May 30, 2003

Mr. John Skolds, President
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION (RAI) RELATED TO THE STAFF'S REVIEW OF THE LICENSE RENEWAL ENVIRONMENTAL REPORT FOR THE DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3 (TAC NOS. MB6843 AND MB6844)

Dear Mr. Skolds:

The staff is reviewing the license renewal Environmental Report (ER) submitted by Exelon Generation Company, LLC (Exelon), as part of the application for license renewal for the Dresden Nuclear Power Station, Units 2 and 3 and has identified areas where additional information is needed to complete its review. The staff's RAIs are enclosed. The area where additional information is required is Severe Accident Mitigation Alternatives.

You are requested to provide a response to the enclosed RAI by July 25, 2003, as discussed with your staff. If you have any questions about this RAI, please contact me at (301) 415-1444.

Sincerely,
/RA/
Louis L. Wheeler, Senior Project Manager
Environmental Section
License Renewal and Environmental Impacts Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos.: 50-237 and 50-249

Enclosure: As stated

cc w/enclosure: See next page

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OFFICE OF NUCLEAR REACTOR REGULATION

REQUESTS FOR ADDITIONAL INFORMATION (RAIs) RELATED TO

THE STAFF'S REVIEW OF THE ENVIRONMENTAL REPORT (ER)

RELATED TO LICENSE RENEWAL FOR

DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3

(TAC NOS. MB6843, MB6844)

RAIs related to Severe Accident Mitigation Alternatives

1. The Severe Accident Mitigation Alternatives (SAMA) analysis is based on the most recent version of the Dresden Nuclear Power Station (DNPS) Probabilistic Safety Assessment (PSA) for internal events, i.e., 2002 Update, which is a modification to the modified individual plant examination (IPE) submittal transmitted to the U.S. Nuclear Regulatory Commission (NRC) in June 1996. Provide the following information regarding this PSA model:

   a. a summary description of any peer reviews of the Level 1 and Level 2 portions of this PSA beyond the normally-performed internal second checker reviews (e.g., DNPS Boiling Water Reactor Owners Group Peer Review).

   b. a characterization of the findings of these internal and external peer reviews (if any), and the impact of any identified weaknesses on the SAMA identification and evaluation process.

   c. a breakdown of the internal events core damage frequency (CDF) by major contributors, initiators and accident classes, such as loss of offsite power (LOOP), station blackout (SBO), transients, anticipated transients without scram (ATWS), loss-of-coolant accident (LOCA), interfacing-systems loss-of-coolant accident (ISLOCA), and internal floods.

   d. a description of the major differences from the updated IPE submittal, including the plant and/or modeling changes that have resulted in the new core damage frequency (CDF), along with the corresponding CDF.

2. The CDF cited and used in the SAMA analysis is based on the risk profile for internal events at DNPS Unit 2. Provide the internal events CDF for Unit 3, and a discussion of the reasons for any differences from Unit 2. Discuss the impact on the SAMA analysis, including the impacts of external events, and results if the analysis were based on Unit 3 rather than Unit 2.

3. In the Extended Power Uprate (EPU) Amendment application, Exelon indicates that the Level 2 analysis is based on NUREG/CR-6595. However, there is no such indication in the SAMA portion of the Environmental Report (ER). Based on the above, provide a description of the following:

a. the changes in the Level 2 methodology since the modified IPE submittal, including major modeling assumptions, containment event tree (CET) structure, and binning of endstates.

b. the methodology and criteria for binning CET endstates into release categories used in the Level 3 analysis. Include the definitions of the release characteristics listed in Column 2 of Table 4-5.

c. each release (consequence) category used in the Level 3 analysis (as listed in Column 1 of Table 4-5), the specific source terms used to represent each release category, and a containment matrix describing the mapping of Level 1 results (plant damage state frequencies) into the various release categories.

4. Provide the following information concerning the MELCOR Accident Consequences Code System (MACCS) analyses:

a. the MACCS analysis assumes all releases that occur at ground level and have a thermal content the same as ambient. These assumptions could be non-conservative when estimating offsite consequences. Provide an assessment of the sensitivity of offsite consequences (doses to the population within 50 miles) to these assumptions.

b. the discussion of meteorology indicates that there are data voids in the 2000 data set used. Interpolation was used between hours if only a brief period of data was missing, and hourly observations from the airport were used to fill larger data voids. Provide a characterization of the magnitude and extent of the data voids and the rationale for using the airport data rather than interpolation. Confirm that the 2000 data set is representative of the DNPS site and justify its use.

c. clarify the time periods used for am and pm for the atmospheric mixing heights (e.g., midnight to noon and noon to midnight, versus sunrise to sunset).

5. According to Table F-1 of the Environmental Report (ER), Exelon evaluated 265 SAMA candidates. Of these 265 candidates, 21 were obtained from DNPS-specific documents. It is not clear that the set of SAMAs evaluated in the ER addresses the major risk contributors for DNPS. In this regard, provide the following:

a. a description of how the dominant risk contributors at DNPS, including dominant sequences and cut sets from the current Probabilistic Risk Assessment (PRA) and equipment failures and operator actions identified through importance analyses (e.g., Fussell-Vesely, Risk Reduction Worth, etc.) were used to identify potential plant-specific SAMAs for DNPS.

b. the number of sequences and cut sets reviewed/evaluated and what percentage of the total CDF they represent.

c. a listing of equipment failures and human actions that have the greatest potential for reducing risk at DNPS based on importance analysis and cut set screening.

d. for each dominant contributor identified in the current PRA (2002 Update), a cross-reference to the SAMAs evaluated in the ER which addresses that contributor. If a SAMA was not evaluated for a dominant risk contributor, then justify why SAMAs to further reduce these contributors would not be cost beneficial.

e. the reasons for the difference in the number of SAMAs evaluated for Quad Cities Nuclear Power Station (QCNPS) and DNPS (280 v. 265).

f. a general description of the group of 130 insights mentioned in the original IPE and a discussion of how and whether the insights that were not implemented were factored into the SAMA evaluation.

