May 2, 2007

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

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNIT 1 - ISSUANCE OF AMENDMENT RE: REQUEST FOR TECHNICAL SPECIFICATIONS CHANGE FOR MINIMUM CRITICAL POWER RATIO SAFETY LIMIT (TAC NO. MD4008)

Dear Mr. Crane:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 234 to Renewed Facility Operating License No. DPR-29 for the Quad Cities Nuclear Power Station (Quad Cities), Unit 1. The amendment is in response to your application dated January 16, 2007 (ADAMS Accession No. ML070230535) as supplemented by letter dated April 10, 2007 (ML071100452).

The amendment revises the values of the safety limit minimum critical power ratio in Technical Specifications (TS) Section 2.1.1, "Reactor Core SLs [Safety Limits]." Specifically, the change requires that for Quad Cities, Unit 1, the minimum critical power ratio shall be greater than or equal to 1.11 for two recirculation loop operation, or greater than or equal to 1.13 for single recirculation loop operation.

A copy of the related Safety Evaluation (SE) is also enclosed. The SE for this amendment includes proprietary information, delineated by brackets in the text, and is not publicly available. A non-proprietary version of the evaluation is also provided with this information redacted, and is being made publicly available.

The Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

Joseph F. Williams, Senior Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-254

Enclosures:

1. Amendment No. 234 to DPR-29
2. Proprietary Safety Evaluation
3. Non-proprietary Safety Evaluation

Notice: Enclosure 2 contains Proprietary Information. Upon separation from Enclosure 2, this letter, Enclosure 1, and Enclosure 3 are DECONTROLLED.

cc w/encls: See next page

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cc w/encls: See next page

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Quad Cities Nuclear Power Station, Unit 1

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EXELON GENERATION COMPANY, LLC

AND

MIDAMERICAN ENERGY COMPANY

DOCKET NO. 50-254

QUAD CITIES NUCLEAR POWER STATION, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No.234
License No. DPR-29

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Exelon Generation Company, LLC, et al. (the licensee) dated January 16, 2007, as supplemented by letter dated April 10, 2007, 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 by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 3.B. of Renewed Facility Operating License No. DPR-29 is hereby amended to read as follows:

B. Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 234, are hereby incorporated into the renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented prior to startup from refueling outage Q1R19.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Russell A. Gibbs, Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications and Facility Operating License

Date of Issuance: May 2, 2007

ATTACHMENT TO LICENSE AMENDMENT NO. 234

RENEWED FACILITY OPERATING LICENSE NO. DPR-29

DOCKET NO. 50-254

Replace the following pages of the Facility Operating Licenses and Appendix "A" Technical Specifications with the attached pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
Unit 1 License Page 4	Unit 1 License Page 4
2.0-1	2.0-1

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 234, are hereby incorporated into this renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

C. The licensee shall maintain the commitments made in response to the March 14, 1983, NUREG-0737 Order, subject to the following provision:

The licensee may make changes to commitments made in response to the March 14, 1983, NUREG-0737 Oder without prior approval of the Commission as long as the change would be permitted without NRC approval, pursuant to the requirements of 10 CFR 50.59. Consistent with this regulation, if the change results in an Unreviewed Safety Question, a license amendment shall be submitted to the NRC staff for review and approval prior to implementation of the change.

D. Equalizer Valve Restriction

Three of the four valves in the equalizer piping between the recirculation loops shall be closed at all times during reactor operation with one bypass valve open to allow for thermal expansion of water.

E. The licensee shall fully implement and maintain in effect all provisions of the Commission-approved physical security, training and qualification, and safeguards contingency plans including amendments made pursuant to provisions of the Miscellaneous Amendments and Search Requirements revisions to 10 CFR 73.55 (51 FR 27817 and 27822), and the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The combined sets of plans[1], which contain Safeguards Information protected under 10 CFR 73.21, is entitled: "Quad Cities Nuclear Power Station Security Plan, Training and Qualification Plan, and Safeguards Contingency Plan, Revision 0," submitted by letter dated October 21, 2004.

