CP&L
A Progress Energy Company

John S. Keenan
Vice President
Brunswick Nuclear Plant

SEP 1 8 2001

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TSC-2001-11

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1
DOCKET NO. 50-325/LICENSE NO. DPR-71
REQUEST FOR LICENSE AMENDMENT
REVISION OF MINIMUM CRITICAL POWER RATIO SAFETY LIMIT VALUES

Ladies and Gentlemen:

In accordance with the Code of Federal Regulations, Title 10, Parts 50.90 and 2.101, Carolina Power & Light (CP&L) Company requests a revision to the Technical Specifications for the Brunswick Steam Electric Plant (BSEP), Unit No. 1. The proposed license amendment revises the Minimum Critical Power Ratio (MCPR) Safety Limit values contained in Specification 2.1.1.2 from 1.10 to 1.12 for two recirculation loop operation and from 1.11 to 1.14 for single recirculation loop operation. The basis for these changes is provided in Enclosure 1.

In a letter dated August 9, 2001 (Serial: BSEP 01-0086), CP&L submitted a license amendment application to increase the maximum power level authorized by Section 2.C.(1) of the BSEP, Unit 1 and 2 Operating Licenses from 2558 megawatts thermal (MWt) to 2923 MWt. The revised MCPR Safety Limit values provided herein are based on a maximum power level of 2923 MWt, which is 120 percent of the original licensed power level for BSEP, Unit 1. For a fixed core design, the MCPR Safety Limit results at higher power levels bound those calculated at lower power. Therefore, the revised MCPR Safety Limit values are acceptable for use during BSEP, Unit 1, Cycle 14 operation at any power level up to 120 percent of the original licensed maximum power.

Enclosure 1 provides a description of the proposed changes and an explanation of the basis for the changes. A summary of the relevant input parameters and results of a comparison of the Unit 1 Cycle 13 and Unit 1 Cycle 14 MCPR Safety Limit values is provided in Enclosure 2. The information in Enclosure 2 was provided by Global Nuclear Fuel; this information is considered to be proprietary to Global Nuclear Fuel and should be withheld from public disclosure in accordance with 10 CFR 9.17(a)(4) and 10 CFR 2.790(a)(4). An affidavit attesting to this fact is provided in Enclosure 3. A non-proprietary version of the Global Nuclear Fuel information is provided in Enclosure 4.

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As discussed in Enclosure 5, this license amendment application does not involve a significant hazard consideration in accordance with 10 CFR 50.92. Also, as discussed in Enclosure 6, CP&L has determined that this license amendment request meets the criteria of 10 CFR 51.22(c)(9) for a categorical exclusion from the requirements for an Environmental Assessment.

CP&L requests issuance of the license amendment by March 15, 2002, to coincide with the Unit 1 Refueling Outage 13 (i.e., designated as B114R1). CP&L requests that the Unit 1 amendment, once approved, be issued with an implementation to occur prior to start-up for Unit 1 Cycle 14 operation.

In accordance with 10 CFR 50.91(b), CP&L is providing a copy of this license amendment application to Mr. Mel Fry of the State of North Carolina. In accordance with 10 CFR 50.4(b)(1), CP&L is providing a copy of this license amendment application to the NRC Region II Office and the BSEP Resident Inspector.

Please refer any questions regarding this submittal to Mr. David C. DiCello, Manager – Regulatory Affairs, at (910) 457-2235.

Sincerely,

John S. Keenan

John S. Keenan

WRM/wrm

Enclosures:

1. Basis For Change Request
2. Global Nuclear Fuel Document Entitled "Additional Information Regarding the Cycle Specific SLMCPR for Brunswick Unit 1 Cycle 14" **(Proprietary Information)**
3. Global Nuclear Fuel Affidavit Regarding Withholding from Public Disclosure
4. Global Nuclear Fuel Document Entitled "Additional Information Regarding the Cycle Specific SLMCPR for Brunswick Unit 1 Cycle 14" **(Non-Proprietary Version)**
5. 10 CFR 50.92 Evaluation
6. Environmental Considerations
7. Page Change Instructions
8. Typed Technical Specification Pages - Unit 1
9. Marked-up Technical Specification Pages - Unit 1

John S. Keenan, having been first duly sworn, did depose and say that the information contained herein is true and correct to the best of his information, knowledge and belief; and the sources of his information are officers, employees, and agents of Carolina Power & Light Company.

