Commonwealth Edison
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Downers Grove, Illinois 60515

December 14, 1994

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

Subject: Dresden Nuclear Power Station Units 2 and 3
Quad Cities Nuclear Power Station Units 1 and 2
Response to NRC Request for Additional Information (RAI) Concerning Generic Letter 94-03, dated November 14, 1994, and Open Items from the Safety Evaluation for Dresden Unit 3 and Quad Cities Unit 1
NRC Docket Nos. 50-237/249 and 50-254/265

References:

(a) NRC Safety Evaluation for Dresden Unit 3 and Quad Cities Unit 1, dated July 21, 1994.

(b) ComEd (P. Piet) letter to the NRC (W. Russell), "ComEd Response to Request for Additional Information: TRACG 3D Model Results, Recirculation Line Break," dated September 2, 1994.

(c) ComEd (P. Piet) letter to the NRC (W. Russell), "ComEd Response to Request for Additional Information Regarding NRC Generic Letter (GL) 94-03," dated October 7, 1994.

(d) ComEd (P. Piet) letter to the NRC (W. Russell), "ComEd Additional Response to Request for Additional Information Regarding NRC Generic Letter 94-03," dated October 13, 1994.

(e) ComEd (J. Hosmer, et. al.) presentation to the NRC Staff on October 14, 1994.

(f) NRC letter to ComEd (D. Farrar), "Request for Additional Information Concerning Generic Letter 94-03, 'Intergranular Stress Corrosion Cracking of Core Shrouds in Boiling Water Reactors'," dated November 14, 1994.

(g) ComEd (P. Piet) letter to the NRC (W. Russell), "ComEd response to NRC Request for Additional Information Concerning Main Steam Line Break TRACG Analysis," dated November 15, 1994.

The purpose of this letter is to provide ComEd's response to the Reference (f) RAI regarding NRC Generic Letter 94-03, "Intergranular Stress Corrosion Cracking of Core Shrouds in Boiling Water Reactors" and to provide final Safety Assessments for Dresden Unit 2 and Quad Cities Unit 2. In addition, this letter responds to the open items from the Reference (a)

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NRC Safety Evaluation for Dresden Unit 3 and Quad Cities Unit 1, including revised Safety Assessments that justify operation until the next refueling outages.

Response to NRC Staff RAI of 11/14/94

In ComEd's presentation to the NRC staff on October 14, 1994 (Reference (e)), ComEd addressed the operability of Dresden Unit 2 and Quad Cities Unit 2. In Reference (f), the NRC staff requested additional information from ComEd to address items discussed during this meeting. ComEd's response to these questions are addressed in Attachment A to this letter. A summary of our response is provided below.

1) Additional Information on TRACG Analysis of MSLB

The greatest vertical lift on the core shroud occurs during a postulated Main Steam Line Break (MSLB) accident. This case results in the limiting reactor vessel depressurization transient. The current licensing basis for MSLB is based on plant specific GE LAMB models. These models invoke many simplified and conservative modeling features resulting in a relatively conservative prediction of peak core shroud differential pressures. This type of model is appropriate for the design stage wherein design margins are appropriate. For the operating stage, a more detailed model with refined predictive capabilities is a better analytical tool for the core shroud evaluations. TRACG is such a tool and was used to predict the time dependent and peak differential pressures across the core plate and top shroud region for a postulated MSLB.

Details of the model are provided in Attachment A including modeling assumptions, entry level conditions, correlations to other models, conservative assumptions, uncertainties and inaccuracies in the calculation. Results of the analysis are as follows:

Differential Pressure Across Shroud Head	Dresden 2&3	Quad Cities 1&2
UFSAR MSLB dP_{max} (psid)	12.0	20.0
TRACG MSLB dP_{max} (psid)	9.3	11.0

A complete report of this analysis was submitted to the NRC staff on November 15, 1994 (Reference (g)).

2) Affects of Feedwater Line Break (FWLB) Core Shroud dP

A postulated Feedwater Line Break (FWLB) does not pose limiting conditions for the evaluation of the core shroud cracking issue for the following reasons:

a) Depressurization effects are bounded by those of the MSLB since the postulated break area for FWLB is smaller (0.724 ft^2 vs. 2.4 ft^2) and the initial discharge fluid for the FWLB is liquid. Liquid results in a smaller depressurization rate than that for steam discharge (as is the case for MSLB).

b) Acoustic loading of the core shroud due to postulated FWLB is limited due to the geometry of the feedwater system within the reactor vessel. For a postulated break of the feedwater line outside the vessel, the feedwater sparger inside the vessel reflects, attenuates, and redirects the acoustic wave around the annular space outside the shroud. Acoustic loads due to a postulated recirculation line break are based on an instantaneous 28 inch guillotine break normal to the core shroud surface. Thus the RRLB is the limiting case for asymmetric core shroud loading.

c) Blowdown effects are not limiting for the postulated FWLB due to (i) the relatively small break area, (ii) the presence of the feedwater distribution sparger, and (iii) the relatively high location of the sparger which results in a transition to two-phase and then steam flow early in the transient.

A more detailed response to support why the FWLB is bounded by the MSLB is presented in Attachment A to this letter.

3) Core Spray Function following DBA (with Cracked Piping)

A detailed non-linear piping analysis was performed using the ADINA computer code to address the functionality of the core spray system following a DBA with cracked piping. The core spray system was subjected to the core shroud movements caused by design basis accidents and the combination of a design basis accident and a SSE event. For the cases evaluated, the core spray line strain was found to be less than the functional capability criteria of 5% strain. The forces and moments resulting from these evaluations were used in a limit load evaluation of the core spray line to demonstrate the structural stability of the piping if it were also cracked. These limit load evaluations established the maximum flaw length permitted under these loads. Additional discussion is provided in Attachment A.