F. The licensee shall implement and maintain in effect all provisions of the approved fire protection program as described in the Updated Final Safety Analysis Report for the facility and as approved in the Safety Evaluation Reports dated July 27, 1979 with supplements dated November 5, 1980, and

[1] The Training and Qualification Plan and Safeguards Contingency Plan are Appendices to the Security Plan.

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION RELATED

TO AMENDMENT NO. 234 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-29

EXELON GENERATION COMPANY, LLC

AND

MIDAMERICAN ENERGY COMPANY

QUAD CITIES NUCLEAR POWER STATION, UNIT 1

DOCKET NO. 50-254

1.0 INTRODUCTION

By letter to the Nuclear Regulatory Commission (NRC, the Commission) dated January 16, 2007 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML070230535), as supplemented by letter dated April 10, 2007 (ADAMS Accession No. ML071100452), Exelon Generation Company, LLC (the licensee) requested a change to the technical specifications (TSs) for Quad Cities Nuclear Power Station, (Quad Cities), Unit 1. The proposed change would revise TS Section 2.1.1, "Reactor Core SLs [Safety Limits]." Specifically, the proposed change would require that for Quad Cities, Unit 1, the safety limit minimum critical power ratio (SLMCPR) shall be $\geq$ 1.11 for two recirculation loop operation, or $\geq$ 1.13 for single recirculation loop operation during the operating conditions described by TS 2.1.1.2.

The April 10, 2007, supplement contained clarifying information submitted in response to a staff request for additional information issued by letter dated March 19, 2007 (ADAMS Accession No. ML070670047). The supplement did not expand the scope of the application as originally noticed and did not change the NRC staff's original proposed no significant hazards consideration determination as published in the Federal Register on March 13, 2007 (72 FR 11388).

The licensee is replacing GE14 fuel manufactured by Global Nuclear Fuel (GNF) with Westinghouse SVEA-96 Optima2 fuel assemblies for Quad Cities, Unit 1, Cycle 20. Therefore, the Cycle 20 core will contain both GNF GE14 and Westinghouse SVEA-96 Optima2 fuel. The reference core for Cycle 20 consists of 232 twice-burned GNF GE14 assemblies located near the periphery of the core, 196 once-burned GNF GE14 assemblies distributed throughout the core, and 260 fresh Westinghouse SVEA-96 Optima2 assemblies distributed throughout the

core. There are also 36 bundles of low-enrichment, GNF GE14 fuel that will be distributed throughout the core, including the center control cell.

The NRC-approved Westinghouse methodology calculates a unique SLMCPR value for each of the two fuel product lines present in the core. The higher SLMCPR for the Westinghouse fuel will be adopted for all the bundles in the core, including the co-resident fuel.

2.0 REGULATORY EVALUATION

In its regulatory evaluation, the NRC staff considered the general design criteria (GDC) applicable to similar plants, the licensee's use and application of NRC-approved methods, and limitations applied thereto. The NRC staff also evaluated the proposed license amendment in terms of conformance with the standard TSs.

2.1 GENERAL DESIGN CRITERIA

Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix A, GDC 10 states that the reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences (AOOs). Although Quad Cities, Unit 1 is not bound by GDC 10, the licensee's proposal meets the intent of GDC 10.

Additionally, Section 4.4, "Thermal and Hydraulic Design," of NUREG-0800, Revision 2, "NRC Standard Review Plan (SRP) for the Review of Safety Analysis Reports for Nuclear Power Plants," dated March 2007, states, in part, that the critical power ratio (CPR) is to be established such that at least 99.9 percent of the fuel rods in the core would not be expected to experience departure from nucleate boiling or boiling transition during normal operation or AOOs. The guidance provided by NUREG-0800 forms the basis for the NRC staff's review and ensures that the requirements of GDC 10 are met.

