Georgia Power Company
333 Piedmont Avenue
Atlanta, Georgia 30308
Telephone 404 526-3195

Mailing Address
40 Inverness Center Parkway
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Birmingham, Alabama 35201
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J. D. Woodard
Senior Vice President

the southern electric system

January 27, 1997

Docket Nos. 50-366

HL-5303

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Edwin I. Hatch Nuclear Plant-Unit 2
Response to Request for Additional Information:
Safety Limit Minimum Critical Power Ratios (SLMCPRs)

Gentlemen:

By letter dated December 3, 1996, Georgia Power Company (GPC) submitted a request to revise the Plant Hatch Unit 2 Technical Specifications to change the Safety Limit Minimum Critical Power Ratios (SLMCPRs). In a telephone conversation on January 10, 1997, the NRC staff requested GPC to provide additional information concerning the calculation of the revised SLMCPRs and requested that certain vendor information referenced in the submittal be deleted because it could not be obtained for NRC review. In response, GPC requests that General Electric (GE) letter REK:96-382, included in Enclosure 5 of the December 3, 1996 change request, be replaced by the attached GE letter REK:97-012. The enclosure provides the GPC response to the request for additional information.

Certain information in the enclosure was provided by GE Nuclear Energy and is considered to be GE proprietary information as described in 10 CFR 2.790(a)(4) and the attached affidavit. It is requested that this information be withheld from public disclosure. Proprietary information is denoted by brackets in the right hand margins. A nonproprietary version of the GPC response to the request for additional information is attached for public disclosure.

Should you have any questions in this regard, please contact this office.

Sincerely,

J. D. Woodard

IFL/eb

APO1

Ltr and
change distribution NRC PDR 1 1 w/o encl

Enclosure: GPC Response to Request for Additional Information

Attachments:

1. GE L[illegible] REK:97-012
2. Affida[illegible] of Proprietary Information
3. Nonproprietary Version of the GPC Response to Request for Additional Information

cc: *Georgia Power Company*
Mr. H. L. Sumner, Nuclear Plant General Manager
NORMS

U. S. Nuclear Regulatory Commission, Washington, D. C.
Mr. K. Jabbour, Licensing Project Manager - Hatch

U. S. Nuclear Regulatory Commission, Region II
Mr. L. A. Reyes, Regional Administrator
Mr. B. L. Holbrook, Senior Resident Inspector - Hatch

Attachment 1

GE Letter REK:97-012

GE Nuclear Energy

Richard E. Kingston
Sr. Fuel Project Manager

Nuclear Fuels - Americas
General Electric Company
Castle Hayne Road, P.O. Box 780, M/C A32
Wilmington, NC 28401-0780
910 675-6192
Dial Comm: 8*292-6192
Fx: 910 675-5684

January 14, 1997
REK:97-012

cc: R. G. Cocherell
W. E. Grimme
B. E. Hunt
T. C. Kanellopoulos
G. K. McElroy
W. R. Mertz

JAN 1997

Mr. K. S. Folk, Manager
BWR Core Analysis
Southern Nuclear Operating Company
P. O. Box 1295
Birmingham, AL 35201

Subject: Safety Limit MCPR (SLMCPR) Calculation for Hatch 2 Cycle 14 - Revised letter

Reference: Letter, REK:96-382, "Safety Limit MCPR (SLMCPR) Calculation for Hatch 2 Cycle 14", dated 11/18/96

Dear Mr. Folk:

This is a revision to the reference letter. The only change is that the reference to the procedure used to calculate the SLMCPR has been changed to be suitable for submittal to the NRC. Please supplant the reference letter, which was included in your initial NRC submittal, with this letter.

We have completed calculation of the SLMCPR for Hatch 2 Cycle 14. This calculation is based on the fuel cycle and loading pattern provided by SNC. The core design is the first cycle of operation with a mixed core of GE9 and a full reload of GE13 fuel. The SLMCPR was evaluated at three exposure points over the cycle; BOC, MOC, and EOC-2000 MWd/st. The participation of each fuel type in determining the limit is identified.

This analysis explicitly addresses the GE13 fuel as being the limiting fuel for determination of MCPR thermal limits throughout the cycle and insures that the SLMCPR established near the end of cycle is bounding for the entire cycle.

A description of the procedure used by GE to calculate the SLMCPR has been provided to the NRC (R. J. Reda (GE) to T. E. Collins (NRC), *Proposed Amendment 25 to GE Licensing Topical Report NEDE-24011-P-A (GESTAR II) on Cycle-Specific Safety Limit MCPR*, December 13, 1996 and NEDC-32601P, *Methodology and Uncertainties for Safety Limit MCPR Evaluations*, December, 1996). This submittal is currently under review by the NRC staff.

