

RS-02-095

May 30, 2002

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555Quad Cities Nuclear Power Station, Unit 1
Facility Operating License No. DPR-29
NRC Docket No. 50-254Subject: Request for Technical Specifications Change for Minimum Critical
Power Ratio Safety LimitReference: Letter from Keith R. Jury (Exelon Generation Company, LLC) to U. S.
NRC, "Request for Technical Specifications Change for Minimum
Critical Power Ratio Safety Limit," dated April 8, 2002

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company (EGC), LLC, requests a change to the Technical Specifications (TS) of Facility Operating License Number DPR-29 for the Quad Cities Nuclear Power Station (QCNPS), Unit 1. The proposed change revises the values of the Safety Limit for the Minimum Critical Power Ratio (SLM CPR) in TS Section 2.1.1, "Reactor Core SLs," for Unit 1 Cycle 18 for both two loop operation and single loop operation to 1.10 and 1.11, respectively. EGC requests approval of this proposed change prior to October 31, 2002, to support operation of QCNPS Unit 1 following the refueling outage scheduled to begin on November 5, 2002.

Some of the information contained in Attachment F of this submittal is classified as proprietary to our fuel supplier, Global Nuclear Fuel (GNF), and is identified as text contained between opening double brackets ([[]) and closing double brackets (]]). The proprietary information is of the type that GNF maintains in confidence and withholds from public disclosure. It has been handled and classified as proprietary as supported by the affidavit in Attachment E. We hereby request that this information be withheld from public disclosure in accordance with the provisions of 10 CFR 2.790, "Public inspections, exemptions, requests for withholding." Attachment G provides an edited, non-proprietary version of the information in Attachment F.

This request is subdivided as follows.

1. Attachment A gives a description and safety analysis of the proposed change.
2. Attachment B includes the marked-up Technical Specifications page with the proposed change indicated.

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3. Attachment B-1 includes the Technical Specifications page with the proposed change incorporated.
4. Attachment C describes our evaluation performed using the criteria in 10 CFR 50.91(a)(1) that provides information supporting a finding of no significant hazards consideration using the standards in 10 CFR 50.92(c).
5. Attachment D provides information supporting an Environmental Assessment.
6. Attachment E contains the affidavit supporting the request for withholding the identified proprietary information from public disclosure, as required by 10 CFR 2.790(b)(1).
7. Attachment F provides additional information prepared by GNF supporting the proposed change.
8. Attachment G provides an edited, non-proprietary version of the information in Attachment F.

This proposed change has been reviewed by the Plant Operations Review Committee and the Nuclear Safety Review Board in accordance with the Quality Assurance program.

EGC is notifying the State of Illinois of this request for a change to the TS by transmitting a copy of this letter and its attachments to the designated State Official.

We request that the amendment provide for an implementation period such that it shall be implemented prior to start-up for QCNPS, Unit 1 Cycle 18.

Should you have any questions concerning his letter, please contact Mr. Don Cecchett at (630) 657-2826.

Respectfully,



P. R. Simpson
Manager – Licensing
Mid-West Regional Operating Group

Attachments:

Affidavit

- Attachment A: Description and Safety Analysis for Proposed Changes
- Attachment B: Marked-Up Technical Specifications Page
- Attachment B-1 Revised Technical Specifications Page
- Attachment C: Information Supporting a Finding of No Significant Hazards Consideration
- Attachment D: Information Supporting an Environmental Assessment

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- Attachment E Global Nuclear Fuel Affidavit for Withholding Information
- Attachment F: Global Nuclear Fuel Additional Information Regarding the Cycle Specific SLMCPR for Quad Cities Unit 1 Cycle 18
- Attachment G: Non-Proprietary Version of Global Nuclear Fuel Additional Information Regarding the Cycle Specific SLMCPR for Quad Cities Unit 1 Cycle 18

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Quad Cities Nuclear Power Station
Office of Nuclear Facility Safety – Illinois Department of Nuclear Safety

STATE OF ILLINOIS)
COUNTY OF DUPAGE)
IN THE MATTER OF)

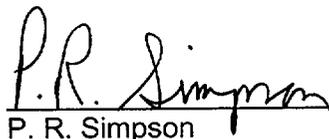
EXELON GENERATION COMPANY, LLC) Docket Number

QUAD CITIES NUCLEAR POWER STATION, UNIT 1) 50-254

SUBJECT: Request for Technical Specifications Change for Minimum Critical Power Ratio Safety Limit

AFFIDAVIT

I affirm that the content of this transmittal is true and correct to the best of my knowledge, information and belief.



P. R. Simpson
Manager – Licensing
Mid-West Regional Operating Group

Subscribed and sworn to before me, a Notary Public in and
for the State above named, this 30th day of
May, 2002.