2.2 CONFORMANCE WITH TECHNICAL SPECIFICATIONS

Fuel design limits can be exceeded if the core exceeds critical power. Critical power is a term used for the power at which the fuel departs from nucleate boiling and enters a transition to film boiling. Due to core-wide and operational variations, the margin to boiling transition is most easily described in terms of a CPR, which is defined as the rod critical power as calculated by an experimental correlation, divided by the actual rod power.

Safety limits are required to be in the TS by 10 CFR 50.36(c)(1), "Safety limits, limiting safety system settings, and limiting control settings." The SLMCPR is a safety limit required to protect the fuel design limits with respect to critical power. The SLMCPR is calculated on a cycle specific basis, because it is necessary to account for the core configuration-specific neutronic and thermal-hydraulic response. It is calculated using a statistical process that takes into account all operating parameters and associated uncertainties. The SLMCPR is the core-wide CPR at which 99.9 percent of the rods in the core would not be expected to undergo boiling transition during normal operation.

The minimum critical power ratio (MCPR) fuel cladding integrity safety limit ensures that during normal operation and during AOOs, at least 99.9 percent of the fuel rods in the core do not

experience transition boiling. This is accomplished by the determination of a CPR margin for transients, which is added to the SLMCPR to determine the operating limit MCPR (OLMCPR). At the OLMCPR, at least 99.9 percent of the fuel rods would be expected not to experience transition boiling during normal operations and transients caused by single operator error or equipment malfunction.

2.3 USE OF NRC-APPROVED METHODS

The CPR correlation developed for Westinghouse SVEA-96 Optima2 fuel is described in Westinghouse Commercial Atomic Power (WCAP)-16081-P-A, "10x10 SVEA Fuel Critical Power Experiments and CPR Correlation: SVEA-96 Optima 2" (ADAMS Accession No. ML051260171), which the NRC staff approved in a safety evaluation (SE) dated May 24, 2000. Westinghouse uses this correlation to model the CPR performance of the Westinghouse SVEA-96 Optima2 fuel that will be loaded into the Quad Cities, Unit 1, Cycle 20 core. WCAP-16081-P-A presents correlations that are based on methods discussed in topical report, CENPD-300-P-A, "Reference Report for Boiling Water Reactor [BWR] Reload Fuel." This report was approved by the NRC staff in a SE dated May 24, 1996.

Westinghouse performed the Quad Cities, Unit 1, Cycle 20 SLMCPR analysis using plant and cycle-specific parameters based on the core loading pattern as stated in the licensee's letter dated January 17, 2007. Westinghouse used NRC-approved neutronic methods (POLCA/PHOENIX, discussed in Combustion Engineering Nuclear Power, LLC, Report CENPD-390-P-A, "The Advanced PHOENIX and POLCA Codes for Nuclear Design of Boiling Water Reactors," dated December 2000 (ADAMS Accession No. ML010100348), and approved by the NRC for Quad Cities, Unit 1, Cycle 20 in an NRC letter dated April 4, 2006 (ADAMS Accession No. ML060750258), to analyze the planned operating strategy. The licensee confirmed the nuclear design using CASMO-4/MICROBURN-B2, which is discussed in Siemens Power Corporation Report EMF-2158(P)(A), "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/Microburn- B2," dated October 1999 (ADAMS Accession No. ML003698553). PHOENIX and CASMO4 are lattice physics codes, and POLCA and MICROBURN-B2 are three dimensional core simulators.

2.4 LIMITATIONS TO NRC-APPROVED METHODS

The Westinghouse methodology determines separate SLMCPR values for different, co-resident fuel. For transient analyses, Westinghouse developed the USAG14 correlation to model the coresident GNF fuel. USAG14 is used to determine the conservative margin to be applied to the OLMCPR for the legacy fuel that ensures that the legacy fuel operating limits meet the statistical criterion given in the SRP that there is a 95-percent probability at a 95-percent confidence level that the hottest fuel rod in the core does not experience boiling transition during normal operation or AOOs. The NRC staff did not generically review and approve the Westinghouse CPR correlation for GNF GE14 fuel. Therefore, the use of this method must be reviewed and approved on a plant- and cycle-specific basis.

