

June 16, 2004

Mr. Christopher M. Crane, President
and Chief Nuclear Officer
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: ISSUANCE OF AMENDMENT FOR IRRADIATION OF FOUR LEAD TEST
ASSEMBLIES - BYRON STATION, UNIT 1 (TAC NO. MC1520)

Dear Mr. Crane:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment No. 137 to Facility Operating License No. NPF-37. The amendment is in response to the Exelon Generation Company, LLC, application dated December 5, 2003, (ML033421130).

The amendment permits a change in the fuel rod-average-burnup limit from 60,000 MWD/MTU to 65,000 MWD/MTU for four lead test assemblies during Byron Station, Unit 1, Cycle 13. This amendment is being issued pursuant to Section 50.59(c)(2) of Title 10 of the *Code of Federal Regulations* because a design basis limit for a fission product is being altered (10 CFR 50.59(c)(2)(vii)).

A copy of the Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

George F. Dick, Jr., Project Manager, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-454

Enclosures: 1. Amendment No. 137 to NPF-37
2. Safety Evaluation

cc w/encls: See next page

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OFFICIAL RECORD COPY

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EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-454

BYRON STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 137
License No. NPF-37

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated December 5, 2003, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended to permit the irradiation of four lead test assemblies up to 65,000 MWD/MTU during Operating Cycle 13 as set forth in the application for amendment by the licensee, dated December 5, 2003.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Date of Issuance: June 16, 2004

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 137 TO FACILITY OPERATING LICENSE NO. NPF-37

EXELON GENERATION COMPANY, LLC

BYRON STATION, UNIT NO. 1

DOCKET NO. STN 50-454

1.0 INTRODUCTION

By application dated December 5, 2003 (ML033421130), Exelon Generation Company, LLC (Exelon, the licensee) requested a license amendment for Byron Station, Unit 1 (Byron 1), operating license number NPF-37. The staff's proposed no significant hazards consideration determination was published in the *Federal Register* on January 20, 2004 (69 FR 2742).

The licensee requested an amendment to irradiate four lead test assemblies (LTAs) beyond the current design basis burnup of 60,000 MWD/MTU to a peak rod average of 65,000 MWD/MTU during Byron Unit 1, Cycle 13. The LTAs consist of one LTA with VANTAGE+ ZIRLO clad, low tin ZIRLO LT-1 clad, and low tin ZIRLO LT-2 clad fuel rods, one LTA with VANTAGE+ ZIRLO clad, and low tin ZIRLO LT-1 clad fuel rods, and the remaining two LTAs with standard Westinghouse 17x17 VANTAGE+ ZIRLO clad fuel rods. The low tin ZIRLO LT-1 and LT-2 cladding, both manufactured by Westinghouse Electric Company, are new versions of the ZIRLO material, and are not within the licensing basis of the approved ZIRLO as described in WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report." Irradiation of these fuel assemblies will provide data on fuel and cladding material performance to support the high burnup fuel program. On September 22, 2003, the staff granted an exemption (ML031910765) from the requirements of Section 50.44 of Title 10 of the *Code of Federal Regulations* (10 CFR), 10 CFR 50.46, and Appendix K to 10 CFR Part 50, for the low tin ZIRLO LTAs in Byron 1 Operating Cycle 13. The exemptions were necessary because the tin content of ZIRLO LT-1 and LT-2 in the LTAs was below the currently approved tin content for ZIRLO as previously approved by the staff.

2.0 REGULATORY EVALUATION

There are no specific technical specifications (TS) or license conditions in the Byron license that impose a limit on fuel rod burnup. However, in amendments 78 and 70 (December 19, 1995) to the licenses for Byron, Units 1 and 2, and Braidwood, Units 1 and 2, respectively, the staff approved the use of ZIRLO clad fuel rods. The staff's approval for the use of ZIRLO was based on licensee's commitment to an NRC approved (July 1, and October 9, 1991) Westinghouse Topical Report, WCAP-12610, regarding the use of Westinghouse Vantage+ fuel design. The Byron Updated Final Safety Evaluation Report (UFSAR) describes how the licensee applies WCAP-12610 at Byron. In approving WCAP-12610, the staff found ZIRLO clad fuel to be acceptable for rod-average-burnups up to 60,000 MWD/MTU. The approved topical report is designated as WCAP-12610-P-A.

While the licensees may make some changes to their facilities without staff approval under 10 CFR 50.59, there are limitations. One limitation is identified in 10 CFR 50.59(c)(2)(vii), in which a proposed change would “result in a design basis limit for a fission product barrier as described in the Final Safety Analysis Report (as undated) being exceeded or altered.” Because the fuel cladding is a fission product barrier and burnup is a design basis limit as described in the Byron UFSAR, a license amendment is required to increase the fuel burnup.

3.0 TECHNICAL EVALUATION

3.1 Mechanical Design

The licensee performed mechanical design analyses of the LTAs using the same methodology approved for the VANTAGE+ fuel design as described in WCAP-12610-P-A. The design analyses included material properties, cladding corrosion, rod growth, rod internal pressure, and thermal creep. The material properties of ZIRLO LT-1 and LT-2 cladding are very similar to those of the approved ZIRLO cladding since there are only slight variations in the tin content. The licensee found that the ZIRLO LT-1 and LT-2 cladding has better corrosion performance than the approved ZIRLO cladding, and compatible thermal creep to the ZIRLO or Zircaloy-4 cladding. Using the approved PAD 4.0 fuel performance code, the licensee determined that the four LTAs meet all the mechanical design limits for Byron 1 during Cycle 13.