6. The SAMA analysis did not include an assessment of SAMAs for external events. The DNPS IPE for External Events (IPEEE) has shown that the CDF due to internal fire initiated events is 1.7×10^{-5} per reactor year for Unit 2 and 3.1×10^{-5} per reactor year for Unit 3. The risk analyses at other commercial nuclear power plants also indicate that external events could be large contributors to CDF and the overall risk to the public. In this regard, provide the following:

a. NUREG-1742 ("Perspectives Gained From the IPEEE Program," Final Report, 4/02), lists the significant fire area CDFs for DNPS (pages 3-15 and 3-16 of Volume 2). While these fire-related CDF estimates may be conservative, they are still large relative to the DNPS internal events CDF. For each fire area or dominant fire sequence, explain what measures were taken to further reduce risk, and explain why these CDFs can not be further reduced in a cost effective manner.

b. the IPEEE Safety Evaluation Report (SER), Extended Power Uprate (EPU) SER, and NUREG-1742 (Tables 2.7 and 2.12) identify seismic outliers and improvements for DNPS. Confirm that all of the plant improvements that address the outliers have been implemented. If not, then discuss the rationale within the context of this SAMA study. For those improvements still pending (e.g., seismically-verified makeup path to the isolation condenser, and modifications to improve the reliability of the containment cooling service water cooling function), provide a brief description of each improvement and its status.

c. Exelon states that Phase 2 SAMA 5 remains under investigation for resolution as part of the DNPS closeout of the IPEEE commitments. Describe the improvements under investigation, their status, and expected implementation schedule. As part of this response, identify the systems, structures, and components (SSCs) that limit the plant high confidence in low probability of failure (HCLPF). Justify why modifications to increase seismic capacity would not be cost-beneficial when evaluated consistent with the regulatory analysis

guidelines for those structures, systems and components (SACS) below 0.3g yet not expected to be modified.

7. The SAMA analysis did not include an assessment of the impact that PRA uncertainties and external event risk considerations would have on the conclusions of the study. Some license renewal applicants have opted to double the estimated benefits (for internal events) to accommodate any contributions for other initiators when sound reasons exist to support such a numerical adjustment, and to incorporate additional margin in the SAMA screening criteria to address uncertainties in other parts of the analysis (e.g., an additional factor of two in comparing costs and benefits of each SAMA). At DNPS, external events (both fire and seismic) are dominant contributors to the total CDF, and are over a factor of 10 greater than internal event contributions. On that basis, provide the following information to address these concerns:

   a. an estimate of the uncertainties associated with the calculated core damage frequency (e.g., the mean and median internal events CDF estimates and the 5^{th} and 95^{th} percentile values of the uncertainty distribution).

   b. an assessment of the impact on the Phase 1 screening if risk reduction estimates are increased to account for uncertainties in the risk assessment and the additional benefits associated with external events (as applicable).

   c. an assessment of the impact on the Phase 2 evaluation if risk reduction estimates are increased to account for uncertainties in the risk assessment and the additional benefits associated with external events (as applicable). Consider the uncertainties due to both the averted cost-risk and the cost of implementation to determine changes in the net value for these SAMAs.

8. For certain SAMAs considered in the ER, there may be lower cost alternatives that could achieve much of the risk reduction, such as adding a diesel-driven battery charger. Confirm that low cost alternatives to Phase 2 SAMAs were considered, and provide a brief discussion of these alternatives.

9. During the review of the EPU application, the staff noted several areas where the PSA should be modified to reflect modifications to the plant or changes in success paths. These include: a plant modification to install a recirculating pump run back control circuit; a plant modification to trip the condensate/booster pump D in the event of a LOCA to prevent an overload condition from occurring; a change in success criteria for reactor pressure vessel (R.V.) depressurization in a transient without a stuck open relief valve (two valves under EPU conditions); a change in success criteria for R.V. over pressure protection in ATWS sequences (12 of 13 valves under EPU conditions). Confirm whether these model changes, as well as others, have been incorporated in the PSA used for the SAMA analysis. For those not incorporated, provide an assessment of the impact that the model change would have on the SAMA analysis.

10. During the review of the EPU application, the staff noted that a new means of inducing a LOOP initiating event potentially exists under EPU conditions. The end result could be an overbusy condition on the unit auxiliary or reserve auxiliary transformer. Given this

new condition, provide an evaluation of the costs and benefits associated with the replacement of the affected transformer with a higher capacity transformer.

11. In Section 4.20.5 of the ER, Exelon states that a preliminary cost estimate was prepared for each of the remaining candidates (remaining after the initial screening). However, implementation costs were provided for only one of the Phase 2 SAMAs. Provide the estimated implementation costs (preliminary cost estimates) for the Phase 2 SAMAs, so that the staff can readily determine whether any of these SAMAs are potentially cost-beneficial when considering the impact of external events and uncertainties. In addition, indicate the minimal cost assumptions used for procedure and hardware changes.

12. For Phase 2 SAMAs 3, 6, 7, and 10, hardware modifications, as well as procedural changes, are necessary. However, the hardware modifications are not fully described. Briefly describe the proposed hardware modifications.