The Westinghouse methodology does not generate the information necessary to calculate a technically justified SLMCPR value for the co-resident legacy fuel. Therefore, the NRC staff finds that the Westinghouse methodology is not a cycle-specific methodology. In light of the facts that Quad Cities, Unit 1, Cycle 20, will operate at 120 percent of the plant's originally licensed thermal power, and that there is a large batch fraction (36 percent) of fresh fuel, the staff reviewed assumptions made in CENDP-300-P-A that pertain to the co-resident fuel,

specifically for their continued applicability to these operating conditions. Further discussion is presented in Section 3.2 of this safety evaluation.

3.0 TECHNICAL EVALUATION

The MCPR safety limit is assessed based on core and fuel operating characteristics that are typically determined by a lattice physics code. The operating characteristics are then input to a critical power correlation, which is determined by a fuel vendor, based on extensive experimental data relevant to a particular fuel design. The critical power correlation then yields a MCPR for the core.

The core-wide MCPR is then increased by a margin. The margin is determined by statistical convolution of uncertainties in the SLMCPR determination process. These uncertainties may include, among other things, experimental CPR correlation uncertainty, uncertainties arising from the use of computer codes, manufacturing uncertainties in the fuel, and power distribution uncertainties.

As stated above, many aspects of the method that Westinghouse used to asses the SLMCPR for Quad Cities, Unit 1, Cycle 20, are generically approved. The sections that follow describe the NRC staff's review of the core- and cycle-specific compliance with NRC's conditions and limitations applied to those methods.

3.1 SLMCPR FOR WESTINGHOUSE SVEA-96 OPTIMA2 FUEL

The SLMCPR was determined in accordance with the approved methods discussed in Section 2.3 of this SE. WCAP-16081-P-A provides the CPR correlation adaptation and validation for 10x10 SVEA-96 Optima2 fuel for input to the methods described in CENPD-300-P-A. Upon approval of the reports discussed above, the NRC issued several conditions that must be satisfied by the licensee that are relevant to the SLMCPR determination. The NRC staff reviewed conditions applied to the approval of each report. Restrictions imposed on the CPR for Westinghouse SVEA-96 Optima2 fuel apply limitations to the range of parameters over which the CPR correlation is valid. The range of parameters envelops the operating range expected for Quad Cities, Unit 1, Cycle 20. Therefore, the NRC staff concludes that WCAP-16081-P-A has been applied correctly to model the fresh, Westinghouse SVEA-96 Optima2 fuel that will be in the core.

The Westinghouse BWR licensing methodology described in CENPD-300-P-A presents generic approaches for performing the required safety analyses. However, the NRC staff's SE report (SER) and the supporting technical evaluation report for CENPD-300-PA defined the specific acceptable methodology and delineated the important conditions and limitations.

The NRC staff reviewed the conditions and limitations in the SER approving CENPD-300-P-A and determined that, for Quad Cities, Unit 1, Cycle 20, conditions 1 to 6 and 8 are satisfied, because the licensee applied the methodologies from CENPD-300-P-A consistent with the manner specified in conditions 1 to 6 and 8 of the SER approving CENPD-300-P-A. The NRC staff also concludes that Restriction 7 of the SER relies on evaluation of the core and cycle-specific conditions, and pertains to legacy fuel, and not Westinghouse fuel. Therefore, Restriction 7 does not apply to the SLMCPR for Westinghouse SVEA-96 Optima2 fuel. The NRC staff concludes that the licensee applied an NRC-approved methodology in an acceptable manner. The proposed SLMCPR for the Westinghouse SVEA-96 Optima2 fuel is acceptable.

3.2 SLMCPR FOR CO-RESIDENT GE14 FUEL

The NRC staff reviewed the licensee's submittal regarding the SLMCPR determined by Westinghouse for the GE14 fuel, and the SLMCPR applied to the fuel by Exelon. The NRC staff considered Westinghouse's compliance with restrictions and limitations on the CENPD 300-P-A methodology, and additional information required to validate the assumptions that Westinghouse made regarding the legacy fuel, to determine the acceptability of the SLMCPR as proposed by Exelon.