Notary Public

Attachment A
Request for Technical Specifications Change
for Minimum Critical Power Ratio Safety Limit

DESCRIPTION AND SAFETY ANALYSIS
FOR PROPOSED CHANGES

A. SUMMARY OF PROPOSED CHANGES

Pursuant to 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company (EGC), LLC, requests a change to the Technical Specifications (TS) for Quad Cities Nuclear Power Station (QCNPS), Unit 1. The proposed change revises the Safety Limit Minimum Critical Power Ratio (SLMCPR) in accordance with the General Electric (GE) Company's standard safety analysis methodology, GESTAR II (Reference 2), which requires that a cycle specific SLMCPR be calculated for each cycle. The proposed change revises the SLMCPR for Unit 1 Cycle 18 for two loop operation and single loop operation to 1.10 and 1.11, respectively.

The proposed change is described in detail in Section E of this Attachment. The marked up TS page is provided in Attachment B.

B. DESCRIPTION OF THE CURRENT REQUIREMENTS

TS Section 2.1.1, "Reactor Core SLs" contains the SLMCPR for two loop operation and for single loop operation and reads, in part, as follows, "MCPR shall be ≥ 1.11 for two recirculation loop operation or ≥ 1.12 for single recirculation loop operation."

C. BASES FOR THE CURRENT REQUIREMENTS

The fuel cladding integrity SLMCPR is established to assure that at least 99.9% of the fuel rods in the core do not experience boiling transition during an anticipated operational occurrence (AOO). To determine the specific value for the cycle specific safety limit, a full core statistical analysis is performed. The core model incorporates the uncertainty in the measurement of core operating parameters, critical power ratio (CPR) calculational uncertainties, and the statistical uncertainty associated with the fuel vendor's correlation. The probability of boiling transition occurring, and the number of rods that might possibly experience boiling transition as a function of the nominal MCPR, is then calculated. The SLMCPR for the current QCNPS cycle (i.e., cycle 17A) is based on Framatome ANP (FANP) calculation methodologies as described in the current TS.

D. NEED FOR REVISION OF THE REQUIREMENT

To support the Cycle 18 operation, GE methodology was used to calculate the required SLMCPR. The results of this analysis indicate that the SLMCPR can be reduced from the current TS values and that the exposure dependency in the current TS (Reference 1) can be eliminated. Thus the proposed change will simplify the TS and provide increased operational flexibility.

Attachment A
Request for Technical Specifications Change
for Minimum Critical Power Ratio Safety Limit

E. DESCRIPTION OF THE PROPOSED CHANGE

The value of the SLMCPR for Unit 1 in TS Section 2.1.1.2, is revised to read, "For Unit 1, MCPR shall be ≥ 1.10 for two recirculation loop operation or ≥ 1.11 for single recirculation loop operation."

F. SAFETY ANALYSIS OF THE PROPOSED CHANGE

Attachment F contains a safety analysis of the proposed change in a format that GNF has established with the NRC for submitting changes to the SLMCPR. The results of that analysis are summarized in the following paragraphs.

Table 1 of Attachment F summarizes the relevant input parameters and results of the SLMCPR determination for the QCNPS, Unit 1, Cycle 18, 17, and 17A cores. The quantities that have been shown to have some impact on the determination of the SLMCPR are provided. The QCNPS, Unit 1, Cycle 18 core will contain a mixture of FANP and GNF fuel. The QCNPS, Unit 1, Cycle 17 core was loaded with FANP fuel. The SLMCPR evaluations for Cycle 18 were performed using GNF methods and generic uncertainties, supplemented with QCNPS Unit 1 specific uncertainties. These calculations use the GEXL14 correlation for GE14 fuel, which is described in Reference 2, and the GEXL96 correlation for FANP ATRIUM-9B fuel, which is described in Reference 3.

Based on the material presented in Attachment F, it is concluded that the calculated SLMCPR value of 1.10 for the QCNPS Unit 1 Cycle 18 core is appropriate for two loop operation and 1.11 for single loop operation.

G. IMPACT ON PREVIOUS SUBMITTALS

EGC has reviewed the proposed change regarding its impact on any previous submittals. Reference 1 requested a Technical Specifications change to the SLMCPR to support a mid-cycle core shuffle. Although it is related to this change, in that it involves a change to the MCPR, it does not impact the changes presented for the new SLMCPR for Cycle 18 operation.

H. SCHEDULE REQUIREMENTS

EGC requests approval of the proposed change prior to October 31, 2002, to support operation of QCNPS Unit 1 following the refueling outage scheduled to begin on November 5, 2002.