M. A. Turlal
Notary (Seal)

My commission expires: May 18, 2003

cc (with enclosures):

U. S. Nuclear Regulatory Commission, Region II
ATTN: Mr. Bruce S. Mallett, Acting Regional Administrator
Sam Nunn Atlanta Federal Center
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U. S. Nuclear Regulatory Commission
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8470 River Road
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ATTN: Mr. Donnie J. Ashley (Mail Stop OWFN 8G9)
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Rockville, MD 20852-2738

cc (without Enclosure 2):

Ms. Jo A. Sanford
Chair - North Carolina Utilities Commission
P.O. Box 29510
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Mr. Mel Fry
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ENCLOSURE 1

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1
DOCKET NO. 50-325/LICENSE NO. DPR-71
REQUEST FOR LICENSE AMENDMENT
REVISION OF MINIMUM CRITICAL POWER RATIO SAFETY LIMIT VALUES

Basis For Change Request

Introduction

In accordance with the Code of Federal Regulations, Title 10, Parts 50.90 and 2.101, Carolina Power & Light (CP&L) Company requests a revision to the Technical Specifications for the Brunswick Steam Electric Plant (BSEP), Unit No. 1. The license amendment application revises the Minimum Critical Power Ratio (MCPR) Safety Limit values contained in Specification 2.1.1.2 from 1.10 to 1.12 for two recirculation loop operation and from 1.11 to 1.14 for single recirculation loop operation.

Current Requirement

Specification 2.1.1.2 states:

> With the reactor steam dome pressure ≥ 785 psig and core flow ≥ 10% rated core flow:
>
> MCPR shall be ≥ 1.10 for two recirculation loop operation or ≥ 1.11 for single recirculation loop operation.

Proposed Change

Revise Specification 2.1.1.2 to state:

> With the reactor steam dome pressure ≥ 785 psig and core flow ≥ 10% rated core flow:
>
> MCPR shall be ≥ 1.12 for two recirculation loop operation or ≥ 1.14 for single recirculation loop operation.

Basis For Proposed Change

Specification 2.1.1.2 establishes a MCPR Safety Limit value, which if not exceeded, ensures that no mechanistic fuel damage is calculated to occur. Since the parameters which result in fuel

damage are not directly observable during reactor operation, the thermal and hydraulic conditions resulting in a departure from nucleate boiling (i.e., transition boiling) have been used to designate the beginning of the region where fuel damage could occur. Although it is recognized that a departure from nucleate boiling would not necessarily result in damage to boiling water reactor fuel rods, the critical power at which boiling transition is calculated to occur has been adopted as a convenient limit. However, uncertainties in monitoring the core operating state and in the procedures used to calculate the critical power result in an uncertainty in the value of the critical power. Therefore, the MCPR Safety Limit is defined as the critical power ratio in the limiting fuel assembly for which more than 99.9 percent of the fuel rods in the core are expected to avoid boiling transition, considering the power distribution within the core and all uncertainties.

The Global Nuclear Fuel methodology for MCPR Safety Limit determination for each fuel design is contained in topical report NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel (GESTAR II)." To address NRC concerns relating to the methodologies and procedures for determining cycle-specific MCPR Safety Limits, Global Nuclear Fuel (under the corporate name of General Electric) submitted several topical reports for NRC review and approval. These topical reports include: (1) description of the procedures used to account for the reload-specific core design and operation in determining the cycle-specific MCPR Safety Limit in NEDC-32601P; (2) the power distribution uncertainty for the new GE 3D-MONICORE core surveillance system in NEDC-32694P; and (3) the methodology and uncertainties required for the implementation of cycle-specific MCPR Safety Limits in Amendment 25 to NEDE-24011-P-A. By letter dated March 11, 1999, from Frank Akstulewicz, NRC, to Glen Watford, General Electric, the NRC approved the use of Amendment 25 to NEDE-24011-P-A. Amendment 25 to NEDE-24011-P-A provides methods and uncertainties required for implementing cycle-specific MCPR Safety Limits that replace the former, generic, bounding MCPR Safety Limits.

The MCPR Safety Limit analysis for BSEP, Unit 1, Cycle 14 has been performed by Global Nuclear Fuel using the NRC-approved methods and procedures described in topical report NEDE-24011-P-A. Use of the NRC-approved methodologies ensures that the resulting MCPR Safety Limit values satisfy the fuel design safety criteria that more than 99.9 percent of the fuel rods in the core are expected to avoid boiling transition if the safety limits are not exceeded. As a result, the proposed MCPR Safety Limit value changes do not significantly impact any safety analysis assumptions or results.

A summary of the relevant input parameters and results of a comparison of the Unit 1 Cycle 13 and Unit 1 Cycle 14 MCPR Safety Limit values is provided in Enclosure 2. Some of the information contained in the document is considered proprietary by Global Nuclear Fuel and should be withheld from public disclosure in accordance with 10 CFR 9.17(a)(4) and 10 CFR 2.790(a)(4). An affidavit attesting to this fact is provided in Enclosure 3. A non-proprietary version of the Global Nuclear Fuel document is provided in Enclosure 4.

Needed Approval Schedule

CP&L requests issuance of the license amendment by March 15, 2002, to coincide with the Unit 1 Refueling Outage 13 (i.e., designated as B114R1). CP&L requests that the Unit 1 amendment, once approved, be issued with an implementation to occur prior to start-up for Unit 1 Cycle 14 operation.