3.2.1 USAG14 Correlation for OLMCPR

As discussed in Section 2.4 of this SE, Westinghouse uses a critical power correlation that has been renormalized to predict the performance of legacy fuel. The USAG14 CPR correlation was developed from the Westinghouse CPR correlation by varying key parameters important to the CPR correlation such as mass flux, enthalpy, and pressure. The correlation prediction was corrected using operational and experimental data. The CPR correlation predictions were validated using the results of core-specific General Electric Critical Quality Boiling Length (GEXL) correlation predictions, which were developed from actual, full-scale bundle data. The Westinghouse methodology also adds a multiplicative factor to the USAG14 CPR prediction such that a conservative adder to the OLMCPR is developed.

Limitation 7 of the SE approving CENDP-300-P-A states, "The ABB/CE methodology for determining the operating limit minimum critical power ration for non-ABB/CE fuel as described in CENPD-300-P and additional submittals is acceptable only when each licensee application of the methodology identifies the value of the conservative adder to the OLMCPR. The correlation applied to the experimental data to determining the value of the adder must be shown to meet the 95/95 statistical criterion. In addition, the licensee's submittal must include the justification for the adder and reference the appropriate supporting documentation."

The licensee complied with this approach and established the conservative multiplier. The NRC staff concludes that Limitation 7 of the SER to CENPD-300-P-A has been satisfied. The USAG14 correlation has been applied in an acceptable manner based on compliance with Restriction 7 of the SER to CENPD-300-P-A.

3.2.2 Variation to Westinghouse SLMCPR Methodology

The Westinghouse SLMCPR methodology for the co-resident GNF GE14 fuel involves assumptions that are intended to yield a bounding SLMCPR value for the legacy fuel. These assumptions result in the application of two separate SLMCPR values for a reload core: the SLMCPR for the legacy fuel, and the SLMCPR for the fresh, Westinghouse fuel.

In light of advances in operating strategy, which include changes in reload fuel batch fractions, implementation of extended power uprates, and possible increases in gadolinia loadings, the staff has identified concerns with these assumptions. Particularly, the NRC staff is concerned that Westinghouse assumes [
] without further analysis.

Due to the nature of the assumptions made by Westinghouse, the licensee elected to adopt the SLMCPR for SVEA-96 Optima2 fuel for the entire core. Because the SVEA-96 Optima2 fuel

SLMCPR is higher than the SLMCPR for the Cycle 19, GE14 fuel, this is likely a conservative treatment of the SLMCPR.

The staff found this treatment acceptable for the case of Dresden Nuclear Power Station (Dresden), Unit 3, Cycle 20, which had a similar core composition. The Dresden, Unit 3 core design, however, had a greater difference between the SLMCPR for the Westinghouse fuel and the legacy fuel than that for Quad Cities, Unit 1, Cycle 20. The Dresden, Unit 3, Cycle 20 SLMCPR that was originally proposed for GNF was 0.02 less than that originally proposed for the Westinghouse fuel. Thus, when Exelon decided to apply the Westinghouse SLMCPR core-wide at Dresden, Unit 3, it increased the proposed SLMCPR for the GNF fuel by a value of 0.02, which is a conservative increase.

For Quad Cities, Unit 1, however, there is a difference between the SLMCPR value for GNF fuel proposed by Westinghouse and that for the Westinghouse of 0.01, which results in a slightly less conservative increase in the legacy fuel SLMCPR value at Quad Cities, Unit 1, when compared to Dresden, Unit 3, Cycle 20. Therefore, the NRC staff requested that Westinghouse provide clarifying information about the assumptions made in the SLMCPR analysis for the fresh, reload fuel. The NRC staff also requested additional information to determine whether the Westinghouse fuel SLMCPR could be conservatively applied to the coresident fuel.

