

December 12, 2001

The Honorable Richard A. Meserve  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

Dear Chairman Meserve:

SUBJECT: CORE POWER UPRATES FOR DRESDEN NUCLEAR POWER STATION,  
UNITS 2 AND 3 AND QUAD CITIES NUCLEAR POWER STATION,  
UNITS 1 AND 2

During the 488<sup>th</sup> meeting of the Advisory Committee on Reactor Safeguards, December 5-7, 2001, we completed our review of the Exelon Generation Company (Exelon) license amendment requests for increases in core thermal power for the Dresden Nuclear Power Station, Units 2 and 3, and the Quad Cities Nuclear Power Station, Units 1 and 2, pursuant to the General Electric (GE) Nuclear Energy Extended Power Uprate Program. We had previously discussed this matter with representatives of the NRC staff and Exelon during our 487<sup>th</sup> meeting on November 7-9, 2001. Our Subcommittee on Thermal-Hydraulic Phenomena reviewed this matter during a meeting held on October 25-26, 2001. During our review, we had the benefit of the documents referenced.

## **RECOMMENDATION**

We agree with the staff's recommendation that the Commission should issue license amendments that will permit increases in the licensed power levels of the Dresden and Quad Cities Nuclear Power Plants by 17% and 17.8%, respectively.

## **DISCUSSION**

Exelon has requested amendments to the operating licenses of the Dresden Nuclear Power Station, Units 2 and 3, and the Quad Cities Nuclear Power Station, Units 1 and 2, for an increase in the operating power limits. Presently, the power limits are 2527 MWt for the Dresden Units and 2511 MWt for the Quad Cities Units. All four units would be uprated to 2957 MWt, which represents uprates of 17% and 17.8%, respectively. These four units employ the GE boiling water reactor (BWR/3) nuclear steam supply system and the Mark I containment design.

Exelon used the NRC-approved GE generic methodology (ELTR-1 and ELTR-2) for analyzing extended power uprates (EPUs). Precedents for EPU applications using these methods have

been set by the Monticello (1998), Hatch (1998), and Duane Arnold (2001) nuclear power plant licensees. These uprate requests were approved by the Commission. These precedents have guided Exelon and the staff in the preparation and review of the current EPU applications.

The uprate applications for Dresden and Quad Cities are nearly identical, and are similar in concept to that for Duane Arnold. The increased power is achieved by use of a new fuel design; a sophisticated fuel management scheme is used to ensure that all regulatory limits for fuel behavior continue to be met. Both feedwater flow and steam flow rates are increased, but the dome pressure and overall core flow remain unchanged. The increased steam and feedwater flow rates require modifications to the steam dryers and the use of all feedwater and condensate pumps. Because the pressure and temperatures and the overall water inventory in the primary coolant system remain essentially unchanged, effects of the EPUs on design-basis accidents are relatively minor. There are slight increases in risk due primarily to the increased decay heat to be removed in loss-of-coolant accidents and to the shortened available time for operator action during events such as anticipated transients without scram.

The staff has determined that the proposed EPUs meet all regulatory criteria, and that the licensee has used approved predictive methods. In addition, the important materials degradation issues have been identified and adequate management programs are in place to monitor potential increases in degradation rates.

The GE Topical Report, ELTR-1, that supports the EPUs (Reference 6) includes the requirement that certain large transient tests be performed to confirm the effectiveness of the implemented plant modifications. GE has since reached the conclusion that these tests are not necessary for power uprates in which reactor steam dome pressure is not changed. The staff agrees with this conclusion for the Dresden and Quad Cities applications. Technical arguments to support this decision are documented in the Safety Evaluation (SE). We concur with the staff's conclusion for these plants.

In our report on the Duane Arnold Energy Center power uprate, we expressed concerns about the adequacy of the documentation of the staff's review, as reflected in its SE. We noted that many of the challenges that we encountered in that review would have been eased if the staff had provided more details concerning its review and the criteria used to reach conclusions in the SE. We have similar concerns about the Dresden and Quad Cities SEs. Frequently, the licensee's analysis is just summarized and the results of the staff's evaluation are represented by a statement that the analysis is "acceptable." These summary statements do not reflect the substantial effort that went into the staff's review, including audits conducted onsite and at vendor facilities. The depth of the review became more apparent during meetings at which the staff presented more details and responded to our questions. The staff's responses have given us sufficient assurance that an appropriate technical review has been performed and that the staff's conclusions are valid. Upgrading the SEs to better reflect the depth and breadth of the staff's engineering evaluations would provide the public a better sense of these activities and engender more confidence in the work of the NRC.

Although the depth and breadth of the staff's review of these uprates has been adequate, development of a Standard Review Plan Section would help ensure an adequate review of future power uprate applications. It would also clarify to both the public and licensees what is required for an application for power uprate to be found acceptable.