ENCLOSURE 3

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1
DOCKET NO. 50-325/LICENSE NO. DPR-71
REQUEST FOR LICENSE AMENDMENT
REVISION OF MINIMUM CRITICAL POWER RATIO SAFETY LIMIT VALUES

Global Nuclear Fuel Affidavit
Regarding Withholding from Public Disclosure

Affidavit

I, Glen A. Watford, being duly sworn, depose and state as follows:

(1) I am Manager, Nuclear Fuel Engineering, 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 Brunswick Unit 1 Cycle 14," dated August 9, 2001.

(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.

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.

Affidavit

State of North Carolina)
County of New Hanover) SS:

Glen A. Watford, being duly sworn, deposes and says:

That he has read the foregoing affidavit and the matters stated therein are true and correct to the best of his knowledge, information, and belief.

Executed at Wilmington, North Carolina, this 24th day of August, 2001

Glen A. Watford
Global Nuclear Fuel – Americas, LLC

Subscribed and sworn before me this 24 day of AUGUST, 2001

James E. McGinness

JAMES E. McGINNESS
Notary Public, State of North Carolina
New Hanover County
My Commision Expires 1/23/2006

Notary Public, State of North Carolina

My Commission Expires

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ENCLOSURE 4

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1
DOCKET NO. 50-325/LICENSE NO. DPR-71
REQUEST FOR LICENSE AMENDMENT
REVISION OF MINIMUM CRITICAL POWER RATIO SAFETY LIMIT VALUES

Global Nuclear Fuel Document Entitled
"Additional Information Regarding the
Cycle Specific SLMCPR for Brunswick Unit 1 Cycle 14"
(Non-Proprietary Version)

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 Nos. M99070 and M95081), January 11, 1999.

[3] *General Electric BWR Thermal Analysis Basis (GETAB): Data, Correlation and Design Application*, NEDO-10958-A, January 1977.

Comparison of Brunswick Unit 1 Cycle 14 SLMCPR Value

Table 1 summarizes the relevant input parameters and results of the safety limit MCPR (SLMCPR) determination for the Brunswick Unit 1 Cycle 14 and Cycle 13 cores. The SLMCPR evaluations were performed using NRC approved methods and uncertainties[1]. These evaluations yield different calculated SLMCPR values because different inputs were used. The quantities that have been shown to have some impact on the determination of the SLMCPR are provided.

In comparing the Brunswick Unit 1 Cycle 14 and Cycle 13 SLMCPR values it is important to note the impact of the differences in the core and bundle designs. These differences are summarized in Table 1.

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The uncontrolled bundle pin-by-pin power distributions were compared between the Brunswick Unit 1 Cycle 14 bundles and the Cycle 13 bundles. 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. Based on these comparisons, the conclusion is reached that the Brunswick Unit 1 Cycle 14 core/cycle has a flatter core MCPR distribution [[ ]] and flatter in-bundle power distributions [[ ]] than what was used to perform the Cycle 13 SLMCPR evaluation.

[[double brackets indicate the]]
[[location of proprietary information]]

The calculated 1.12 Monte Carlo SLMCPR for Brunswick Unit 1 Cycle 14 is consistent with what one would expect [[

]] the 1.12 SLMCPR value is appropriate.

Based on all of the facts, observations and arguments presented above, it is concluded that the calculated SLMCPR value of 1.12 for the Brunswick Unit 1 Cycle 14 core is appropriate. It is reasonable that this value is larger than the 1.10 value calculated for the previous cycle.

For single loop operations (SLO) the calculated safety limit MCPR for the limiting case is 1.14 [[
]]

Supporting Information

The following information is provided in response to NRC questions on previous submittals containing GE14 fuel designs.

1. Provide the fuel types and numbers of assemblies used in Brunswick Unit 1 Cycle 14 operation and identify if they are fresh or irradiated fuel (once or twice burned, etc.). Also, provide the fuel loading pattern for Cycle 14 and identify its difference from Cycle 13 and the impact on the SLMCPR calculation.

Response:

The requested core loading information is provided as Figures 1 and 2. The impact of the fuel loading pattern differences on the calculated SLMCPR is correlated to the values of [[

]]

2. The approved methodologies used include NEDC-32694P, NEDC-32601P, Amendment 25 to NEDE-24011P-A, and NEDC-32505P, Revision 1. However, Table 1 indicates that the same power distribution uncertainty in GETAB is used for both Cycle 13 and Cycle 14. Please identify which power distribution uncertainties and SLMCPR uncertainties for SLMCPR are used to support this amendment request.

