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U. S. Nuclear Regulatory Commission
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**SUSQUEHANNA STEAM ELECTRIC STATION
PROPOSED LICENSE AMENDMENT NO. 285 FOR
UNIT 1 OPERATING LICENSE NO. NPF-14 AND
PROPOSED LICENSE AMENDMENT NO. 253 FOR
UNIT 2 OPERATING LICENSE NO. NPF-22
CONSTANT PRESSURE POWER UPRATE APPLICATION –
SUPPLEMENT**   **Docket Nos. 50-387**
PLA - 6306   **and 50-388**

> Reference: 1)   *PLA-6076, B. T. McKinney (PPL) to USNRC,*
> *"Proposed License Amendment Numbers 285 for Unit 1 Operating*
> *License No. NPF-14 and 253 for Unit 2 Operating License No. NPF-22*
> *Constant Pressure Power Uprate," dated October 11, 2006.*

Pursuant to 10 CFR 50.90, PPL Susquehanna LLC (PPL) requested in Reference 1
approval of amendments to the Susquehanna Steam Electric Station (SSES) Unit 1 and
Unit 2 Operating Licenses and Technical Specifications to increase the maximum power
level authorized from 3489 Megawatts Thermal (MWt) to 3952 MWt, an approximate
13% increase in thermal power. The proposed Constant Pressure Power Uprate (CPPU)
represents an increase of approximately 20% above the Original Licensed Thermal
Power.

The purpose of this letter is to provide a supplement to Reference 1 that provides
additional information requested by the Nuclear Regulatory Commission (NRC) to
support their review based on topics discussed at the October 9 and November 14, 2007
Advisory Committee on Reactor Safeguards subcommittee meetings and a teleconference
held with the NRC staff on October 18, 2007.

Attachment 1 contains AREVA NP, Inc. (AREVA) proprietary information. As such,
AREVA requests that the proprietary information be withheld from public disclosure in
accordance with 10 CFR 2.390 (a) 4 and 9.17 (a) 4. Attachment 2 contains the non-
proprietary version of the information contained in Attachment 1.

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An affidavit supporting the AREVA request for withholding Attachment 1 from public disclosure is provided in Attachment 3.

There are no new regulatory commitments associated with this submittal.

PPL has reviewed the "No Significant Hazards Consideration" and the "Environmental Consideration" submitted with Reference 1 relative to the responses. We have determined that there are no changes required to either of these documents.

If you have any questions or require additional information, please contact Mr. Michael H. Crowthers at (610) 774-7766.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: ___12·30·07___

B. T. McKinney

Attachment 1: Proprietary Version of the Supplemental Information
Attachment 2: Non-Proprietary Version of the Supplemental Information
Attachment 3: AREVA NP, Inc. Affidavit

Copy: NRC Region I
         Mr. R. V. Guzman, NRC Sr. Project Manager
         Mr. R. R. Janati, DEP/BRP
         Mr. F. W. Jaxheimer, NRC Sr. Resident Inspector

Attachment 2 to PLA-6306
Non-Proprietary Version of the Supplemental Information

Introduction

Based on topics discussed at the October 9 and November 14, 2007, ACRS subcommittee meetings and a teleconference held with the NRC staff on October 18, 2007, PPL is submitting the following information to assist the NRC staff in their review of the PPL Constant Pressure Power Uprate (CPPU).

The information provided addresses:

1. Void Fraction Measurement

2. Void Quality Correlation

3. Bypass Voiding

4. Power Distribution Uncertainties

1. **Void Fraction Measurement**

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Facility Description

[

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Data Collection

[

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Facility Calibration

[

]

Measurement Technique

[

]

Conclusion

[

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Figure 1: Test Facility

Figure 2: Count Rate Plots

2. Void Quality Correlation

The void correlation used for the SSES CPPU cycle design [   ] has been validated against measured ATRIUM-10 void fractions up to void fractions of [   ]. The comparison shows that the standard deviation between calculated and measured values is [   ]. The question has been raised with respect to the impact of void fraction uncertainties for higher void fractions on Minimum Critical Power Ratio (MCPR).