The results are tabulated below:

EOC SLMCPR	1.12
Single Loop EOC SLMCPR	1.14

Details of this calculation are documented and verified in the DRF.

If you have any questions, please call me.

Yours truly,

Rick Kingston

R. E. Kingston
Senior Fuel Project Manager
M/C A33, (910) 675-6192

rk

Attachment 2

Affidavit of Proprietary Information

Attachment

Affidavit

I, James F. Klapproth, being duly sworn, depose and state as follows:

(1) I am Manager, Product Definition, General Electric Company ("GE") 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 letter, J. D. Woodard (Southern Nuclear Operating Company) to the U. S. Nuclear Regulatory Commission Document Control Desk, *Edwin I. Hatch Nuclear Plant-Unit 2, Response to Request for Additional Information: Safety Limit Minimum Critical Power Ratios (SLMCPRs),* letter number HL-5303, Docket No. 50-366.

(3) In making this application for withholding of proprietary information of which it is the owner, GE 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 General Electric's competitors without license from General Electric 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 General Electric, its customers, or its suppliers;

d. Information which reveals aspects of past, present, or future General Electric customer-funded development plans and programs, of potential commercial value to General Electric;

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 both 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 GE, 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 GE, 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. Access to such documents within GE 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 GE 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 would provide other parties, including competitors, with information related to detailed results of analytical models, methods and processes, including computer codes, which GE has developed, requested NRC approval of, and applied to perform evaluations of the BWR. The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GE asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit–making opportunities. The fuel design and analytical methodology are part of GE's comprehensive BWR safety and technology base, and their 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 GE.

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.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE 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 GE 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 GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

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

James F. Klapproth, 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 23 day of January, 1997.

James F. Klapproth
General Electric Company

Subscribed and sworn before me this 23 day of January, 1997.

Joan M. Anderson

My commission expires on 10/08/2001
Notary Public, State of North Carolina

Attachment 3

Nonproprietary Version of the GPC Response to Request for Additional Information

Enclosure

Edwin I. Hatch Nuclear Plant-Unit 2
Response to Request for Additional Information:
Safety Limit Minimum Critical Power Ratios (SLMCPRs)

INTRODUCTION

In the course of calculating a cycle-specific Safety Limit Minimum Critical Power Ratio (SLMCPR) for another utility, it was determined that the GESTAR II (*General Electric Standard Application for Reactor Fuel,* NEDE-24000-P-A-11[1], and U.S. Supplement NEDE-24011-P-A-11[1]-US, November 17, 1995) fuel type generic SLMCPR may be non-conservative when applied to some core and fuel designs. The U.S. Nuclear Regulatory Commission (USNRC) was informed of this condition in a telephone call by GE on March 27, 1996, and it was the subject of a 10 CFR Part 21 notification from General Electric Nuclear Energy (GENE) dated May 24, 1996.

GENE's calculation of the revised plant-specific SLMCPR values for Hatch-2 Cycle 13 and Cycle 14 are based upon NRC approved methods (*General Electric Standard Application for Reactor Fuel*, NEDE-24011-P-A-11 and U.S. Supplement NEDE-24011-P-A-11-US, November 17, 1995) which have been discussed between GENE and the NRC during their meetings with the NRC staff on April 17, 1996, and May 6 through 10, 1996. The implementing procedures are identical to those used for similar recent analyses (Dockets 50-341, 50-324, 50-325, 50-298, 50-277, et al) and described in GENE's proposed Amendment 25 to GESTAR II (R. J. Reda (GE) to T. E. Collins (NRC), *Proposed Amendment 25 to GE Licensing Topical Report NEDE-24011-P-A (GESTAR II) on Cycle Specific Safety Limit MCPR,* December 13, 1996). These procedures incorporate cycle-specific parameters into the analysis which include: 1) the actual core loading, 2) conservative variations of projected control blade patterns, 3) the actual bundle parameters, and 4) the full cycle exposure range.

The revised SLMCPR values for Hatch-2 Cycle 13 and Cycle 14 were submitted to the NRC in Reference 1. Based on this submittal, the NRC has requested more detailed information concerning the analyses performed to revise the Hatch-2 Cycle 13 and 14 SLMCPRs. This information is provided in the remaining portions of this enclosure.

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[1] Revision 11 has since been superseded by Revision 13 dated August 1996. All the Revision 13 material pertinent to this application is unchanged from Revision 11. For purposes related to evaluation of this application, Revisions 11 and 13 may be considered equivalent and used interchangeably.