Response:

The GETAB (NEDO-10958-A) power distribution uncertainties are used for both Cycle 13 and Cycle 14. GETAB is invoked by reference from NEDE-24011P-A. The GETAB power distribution uncertainties are also reported in column 2 of Table 2.1 of NEDC-32601P. For the GETAB methodology, only the "TIP Reading and Bundle Power" and the "TIP Reading Random Uncertainty" values are classified as power distribution uncertainties. The GETAB values for these two quantities given in column 2 of Table 2.1 of NEDC-32601P are the ones that were used for this submittal. The NRC staff has taken the position in their SER dated March 11, 1999 that the non-power distribution uncertainties reported in NEDC-32601P are "revisions" or "updates" to the GETAB values. GE (GNF) has accepted this position so that the revised non-power distribution uncertainties are used for all SLMCPR calculations performed after June 1999 regardless of which approved methodology is used for the power distribution uncertainties. A line has been added to Table 1 to indicate that the revised non-power distribution uncertainties from NEDC-32601P-A Table 2.1 were used for Brunswick Unit 1 Cycle 14.

3. Provide the details for R-Factor calculation for GE14 fuel and provide the data bases to justify that the approach is conservative with respect to the approved method stated in NEDC-32505P, Revision 1.

Response:

Calculation of GE14 R-factors follows the approved methodology of NEDC-32505P Revision 1. The R-factor calculations consist of three essential components: the weight scheme for combining rod peaking factors, the additive constants for adjusting individual position performance and the behavior for partially controlled conditions. The weighting scheme of GE14 is identical to that of GE12 because the two bundles are identical in the lattice geometry. The GE14 bundle is similar to the GE12 bundle. It is a 10x10 design with 78 full length rods, 14 part length rods and 2 large central water rods. The location of the part length rods and the water rods are identical. The main difference is that the length of the part length rods and the spacer locations are slightly different. The additive constants are derived from the test data along with the GEXL coefficients. For partially controlled conditions, the bundle R-factors are calculated based on the prescribed axial power shapes that correspond to the specific GEXL correlation. [[

]] The process used for GE14 is the same as the approved methodology in NEDC-32505PA Revision 1 and the recommendations in the SER.

4. Provide the details for GEXL14 correlation including its development and verification process, and data bases, and justify that the GEXL14 correlation is conservative.

Response:

Section 1.2.7 of NEDE-24011-P-A (GESTAR II) provides the conditions by which a GEXL correlation may be developed and documented. Explicit NRC approval of the "GEXL topical report" is not required under the NRC-approved provisions of Amendment 22 to GESTAR II.

An overview of the evaluations performed for GE14 fuel was provided previously in NEDC-32868P, Revision 0, December 1998 titled "GE14 Compliance with Amendment 22 of NEDE-24011-P-A (GESTAR II)". This document was transmitted by G. A. Watford (GE) letter MFN-045-98 dated December 11, 1998 to the attention of M. J. Davis at the NRC Document Control Desk. Section 2.8.3 of this document describes the GEXL14 correlation.

Additional supporting details were provided previously by separate transmittal of "GEXL14 Correlation for GE14 Fuel", NEDC-32851P, Revision 1, September 1999. This document was transmitted by G.A. Watford (GE) letter FLN-2000-12 dated August 8, 2000 to the NRC Document Control Desk and to the attention of Tai L. Huang (NRC). Section 3 of NEDC-32851P, Revision 1 describes the database used to develop the GEXL14 correlation for GE14 fuel.

GEXL14 correlation is developed based on the full scale ATLAS test data. The full scale test data were used to generate the GEXL coefficients as well as the additive constants for R-factor calculations to accurately predict the data points over the application range. The report "GE14 Compliance with Amendment 22 of NEDE-24011-P-A (GESTAR II)" documents the GEXL14 data and verification base. The database used to develop the GEXL14 correlation consists of [[ ]] different test assemblies. This correlation development database consisted of a total of [[ ]] critical power data points. The database used to verify the GEXL14 correlation consists of [[ ]] different test assemblies. The correlation verification database consisted of a total of [[ ]] data points. [[

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The GEXL14 correlation is valid for GE14 fuel over the following range of state points:

	Database range	Correlation application range
Pressure:	[[	]]
Mass Flux:	[[	]]
Inlet Subcooling:	[[	]]
R-factor:	[[	]]
*exception		[[ ]]

[[

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The GEXL14 correlation like previous GEXL correlations is derived as a best fit to the ATLAS critical power data. The GEXL correlation is not intended to be conservative. The GEXL correlation is derived following the process described in GESTAR II (NEDE-24011-P-A-14) Section 1.1.7.C.iv "Correlation fit to data shall be best fit". The bias and uncertainty in the correlation is determined as specified in GESTAR Section 1.1.7. The overall GEXL14 uncertainty is [[ ]]. This uncertainty is an explicit input to the approved SLMCPR methodology.

5. Provide justification that the impacts of low R-factor and low subcooling are reflected in developing the overall bias and uncertainty, inaccuracies associated with the GEXL correlation are accounted for in the SLMPCR calculation. Also, identify the analysis and the data bases available in the approved topical report.

Response:

The "GEXL14 Correlation for GE14 Fuel", NEDC-32851P, Revision 1, September 1999 was transmitted by G.A. Watford (GE) letter FLN-2000-12 dated August 8, 2000 to the NRC Document Control Desk and to the attention of Tai L. Huang (NRC). Section 3 of NEDC-32851P, Revision 1 describes the database used to develop the GEXL14 correlation for GE14 fuel.

