December 22, 1992

Docket Nos. 50-295
and 50-304

Mr. Thomas J. Kovach
Nuclear Licensing Manager
Commonwealth Edison Company-Suite 300
OPUS West III
1400 OPUS Place
Downers Grove, Illinois 60515

Dear Mr. Kovach:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON ZION NUCLEAR POWER STATION - INDIVIDUAL PLANT EXAMINATION SUBMITTAL - GENERIC LETTER 88-20 (TAC NOS. M74492 AND M74493)

By letter dated April 24, 1992, you submitted the Zion Nuclear Power Station, Units 1 and 2, Individual Plant Examination (IPE) results for NRC review. Based on our review of your submittal, we have determined that additional information is required. The enclosed list of questions identifies the information needed. Please review these questions so that we can schedule a conference call in about 20-30 days to discuss your responses. At the conclusion of the call, we can hopefully advise you regarding which questions will still require a formal written response or we may agree that a meeting or additional calls would be useful in further pursuing responses to the questions. In either case, we will require your written response within 60 days of the date of this letter.

The reporting and/or recordkeeping requirements contained in this letter affect fewer than ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

Please contact me should you have any questions regarding this request.

Sincerely,

Original Signed By:

Clyde Y. Shiraki, Sr. Project Manager
Project Directorate III-2
Division of Reactor Projects III/IV/V
Office of Nuclear Reactor Regulation

Enclosure:
Request for Additional Information

cc w/enclosure:
See next page

DISTRIBUTION

Docket File	NRC & Local PDRs	PDIII-2 r/f	PDIII-2 p/f
TKing	JRoe	JDyer	CShiraki
CMoore	OGC	EJordan	ACRS(10)
RHernan	CAder	JFlack	

LA/PDIII-2	PM/PDIII-2	D/PDIII-2
CMoore	CShiraki:rc	JDyer
12/22/92	12/22/92	12/22/92

DFOI
/1

9212300395 921222
PDR ADOCK 05000295
P PDR

December 22, 1992

Docket Nos. 50-295
and 50-304

Mr. Thomas J. Kovach
Nuclear Licensing Manager
Commonwealth Edison Company-Suite 300
OPUS West III
1400 OPUS Place
Downers Grove, Illinois 60515

Dear Mr. Kovach:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON ZION NUCLEAR POWER STATION - INDIVIDUAL PLANT EXAMINATION SUBMITTAL - GENERIC LETTER 88-20 (TAC NOS. M74492 AND M74493)

By letter dated April 24, 1992, you submitted the Zion Nuclear Power Station, Units 1 and 2, Individual Plant Examination (IPE) results for NRC review. Based on our review of your submittal, we have determined that additional information is required. The enclosed list of questions identifies the information needed. Please review these questions so that we can schedule a conference call in about 20-30 days to discuss your responses. At the conclusion of the call, we can hopefully advise you regarding which questions will still require a formal written response or we may agree that a meeting or additional calls would be useful in further pursuing responses to the questions. In either case, we will require your written response within 60 days of the date of this letter.

The reporting and/or recordkeeping requirements contained in this letter affect fewer than ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

Please contact me should you have any questions regarding this request.

Sincerely,

Original Signed By:

Clyde Y. Shiraki, Sr. Project Manager
Project Directorate III-2
Division of Reactor Projects III/IV/V
Office of Nuclear Reactor Regulation

Enclosure:
Request for Additional Information

cc w/enclosure:
See next page

DISTRIBUTION

Docket File	NRC & Local PDRs	PDIII-2 r/f	PDIII-2 p/f
TKing	JRoe	JDyer	CShiraki
CMoore	OGC	EJordan	ACRS(10)
RHernan	CAder	JFlack	

LA/PDIII-2	PM/PDIII-2	D/PDIII-2
CMoore	CShiraki:rc	JDyer
12/22/92	12/22/92	12/22/92

Mr. Thomas J. Kovach
Commonwealth Edison Company

Zion Nuclear Power Station
Unit Nos. 1 and 2

cc:

Michael I. Miller, Esquire
Sidley and Austin
One First National Plaza
Chicago, Illinois 60690

Dr. Cecil Lue-Hing
Director of Research and Development
Metropolitan Sanitary District
of Greater Chicago
100 East Erie Street
Chicago, Illinois 60611

Phillip Steptoe, Esquire
Sidley and Austin
One First National Plaza
Chicago, Illinois 60603

Mayor of Zion
Zion, Illinois 60099

Illinois Department of Nuclear Safety
Office of Nuclear Facility Safety
1035 Outer Park Drive
Springfield, Illinois 62704