Based on previous irradiation performance of LT-1 and LT-2 cladding (in LTAs which is similar to the performance of ZIRLO cladding and acceptable analyses predicting LT-1 and LT-2 cladding performance at 65,000 MWD/MTU give this similarity), the staff concludes that the LTA mechanical design is acceptable to a peak rod average of 65,000 MWD/MTU for Byron 1 during Cycle 13.

3.2 Core Design

Traditionally, the staff had two criteria for LTA programs, i.e., the number of LTAs should be limited and the core locations of LTAs should be non-limiting (not in the highest power regions). Recently, the staff endorsed the concept of locating LTAs next to the highest power regions for simulating typical reactor operations. By letters dated January 8 and August 28, 2003, the staff approved the Westinghouse topical report WCAP-15604-NP, Rev. 1, entitled “Limited Scope High Burnup Lead Test Assemblies,” which provides the basis and guidelines for the operation of a limited number of LTAs for the high burnup irradiation program.

The licensee performed nuclear design analyses using the approved reload methodology in WCAP-9272-P-A, “Westinghouse Reload Safety Evaluation Methodology,” for the LTAs. The licensee determined that the LTA design features have an insignificant impact on the overall core nuclear design. The licensee is, therefore, assured that the LTAs are not positioned in the highest power locations, and are consistent with the guidelines in the approved topical report, WCAP-15604-NP, Rev. 1.

The licensee performed thermal-hydraulic analyses using the approved Westinghouse methodology for the LTAs. The design analyses covered the LTA's impact on the resident fuel, including departure from nucleate boiling (DNB), pressure drop, assembly lift, and lateral flow. The results showed that the resident fuel analyses bound the LTA performance. Thus, the licensee assured that use of the LTAs has no impact on the thermal-hydraulic design of the resident fuel.

Based on the licensee's use of approved methodologies and the acceptable results obtained, as described previously, the staff concludes that the LTA core design including nuclear and thermal-hydraulic analyses is acceptable to a peak rod average of 65,000 MWD/MTU for Byron, Unit 1 during Cycle 13.

3.3 Non-LOCA Transients

The licensee performed non-loss-of-coolant accident (LOCA) transient safety analyses to assess the impact of the LTAs in Chapter 15 of the UFSAR. Since the LTAs are geometrically identical to the current resident fuel and there are insignificant material changes from the approved ZIRLO to the low tin ZIRLO LT-1 and LT-2 with respect to these transients, the current Byron Station Transient Safety Analysis of Record remains bounding for the four LTAs.

Based on the conservative analyses and similar design features described previously, the staff concludes that the proposed use of the LTAs will not violate safety limits including DNB, cladding temperature, and system pressure, and are thus acceptable to a peak rod average of 65,000 MWD/MTU for Byron 1 during Cycle 13.

3.4 LOCA Analysis

The licensee has completed similar LTA irradiation programs during previous cycles. The licensee determined that the four LTAs continue to meet the same emergency core cooling system (ECCS) design requirements as the resident fuel for the Byron Unit 1 Cycle 13 core. No safety limits or setpoints have been altered as a result of the use of the LTAs. The LTAs are placed in core locations that will not experience the most limiting power peaking during the Cycle 13 operation. The ZIRLO LT-1 and LT-2 cladding has been tested for corrosion resistance, tensile and burst strength, and creep characteristics. The results indicate that ZIRLO LT-1 and LT-2 clad fuel rods meet all the necessary ECCS criteria and will perform satisfactorily as do the previously approved fuel rods.

Based on the previously acceptable ECCS performance of LTAs incorporating LT-1 and LT-2 clad rods in Byron, Units 1 and 2, the staff concludes that the licensee has demonstrated that the LTAs will perform adequately under LOCA conditions, and thus the LTAs are acceptable to a peak rod average of 65,000 MWD/MTU for Byron 1 during Cycle 13.

4.0 SUMMARY

The staff has reviewed the licensee's proposed amendment change to revise the burnup for four LTAs. Based on the staff evaluation, as set forth in Section 3, the staff concludes that the proposed amendment change is acceptable to revise the burnup to a peak rod average of 65,000 MWD/MTU for the LTAs in Byron 1 during Cycle 13.

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Illinois State official was notified of the proposed issuance of the amendment. The State official had no comments.

6.0 ENVIRONMENTAL CONSIDERATION

In support of the September 22, 2003, an exemption approving the use of the low tin ZIRLO clad fuel rods, the staff published an Environmental Assessment (EA) in the *Federal Register* (68FR54246) on September 16, 2003, which also addressed the irradiation of the LTAs up to 69,000 MWD/MTU. In the EA, staff reported its conclusion that permitting irradiation of the "four fuel assemblies (M09E, M10E, M11E, and M12E) to a burnup of 69,000 MWD/MTU, will not have a significant effect on the quality of the human environment. Accordingly, the NRC has determined not to prepare an environmental impact statement for the proposed actions." In addition, the amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (69 FR 2742). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: S. Wu

Date: June 16, 2004