I. REFERENCES

1. Letter from Keith R. Jury (Exelon Generation Company, LLC) to U.S. NRC, "Request for Technical Specifications Change for Minimum Critical Power Ratio Safety Limit," dated April 8, 2002
2. NEDE-24011-P-A-14, "General Electric Standard Application for Reactor Fuel (GESTAR II)," June 2000

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3. NEDC-32981P, Revision 0, "GEXL Correlation for ATRIUM-9B Fuel," September 2000

**Attachment B
Request for Technical Specifications Change
for Minimum Critical Power Ratio Safety Limit**

MARKED – UP TECHNICAL SPECIFICATIONS PAGE

2.0-1

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

2.1.1.1 With the reactor steam dome pressure < 785 psig or core flow < 10% rated core flow:

THERMAL POWER shall be \leq 25% RTP.

2.1.1.2 With the reactor steam dome pressure \geq 785 psig and core flow \geq 10% rated core flow:

For Unit 1, MCPR shall be \geq 1.11 1.10 for two recirculation loop operation or \geq 1.12 1.11 for single recirculation loop operation.

For Unit 2, MCPR shall be \geq 1.11 for two recirculation loop operation, or for single recirculation loop operation, MCPR shall be \geq 1.12.

2.1.1.3 Reactor vessel water level shall be greater than the top of active irradiated fuel.

2.1.2 Reactor Coolant System Pressure SL

Reactor steam dome pressure shall be \leq 1345 psig.

2.2 SL Violations

With any SL violation, the following actions shall be completed within 2 hours:

2.2.1 Restore compliance with all SLs; and

2.2.2 Insert all insertable control rods.

**Attachment B-1
Technical Specification Change
with Changes Incorporated**

Revised Technical Specifications Page

2.0-1

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

- 2.1.1.1 With the reactor steam dome pressure < 785 psig or core flow < 10% rated core flow:

THERMAL POWER shall be \leq 25% RTP.

- 2.1.1.2 With the reactor steam dome pressure \geq 785 psig and core flow \geq 10% rated core flow:

For Unit 1, MCPR shall be \geq 1.10 for two recirculation loop operation or \geq 1.11 for single recirculation loop operation.

For Unit 2, MCPR shall be \geq 1.11 for two recirculation loop operation, or for single recirculation loop operation, MCPR shall be \geq 1.12.

- 2.1.1.3 Reactor vessel water level shall be greater than the top of active irradiated fuel.

2.1.2 Reactor Coolant System Pressure SL

Reactor steam dome pressure shall be \leq 1345 psig.

2.2 SL Violations

With any SL violation, the following actions shall be completed within 2 hours:

2.2.1 Restore compliance with all SLs; and

2.2.2 Insert all insertable control rods.

Attachment C
Request for Technical Specifications Change
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INFORMATION SUPPORTING A FINDING OF
NO SIGNIFICANT HAZARDS CONSIDERATION

According to 10 CFR 50.92(c), "Issuance of amendment," a proposed amendment to an operating license involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not:

Involve a significant increase in the probability or consequences of an accident previously evaluated; or

Create the possibility of a new or different kind of accident from any accident previously evaluated; or

Involve a significant reduction in a margin of safety.

Exelon Generation Company (EGC), LLC, is proposing to amend the Quad Cities Nuclear Power Station (QCNPS) Technical Specifications (TS) to revise the Safety Limit Minimum Critical Power Ratio (SLMCPR) to support QCNPS, Unit 1 Cycle 18 operation. The proposed change revises the SLMCPR for Unit 1 Cycle 18 for two loop operation and single loop operation to 1.10 and 1.11, respectively.

Information supporting the determination that the criteria set forth in 10 CFR 50.92 is met for this amendment request is indicated below.

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

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 safety limit for the minimum critical power ratio (SLMCPR) for Quad Cities Nuclear Power Station (QCNPS), Unit 1, Cycle 18 such that the fuel is protected during normal operation and during any plant transients or anticipated operational occurrences.

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 any transients or anticipated operational occurrences. Operational limits will be established based on the proposed SLMCPR to ensure that the SLMCPR is not violated during all modes of operation. This will ensure that the fuel design safety criteria (i.e., that at least 99.9% of the fuel rods do not experience transition boiling

Attachment C
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during normal operation and anticipated operational occurrences) is met. Since the operability of plant systems designed to mitigate any consequences of accidents has not changed, 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.

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

Creation of the possibility of a new or different kind of accident would require the creation of one or more new precursors of that accident. New accident precursors may be created by modifications of the plant configuration, including changes in allowable modes of operation. The proposed change does not involve any modifications of the plant configuration or allowable modes of operation. The proposed change to the SLMCPR assures that safety criteria are maintained for QCNPS, Unit 1, Cycle 18.

