SERIAL: HNP-11-075
10 CFR 50.90

Progress Energy

AUG 2 5 2011

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/RENEWED LICENSE NO. NPF-63
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
REGARDING MEASUREMENT UNCERTAINTY RECAPTURE LICENSE AMENDMENT REQUEST

References:
1. Letter from B. Mozafari, Nuclear Regulatory Commission, to W. Jefferson, "MUR RAI (EICB).docx", sent via email dated July 27, 2011
2. Letter from C. L. Burton to the Nuclear Regulatory Commission (Serial: HNP-11-001), "Shearon Harris Nuclear Power Plant, Unit 1, Docket No. 50-400/Renewed License No. NPF-63, Request for License Amendment, Measurement Uncertainty Recapture Power Uprate," dated April 28, 2011. (ADAMS Accession ML11124A180)

Ladies and Gentlemen:

On July 27, 2011, the Harris Nuclear Plant (HNP) received a request from the NRC (Reference 1) for additional information needed to facilitate the review of the License Amendment Request to increase the rated thermal power (RTP) level from 2900 megawatts thermal (MWt) to 2948 MWt, and make Technical Specification changes as necessary to support operation at the uprated power level. The proposed change is an increase in RTP of approximately 1.66%. The proposed uprate is characterized as a measurement uncertainty recapture (MUR) using the Cameron Leading Edge Flow Meter CheckPlus System to improve plant calorimetric heat balance measurement accuracy. This original request was submitted as Serial: HNP-11-001 (Reference 2).

The Enclosure to this submittal contains HNP's response to the NRC's request for additional information.

This document contains no new Regulatory Commitment.

In accordance with 10 CFR 50.91(b), HNP is providing the state of North Carolina with a copy of this response.

Please refer any questions regarding this submittal to Mr. David Corlett, Supervisor – HNP Licensing/Regulatory Programs, at (919) 362-3137.

A001
NRR

Progress Energy Carolinas, Inc.
Harris Nuclear Plant
P. O. Box 165
New Hill, NC 27562

I declare under penalty of perjury that the foregoing is true and correct. Executed on
[8-25-11].

Sincerely,

Keith Holbrook
Manager – Support Services
Harris Nuclear Plant

RKH/kab

Enclosure: Response to Request for Additional Information

cc: Mr. J. D. Austin, NRC Sr. Resident Inspector, HNP
Mr. W. L. Cox, III, Section Chief, N.C. DENR
Mrs. B. L. Mozafari, NRC Project Manager, HNP
Mr. V. M. McCree, NRC Regional Administrator, Region II

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Summary

By letter dated April 28, 2011, (ADAMS Accession No. ML11124A180), Carolina Power & Light Company (CP&L), now doing business as Progress Energy Carolinas, Inc., submitted a proposed amendment for the Shearon Harris Nuclear Power Plant, Unit 1 (HNP). The proposed amendment will increase the rated thermal power (RTP) level from 2900 megawatts thermal (MWt) to 2948 MWt, and make Technical Specification (TS) changes as necessary to support operation at the uprated power level. The proposed change is an increase in RTP of approximately 1.66%. The proposed uprate is characterized as a measurement uncertainty recapture (MUR) using the Cameron Leading Edge Flow Meter (LEFM) CheckPlus System to improve plant calorimetric heat balance measurement accuracy. The proposed change will revise Renewed Operating License NPF-63 Maximum Power Level; Appendix A, TS definition of RTP; Reactor Core Safety Limits; Reactor Trip System Instrumentation; Minimum Allowable Power Range Neutron Flux high setpoint with Inoperable Steam Line Safety Valves; and TS Bases Section 3/4.7.1 to reflect the uprated reactor core power level.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the information submitted by the licensee, and based on this review determined the following information is required to complete the evaluation of the subject amendment request:

Request 1:

In the LAR, Enclosure 2, page 18, section I.1.H "Actions for Exceeding Completion Time and Technical Basis", the licensee described the LEFM CheckPlus modes of operation: Normal and Maintenance. The licensee defines the loss of a single flow plane on a single feedwater line or multiple feedwater lines as Maintenance Mode.

The licensee states that the thermal power uncertainty associated with the LEFM CheckPlus system in Normal mode is 0.34%. When the system is in Maintenance mode, the calculated thermal power uncertainty is stated as being 0.48%, regardless of whether a single flow plane is lost on one or multiple feedwater lines.

Hence, Maintenance mode encompasses three possible scenarios:

1- Loss of a single flow plane on one feedwater line.
2- Loss of a single flow plane on two feedwater lines.
3- Loss of a single flow plane on all three feedwater lines.