The Westinghouse fuel SLMCPR value is determined [

]. To clarify this assumption, the staff issued a request for additional information to determine the burnup characteristics modeled for assembly type QAG4, [ ]. By letter dated April 10, 2007, the licensee provided Westinghouse's response, which stated that the core power and burnup distributions are determined using POLCA7 core models that explicitly model each assembly type's nuclear and thermal-hydraulic characteristics. [

]. The data base for the CPR correlation is based on the subbundle geometry unique to SVEA-96 Optima2 fuel, and does not apply to GE14 fuel.

Since the NRC staff has determined previously that the USAG14 correlation that is used for transient analysis to determine the operating limit minimum critical power ratio for GE fuel has been statistically treated to conform to GEXL characteristics, it may be a more adequate CPR correlation to model legacy fuel in the core. Therefore, the NRC staff requested that Westinghouse recompute the CPR performance for the legacy fuel using the USAG14 correlation in place of the D4.1.1 correlation that is used for Westinghouse fuel. The NRC staff determined that this modeling would provide additional assurance that the SLMCPR that Westinghouse calculated for the SVEA-96 Optima2 fuel could be conservatively applied to the GE14 fuel.

The NRC staff reviewed the limiting CPR performance of the legacy fuel for the beginning of the upcoming cycle and determined that, at the beginning of the fuel cycle, the D4.1.1 correlation that is used to model CPR performance of Westinghouse fuel non-conservatively over-predicts the CPR performance of GE fuel when compared to USAG14. [

]. The shift in predicted CPR performance between the two correlations does not appear to be so significant that the interplay between assembly and fuel rod MCPRs resulting in the most limiting CPR distribution toward the end of cycle becomes less dominant in determining the SLMCPR for the core. Therefore, the re-analyzed CPR distributions illustrate more clearly that the dominant phenomena in determining the cycle-limiting SLMCPR remain dominant in light of the modified analysis technique. The NRC staff concludes on this basis that the proposed SLMCPR is sufficiently conservative to apply to the GE14 fuel.

The NRC staff concludes that the proposed SLMCPR is conservative with respect to the GE14 fuel for several other reasons, as well. First, Westinghouse identified an operating margin relative to the OLMCPR. Second, the licensee provided data to show that the previous cycle SLMCPR for GE14 fuel was calculated at [ ], whereas the licensed SLMCPR was 1.10. Therefore, assuming that the SLMCPR was calculated consistent with NRC-approved methods, the SLMCPR from the previous cycle was conservative by [ ]. In consideration of the above information, the NRC staff concludes that the SLMCPR of 1.11 proposed by Exelon, as applied to GE14 fuel, is sufficiently conservative and, on that basis, is acceptable for two loop operation.

3.2.3 Review of Part 21 Issues

Since approval of CENPD-300-P-A, insight gained through operating experience has shown that additional conservatisms must be applied to CPR correlations to obtain SLMCPR values. A notice submitted by GE in accordance with 10 CFR Part 21, “Reporting of Defects and Noncompliance” identified potential non-conservatisms related to the critical power determination for GE14 and GE12 fuel with Zircaloy spacers. The licensee indicated that this 10 CFR Part 21 notification concerns GNF GE14 fuel, and that the Westinghouse correlation used for the GNF GE14 fuel was developed using GE data corrected for the issue identified in the 10 CFR Part 21 notification. The NRC staff finds consideration and resolution of the 10 CFR Part 21 issue acceptable. The licensee provided adequate information to justify the revised methods applied by Westinghouse to determine the SLMCPR for GNF GE14 fuel in the core. In consideration of the information provided by the licensee, identification of the OLMCPR adder, and the 10 CFR Part 21 issue resolution, the NRC staff finds that the licensee may implement the proposed SLMCPR for GNF GE14 fuel for Quad Cities, Unit 1, Cycle 20.

3.3 SINGLE LOOP OPERATION SLMCPR

During reactor operation with a single recirculation loop in service, the licensee proposed an SLMCPR value of $\geq$1.13. This value has additional conservatism beyond that approved for dual recirculation loop operation to account for core flow uncertainty. The NRC staff reviewed the licensee’s applications of core flow uncertainty to the SLMCPR and found it acceptable because the single recirculation loop SLMCPR provides adequately conservative margin for core flow uncertainty associated with single recirculation loop operation. Therefore, the single recirculation loop SLMCPR is acceptable and may be implemented for Quad Cities, Unit 1, Cycle 20.

