operation until remedial modifications for Wall 38 can be planned and implemented.

Summary, Conclusions, and Future Actions

Briefly summarizing these results, there was only one masonry wall (Wall 38, Unit 3) of concern for which refined pressure transient analyses were necessary. Modeling refinements were successful in significantly reducing the pressure load on the wall. However, even with these refinements, the wall cannot withstand the peak calculated pipe break pressure. Additionally, it was determined that minor structural reinforcements, coupled with increasing the vent area from the compartment would yield acceptable results. It was also determined that some of the equipment located on Wall 38 was necessary to isolate the break, but that this concern could be alleviated by relocating the equipment.

Finally, it was determined that the potential consequences of an RWCS pipe break event in Unit 3 were acceptable, on an interim basis, based on an expansion of the methodology and conclusions of the SEP for Dresden Unit 2.

CECo is presently evaluating the potential alternative modifications to resolve the concerns associated with Wall 38. These modification alternatives include relocating the aforementioned electrical equipment, or providing minor structural reinforcements to the wall coupled with increasing the vent area from the heat exchanger compartment. This evaluation and a schedule for implementation will be completed by May 1, 1990. At that time, CECo will provide a final response on this issue. In the interim, the limited risk assessment described in this letter and in Attachment B provides reasonable assurance of safety for the current plant configuration.

Please direct any questions that you may have on this response to this office.

Respectfully,

Milton H. Richter

M. H. Richter
Generic Issues Administrator

Attachment: A - Dresden Station RWCS Heat Exchanger Room Configuration
B - Dresden Station Unit 3 Limited Risk Assessment

MHR/jg

cc: A. B. Davis - Regional Administrator, Region III
Resident Inspector - Dresden Station
B. Siegel - Dresden Station Project Manager

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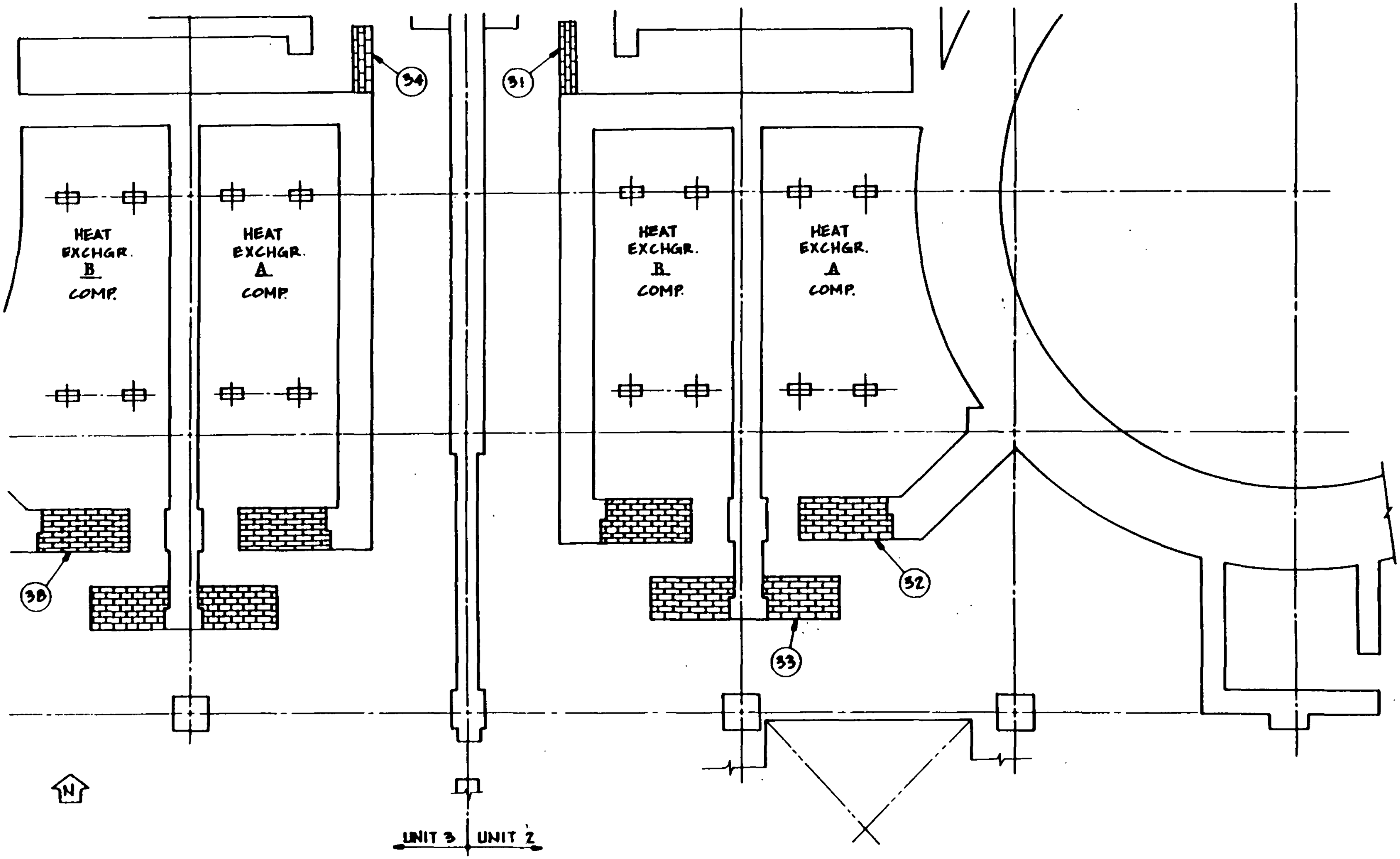
ATTACHMENT A