[[

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It is difficult to predict and therefore detect the rod location of the boiling transition in a bundle with low R-factor because many rods show the same vulnerability to boiling transition; nevertheless, the critical power value itself is well-predicted. This fact is supported by the lack of any trend in the correlation error as the lower R-factor values are approached. The second point is that the GEXL14

correlation exhibits the typical almost-linear behavior in the critical quality for low R-factor values that one would expect [[

]]

6. The staff approved those methodologies cited in Question 2 with one condition that the 3D-MONICORE bundle power calculational uncertainty should be verified when applied to fuel and core designs not included in the benchmark comparisons in Tables 3.1 and 3.2 of NEDC-32694P, and three actions should be taken for application of NEDC-32601P for a new fuel. GE14 is considered a new fuel at the time the staff approved those licensing topical reports, therefore, provide the details of the actions taken and verification for Brunswick Unit 1 Cycle 14 operation.

Response:

The referenced requirement for 3D-MONICORE and the three actions pertaining to NEDC-32601P correspond to the four items listed as the NRC's Technical Position in Enclosure 2 accompanying their SER dated March 11, 1999 approving NEDC-32601P and NEDC-32694P. The NRC positions are quoted here together with the actions taken to satisfy each item. Item (a) is the specific requirement from NEDC-32694P that pertains to 3D-MONICORE. Items (b), (c) and (d) are the three actions pertaining to NEDC-32601P referred to in the question.

Item (a): Since changes in the fuel and core design can have a significant effect on the calculation accuracy, the 3D-MONICORE bundle power calculational uncertainty should be verified when applied to fuel and core designs not included in the benchmark comparisons of Tables-3.1 and 3.2 of NEDC-32694P.

This item pertains only to the application of the reduced power distribution uncertainties and methodology given in NEDC-32694P. This item or part of the question is not applicable when the original GETAB methodology and uncertainties are used. The original GETAB methodology and uncertainties have been demonstrated to be sufficiently conservative to be generically applicable to all GE fuel designs. In fact, the GETAB methodology has been shown to be sufficiently conservative to also be applicable to some fuels and monitoring systems not developed by GE. Note that the original GETAB methodology and uncertainties produces SLMCPR values that are on the order of [[ ]] than the SLMCPR values produced using the methodology and reduced uncertainties defined in NEDC-32694P. The original approved GETAB methodology and uncertainties were used since the additional CPR margin that is provided by taking credit for the excessive GETAB conservatism was not required to efficiently operate Brunswick Unit 1 Cycle 14.

Item (b): Since changes in fuel design can have a significant effect on the calculation accuracy, the TGBLA fuel rod power calculational uncertainty should be verified when applied to fuel designs not included in the benchmark comparisons of Table 3.1 of NEDC-32601P.

The fidelity of the TGBLA lattice physics calculations for fuel rod powers depend on the lattice designs. The key considerations are the lattice geometry, the location of the water rods, the location of the gadded rods and for vanished-rod lattices the location of the part-length rods. All these characteristics are identical for GE12 and GE14. See the response to question (3) above. Although the length of the part-length rods is different between GE12 and GE14, this has no impact on the lattice calculations which are performed either for a fully-rodded or partially-rodded lattice. Table 3.1 of NEDC-32601P includes several 10x10 lattices. The values given in Table 3.1 for GE12 are representative of the values being calculated for GE14, thus there is no impact.

Item (c): The effect of the correlation of rod power calculation uncertainties should be reevaluated to insure the accuracy of R-Factor uncertainty when the methodology is applied to a new fuel lattice.

The R-factor uncertainty is dominated by the same factors that influence the rod powers as described above for item (b). The uncertainty is the same for GE12 and GE14. The derivation of the uncertainty value is presented for GE 10x10 lattices (i.e., GE12 and GE14) in Appendix C of NEDC-32601P-A.

Item (d): In view of the importance of MIP criterion and its potential sensitivity to changes in fuel bundle designs, core loading and operating strategies, the MIP criterion should be reviewed periodically as part of the procedural review process to insure that the specific value recommended in NEDC-32601P is applicable to future designs and operating strategies.

The calculated value of MIP depends only on two things: [[

]] The GEXL correlation for GE14 was provided in the Amendment 22 submittal for GE14 together with the uncertainty [[ ]] that is needed for the SLMCPR analyses and the calculation of MIP. See also the response to question (4) above. GE (GNF) continues to monitor MIP and periodically assess it as part of their procedural review process. Specific scoping analyses preformed for cores partially and fully-loaded with GE14 fuel have given no indications that suggests that the MIP values from these calculations are statistically distinct from historical data. [[

]] Thus there is no indication that the MIP criteria should be changed.