Inaccuracies in the AREVA void-quality relationship directly contribute to the assembly power uncertainty that is used in computing the cycle-specific MCPR Safety Limit. Void reactivity is a strong feedback mechanism in BWR's. Deviations in the void fraction are exhibited as deviations between the calculated and measured Transversing Incore Probe (TIP) distributions. As the void deviations increase, the effective radial power uncertainty would also increase. From this perspective, the void correlation uncertainties are already incorporated in the AREVA licensing limits.

To explore the question further, a sensitivity study was performed to assess the impact on licensing limits of biasing the current correlation towards the extreme of the ATRIUM-10 correlation data. [

]

	Reference Depletion	Okawa-Lahey Depletion	Change
Limiting ΔCPR	[ ]	[ ]	[ ]
Licensing ΔCPR (2 significant digits)	[ ]	[ ]	[ ]

[

                                                                                                    ]

Summary

First, uncertainties in the void correlation are already included in the assembly radial power uncertainty. Second, no significant increase in uncertainties will occur at void fractions above those measured in the KATHY facility. Finally, a sensitivity calculation was performed to assess the impact of introducing a bias in the void correlation [
                                    ]; the results demonstrated that there was no change in the MCPR Safety Limit or MCPR Operating Limit.

Note:

[

]

3. Bypass Voiding

The OPRM (Oscillation Power Range Monitor) system consists of 4 OPRM trip channels. Each trip channel in the OPRM system is divided into 30 OPRM cells; the signal for each cell consisting of the sum of four Local Power Range Monitors (LPRMs) in a localized region of the core. A trip setpoint specifies the normalized amplitude (peak/average cell signal) at which each LPRM cell generates a cell trip. A reactor scram is generated when one OPRM cell trips in any two OPRM channels (two-out-of-four logic).

A dual recirculation pump trip starting on the Maximum Extended Load Line Limit Analysis (MELLLA) boundary will produce the highest increase in bypass voiding. The SSES Technical Specifications require an immediate manual reactor scram upon entry into natural circulation. Thus, the natural circulation condition would be present for only a short time since operation at natural circulation is not permitted.

A dual recirculation pump trip would result in a small increase in voiding near the top of the core bypass region. Thus, the signal of the LPRMs near the upper LPRMs (D-Level LPRMs) may be decreased because of the reduction in thermal neutrons around the detectors caused by the presence of the increased voiding.

The reduced signal from the upper LPRMs would affect the signal provided to the OPRM system. [

] For further details, see AREVA NP Inc. response to NRC Request for Additional Information dated October 26, 2007 entitled "Response to a Request for Additional Information Regarding ANP-10262-(P) Revision 0, Enhanced Option III Long Term Stability Solution."

[

], PPL will conservatively assume that the oscillatory part of the OPRM cell signal (numerator of the normalized amplitude signal) is affected in order to determine a conservative trip setpoint penalty. This penalty will be determined as described below:

The highest amount of upper bypass voiding occurs at the highest core power to core flow ratio. The highest core power to core flow ratio occurs within the operating domain on the MELLLA boundary at natural circulation conditions. This operating condition will be used to determine the maximum expected voiding in the top of the bypass region. Once the amount of bypass voiding is determined, the effect of the voiding on the LPRM signal will be determined by lattice physics calculations that model the bypass voiding around the detector. The calculated reduction in the LPRM signal will then be used to determine an OPRM amplitude setpoint penalty.

Since the OPRM cells compare a normalized oscillation amplitude setpoint to a normalized OPRM signal, the conservative OPRM amplitude setpoint penalty would be applied to the portion of the setpoint above one. For example, if the OPRM amplitude setpoint is 1.15 and the OPRM penalty is 5 percent, the OPRM setpoint penalty would be 0.0075, resulting in an effective OPRM amplitude setpoint of 1.14.

SSES specific analyses will be performed to determine the exact magnitude of the penalty.