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

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

The value of the proposed SLMCPR provides a margin of safety by ensuring that no more than 0.1% of the rods are expected to be in boiling transition if the MCPR limit is not violated. The proposed change will ensure the appropriate level of fuel protection. Additionally, operational limits will be established based on the proposed SLMCPR to ensure that the SLMCPR is not violated during all modes of operation. This will ensure that the fuel design safety criteria (i.e., that at least 99.9% of the fuel rods do not experience transition boiling during normal operation as well as anticipated operational occurrences) are met.

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

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INFORMATION SUPPORTING AN ENVIRONMENTAL ASSESSMENT

Exelon Generation Company (EGC), LLC, has evaluated this proposed change against the criteria for identification of licensing and regulatory actions requiring environmental assessment in accordance with 10 CFR 51.21, "Criteria for and identification of licensing and regulatory actions requiring environmental assessment." EGC has determined that this proposed change meets the criteria for a categorical exclusion set forth in 10 CFR 51.22(c)(9), "Criteria for categorical exclusion; identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review," and as such, has determined that no irreversible consequences exist in accordance with 10 CFR 50.92(b), "Issuance of amendment." This determination is based on the fact that this change is being proposed as an amendment to a license issued pursuant to 10 CFR 50, "Domestic Licensing of Production and Utilization Facilities," which changes a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, "Standards for Protection Against Radiation," or that changes an inspection or a surveillance requirement, and the amendment meets the following specific criteria.

- (i) The amendment involves no significant hazards consideration.

As demonstrated in Attachment C, this proposed change does not involve any significant hazards consideration.

- (ii) There is no significant change in the types or significant increase in the amounts of any effluent that may be released offsite.

The proposed change is limited to revising the Safety Limit Minimum Critical Power Ratio. This change does not by itself allow for an increase in the unit power level, does not increase the production, nor alter the flow path or method of disposal of radioactive waste or byproducts. Therefore, the proposed change does not affect actual unit effluents.

- (iii) There is no significant increase in individual or cumulative occupational radiation exposure.

The proposed change will not result in changes in the operation or configuration of the facility. There will be no change in the level of controls or methodology used for processing of radioactive effluents or handling of solid radioactive waste, nor will the proposal result in any change in the normal radiation levels within the plant. Therefore, there will be no increase in individual or cumulative occupational radiation exposure resulting from this change.

**Attachment E
Request for Technical Specifications Change
for Minimum Critical Power Ratio Safety Limit**

Global Nuclear Fuel

Affidavit for Withholding Information



Global Nuclear Fuel

A Joint Venture of GE, Toshiba, & Hitachi

Affidavit

I, Jens G. Andersen, state as follows:

- (1) I am Fellow, TRACG Development, Global Nuclear Fuel – Americas, L.L.C. (“GNF-A”) and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.
- (2) The information sought to be withheld is contained in the attachment, “Additional Information Regarding the Cycle Specific SLMCPR for Quad Cities Unit 1 Cycle 18,” May 28, 2002.
- (3) In making this application for withholding of proprietary information of which it is the owner or licensee, GNF-A relies upon the exemption from disclosure set forth in the Freedom of Information Act (“FOIA”), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4) and 2.790(a)(4) for “trade secrets and commercial or financial information obtained from a person and privileged or confidential” (Exemption 4). The material for which exemption from disclosure is here sought is all “confidential commercial information,” and some portions also qualify under the narrower definition of “trade secret,” within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).
- (4) Some examples of categories of information which fit into the definition of proprietary information are:
 - a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GNF-A’s competitors without license from GNF-A constitutes a competitive economic advantage over other companies;
 - b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;
 - c. Information which reveals cost or price information, production capacities, budget levels, or commercial strategies of GNF-A, its customers, or its suppliers;
 - d. Information which reveals aspects of past, present, or future GNF-A customer-funded development plans and programs, of potential commercial value to GNF-A;
 - e. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b., above.

- (5) The information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GNF-A, and is in fact so held. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in (6) and (7) following. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GNF-A, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence.
- (6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which it was licensed to GNF-A. Access to such documents within GNF-A is limited on a "need to know" basis.
- (7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GNF-A are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.
- (8) The information identified in paragraph (2) is classified as proprietary because it contains details of GNF-A's fuel design and licensing methodology.

The development of the methods used in these analyses, along with the testing, development and approval of the supporting methodology was achieved at a significant cost, on the order of several million dollars, to GNF-A or its licensor.

- (9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GNF-A's competitive position and foreclose or reduce the availability of profit-making opportunities. The fuel design and licensing methodology is part of GNF-A's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical, and NRC review costs comprise a substantial investment of time and money by GNF-A or its licensor.