In consideration of the information discussed above, the NRC staff finds that the proposed amendment is acceptable. Specifically, the licensee for Quad Cities, Unit 1, may revise

TS 2.1.1.2, to reflect recently analyzed values. These values shall be ≥1.11 for two recirculation loop operation, and ≥1.13 for single recirculation loop operation.

The licensee did not provide any proposed markups to the TS Bases associated with TS 2.1.1.2. The NRC staff recommends that the licensee conduct a timely review of the Bases and remove any references that are no longer used as a result of the adoption of a new SLMCPR determination methodology.

4.0 FINAL NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration, and published for public comments, such finding on March 13, 2007 (72 FR 11388). Because this amendment is being issued after the 30-day comment period and before the expiration of the 60-day period providing opportunity to request a hearing, a final no significant hazards consideration determination is included in this safety evaluation.

As required by the 10 CFR 50.91(a), the licensee, in its submission, provided its analysis of the issue of no significant hazards consideration. The NRC staff has reviewed the licensee's analysis against the standards of 10 CFR 50.92(c). The NRC staff's review is presented below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No

   The probability of an evaluated accident is derived from the probabilities of the individual precursors to that accident. The consequences of an evaluated accident are determined by the operability of plant systems designed to mitigate those consequences. Limits have been established consistent with NRC-approved methods to ensure that fuel performance during normal, transient, and accident conditions is acceptable. The proposed change conservatively establishes the SLMCPR for QCNPS [Quad Cities Nuclear Power Station], Unit 1, Cycle 20 such that the fuel is protected during normal operation and during plant transients or anticipated operational occurrences (AOOs).

   Changing the SLMCPR does not increase the probability of an evaluated accident. The change does not require any physical plant modifications, physically affect any plant components, or entail changes in plant operation. Therefore, no individual precursors of an accident are affected.

   The proposed change revises the SLMCPR to protect the fuel during normal operation as well as during plant transients or AOOs. Operational limits will be established based on the proposed SLMCPR to ensure that the SLMCPR is not violated. This will ensure that the fuel design safety criterion (i.e., that at least 99.9% of the fuel rods do not experience transition boiling during normal operation and AOOs) is met. Since the proposed change does not affect operability of plant systems designed to mitigate any consequences of accidents, the consequences of an accident previously evaluated are not expected to increase.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No

   Creation of the possibility of a new or different kind of accident requires creating one or more new accident precursors. New accident precursors may be created by modifications of plant configuration, including changes in allowable modes of operation. The proposed change does not involve any plant configuration modifications or changes to allowable modes of operation. The proposed change to the SLMCPR assures that safety criteria are maintained for QCNPS, Unit 1, Cycle 20.

   Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

   Response: No

   The SLMCPR provides a margin of safety by ensuring that at least 99.9% of the fuel rods do not experience transition boiling during normal operation and AOOs if the MCPR limit is not violated. The proposed change will ensure the current level of fuel protection is maintained by continuing to ensure that at least 99.9% of the fuel rods do not experience transition boiling during normal operation and AOOs if the MCPR limit is not violated. The proposed SLMCPR values were developed using NRC-approved methods. Additionally, operational limits will be established based on the proposed SLMCPR to ensure that the SLMCPR is not violated. This will ensure that the fuel design safety criterion (i.e., that no more than 0.1% of the rods are expected to be in boiling transition if the MCPR limit is not violated) is met.

   Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on this review, the three standards of the 10 CFR 50.92(c) are satisfied. Therefore, the NRC staff has determined that the amendment request involves no significant hazards consideration.

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

The amendments change the requirements with respect to installation or use of a facility's component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves 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 (72 FR 11388; March 13, 2007). Accordingly, the amendment meets 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: B. Parks

Date: May 2, 2007