Prepared by:

G.M. Baka

G.M. Baka
Technical Project Manager
Brunswick Unit 1 Project

Verified by:

E.W. Gibbs

E.W. Gibbs
Technical Project Manager
Global Nuclear Fuel - Americas

Table 1

Comparison of the Brunswick Unit 1 Cycle 14 and Cycle 13 SLMCPR

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]]

Figure 1 Reference Core Loading Pattern – Cycle 13

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
1									19	19	19	20	19	19	20	19	19	19									52
2			Bundle IAT					19	1	1	2	1	3	3	1	2	1	1	19								50
3					20	19	20	19	3	3	4	3	2	2	3	4	3	3	19	20	19	20					48
4				19	19	2	2	3	4	2	4	2	4	4	2	4	2	4	3	2	2	19	19				46
5			20	19	20	2	3	4	2	19	2	4	2	2	4	2	19	2	4	3	2	20	19	20			44
6			19	1	2	3	4	2	19	2	4	4	20	20	4	4	2	19	2	4	3	2	1	19			42
7			20	2	3	4	19	4	4	4	2	4	2	2	4	2	4	4	4	19	4	3	2	20			40
8		19	19	3	4	2	4	2	4	2	4	2	4	4	2	4	2	4	2	4	2	4	3	19	19		38
9	20	1	3	4	2	19	4	4	2	19	4	4	2	2	4	4	19	2	4	4	19	2	4	3	1	20	36
10	19	1	3	2	19	2	4	2	19	2	1	4	20	20	4	1	2	19	2	4	2	19	2	3	1	19	34
11	19	2	4	4	2	4	2	4	4	1	4	2	4	4	2	4	1	4	4	2	4	2	4	4	2	19	32
12	20	1	3	2	4	4	4	2	4	4	2	4	2	2	4	2	4	4	2	4	4	4	2	3	1	20	30
13	19	3	2	4	2	20	2	4	2	20	4	2	19	19	2	4	20	2	4	2	20	2	4	2	3	19	28
14	19	3	2	4	2	20	2	4	2	20	4	2	19	19	2	4	20	2	4	2	20	2	4	2	3	19	26
15	20	1	3	2	4	4	4	2	4	4	2	4	2	2	4	2	4	4	2	4	4	4	2	3	1	20	24
16	19	2	4	4	2	4	2	4	4	1	4	2	4	4	2	4	1	4	4	2	4	2	4	4	2	19	22
17	19	1	3	2	19	2	4	2	19	2	1	4	20	20	4	1	2	19	2	4	2	19	2	3	1	19	20
18	20	1	3	4	2	19	4	4	2	19	4	4	2	2	4	4	19	2	4	4	19	2	4	3	1	20	18
19		19	19	3	4	2	4	2	4	2	4	2	4	4	2	4	2	4	2	4	2	4	3	19	19		16
20			20	2	3	4	19	4	4	4	2	4	2	2	4	2	4	4	4	19	4	3	2	20			14
21			19	1	2	3	4	2	19	2	4	4	20	20	4	4	2	19	2	4	3	2	1	19			12
22			20	19	20	2	3	4	2	19	2	4	2	2	4	2	19	2	4	3	2	20	19	20			10
23				19	19	2	2	3	4	2	4	2	4	4	2	4	2	4	3	2	2	19	19				08
24					20	19	20	19	3	3	4	3	2	2	3	4	3	3	19	20	19	20					06
25								19	1	1	2	1	3	3	1	2	1	1	19								04
26									19	19	19	20	19	19	20	19	19	19									02
	01	03	05	07	09	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	

Bundle Name	IAT	# in Core	# Fresh	Cycle Loaded
GE13-P9DTB403-5G6.0/7G5.0-100T-146-T	1	36	0	12
GE13-P9DTB403-7G6.0/7G5.0-100T-146-T	2	160	0	12
GE13-P9DTB405-5G6.0/7G5.0-100T-146-T	3	52	52	13
GE13-P9DTB402-13G6.0/1G2.0-100T-146-T	4	168	168	13
GE13-P9DTB380-10G5.0A-100T-146-T	19	96	0	11
GE13-P9DTB380-11G5.0A-100T-146-T	20	48	0	11
	Total	560	220	