Affidavit

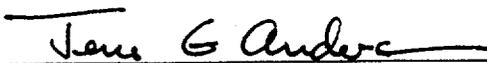
The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GNF-A's competitive advantage will be lost if its competitors are able to use the results of the GNF-A experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GNF-A would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GNF-A of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed at Wilmington, North Carolina, this 28 day of May, 2002.



Jens G. Andersen
Global Nuclear Fuel – Americas, LLC

**Attachment G
Request for Technical Specifications Change
for Minimum Critical Power Ratio Safety Limit**

Global Nuclear Fuel

**Non-Proprietary Version of Additional Information Regarding the
Cycle Specific SLMCPR for Quad Cities Unit 1 Cycle 18**

References

- [1] Letter, Frank Akstulewicz (NRC) to Glen A. Watford (GE), "Acceptance for Referencing of Licensing Topical Reports NEDC-32601P, *Methodology and Uncertainties for Safety Limit MCPR Evaluations*; NEDC-32694P, *Power Distribution Uncertainties for Safety Limit MCPR Evaluation*; and Amendment 25 to NEDE-24011-P-A on Cycle Specific Safety Limit MCPR," (TAC Nos. M97490, M99069 and M97491), March 11, 1999.
- [2] Letter, Thomas H. Essig (NRC) to Glen A. Watford (GE), "Acceptance for Referencing of Licensing Topical Report NEDC-32505P, Revision 1, *R-Factor Calculation Method for GE11, GE12 and GE13 Fuel*," (TAC No. M99070 and M95081), January 11, 1999.
- [3] *General Electric BWR Thermal Analysis Basis (GETAB): Data, Correlation and Design Application*, NEDO-10958-A, January 1977.
- [4] Letter, Glen A. Watford (GNF-A) to U. S. Nuclear Regulatory Commission Document Control Desk with attention to R. Pulsifer (NRC), "Confirmation of 10x10 Fuel Design Applicability to Improved SLMCPR, Power Distribution and R-Factor Methodologies", FLN-2001-016, September 24, 2001.
- [5] Letter, Glen A. Watford (GNF-A) to U. S. Nuclear Regulatory Commission Document Control Desk with attention to J.E. Donoghue (NRC), "Confirmation of Applicability of the GEXL14 Correlation and Associated R-Factor Methodology for Calculating SLMCPR Values in Cores Containing GE14 Fuel", FLN-2001-017, October 1, 2001.
- [6] GEXL96 Correlation for ATRIUM-9B Fuel, NEDC-32981P, Revision 0, September 2000.
- [7] Letter, G.A. Watford (GNF) to J.E. Donoghue (NRC), Final Presentation Material for GEXL Presentation - February 11, 2002, FLN-2002-004, February 12, 2002.
- [8] GNF-A design record file (DRF) 0000-0003-2122 titled "Quad Cities 1 Cycle 18 – Safety Limit MCPR (SLMCPR)".

Comparison of Quad Cities Unit 1 SLMCPR Values for Cycles 18 and 17, 17A

Table 1 summarizes the relevant input parameters and results of the SLMCPR determination for the Quad Cities Unit 1 Cycle 18 and 17 cores. The SLMCPR evaluations were performed using NRC approved methods and uncertainties^[1], supplemented with Quad Cities Unit 1 specific uncertainties. These calculations use the GEXL14 correlation for GE14 fuel and GEXL96^[6] for the SPC fuel. The SLMCPR evaluations for Cycle 17 and 17A were performed by SPC. The quantities that have been shown to have some impact on the determination of the safety limit MCPR (SLMCPR) are provided.

In general, the calculated safety limit is dominated by two key parameters: (1) flatness of the core bundle-by-bundle MCPR distributions and (2) flatness of the bundle pin-by-pin

power/R-factor distributions. Greater flatness in either parameter yields more rods susceptible to boiling transition and thus a higher calculated SLMCPR.

[[]]

Pin-by-pin power distributions are characterized in terms of R-factors using the NRC approved methodology^[2]. [[]]

Summary

[[]] have been used to compare quantities that impact the calculated SLMCPR value. The calculated 1.10 Monte Carlo SLMCPR for Quad Cities Unit 1 Cycle 18 is consistent with what one would expect [[]]

Based on all of the facts, observations and arguments presented above, it is concluded that the calculated SLMCPR value of 1.10 for the Quad Cities Unit 1 Cycle 18 core is appropriate.

For single loop operations (SLO) the calculated safety limit MCPR for the limiting case is 1.11 as determined by specific calculations for Quad Cities Unit 1 Cycle 18.