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Explain which of the above scenarios was used by Cameron Engineering to calculate the thermal power uncertainty of 0.48%. State whether it was calculated based on the loss of a single flow plane on one feedwater line or based on the loss of a single flow plane on all three feedwater lines.

Response:

Thermal power uncertainty associated with the LEFM CheckPlus system, while in maintenance mode, was calculated assuming a loss of a single flow plane on all three feedwater lines. The LEFM is composed of two trains of metering planes (plane A and plane B). Both metering plane A and metering plane B exist on each of the three feedwater pipes. The failure of the A metering plane on one feedwater pipe would not result in the failure of the A metering planes on all three feedwater pipes. However, the uncertainty associated with maintenance mode assumes that the A metering planes are out-of-service. Likewise, although the failure of the B metering plane on one feedwater pipe would not result in the failure of the B metering planes on the other two feedwater pipes, the maintenance mode uncertainty would assume that all three B metering planes are out-of-service. Note that the failure of metering plane A with metering plane B operating as designed would result in the LEFM entering maintenance mode. Likewise, the failure of metering plane B with metering plane A operating as designed would result in the LEFM entering maintenance mode. Maintenance mode is described in the LAR, Enclosure 2, pages 18 and 19 in section I.1.H.

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Request 2:

In the LAR, Enclosure 2, page 19, section I.1.H "Actions for Exceeding Completion Time and Technical Basis", the licensee described the LEFM CheckPlus Fail mode. One event that would lead to the system entering Fail mode is the loss of both flow planes (A and B) on a single feedwater line or multiple feedwater lines.

2.a. Explain what mode would be entered if flow plane A became inoperable in one feedwater line and flow plane B became inoperable on a different feedwater line.

2.b. Explain how the licensee can identity which flow plane is the A plane and which is the B plane. If a single flow plane fails on two different feedwater lines, describe how would the licensee know which planes failed (i.e. two A planes, two B planes, or one A and one B plane).

Response:

2.a. With flow plane A inoperable in one feedwater line and flow plane B inoperable on a different feedwater line, the LEFM would automatically enter Fail mode.

The LEFM is composed of two trains of metering planes (plane A and plane B). Both metering plane A and metering plane B exist on each of the three feedwater pipes. Each metering plane on each feedwater pipe consists of four paths. Therefore, there are a total of twelve A metering plane paths and twelve B metering plane paths.

The failure of one of the twelve metering plane A paths would cause the LEFM to enter maintenance mode. The maintenance mode uncertainty would assume that all twelve A metering plane paths are out-of-service. Likewise, the failure of one of the twelve metering plane B paths would cause the LEFM to enter maintenance mode, and the uncertainty used would be based upon the assumption that all twelve B metering plane paths are out-of-service.

Note that the failure of metering plane A (due to the failure of one or more of twelve metering paths) with all twelve B metering plane paths operating as designed would result in the LEFM entering maintenance mode. Maintenance mode is described in the LAR, Enclosure 2, pages 18 and 19 in section I.1.H. Note that maintenance mode on a LEFM CheckPlus system is similar to having a LEFM Check system. Reference LAR, Enclosure 2, page 20, section I.1.H.ii, "Cameron LEFM – Maintenance Mode."

If flow plane A became inoperable on one feedwater line (one of four metering plane A paths failed), the LEFM would enter maintenance mode. If flow plane A became inoperable on one feedwater line while flow plane B became inoperable on a different feedwater line, the LEFM would automatically enter Fail mode, and would simultaneously generate a LEFM CheckPlus system fail alarm in the control room. Reference LAR, Enclosure 2, page 20, section I.1.H.i, "Cameron LEFM – Fail Mode."

2.b. The licensee can identify the different flow paths based upon path labeling using the HNP plant process computer. The output of each of the 24 LEFM metering paths provides data points on the HNP plant computer. Therefore, the licensee would be able to identify which plane failed after entering maintenance mode. In addition, the LEFM electronics cabinet is accessible during power operations. Therefore, the licensee would be able to access the alarm logs and path data if a communications failure were to occur between the plant computer and the LEFM electronics cabinet.

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Request 3:

In the LAR, Enclosure 2, page 17, section I.1.G "Completion Time and Technical Basis," the licensee states: 'A completion time of 72 hours is proposed for operation at any power level above the current licensed power of 2900 MWt with the LEFM not fully functional.'

Plant operation at any power level above the current licensed power of 2900 MWt with the LEFM not fully functional for a determined period of time is only acceptable if steady-state conditions persist throughout that period.