Enclosure
Response to Request for Additional Information:
Safety Limit Minimum Critical Power Ratios (SLMCPRs)

HATCH-2 CYCLE 13

Control Rod Pattern Development for the Hatch-2 Cycle 13 SLMCPR Analysis

Projected control blade patterns for the rodded burn through the cycle were used to deplete the core to the cycle exposures to be analyzed. At the desired cycle exposures, the bundle exposure distributions and their associated R-factors were utilized for the SLMCPR cases to be analyzed. The use of different rod patterns to achieve the desired cycle exposure has been shown to have a negligible impact on the actual calculated SLMCPR. An estimated SLMCPR was obtained for an exposure point near beginning of cycle (BOC), middle of cycle (MOC), and end of cycle (EOC) in order to establish which exposure point(s) would produce the highest (most conservative) calculated SLMCPR.

The Safety Limit MCPR is analyzed with radial power distributions that maximize the number of bundles at or near the Operating Limit MCPR during rated power operation. This approach satisfies the stipulation in Reference 2 that the number of rods susceptible to boiling transition be maximized. GENE has established criteria to determine if the control rod patterns and resulting radial power distributions are acceptable. These criteria were discussed with the NRC inspection team during the May 5-9, 1996, inspection of GENE and have since been incorporated into the GENE technical design procedures. These criteria include no gross violations of Technical Specification operating limits (e.g., MCPR, MAPLHGR, LHGR), criticality (calculated, normalized K_{eff} near one), and total ----------. Different rod patterns were analyzed until the criteria on the above parameters were met. The rod pattern search was narrowed by starting from a defined set of patterns known from prior experience to yield the flattest possible MCPR distributions. This was done for three exposure points in the cycle. A Monte Carlo analysis was then performed for the BOC, MOC peak hot excess point and EOC-1000 MWD/STU exposure points to establish the maximum SLMCPR for the cycle.

Comparison of Hatch-2 Cycle 13 SLMCPR versus the Generic GE9 Value

Table 1 summarizes the relevant input parameters and results of the SLMCPR determination for both the generic GE9 core and the Hatch-2 Cycle 13 core.

GESTAR II (Reference 3) specifies that the SLMCPR analysis for a new fuel design shall be performed for a large high power density plant assuming a bounding equilibrium core. The GE9 product line generic SLMCPR (1.06) was determined according to this specification.

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Hatch-2 Cycle 13 is not an equilibrium core. It is a core of all GE9 fuel with varying enrichments (except for four GE-13 Lead Use Assemblies).----------
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The maximum relative power in Hatch-2 Cycle 13 compared to the generic analysis is not significantly different; however, as Table 1 shows, there are considerably different percentages of bundles closer to the core MCPR. Table 1 shows ----------
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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. The Hatch-2 Cycle 13 core has a much flatter core MCPR distribution than the generic GE9 equilibrium core due to the conventional scatter load design. This is the primary reason the calculated SLMCPR for the Hatch-2 Cycle 13 core is 0.02 higher than the calculated SLMCPR for the generic GE9 equilibrium core.

Another important difference is that the Cycle 13 SLMCPR analysis has ----------
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---, one is assured of having the flattest possible pin-by-pin R-factors in the SLMCPR calculation. By design, the R-factor distributions are optimized for their uncontrolled state, and control blade insertion causes the distributions to become more peaked (or less flat). Therefore, the most conservative approach is to perform the SLMCPR calculation where the "base" rod pattern places all the potentially limiting bundles in an uncontrolled state. This contrasts

to the GE9 generic study where only about ---------- were uncontrolled.

The SLMCPR adder for single loop operation was examined for applicability after the increase in base SLMCPR. Although no specific single loop SLMCPR calculation was performed for Hatch-2 Cycle 13, a number of plant-specific single loop operation SLMCPR calculations have been performed. These calculations use the same procedure described above for the cycle-specific dual loop calculation, except that they apply the larger uncertainties specified by Reference 4 for SLO conditions. From the results of these calculations, it was concluded that the SLO adder is linearly correlated to the base value (dual loop SLMCPR) and slowly increases as the base value increases. For a base value of 1.08, an adder of 0.01 is adequate.

Table 1: Comparison of Generic GE9 and Hatch-2 Cycle 13

Quantity, Description	GE9 Generic	Hatch-2 Cycle 13
Number of Bundles in Core	764	560
Calculated Safety Limit MCPR	1.06	1.08

Summary

Based on all of the facts, observations and arguments presented above, it is appropriate to conclude that the calculated SLMCPR value of 1.08 for the Hatch-2 Cycle 13 transition core is reasonable. It is reasonable that this value is 0.02 higher than the 1.06 value calculated for the generic GE9 D-Lattice equilibrium core.