Dr. F. Peter Ford did not participate in the Committee's deliberations regarding this matter.

Additional comments by ACRS Member Stephen L. Rosen are provided below.

Sincerely,

**/RA/**

George E. Apostolakis  
Chairman

Additional Comments by ACRS Member Stephen L. Rosen

I concur with my colleagues that the requested EPU should be granted. However, I have the following additional comments.

The staff has accepted the applicant's arguments that it is unnecessary to conduct tests of the units' capability to successfully respond to a generator load rejection or a main steam isolation valve closure demand at the higher steam flows at EPU conditions. The applicant maintains that these tests were part of the units' initial startup testing and need not be repeated at EPU conditions.

The applicant's justification for this position includes the fact that reactor pressure is unchanged by the planned EPU and that unnecessary plant transients should be avoided. They also argue that no new plant equipment will be installed that could affect the units' demonstrated capability to respond to a generator load rejection or a main steam isolation valve closure demand.

The staff has also accepted the applicant's arguments that it is unnecessary to conduct integral testing of the new recirculation "run back" system. In this case, although new equipment will be added to the plant to rapidly reduce recirculation flow and reactor power to match feedwater flow in the event of a main feedwater or condensate pump trip, the applicant argues that overlapped simulated logic functional tests are sufficient.

The applicant's justification for this position is that a reactor scram will occur if "run back" is unsuccessful after a sudden feedwater flow reduction.

Generator load rejections, main steam isolation valve closure demands, and main feedwater or condensate pump trips are Anticipated Operational Occurrences with expected frequencies in the range of 1 per 1-10 years. In granting the applicant's EPU request without requiring performance of integral testing, the staff has relied on the applicant's "well established quality assurance programs including component and system level post-modification testing."

Since integral tests of the plants' response can reveal otherwise undetected latent flaws, these tests should be conducted to confirm that these programs have achieved the desired result.

I am not convinced by the applicant's arguments and the staff's conclusion that integral tests are not necessary. I believe approval of the EPU application should be conditioned on the successful completion of these tests shortly after reaching EPU conditions.

References:

1. Memorandum dated October 10, 2001, to John T. Larkins, ACRS, from J. Zwolinski, Office of Nuclear Reactor Regulation, NRC, Subject: Draft Safety Evaluation for Dresden Nuclear Power Station, Units 2 and 3, and Quad Cities Nuclear Power Station, Units 1 and 2, Extended Power Uprate (draft Predecisional report).
2. Draft Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Facility Operating License No. DPR-25, Exelon Generation Company, LLC, Dresden Nuclear Power Station, Units 2 and 3, received December 7, 2001.
3. GE Topical Report, NEDC-32962P, "Safety Analysis Report for Dresden 2 & 3 Extended Power Uprate," dated December 2000 (Proprietary).
4. GE Topical Report, NEDC-32961P, "Safety Analysis Report for Quad Cities 1 & 2 Extended Power Uprate," dated December 2000 (Proprietary).
5. Letter dated December 27, 2000, from Commonwealth Edison Company, to U.S. NRC, Subject, Request for License Amendment for Power Uprate Operation.
6. GE Nuclear Energy, Topical Report, NEDC-32424P-A, "Generic Guidelines for General Electric Boiling Water Reactor Extended Power Uprate," (ELTR-1) February 1999 (Proprietary).
7. GE Nuclear Energy, Topical Report, NEDC-32523P-A, "Generic Evaluations of General Electric Boiling Water Reactor Extended Power Uprate," (ELTR-2) February 2000 (Proprietary).
8. GE Nuclear Energy, Topical Report, NEDC-32523P-A, Supp 1, Volume 1, "Generic Evaluations of General Electric Boiling Water Reactor Extended Power Uprate - Supplement 1, Volume I," February 1999, and Volume II, April 1999 (ELTR-2) (Proprietary).
9. Exelon Generation Company Memorandums: Response to Requests for Additional Information Supporting License Amendment Requests to Permit Uprated Power Operation, Dresden Nuclear Power Station and Quad Cities Nuclear Power Station, dated August 9, August 14, August 31, August 31, September 5, September 5, September 14, September 19, September 25, September 26, September 27 (contains proprietary information), and September 27, 2001.
10. Exelon Generation Company Memorandums: Response to Requests for Additional Information Supporting License Amendment Requests to Permit Uprated Power Operation, Dresden Nuclear Power Station and Quad Cities Nuclear Power Station, dated August 8 (contains proprietary information), August 13 (contains proprietary information), August 13, August 14, and August 29, 2001.
11. Memorandum dated December 3, 2001, from P. Boehnert, ACRS, to ACRS Members, Subject: Dresden/Quad Cities Power Uprate - Exelon Response to ACRS Questions/Additional Information Regarding NRC Review of PRA.