U. S. Nuclear Regulatory Commission
Resident Inspectors Office
105 Shiloh Blvd.
Zion, Illinois 60099

Regional Administrator, Region III
U. S. Nuclear Regulatory Commission
799 Roosevelt Road, Bldg. #4
Glen Ellyn, Illinois 60137

Robert Neumann
Office of Public Counsel
State of Illinois Center
100 W. Randolph
Suite 11-300
Chicago, Illinois 60601

REQUEST FOR ADDITIONAL INFORMATION
ZION IPE

F.E. 1 Please provide a discussion of the role of the CECO operations, training and maintenance personnel in the development of the Zion IPE. Of particular interest is the manner in which they participated in the peer review process and how their knowledge of the plant design and operation was incorporated to assure that the IPE represents the as-built, as-operated plant.

F.E. 2 The submittal indicates that all flood zones were eliminated from further consideration through a qualitative analysis but provides no information on the zones, equipment affected, frequency of occurrence nor criteria used for their elimination. Please describe your process addressing the zones with safety related equipment considered, the types of flood initiators, and frequency of the initiators. Discuss your consideration of drains (including backflooding to other areas and probability of failure, i.e., due to blockage), separation, doors allowing flood propagation to other areas, credit given for actions by operators to stop the flood or to mitigate the consequences and the specific criteria used to eliminate each zone.

F.E. 3 The Instrument Air System has been eliminated as an initiating event because the equipment that is supported by it either fails in a "fail-safe" position or has accumulators which will allow it to function for a limited time upon loss of air. Provide a discussion of your investigation into the position of valves such that the position they assume on the loss of air is in fact a "fail-safe" position for all conditions in this analysis. Discuss your basis for these assumptions (e.g., investigation and/or tests performed on air accumulators which demonstrates that the leakage from accumulators will not compromise the functioning of critical valves such as the PORV). Please discuss the sensitivity of the results to these assumptions.

F.E. 4 Please identify those transients from NUREG/CR-3862 which were relevant to Zion and grouped into the one "anticipated Transient" initiating event. Also identify which used generic data and which used plant specific data and discuss the method used to evaluate the frequency.

F.E. 5 Provide a discussion of the rationale and process used in the grouping of initiating events (including various types of transients and LOCAs) according to the success criteria and plant response.

F.E. 6 The submittal has identified the frequency of loss of Service Water (1.1E-7) per year as a plant specific calculation. We note that there is a significant difference between this frequency and that used in the NUREG-1150 analysis (9.4E-4). Please identify those attributes of the service water system that could account for the difference, e.g., common cause failure of equipment in the

intake structure and pipe breaks. Provide a similar discussion for Closed Cooling Water.

F.E. 7 Describe the process used to identify and account for Interfacing System LOCAs (I S LOCA). Discuss the most likely flow paths and the impact of the degradation or loss of mitigating systems due to the I S LOCA.

F.E. 8 In NUREG/CR-3300 documenting the review of the ZPSS it was indicated that DC bus 112 was chosen as an initiating event because it would cause loss of main feedwater, reactor trip, loss of power to one of two PORVs and loss of control power or AC bus 149 and thus loss of one motor driven auxilia.; feedwater pump. The IPE submittal identifies DC bus 111 as the bus chosen "since this bus provides the worst plant response with loss of the main feedwater pumps". Provide a discussion with respect to the differences in the impact on the analysis of loss of these buses and the basis for the choice.

F.E. 9 Provide a description and an example of the calculation of conditional failure probabilities used to address dependencies of some tree nodes on preceding nodes in place of the fault tree quantification as alluded to in the discussion in section 4.5 of the submittal. Include in your discussion the extent to which this was done and how these values were reincorporated in the sequence quantification.

F.E. 10 The section of the IPE reporting the results of the analysis does not address the frequency of specific sequences. Please discuss the contribution of Station Blackout sequences and the key contributors emanating from LOSP and DLOSP events and include those sequences of the initiating events that proceed to core damage without station blackout. Also discuss the contribution from sequences involving Reactor Coolant Pump Seal LOCA and/or other key contributors. Include a discussion of the seal LOCA model used in the analysis. In addition please discuss the contribution from the ATWS sequences.

F.E. 11 It is indicated in the submittal that extensive analyses were conducted to determine the specific success criteria for the different systems in each sequence in the Plant Response Trees, however there is no description provided for the nodes of each tree. Please provide a cross index of the success criteria for the nodes of the event trees, especially for those which have more than two branches and identify the key bases and assumptions used for each node. Include the success criteria for the support systems.