Impact of Bypass Voiding on the Average Power Range Monitor (APRM) Flow Biased Scram Setpoint

Application of a penalty to the APRM Flow Biased Scram Setpoint is not warranted given that the APRM Flow Biased Scram Setpoint, as described in PPL letter (PLA-6031) to NRC dated December 1, 2006 (ML063460050), are not credited in any safety analysis. PLA-6130 states:

> "As described in the 'Applicable Safety Analyses, LCO, and Applicability' portion of the TS Bases for Table 3.3.1.1-1 function 2.b, Simulated Thermal Power - High, the Average Power Range Monitor Simulated Thermal Power - High Function is not credited in any plant Safety Analyses.... The associated SSES TS Bases states 'Functions not specifically credited in the accident analysis are retained for the overall redundancy and diversity of the RPS as required by the NRC-approved licensing basis.' Therefore, this function is part of the Reactor Protective System and is included in the TS since it is part of the RPS design and is part of the existing licensing basis."

The above PLA-6130 was reviewed and approved by NRC as part of the SSES Average Power Range Monitor/Rod Block Monitor/Technical Specifications/Maximum Extended Load Line Limit Analysis (ARTS/MELLLA) License Amendments 242 and 220.

As a result of the above, the following Operating License condition is proposed:

> "For CPPU, an OPRM amplitude setpoint penalty will be applied to account for a reduction in thermal neutrons around the LPRM detectors caused by transients that increase voiding. This penalty will be applied until NRC evaluation determines that a penalty to account for this phenomenon is not warranted."

4. Power Distribution Uncertainties

The available AREVA gamma scan data will be used to determine the impacts on the calculated power distribution uncertainties. The power distribution uncertainties are inputs to the MCPR Safety Limit calculation. Both pin and bundle power distribution uncertainties are addressed as described below.

Gamma Scan Impact on Bundle Power Distribution Uncertainty

Bundle gamma scan data is not used directly to define the calculated bundle power distribution uncertainty. Gamma scan data is used to define the correlation coefficients as described in EMF-2158(P)(A) "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4 Microburn-B2. Both TIP uncertainties and these correlation coefficients are used to calculate the bundle power distribution uncertainty. The correlation coefficient is determined from comparison of the calculated power distribution to available bundle gamma scan data.

The TIPs directly measure the local neutron flux from the surrounding four fuel assemblies. Thus, the calculated bundle power distribution uncertainty will be closely related to the calculated TIP uncertainty. However, the bundle powers in the assemblies surrounding a TIP are not independent. If a bundle is higher in power, neutronic feedback increases the power in the nearby assemblies, thus producing a positive

correlation between nearby bundles. The gamma scan data provides the means to determine this correlation according to the EMF-2158(P) (A) methodology. A smaller

correlation coefficient implies that there is less correlation between nearby bundle powers, thus, there would be a larger bundle power distribution uncertainty.

Existing Gamma Scan Results

The average correlation coefficient defined in EMF-2158(P) (A) was calculated to be [   ]. The calculated TIP uncertainty was determined to be [   ] in EMF-2158(P)(A). Combining the calculated TIP uncertainty and the correlation coefficient results in a calculated bundle power distribution uncertainty of [   ].

[

                    ]

A sensitivity calculation was performed to evaluate the change in the correlation coefficient for the SSES CPPU design. For the CPPU cycles, the calculated bundle power distribution uncertainty is combined with other uncertainties to produce the measured radial power uncertainty with assumed LPRM failures, number of TIPs out-of-service, and a specified LPRM calibration interval. [

                                                               ]

Until further gamma scan data is available, the conservatively adjusted correlation coefficient will be used for SSES CPPU to calculate an adjusted bundle power distribution uncertainty as discussed above. The adjusted bundle power distribution uncertainty will be used in the MCPR Safety Limit calculation for the SSES CPPU licensing analysis.

Gamma Scan Impact on Pin Power Distribution Uncertainty

Pin-by-pin gamma scan data is used to determine the local power uncertainty. The pin gamma scan data from Quad Cities was taken at seven axial levels and resulted in a pin power distribution uncertainty of [   ]. Additional pin gamma scans were taken by

KWU at 4 axial levels and included two-9X9 UO$_2$, one 9X9 MOX and one ATRIUM-10 UO$_2$ assemblies. The local power uncertainty from the KWU data was [   ] which is

very consistent with the Quad Cities data. The consistency of these very different sets of data indicates that additional gamma scan data would not change the uncertainty significantly. Furthermore, there is no trend in the standard deviations as a function of axial level, indicating that the local power uncertainty is not void fraction dependent.