Supporting Information

The following information is provided in response to NRC questions on similar submittals regarding changes in Technical Specification values of SLMCPR. NRC questions pertaining to how GE14 applications satisfy the conditions of the NRC SER^[1] have been addressed in Reference [4]. Other generically applicable questions related to application of the GEXL14 correlation and the applicable range for the R-factor methodology are addressed in Reference [5]. Only those items that require a plant/cycle specific response are presented below since all the others are contained in the references that have already been provided to the NRC.

The core loading information for Quad Cities Unit 1 Cycles 17A and 18 is provided in Figures 1 and 2, respectively. The impact of the fuel loading pattern differences on the calculated SLMCPR is correlated to the values of [[]]

The power and non-power distribution uncertainties that are used in the analyses are indicated in Table 2. The referenced document numbers have previously been reviewed and approved by the NRC.

Table 1
Comparison of the Quad Cities Unit 1 Cycle 18 and Cycle 17, 17A SLMCPR

QUANTITY, DESCRIPTION	Quad Cities Unit 1 Cycle 17	Quad Cities Unit 1 Cycle 17A	Quad Cities Unit 1 Cycle 18
Number of Bundles in Core	724	724	724
Limiting Cycle Exposure Point	N/A	N/A	EOR-1.5K
Cycle Exposure at Limiting Point [MWd/MTU]	N/A	N/A	15500
Reload Fuel Type	ATRIUM-9B	ATRIUM-9B	GE14
Latest Reload Batch Fraction [%]	32.6%	0%	40.9%
Latest Reload Average Batch Weight % Enrichment	3.82%	0%	4.10%
Batch Fraction for GE14	0%	0%	40.9%
Batch Fraction for ATRIUM-9B	60.1%	60.1%	59.1%
Batch Fraction for GE10	39.9%	39.9%	0%
Core Average Weight % Enrichment	3.52%	3.52%	3.85%
Core MCPR (for limiting rod pattern)	N/A	N/A	1.49
[[]]
[[]]
Power distribution uncertainty	N/A	N/A	See Table 2, Column 2
Non-power distribution uncertainty	N/A	N/A	See Table 2, Column 2
Calculated Safety Limit MCPR	1.11¹	1.15¹	1.10²

¹ SPC Safety Limit MCPR of 1.11/1.15 includes the effects of channel bow per SPC approved method.

² GNF Safety Limit MCPR of 1.10 does not include the effects of channel bow per GNF approved method.
Such effects are incorporated in the Operating Limit.

Table 2
Inputs for modeling the plant system uncertainties for the GETAB and Quad Cities Unit 1
Cycle 18 Models

DESCRIPTION	COLUMN 1 Uncertainty Values (%)	COLUMN 2 Quad Cities Unit 1 Specific Values (%)
Non-power Distribution Uncertainties	(NEDC-32601P-A)	
Core flow rate (derived from pressure drop)	2.5 TLO 6.0 SLO	2.5 TLO 6.0 SLO
Individual channel flow area	2.0	2.0
Individual channel friction factor	5.0	5.0
Friction factor multiplier	6.0	6.0
Reactor pressure	0.7	0.7
Core inlet temperature	0.2	0.2
Feedwater temperature	0.8	0.8
Feedwater flow rate	1.8	2.3
Power Distribution Uncertainties	GETAB Values (%) (NEDO-10958-A)	
GEXL R-factor	1.6	1.6
Random effective TIP reading	1.2 TLO 2.85 SLO	1.2 TLO 2.85 SLO
Systematic effective TIP reading	8.6	10.0
Integrated effective reading	0.0	0.0
Bundle power	0.0	0.0
Effective total bundle power uncertainty*	4.3	5.0

*Derived quantities (derived from proceeding modeling uncertainties).

Assessment of Potential Penalty [[]]

In a meeting with the NRC staff on February 11, 2002 (Reference [7]) [[]] To evaluate the impact on SLMCPR, the process described in Reference [7] was applied to Quad Cities Unit 1, Cycle 18. The results are shown in Table 3.

Table 3

Net Adjustment to SLMCPR [[]]		Dual Loop Operation		Single Loop Operation	
		0 – 12	12 – EOC	0 – 12	12 – EOC
	Exposure Range (GWD/MT)	0 – 12	12 – EOC	0 – 12	12 – EOC
	Proposed Tech Spec SLMCPR	1.10	1.10	1.11	1.11
Step	Calculated M/C SLMCPR	[[]]]
1	Margin to Proposed SLMCPR	[[]]]
2,3	[[]]]
4	Credit for Reduced Uncertainties	[[]]]
	[[]]]
	Net unrounded change	[[]]]
	Adjusted SLMCPR with rounding	1.07	1.10	1.08	1.11
	Requested SLMCPR for Tech Specs	1.10	1.10	1.11	1.11

Step 5 credit applies only for OLMCPR and is not relevant for Tech Specs under review.