F.E. 12 The values provided as screening criteria identified in NUREG-1335 are mean values. Provide a discussion regarding the comparison of the value of the core damage frequency for sequences arrived at

through your use of "point estimates" verses what may have been arrived at through the use of mean values.

F.E. 13 Since the use of "realistic" success criteria and operator actions have had a significant impact on the results of the IPE and the sensitivity analysis performed for the human error rates for some of these operator actions has shown some of them to be sensitive, it would appear to be of value to perform sensitivity assessments for the success criteria. Have sensitivity studies been performed? If so, please discuss the sensitivity of the results of the analysis to the success criteria used in the analysis for the initiating events. Also, if performed, include a discussion of the impact of the success criteria upon those sequences which are designated as "Success With Accident Management" which, if designated as "failure," would have resulted in an estimated core damage frequency of 1.86E-4.

F.E. 14 Discuss how the "key" component strategy assisted in identifying other components in your plant whose failure rate may be higher than the generic rate used and could contribute to potential vulnerabilities.

F.E. 15 It was noted that the beta factor values used for the diesel generators (fail to start) in the Zion IPE (4.3E-3) was significantly less than the values estimated in NUREG/CR-4550 (3.8E-2). Provide as an example a discussion of the process used to arrive at the beta factor and factor values for the 2/2, 2/3 and 3/3 diesel generator common cause failures used in the IPE as appropriate. Provide sufficient supporting documentation for nomenclature and data (or references) to allow for an understanding of the process.

F.E. 16 Discuss the practice of using the average of the common cause failure factors in the data base for other components (such as batteries) verses specific values from the generic data base, characterize the magnitude of the values used and discuss your assessment of the impact of this approach on the results of the analysis.

F.E. 17 Section 4.6.4 of the submittal addressing the decay heat removal evaluation indicates that there is redundancy and diversity in the systems used in decay heat removal and that they and the related operator actions have relatively low failure rates, however no discussion of the contributions to core damage frequency was provided. Please discuss the contribution to core damage frequency of the decay heat removal systems and the sensitivity of these systems to failure of support systems and/or assumptions (including timing) used in relevant operator actions as possible areas of significance as suggested in Appendix 5 of Generic Letter 88-20.

F.E. 18 You have indicated that HVAC systems are independent, each with its own power supply and cooling water connections, and that loss of HVAC was not included as an initiating event. Provide a description of your investigation into the impact of loss of HVAC to the rooms containing safety related equipment. Discuss the systems sensitive to temperature change, and the areas considered (including rooms containing AC & DC power equipment and Control Room), methods of assessment, credit given for operator actions, timing, temporary equipment, and rationale for elimination as an initiating event or as support to specific equipment. Please identify those systems for which the HVAC was included as part of the system model.

H.F. 1 Please discuss the process used to assure that key HRA assumptions about operator actions, information available to operators, plant environment, etc., represent the conditions in the as-built, as-operated plant. In particular, please discuss information related to interviews with operators and plant walkdowns.

H.F. 2 Please discuss the consideration of human actions on initiating events (as opposed to responding to events following procedures). Please discuss the involvement of HRA specialist(s) in this process.

H.F. 3 Please discuss by way of examples 1) the selection process for steps to be included in the THERP trees, and 2) the basis for and impacts of treating certain cognitive actions as "second nature."

H.F. 4 Please provide a discussion of types of human errors considered, and a rationale for selection of the specific type(s) selected for quantitative analysis. While detailed reporting of all actions is beyond the scope of this review, the review process could be enhanced by a summary with a general discussion and examples to demonstrate: (1) the use of a systematic categorization of types of human tasks, or human error taxonomy; (2) the rationale for selection of types of tasks/errors to model; (3) for each major type of task or task environment, the kinds and comprehensiveness of performance shaping factors considered, and some rationale for selecting the few that are most important; (4) the approach used for task analysis, and; (5) the approach used for representation (presumed to be HRA trees per NUREG/CR-1278).

H.F. 5 Please provide information including examples on what consideration was given to "latent errors" such as maintenance, test or calibration errors that may lead to system failure or misoperation on demand, how their potential effects were considered in the IPE, and what the impact on the IPE results would be if they were assessed independently.

H.F. 6 As requested in NUREG-1335, please provide a listing of the time available for each operator recovery action analyzed; the estimated time for actual operator performance under postulated

severe accident conditions; and a summary description of the technical basis for the estimates.