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Response to Request for Additional Information:
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HATCH-2 CYCLE 14

Control Rod Pattern Development for the Hatch-2 Cycle 14 SLMCPR Analysis

Projected control blade patterns for the rodded burn through the cycle were used to deplete the core to the cycle exposures to be analyzed. At the desired cycle exposures, the bundle exposure distributions and their associated R-factors, determined in accordance with Reference 5, were utilized for the SLMCPR cases to be analyzed. The use of different rod patterns to achieve the desired cycle exposure has been shown to have a negligible impact on the actual calculated SLMCPR. An estimated SLMCPR was obtained for an exposure point near beginning of cycle (BOC), middle of cycle (MOC), and end of cycle (EOC) in order to establish which exposure point(s) would produce the highest (most conservative) calculated SLMCPR.

The Safety Limit MCPR is analyzed with radial power distributions that maximize the number of bundles at or near the Operating Limit MCPR during rated power operation. This approach satisfies the stipulation in Reference 2 that the number of rods susceptible to boiling transition be maximized. GENE has established criteria to determine if the control rod patterns and resulting radial power distributions are acceptable. These criteria were discussed with the NRC inspection team during the May 5-9, 1996, inspection of GENE and have since been incorporated into the GENE technical design procedures. These criteria include no gross violations of Technical Specification operating limits (e.g., MCPR, MAPLHGR, LHGR), criticality (calculated, normalized K_{eff} near one), and total ----------. Different rod patterns were analyzed until the criteria on the above parameters were met. The rod pattern search was narrowed by starting from a defined set of patterns known from prior experience to yield the flattest possible MCPR distributions. This was done for three exposure points in the cycle. A Monte Carlo analysis was then performed for the BOC, MOC peak hot excess point and EOC-1000 MWD/STU exposure points to establish the maximum SLMCPR for the cycle.

Comparison of Hatch-2 Cycle 14 SLMCPR versus the Generic GE13 Value

Table 2 summarizes the relevant input parameters and results of the SLMCPR determination for both the generic GE13 core and the Hatch-2 Cycle 14 core.

GESTAR II (Reference 3) specifies that the SLMCPR analysis for a new fuel design shall be performed for a large high power density plant assuming a bounding equilibrium core. The GE13 product line generic SLMCPR (1.09) was determined according to this specification.

Hatch-2 Cycle 14 is not an equilibrium core. It is a mixed core of mainly GE9 with a fresh reload batch of GE13 fuel. ----------
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The maximum relative power in Hatch-2 Cycle 14 compared to the generic analysis is not significantly different; however, as Table 2 shows, there are considerably different percentages of bundles closer to the core MCPR. In Table 2, it is shown that ----------
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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. The Hatch-2 Cycle 14 core has a much flatter core MCPR distribution than the generic GE13 equilibrium core due to the conventional scatter load design. This is the primary reason the calculated SLMCPR for the Hatch-2 Cycle 14 core is 0.03 higher than the calculated SLMCPR for the generic GE13 equilibrium core.

Another important difference is that the Cycle 14 SLMCPR analysis has ----------
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---, one is assured of having the flattest possible pin-by-pin R-factors in the SLMCPR calculation. By design, the R-factor distributions are optimized for their uncontrolled state, and control blade insertion causes the distributions to become more peaked (or less flat). Therefore, the most conservative approach is to perform the SLMCPR calculation where the "base" rod pattern places all the potentially limiting bundles in an uncontrolled state. This contrasts

to the GE13 generic study where only about ---------- were uncontrolled.

A plant/cycle-specific calculation of the single loop operation (SLO) SLMCPR was made. The results confirm that the 0.02 SLO adder for Hatch-2 Cycle 14 is adequate.

Table 2: Comparison of Generic GE13 and Hatch-2 Cycle 14

Quantity, Description	GE13 Generic	Hatch-2 Cycle 14
Number of Bundles in Core	764	560
Calculated Safety Limit MCPR	1.093	1.12

Summary

Based on all of the facts, observations, and arguments presented above, it is appropriate to conclude that the calculated SLMCPR value of 1.12 for the Hatch-2 Cycle 14 transition core is reasonable. It is reasonable that this value is 0.03 higher than the 1.09 value calculated for the generic GE13 equilibrium core.

REFERENCES

1. GPC letter request dated December 3, 1996, to revise the Plant Hatch Unit 2 Technical Specifications to change the Safety Limit Minimum Critical Power Ratios.

2. Licensing Topical Report, *General Electric BWR Thermal Analysis Basis (GETAB): Data, Correlation, and Design Application*, NEDO-10958-A, January 1977.

3. *General Electric Standard Application for Reactor Fuel*, NEDE-24011-P-A-13-US, August 1996.

4. *General Electric Fuel Bundle Designs*, NEDE-31152P, *Revision 5, June 1996*.

5. NEDC-32505P, *R-Factor Calculation Method for GE11, GE12, and GE13 Fuel*, November 1995.