3.a. Explain if the proposed completion time for operation at any power level above the current licensed power of 2900 MWt with the LEFM not fully functional is dependent on the plant maintaining steady-state conditions throughout the selected period.

3.b. Explain what the maximum permitted power level will be if, while in Maintenance mode, the plant experiences a power decrease below 2900 MWt. Provide a justification for this action.

3.c. Explain what the maximum permitted power level will be while in Maintenance mode if, before entering Maintenance mode, the plant rated thermal power was less than 2900 MWt. Provide a justification for this action.

<u>Response</u>:

Enclosure 2, page 8, section I.1 defines the two LEFM operating modes as 'Normal' and 'Maintenance'. When a plane of operation is lost, the system alerts the control room operators through the annunciator window for computer alarm reactor, and shifts from Normal operation to Maintenance mode. If the system suffers a loss of AC power or other total failure, the system will automatically enter Fail mode. In order to respond to the RAIs below, 'not fully functional' will be referred to as Maintenance mode.

3.a. The 72 hour completion time begins when the annunciator alarm is received in the control room. The alarm is caused by the LEFM CheckPlus System in the alert (Maintenance mode) or Fail mode. With regard to steady-state operation, the response is different for these two situations. The LEFM operating in the Maintenance mode is not dependent on the plant maintaining steady-state conditions throughout the 72 hour period. The LEFM system remains operational in the Maintenance mode with an increase in

uncertainty as compared to the Normal mode (0.48% versus 0.34%). As stated in the Cameron Topical Report ER-157P, Revision 8, LEFM systems (Check or CheckPlus) provide accurate flow and temperature indications from synchronization to full power. In the event the LEFM is inoperable (Fail mode), the feedwater flow rate and feedwater temperature inputs to the calorimetric are determined by the feedwater venturi flow nozzles and RTDs. The venturi-based flow rate and feedwater temperature are normalized to the LEFM. In this condition steady-state operation is a factor to ensure that the plant transient has not affected the accuracy of the normalized feedwater venturi system. As stated in LAR, Enclosure 2, page 20, section I.1.H.i, Cameron LEFM - Fail Mode, "With the LEFM in Fail mode, if the plant experiences a power decrease below 2900 MWt (98.4% of RTP) during the 72 hour completion time (allowed outage time), the maximum permitted power level will be the current licensed core power level of 2900 MWt until the LEFM is restored to either Normal or Maintenance mode operation."

3.b. The maximum permitted power level while in the Maintenance mode is 2943 MWt. As stated in the response to 3.a above, the LEFM system remains operational in the Maintenance mode and maintaining steady-state conditions is not required.

3.c. The maximum permitted power level is 2943 MWt, and is independent of the power level when entry into the Maintenance mode occurs. As stated in response to 3.a above, the LEFM system remains operational in the Maintenance mode. The increased uncertainty between the Normal mode and Maintenance mode is accommodated by the reduced allowable power in the Maintenance mode, so no additional restrictions are necessary.

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Request 4:

In the LAR, Enclosure 1, the licensee proposed changes to the following functions found in Technical Specifications (TS) Table 2.2-1 "Reactor Trip System Instrumentation Trip Setpoint:"

Functional Unit		Current Value	MUR Value
Power Range Neutron Flux – High Setpoint	Total Allowance	7.5	5.83
	Trip Setpoint	≤ 109% of RTP	≤ 108% of RTP
	Allowable Value	≤ 111.1% of RTP	≤ 109.5% of RTP
Power Range Neutron Flux – Low Setpoint	Total Allowance	8.3	7.83
	Allowable Value	≤ 27.1% of RTP	≤ 26.8% of RTP
Power Range Neutron Flux – High Positive Rate	Total Allowance	2.5	2.33
Power Range Neutron Flux – High Negative Rate	Total Allowance	2.5	2.33

The licensee also stated that the safety analysis limit (SAL) for the Power Range Neutron Flux High Setpoint was reduced from 118% to 117% of current rated thermal power.

4.a. Provide summary calculations for the TS changes listed in the table above including the determination of Total Loop Uncertainty, Nominal Trip Setpoint, Allowable Value, As-Found and As-Left Tolerances, if applicable, and a description of the methodology used to make the calculations.

4.b. Provide summary calculations for the Power Range Neutron Flux High Setpoint SAL including the Total Loop Uncertainty, Nominal Trip Setpoint, Allowable Value, As-Found Tolerance and As-Left Tolerances, if applicable, and a description of the methodology used to make the calculation.

4.c. Confirm whether the Trip Setpoint in TS Table 2.2-1 is the Nominal Trip Setpoint. If not, describe to what it refers.