[[]]

[[]] The details for the cycle-specific assessment that was performed for Quad Cities Unit 1, Cycle 18 are documented in Reference [8].

[[]]

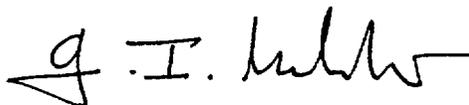
Therefore, as indicated in Table 3, the requested SLMCPR values of 1.10 for Dual Loop Operation (DLO) and 1.11 for the Single Loop Operation (SLO) Technical Specification SLMCPR for Quad Cities Unit 1, Cycle 18 are appropriate. [[]]

Prepared by:

Verified by:

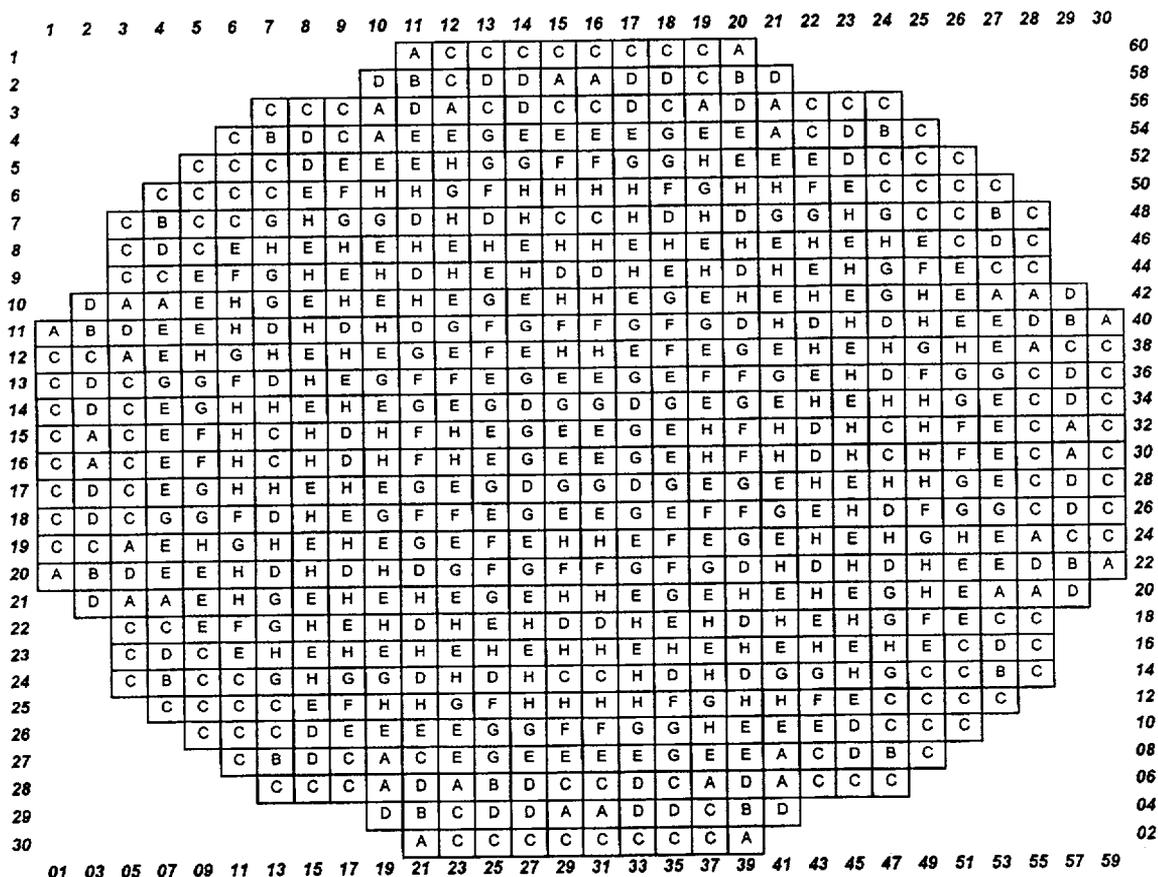


H. Zhang
Technical Program Manager



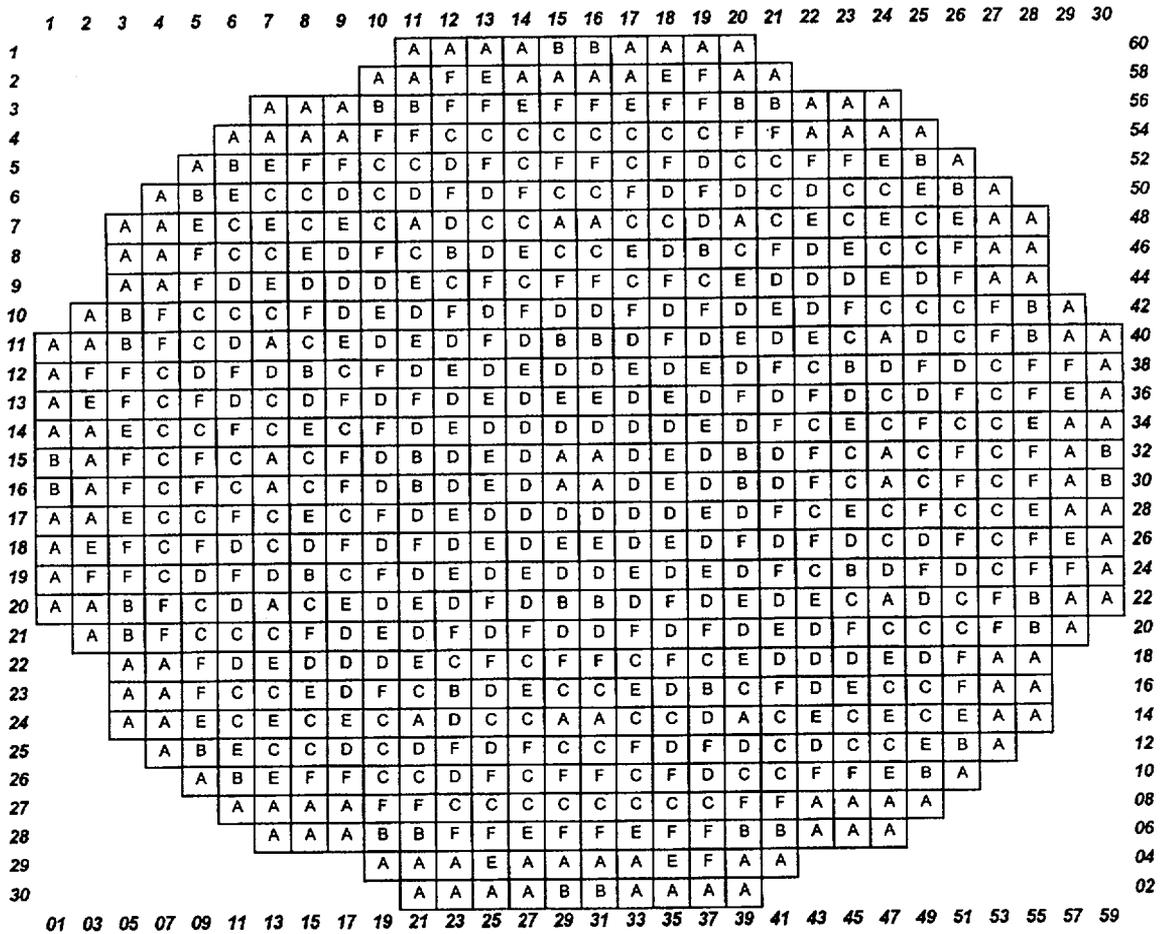
G.I. Maldonado
Technical Program Manager

Figure 1 Reference Core Loading Pattern – Cycle 17A



Bundle Name	Number in Core	Cycle Loaded
A GE10-P8HXB311-8GZ-100T-145-T6-3869	40	14