4) PLEDGE Model Usage for Crack Depth Sizing

The justification for the use of the PLEDGE model to predict the core shroud crack growth rate is supported by the benchmark results of the PLEDGE model validation provided by the BWRVIP. There is a continuing effort being pursued by the BWRVIP and GE to prepare a topical report on the PLEDGE crack growth model. Additional information on the model's dependency on conductivity, ECP, residual

stress, fluence and material sensitization and their relative interdependence is provided in a BWRVIP letter dated November 10, 1994. Therefore, no additional information is being provided by ComEd at this time.

5) TRACG Results for Recirculation LOCA Case

Detailed results of the TRACG analysis for the postulated recirculation line break were provided in detail in Reference (b) and are summarized in Attachment A to this letter. The requested information was extracted from the existing analysis files and thus no revision to the previously submitted analysis reports (Reference (b) and Reference (g)) are required.

The above information summarizes more detailed information provided in Attachment A, Reference (b) and Reference (g) and completes ComEd's response to the NRC staff request for additional information (Reference (f)).

Quad Cities Unit 2 and Dresden Unit 2 Revised Safety Assessment

In Reference (g), ComEd transmitted the results of the MSLB TRACG analysis to the NRC staff. As a result of the MSLB TRACG analysis, ComEd revised the Safety Assessment for Dresden Unit 2 and Quad Cities Unit 2. Attachments B and C to this letter present the revised Safety Assessments for Dresden Unit 2 and Quad Cities Unit 2. The revised Safety Assessments include a better definition of shroud loads as presented in References (b) and (g).

The bounding maximum dP across the shroud head for Dresden Unit 2 and 3 and Quad Cities Unit 1 and 2 (considering increased core flow conditions) is 11 psid. This value is less than the preliminary value of 14 psid that was used in the Safety Assessment presented to the NRC staff in References (c) and (d). Therefore, the previous Safety Assessments for Quad Cities Unit 2 and Dresden Unit 2 were conservative.

Note that the licensing basis dP across the shroud, as presented in the respective UFSARs, is 20 psid for Quad Cities Units 1 and 2 and 12 psid for Dresden Units 2 and 3. These values are conservative compared to the values from the TRACG analysis. ComEd is continuing to use the more conservative UFSAR shroud head differential pressure for all licensing basis analysis. The results of the TRACG analysis are presently being used only for the evaluation of the shroud lift consequences associated with a postulated through wall flaw. ComEd will continue to review this issue as part of the BWR-VIP and will advise the NRC staff per 10CFR50, if a decision is made to incorporate the TRACG loads into the licensing basis.

The results presented in the revised Safety Assessments for Dresden Unit 2 and Quad Cities Unit 2 (Attachments B and C), demonstrate the safety of continued operation until the

upcoming 1995 refueling outages.

Quad Cities Unit 1 and Dresden Unit 3 Revised Safety Assessment

In the NRC Safety Evaluation for Dresden Unit 3 and Quad Cities Unit 1 (Reference (a)), the NRC Staff requested that ComEd provide the following confirmatory analyses:

(1) a computerized 3-dimensional asymmetric depressurization analysis for the recirculation line break, including assumptions and entry level conditions.

(2) the WHAM calculations for the recirculation line break, including assumptions and entry level conditions, and

(3) a detailed analysis (based on the most limiting seismic input motion) of shroud movements, assuming a 360 degree through-wall crack, following postulated events, including all assumptions, entry level conditions, calculational techniques, and conservatisms.

As noted in Attachment A to this letter, ComEd provided to the NRC Staff a TRACG Recirculation Line Break (RLB) Analysis in Reference (b). Also, Reference (b) addresses the GE WHAM calculation for the recirculation line break. Therefore, ComEd has addressed open items (1) and (2) as delineated above from the NRC staff's safety evaluation (Reference (a)).

Attachments D and E to this letter are revised Safety Assessments for Dresden Unit 3 and Quad Cities Unit 1 that provide the detailed analysis of shroud movements, assuming a 360 degree through-wall crack, following postulated events, as requested in Reference (a). Therefore, ComEd has addressed open item (3) as delineated above from the NRC staff's safety evaluation (Reference (a)).

The results of our assessments show that there is sufficient margin to demonstrate safe operation of both Dresden Unit 3 for 24 months and Quad Cities Unit 1 for 20 months of operation above cold shutdown. The information provided above in conjunction with the more detailed information provided in Attachment D and E and supported by the information included in References (b) and (g) completes ComEd's response to all open items from the Reference (a) NRC staff Safety Evaluation Report.

ComEd is committed to restoring operating margins for the core shroud weldments. As such, ComEd plans to repair the core shrouds at Dresden Unit 3 and Quad Cities Unit 1 during the next scheduled refueling outages (D3R14 and Q1R14, respectively).

To the best of my knowledge and belief, the statements contained in this response are true and correct. In some respects, 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.

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

Sincerely,

Peter L. Piet
Nuclear Licensing Administrator

Attachments:

A. Response to the November 14, 1994, NRC RAI.
B. Revised Safety Assessment for Dresden Unit 2
C. Revised Safety Assessment for Quad Cities Unit 2
D. Revised Safety Assessment for Dresden Unit 3
E. Revised Safety Assessment for Quad Cities Unit 1

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