Figure 2 Reference Core Loading Pattern – Cycle 14

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
1									2	2	2	2	2	2	2	2	2	2									52
2			Bundle IAT					4	3	7	7	3	7	7	3	7	7	3	4								50
3					2	2	2	7	3	6	4	6	4	4	6	4	6	3	7	2	2	2					48
4				2	3	7	7	6	6	6	6	6	6	6	6	6	6	6	6	7	7	3	2				46
5			2	3	6	3	6	6	4	3	5	4	4	4	4	5	3	4	6	6	3	6	3	2			44
6			2	7	3	6	4	5	4	1	5	5	4	4	5	5	1	4	5	4	6	3	7	2			42
7			2	7	6	3	5	4	5	4	5	4	5	5	4	5	4	5	4	5	3	6	7	2			40
8		4	7	6	6	5	4	5	4	5	4	5	4	4	5	4	5	4	5	4	5	6	6	7	4		38
9	2	3	3	6	4	4	5	4	1	4	5	4	1	1	4	5	4	1	4	5	4	4	6	3	3	2	36
10	2	7	6	6	3	1	4	5	4	4	4	5	4	4	5	4	4	4	5	4	1	3	6	6	7	2	34
11	2	7	4	6	5	5	5	4	5	4	5	4	5	5	4	5	4	5	4	5	5	5	6	4	7	2	32
12	1	3	6	6	4	5	4	5	4	5	4	5	4	4	5	4	5	4	5	4	5	4	6	6	3	1	30
13	2	7	4	6	4	4	5	4	1	4	5	4	1	1	4	5	4	1	4	5	4	4	6	4	7	2	28
14	2	7	4	6	4	4	5	4	1	4	5	4	1	1	4	5	4	1	4	5	4	4	6	4	7	2	26
15	1	3	6	6	4	5	4	5	4	5	4	5	4	4	5	4	5	4	5	4	5	4	6	6	3	1	24
16	2	7	4	6	5	5	5	4	5	4	5	4	5	5	4	5	4	5	4	5	5	5	6	4	7	2	22
17	2	7	6	6	3	1	4	5	4	4	4	5	4	4	5	4	4	4	5	4	1	3	6	6	7	2	20
18	2	3	3	6	4	4	5	4	1	4	5	4	1	1	4	5	4	1	4	5	4	4	6	3	3	2	18
19		4	7	6	6	5	4	5	4	5	4	5	4	4	5	4	5	4	5	4	5	6	6	7	4		16
20			2	7	6	3	5	4	5	4	5	4	5	5	4	5	4	5	4	5	3	6	7	2			14
21			2	7	3	6	4	5	4	1	5	5	4	4	5	5	1	4	5	4	6	3	7	2			12
22			2	3	6	3	6	6	4	3	5	4	4	4	4	5	3	4	6	6	3	6	3	2			10
23				2	3	7	7	6	6	6	6	6	6	6	6	6	6	6	6	7	7	3	2				08
24					2	2	2	7	3	6	4	6	4	4	6	4	6	3	7	2	2	2					06
25								4	3	7	7	3	7	7	3	7	7	3	4								04
26									2	2	2	2	2	2	2	2	2	2									02
	01	03	05	07	09	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	

Bundle Name	IAT	# in Core	# Fresh	Cycle Loaded
GE13-P9DTB403-5G6.0/7G5.0-100T-146-T	1	28	0	12
GE13-P9DTB403-7G6.0/7G5.0-100T-146-T	2	64	0	12
GE13-P9DTB405-5G6.0/7G5.0-100T-146-T	3	52	0	13
GE13-P9DTB402-13G6.0/1G2.0-100T-146-T	4	168	0	13
GE14-P10DNAB416-17GZ-100T-150-T-2496	5	112	112	14
GE14-P10DNAB425-16GZ-100T-150-T-2497	6	88	88	14
GE14-P10DNAB438-12G6.0-100T-150-T-2498	7	48	48	14
	Total	560	248	

ENCLOSURE 5

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1
DOCKET NO. 50-325/LICENSE NO. DPR-71
REQUEST FOR LICENSE AMENDMENT
REVISION OF MINIMUM CRITICAL POWER RATIO SAFETY LIMIT VALUES

10 CFR 50.92 Evaluation

Carolina Power & Light (CP&L) Company is requesting a change to the Brunswick Steam Electric Plant (BSEP), Unit No. 1 Technical Specifications (TS) to revise the Minimum Critical Power Ratio (MCPR) Safety Limit values contained in Specification 2.1.1.2. The proposed changes revise the MCPR Safety Limit values from 1.10 to 1.12 for two recirculation loop operation and from 1.11 to 1.14 for single recirculation loop operation. CP&L has determined that these proposed changes do not involve a Significant Hazards Consideration. In support of this determination, an evaluation of each of the three (3) standards set forth in 10 CFR 50.92 is provided below.

1. The proposed license amendments do not involve a significant increase in the probability or consequences of an accident previously evaluated.

   The proposed license amendment will establish MCPR Safety Limit values of 1.12 for two recirculation loop operation and 1.14 for single recirculation loop operation. The revised MCPR Safety Limit values have been determined using NRC-approved methods and procedures. These procedures incorporate cycle-specific parameters and reduced power distribution uncertainties in the determination of the MCPR Safety Limit values. These proposed MCPR Safety Limit values do not affect the operability of any plant systems nor do these revised values compromise any fuel performance limits. Therefore, the proposed change to the MCPR Safety Limit values does not result in an increase in the probability of a previously evaluated accident.