B GE10-P8HXB312-7GZ-100T-145-T6-3870	17	14
C GE10-P8HXB332-8G5.0-100T-145-T6-3872	144	15
D GE10-P8HXB333-4G5.0/6G4.0-100T-145-T6-3871	88	15
E ATRM9-P9DATB348-11G6.5-SPC100T-9WR-144-T6-2444	152	16
F ATRM9-P9DATB360-11G6.5-SPC100T-9WR-144-T6-2445	48	16
G ATRM9-P9DATB383-11GZ-SPC100T-9WR-144-T6-2446	92	17
H ATRM9-P9DATB382-12GZ-SPC100T-9WR-144-T6-2438	143	17
Total	724	

Figure 2 Reference Core Loading Pattern – Cycle 18



Bundle Name	Number in Core	Cycle Loaded
A ATRM9-P9DATB348-11G6.5-SPC100T-9WR-144-T6-2444	145	16
B ATRM9-P9DATB360-11G6.5-SPC100T-9WR-144-T6-2445	48	16
C GE14-P10DNAB411-14GZ-100T-145-T6-2564	152	18
D GE14-P10DNAB409-15GZ-100T-145-T6-2565	144	18
E ATRM9-P9DATB383-11GZ-SPC100T-9WR-144-T6-2446	92	17
F ATRM9-P9DATB382-12GZ-SPC100T-9WR-144-T6-2438	143	17
Total	724	