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Response:

4.a. Portions of revised calculation HNP-I/INST-1010, "Evaluation of RTS/ESFAS Tech Spec Related Setpoints, Allowable Values, and Uncertainties," that relate to the impacted Power Range Neutron Flux setpoint related changes, as well as other pages from the calculation that explain the methodology of the calculations are included as Attachment 1. Note that this methodology uses a Channel Statistical Allowance (CSA) to compute the total channel uncertainty. The components of the CSA include the "square root of the sum of the squares" error components of the total loop, including the sensor errors, rack errors, process measurement accuracies, and measurement and test equipment (M&TE) errors; any applicable biases are added algebraically. The CSA term is the equivalent of the Total Loop Uncertainty. The Allowable Value, As-Found and As-Left Tolerances are included in the calculation. The bases for the changes to the Nuclear Instrumentation setpoints is described in Enclosure 1, section 2.2 of the LAR submittal.

As noted in the LAR submittal, Enclosure 2, section I.1.D.iii.a, previous revisions of this calculation have been submitted to the NRC for evaluation as part of LAR 126 on August 31, 2007 and on May 31,2001 as part of the Steam Generator Replacement / Power Uprate project.

4.b. The summary calculations for the Power Range Neutron Flux High Setpoint SAL, Total Loop Uncertainty (CSA for Harris), Allowable Value, As-Found Tolerance, and As-Left Tolerance are provided in Attachment 1, as discussed above. Note that the bases for the Nominal Trip Setpoint and Safety Analysis Limit are provided in Fuels Letter Serial No. NF11-001, which is referenced in HNP-I/INST-1010.

4.c The Trip Setpoint in TS Table 2.2-1 is the Nominal Trip Setpoint.

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Request 5:

The licensee also proposed to add the following two notes to TS Table 2.2.-1:

Note 7: If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

Note 8: The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. NTSPs more conservative than the Trip Setpoints in Table 2.2.1 are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the surveillance procedures (field setting) to confirm channel performance. The methodologies used to determine NTSPs and the as-found and the as-left tolerances are specified in Progress Energy procedure EGR-NGGC-0153, "Engineering Instrument Setpoints."

5.a. Explain the bases for adding these notes.

5.b. Explain what is meant by the terms “as-found” and “as-left” tolerances. Also, describe the methods used to determine their appropriate magnitude.

5.c. Describe where Progress Energy procedure EGR-NGGC-0153, "Engineering Instrument Setpoints," is referenced in the FSAR.

5.d. Submit Progress Energy procedure EGR-NGGC-0153, "Engineering Instrument Setpoints," for NRC staff evaluation

Response:

5.a. The bases for adding Notes 7 and 8 is to provide a partial implementation of the TSTF-493, “Clarify Application of Setpoint Methodology for LSSS Functions,” recommendations to the Nuclear Instrumentation setpoints being impacted by MUR. Specifically, Option A of TSTF-493 recommends the addition of the notes to the Technical Specification Table on Reactor Trip and ESFAS setpoints. There is also a statement in TSTF-493 that:

"There is a plant specific program which verifies that the instrument channel functions as required by verifying the as-left and as-found settings are consistent with those established by the setpoint methodology."

The above provides the bases for adding the notes to the TS Table 2.2-1.
Per a discussion with the NRC on March 29, 2011, partial implementation of Option A of TSTF-493 is acceptable for setpoints that may be impacted by a MUR type uprate.

5.b. The "as-found" and "as-left" tolerances are defined in Progress Energy procedure EGR-NGGC-0153, "Engineering Instrument Setpoints." This document is being submitted as part of response 5.d.

The as-left tolerance is normally equal to the reference accuracy, or the combination of reference accuracies for the device.

The as-found tolerance is determined by the following equation:

As-Found = $\pm$ [(As-left)^2 + (DR)^2 + (MTE)^2]$^{0.5}$, where
As-Left term is normally the reference accuracy

DR is the instrument drift
MTE is the measurement and test equipment error

5.c. Section 7.2 of the FSAR references calculation HNP-I/INST-1010. This is a consolidated calculation that provides an evaluation of the Harris Technical Specification Related Setpoints, Allowable Values, and Uncertainties Associated with RTS/ESFAS Functions. Previous revisions have been submitted to the NRC for review as discussed in Response to RAI 4.a. This FSAR referenced calculation lists reference 2.7 as CP&L Procedure EGR-NGGC-0153, "Engineering Instruments Setpoints."

5.d. Progress Energy procedure EGR-NGGC-0153, "Engineering Instrument Setpoints," is being submitted for NRC staff evaluation as Attachment 2.