H.F. 7 Please provide specific information describing the process used to assess the use of symptom-based procedures in the current plant. The information should focus specifically on justification of assumptions used in the HRA modeling.

H.F. 8 As requested in NUREG-1335, please provide a listing and a discussion of any sequences that drop below the applicable core damage screening criteria because the frequency has been reduced by more than an order of magnitude by credit taken for human recovery actions (not to exceed 50 of the most significant sequences).

H.F. 9 Please provide a concise summary of the quantitative analysis conducted for the HRA. For each type of human action analyzed identify key assumptions leading to selection of a nominal, or basic, HEP from NUREG/CR-1278. Key assumptions about dependencies and performance shaping factors applied should be discussed. Please include a typical example of the representation used (presumably THERP HRA trees), with a sample calculation demonstrating the complete approach to quantification.

H.F. 10 Please provide the basis (or references as appropriate) for the "error recovery" model described on pages 4-123 and 4-124. Please include consideration of: the dynamic nature of the accident response; the likelihood for detection of errors by the operator committing the error or by other crew members; the specificity of the error indications; the impact on performance of having identified an error in an important task; and any additional factors that are likely to influence recovery from error under a severe accident and the subsequent sequence of events given that an error is made.

H.F. 11 Please provide a brief discussion of any habitability considerations in the Level II analysis (as appropriate), and their impact on the assumed recovery actions.

H.F. 12 Please provide additional information on the underlying problem with the RWST refill procedure and the proposed modification that will establish the basis for the assumed improvement.

B.E. 1 It is stated in the Zion IPE submittal that (1) sequences contributing ≥1% to the core damage frequency were examined in the source term analysis, and (2) these sequences account for 82% of the core damage frequency. It is further stated in the IPE that the screening criteria in NUREG-1335 is met. It is not clear how the criteria is met since sequences contributing 18% of the core damage frequency appear to have been screened instead of the 5% recommended. (Criteria #b of NUREG-1335 states that "*all systemic sequences within the upper 95 percent of the total core damage*

frequency" should not be screened.) Provide clarification of this apparent contradiction and clarify which sequences were analyzed for potential source terms.

B.E. 2 In the modeling of severe accidents, there is tremendous uncertainty in regards to the phenomena and therefore, the manner in which an accident will progress and the subsequent impact on containment performance and the source term. The assumptions associated with the various phenomena are varied among the experts and the available modeling codes. It is important, therefore, to be aware of the differences and uncertainties, particularly in relation to their potential impact on containment performance and source terms. A quantitative uncertainty analysis of the various phenomena is not required by Generic Letter 88-20 or NUREG-1335. A sensitivity analysis, however, of those parameters that have the largest effect on the likelihood or time of containment failure and the magnitude of the source term is requested. Suggested parameters are summarized in Table A.5 of NUREG-1335 with detailed information on the uncertainties provided in Volume 2 to NUREG/CR-4551 (supporting documents to NUREG-1150). Based on these discussions and the results of the Zion NUREG-1150 analysis, different assumptions in regards to the potential phenomena appear to have been made in the Zion IPE. For example, NUREG-1150 analysis of Zion found late containment failure dominated by basemat melt-through and also found early containment failure (although small) a contributor. In addition, it is not clear why only a small leak is assumed to occur in the sensitivity analyses and containment failure never leads to a catastrophic failure. It is important that the licensee be aware and recognize the various phenomena particularly in regards to their impact on containment performance and the potential source terms, and therefore, the identification of vulnerabilities and the development of an accident management program. Provide a brief discussion of each of the parameters listed in Table A.5 that were not considered in the sensitivity analysis and the basis for this decision; that is, provide the rationale why the parameters and associated assumptions were not considered to have a large effect on containment performance and source term.

B.E. 3 A containment failure pressure distribution is provided in the submittal. It is not clear, however, how the "uncertainty" of containment failure was considered in the study. That is, when determining if containment failure would occur, were the lower pressures of the distribution considered, or was only the "mean" value used?

B.E. 4 It is not clear if personnel locks, equipment hatches and electrical and piping penetrations were addressed in the analysis. Provide discussion of how these items were accounted for in the containment failure characterization.

B.E. 5 It is not clear in the documentation if the various phenomena, though concluded not to present a challenge to containment integrity, could nonetheless challenge system or human response. Provide discussion how phenomenological effects were integrated into the PRTs and their potential impact on system and human response as appropriate.

B.E. 6 The IPE study did not identify any containment vulnerabilities. Please provide your definition of containment vulnerability which was used in the Zion study and screening process.