A sensitivity study was performed to evaluate the impact of local power uncertainty on the calculated MCPR Safety Limit. [

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The pin power distribution uncertainty will be increased by 50% for the SSES MCPR Safety Limit analyses for CPPU. This is consistent with the treatment of the gamma scan contribution to the bundle power distribution uncertainty.

Conclusion

The available AREVA gamma scan data will be used to determine the impacts on the calculated power distribution uncertainties. The power distribution uncertainties are inputs to the MCPR Safety Limit calculation. Adjusted pin and bundle power distribution uncertainties will be used for the SSES MCPR Safety Limit analyses for CPPU.

Parameter	Submitted CPPU Analysis (From PLA-6076)	Proposed CPPU Analysis
Reactor System Uncertainties		
Feedwater flow rate	1.76%	1.76%
Feedwater temperature	0.76%	0.76%
Core pressure	0.5%	0.5%
Total core flow rate	2.5%	2.5%
Fuel-Related Uncertainties		
Radial power	[	
Assembly flow rate	[	]
Local power	[	]
SPCB additive constant	[	]

* [

]

As a result of the above, the following Operating License condition is proposed.

"Adjusted pin and bundle power distribution uncertainties will be applied to SSES MCPR Safety Limit analyses for CPPU. The adjustments will account for the available gamma scan data."

Attachment 3 to PLA-6306
AREVA NP, Inc.
Affidavit

AFFIDAVIT

STATE OF WASHINGTON)
) ss.
COUNTY OF BENTON   )

1.   My name is Jerald S. Holm. I am Manager, Product Licensing, for AREVA NP Inc. and as such I am authorized to execute this Affidavit.

2.   I am familiar with the criteria applied by AREVA NP to determine whether certain AREVA NP information is proprietary. I am familiar with the policies established by AREVA NP to ensure the proper application of these criteria.

3.   I am familiar with the AREVA NP information contained in the PPL letter PLA-6306, *Susquehanna Steam Electric Station Proposed License Amendment No. 285 for Unit 1 Operating License No. NPF-14 and Proposed License Amendment No. 253 for Unit 2 Operating License No. NPF-22 Constant Pressure Power Uprate Application - Supplement*, and referred to herein as "Document." Information contained in this Document has been classified by AREVA NP as proprietary in accordance with the policies established by AREVA NP for the control and protection of proprietary and confidential information.

4.   This Document contains information of a proprietary and confidential nature and is of the type customarily held in confidence by AREVA NP and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in this Document as proprietary and confidential.

5.   This Document has been made available to the U.S. Nuclear Regulatory Commission in confidence with the request that the information contained in this Document be withheld from public disclosure. The request for withholding of proprietary information is made in

accordance with 10 CFR 2.390. The information for which withholding from disclosure is requested qualifies under 10 CFR 2.390(a)(4) "Trade secrets and commercial or financial information".

6.   The following criteria are customarily applied by AREVA NP to determine whether information should be classified as proprietary:

(a)   The information reveals details of AREVA NP's research and development plans and programs or their results.

(b)   Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.

(c)   The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for AREVA NP.

(d)   The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for AREVA NP in product optimization or marketability.

(e)   The information is vital to a competitive advantage held by AREVA NP, would be helpful to competitors to AREVA NP, and would likely cause substantial harm to the competitive position of AREVA NP.

The information in the Document is considered proprietary for the reasons set forth in paragraphs 6(b) and 6(c) above.

7.   In accordance with AREVA NP's policies governing the protection and control of information, proprietary information contained in this Document have been made available, on a limited basis, to others outside AREVA NP only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. AREVA NP policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.

SUBSCRIBED before me this _19th_

day of _November_, 2007.

Leslie M. Koep
NOTARY PUBLIC, STATE OF WASHINGTON
MY COMMISSION EXPIRES: 6/18/2011