SAFETY-RELATED MASONRY WALLS 31,32,33,34 & 38.

COMMONWEALTH EDISON COMPANY
DRESDEN UNITS 2 & 3
REACTOR WATER CLEAN-UP SYSTEM

ATTACHMENT B

Dresden Station Unit 3
Limited Risk Assessment

This attachment provides an evaluation of the safety significance of a coincident RWCS pipe break and a failure of the RWCS outboard containment isolation valve due to overpressure failure of Wall 38. This evaluation is based on the probabilistic methodology of the SEP evaluation for Dresden Unit 2 (NUREG-0823), expanded to incorporate the particulars of the case at hand.

The safety objective of SEP Topic III-5.B, "Pipe Break Outside Containment," was to ensure that if a pipe should break, the plant could be safely shut down without a loss of containment integrity. A pipe break between the containment penetration and the outboard containment isolation valve, with an assumed single active failure of the inboard containment isolation valve, would result in an unisolatable loss of coolant accident (LOCA) outside containment. Similarly, a break between the outboard containment isolation valve and the first pipe restraint, with an assumed single active failure of the inboard containment isolation valve, could result in an unisolatable LOCA outside containment.

For piping between inboard and outboard containment isolation valves, current NRC guidance requires special low stress/high quality piping. This guidance was not in effect when Dresden Units 2 and 3 were licensed to operate. In the case of Dresden Unit 2 RWCS, piping data was not available to demonstrate that the NRC guidance could be met. As a result, a limited risk assessment was conducted for Dresden Unit 2, the results of which were documented in NUREG-0823. Through this assessment, it was determined that the LOCA frequencies associated with these pipe breaks were all less than 2×10^{-7}/Ryr, and that, as a result, back-fitting to meet current criteria was not required.

The NRC evaluation for Dresden Unit 2, on which this conclusion was based, included the following calculation of the frequency of a break between the outboard isolation valve and the first pipe restraint, coupled with the frequency of failure of a check valve, as well as the probability of failure of the inboard isolation valve, or its circuit breaker. The frequency of this combination of events was determined to be:

F = [F(pipe rupture) x (# pipe segments) + F(check valve rupture)] x [P(inboard isolation valve failure) + P(inboard isolation valve circuit breaker failure)]

$$= (8.7 \times 10^{-7}/\text{Ryr}\ (2) + 8.7 \times 10^{-5}/\text{Ryr})\ (1 \times 10^{-3} + 1 \times 10^{-3})$$
$$= 1.8 \times 10^{-7}/\text{Ryr}.$$

Applying this calculation methodology for Dresden Unit 3 to include the high energy piping up to the inlet of the regenerative heat exchanger yields the following:

$$F = (8.7 \times 10^{-7}/Ryr\ (25) + 8.7 \times 10^{-5}/Ryr)\ (1 \times 10^{-3} + 1 \times 10^{-3})$$
$$= 2.2 \times 10^{-7}/Ryr.$$

The piping up to the regenerative heat exchanger was selected because a break in this piping would produce the most severe pressure transients. The normal temperature of water in this piping is approximately 520 degrees Fahrenheit (F), whereas the temperature of the water downstream of the regenerative heat exchanger is approximately 225 degrees F. Thus, the energy release from an assumed break in the RWCS piping is much greater upstream of the regenerative heat exchanger than downstream. Therefore, a pipe break in the piping downstream of the regenerative heat exchanger was not considered to be significant.

None of the unisolatable breaks postulated in NUREG-0823 have an expected frequency of more than 2×10^{-7}/Ryr. Expanding the scope of the calculation to include the high energy piping up to the inlet of the regenerative heat exchanger yields an expected frequency of 2.2×10^{-7}/Ryr, which does not change the overall conclusion of NUREG-0823. When compared to the expected frequency of accident sequences with core melt and release probabilities on the order of 10^{-5}/Ryr, the incremental risk of these unisolatable RWCS pipe break events is negligible. That is, even assuming a core melt with release after any of these pipe breaks with no further independent failures, the effect on risk due to eliminating these breaks is unimportant. These conclusions support continued operation of the Dresden Station Unit 3 until remedial modifications can be planned and implemented.