   The consequences of a previously evaluated accident are dependent on the initial conditions assumed for the analysis, the behavior of the fuel during the accident, the availability and successful functioning of the equipment assumed to operate in response to the accident, and the setpoints at which these actions are initiated. The MCPR Safety Limit values are determined to ensure that 99.9 percent of the fuel rods will not experience boiling transition during any plant operation if the limit is not exceeded. Operational MCPR limits will be applied that ensure the MCPR Safety Limit is not exceeded during all modes of operation and anticipated operational occurrences. The MCPR Safety Limit does not impact the source term or pathways assumed in accidents previously evaluated. No analysis assumptions are violated, and there are no adverse effects on the factors contributing to offsite and onsite dose. The proposed change to the MCPR Safety Limit values does not affect the performance of any equipment used to mitigate the consequences of a previously evaluated accident. Also, the proposed change

does not affect setpoints that initiate protective or mitigative actions. Based on the determination of the MCPR Safety Limit values using conservative NRC-approved methods and the operability of plant systems designed to mitigate the consequences of accidents not being changed, the proposed changes to the MCPR Safety Limit values does not significantly increase the consequences of a previously evaluated accident.

2. The proposed license amendments will not 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. This proposed license amendment does not involve any facility modifications, and plant equipment will not be operated in a different manner. Also, no new initiating events or transients result from the MCPR Safety Limit changes. As a result, no new failure modes are being introduced. Therefore, the proposed changes to the MCPR Safety Limit values will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. The proposed license amendments do not involve a significant reduction in a margin of safety.

   The margin of safety is established through the design of the plant structures, systems, and components; through the parameters within which the plant is operated; through the establishment of setpoints for actuation of equipment relied upon to respond to an event; and through margins contained within the safety analyses. The proposed change to the MCPR Safety Limit values does not adversely impact the performance of plant structures, systems, components, and setpoints relied upon to respond to mitigate an accident. The MCPR Safety Limit values have been calculated using NRC-approved methods and procedures. The MCPR Safety Limit values are determined to ensure that 99.9 percent of the fuel rods will not experience boiling transition during any plant operation if the limits are not exceeded, thereby ensuring that fuel cladding integrity is maintained. Based on the assurance that the fuel design criteria are being met, the proposed changes do not involve a significant reduction in a margin of safety.

ENCLOSURE 6

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1
DOCKET NO. 50-325/LICENSE NO. DPR-71
REQUEST FOR LICENSE AMENDMENT
REVISION OF MINIMUM CRITICAL POWER RATIO SAFETY LIMIT VALUES

Environmental Considerations

Carolina Power & Light (CP&L) Company has concluded that the proposed license amendment revising the Minimum Critical Power Ratio (MCPR) Safety Limit values contained in Specification 2.1.1.2 from 1.10 to 1.12 for two recirculation loop operation and from 1.11 to 1.14 for single recirculation loop operation are eligible for categorical exclusion from performing an environmental assessment. In support of this determination, an evaluation of each of the three (3) criteria set forth in 10 CFR 51.22(c)(9) is provided below.

1. The proposed changes do not involve a Significant Hazards Consideration, as shown in Enclosure 5.

2. The proposed changes do not result in a significant change in the types or a significant increase in the amounts of any effluent that may be released offsite. The proposed changes do not introduce any new equipment nor require any existing equipment or systems to perform a different type of function than they are presently designed to perform. The proposed changes do not alter the function of existing equipment and will ensure that the consequences of any previously evaluated accident do not increase. Therefore, CP&L has concluded that there will not be a significant increase in the types or amounts of any effluent that may be released offsite and, as such, the changes do not involve irreversible environmental consequences beyond those already associated with normal operation.

3. The revised MCPR Safety Limit values, as determined using NRC-approved methodologies, will ensure the integrity of the fuel is maintained during normal operation. Therefore, the proposed changes does not result in an increase in individual or cumulative occupational radiation exposure.

ENCLOSURE 7

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1
DOCKET NO. 50-325/LICENSE NO. DPR-71
REQUEST FOR LICENSE AMENDMENT
REVISION OF MINIMUM CRITICAL POWER RATIO SAFETY LIMIT VALUES

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ENCLOSURE 8

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1
DOCKET NO. 50-325/LICENSE NO. DPR-71
REQUEST FOR LICENSE AMENDMENT
REVISION OF MINIMUM CRITICAL POWER RATIO SAFETY LIMIT VALUES

Typed Technical Specification Pages - Unit 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 ≤ 25% RTP.

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

MCPR shall be ≥ 1.12 for two recirculation loop operation or ≥ 1.14 for single recirculation loop operation.

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 ≤ 1325 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.

ENCLOSURE 9

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1
DOCKET NO. 50-325/LICENSE NO. DPR-71
REQUEST FOR LICENSE AMENDMENT
REVISION OF MINIMUM CRITICAL POWER RATIO SAFETY LIMIT VALUES

Marked-up Technical Specification Pages - Unit 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 ≤ 25% RTP.

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

1.12

MCPR shall be ≥ ~~1.10~~ for two recirculation loop operation or ≥ ~~1.11~~ for single recirculation loop operation.

1.14

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 ≤ 1325 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.