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APR 3 0 2007

Submitted Pursuant To 10 CFR 2.390

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Stop OP1-17
Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
RESUBMITTAL OF PROPRIETARY INFORMATION
PLA-6199 **Docket No. 50-388**

References: 1) *PLA-5742, B. L. Shriver (PPL) to USNRC, "Supplement to Proposed Amendment No. 221 to Unit 2 License NPF-22: Revised MCPR Safety Limits," dated April 27, 2004.*

2) *PLA-5860, B. T. McKinney (PPL) to USNRC, "Request for Additional Information Regarding Proposed Amendment No. 223 to Unit 2 License NPF-22: MCPR Safety Limits and Reference Changes," dated February 1, 2005.*

3) *PLA-6156, B. T. McKinney (PPL) to USNRC, "Request for Additional Information Regarding Proposed Amendment No. 259 to Unit 2 License NPF-22: MCPR Safety Limits and Reference Changes," dated February 15, 2007.*

The purpose of this letter is to request NRC to remove the previously submitted correspondence identified above, (References 1, 2, and 3) from the NRC Public Document Room and replace each referenced document with a nonproprietary version. Each document has been determined to contain proprietary information which was inadvertently submitted to the NRC without requesting to withhold certain portions from public disclosure in accordance with 10 CFR 2.390.

This document is submitted pursuant to 10 CFR 2.390. Attachments 1, 2, and 3 are resubmitted References 1, 2, and 3 which are requested to be withheld from public disclosure. These resubmitted documents have been revised to contain the statement "Withhold from Public Disclosure under 10 CFR 2.390(a)(4)." The proprietary text has been identified with brackets [ ] on Attachments 1, 2, and 3.

Attachments 4, 5, and 6 are the nonproprietary versions of each document, suitable for public disclosure, and provided for NRC to use in response to any requests submitted under the Freedom of Information Act. The proprietary information has been removed from each document as indicated by the brackets [ ].

A001

Attachment 7 is an affidavit that provides the supporting details and justification for withholding the requested information from public disclosure.

The approach to resolving this issue has been discussed with the Susquehanna NRC Project Manager.

If you have any questions regarding this request and resubmittal, please contact Mr. Duane L. Filchner at (610) 774-7819.

Sincerely,

B. T. McKinney

Attachments –

1) Resubmitted PLA-5742 (Proprietary)
2) Resubmitted PLA-5860 (Proprietary)
3) Resubmitted PLA-6156 (Proprietary)
4) Resubmitted PLA-5742 (Nonproprietary)
5) Resubmitted PLA-5860 (Nonproprietary)
6) Resubmitted PLA-6156 (Nonproprietary)
7) Affidavit

cc: NRC Region I
Mr. A. J. Blamey, NRC Sr. Resident Inspector
Mr. R. V. Guzman, NRC Sr. Project Manager
Mr. R. R. Janati, DEP/BRP

ENCLOSURE to PLA-5742

PPL Response to Request for Additional Information

Unit 2 Cycle 12 MCPR Safety Limit

Response to RAI Questions

NRC Question 1:

Provide a reference core loading pattern for Unit 2 Cycle 12 (U2C12) operation and a detailed description of the final core and fuel design to achieve a 24-month fuel reload cycle at the licensed rated power of 3489 MWth.

PPL Response:

The proposed Minimum Critical Power Safety Limit (MCPRSL) values transmitted via Reference 3 are based on the fuel and core design currently identified in the Susquehanna FSAR. Since this is a mid-cycle submittal, FSAR Figure 4.3-2 represents the Susquehanna Unit 2 Cycle 12 (U2C12) core loading pattern. FSAR Figures 4.3-8-1, 4.3-8-2, 4.3-8-3, 4.3-8-4, and 4.3-8-7 provide bundle descriptions for each bundle type loaded in U2C12. The fuel and core design information contained in these figures is identical to the fuel and core design information used to perform the proposed MCPRSL calculation, and is identical to the fuel and core design information used to perform the previously approved U2C12 MCPRSL (Reference 2).

NRC Question 2:

Identify the approved methodologies used in the U2C12 analysis and justify their applicability to the MCPRSL analysis for U2C12 operation. Also, identify the design documents (i.e., calculations) to support the proposed technical specification amendment, and provide a summary table or figure to show the number of rods that might experience boiling transition.

PPL Response:

Unit 2 Technical Specification 5.6.5 provides the NRC approved references used to support the core operating limits (e.g., LHGR, MCPR, APLGHR). The applicable Technical Specification references for the MCPRSL are:

TS 5.6.5.b.1 PL-NF-90-001-A, "Application of Reactor Analysis Methods for BWR Design and Analysis."

TS 5.6.5.b.4 ANF-524(P)(A), "Advanced Nuclear Fuels Corporation Critical Power Methodology for Boiling Water Reactors."

TS 5.6.5.b.9 EMF-1997(P)(A), "ANFB-10 Critical Power Correlation."

TS 5.6.5.b.13 EMF-2158(P)(A), "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/MICROBURN-B2," Siemens Power Corporation.

Please refer to Figure 1 below for a discussion of the MCPRSL calculation flow path and the use of the above references in the process.

1) The first step is the calculation of power profiles. PPL calculated conservative power profiles using methods documented in PL-NF-90-001-A, (TS 5.6.5.b.1). The power profiles include 2-D radial power, axial power, and fuel rod power (i.e., local power). The power profiles are sent to Framatome-ANP (FANP).

2) The radial power profiles sent to FANP are used to develop a bundle flow vs. bundle power correlation. The correlation is generated using XCOBRA as discussed in ANF-524(P)(A) (TS 5.6.5.b.4). The correlation is used to predict bundle flows as bundle power is changed in the MCPRSL calculation.

3) FANP performs the MCPRSL calculation following the methodology described in ANF-524(P)(A) (TS 5.6.5.b.4). The inputs to the MCPRSL calculation are:

   a) Proposed MCPRSL,

   b) Reactor System, Fuel, and Critical Power Ratio (CPR) Correlation uncertainties.

      The reactor system uncertainties are typical of operating BWRs and are generic in nature and are applicable to PPL. They are provided in ANF-524(P)(A) (TS 5.6.5.b.4).

      The fuel related uncertainties are based on the CPR correlation and the ability of the neutronic codes that support the POWERPLEX core monitoring system to predict fuel pin and bundle powers and bundle flow distribution. The fuel related uncertainties for MICROBURN-B2 and CASMO-4 are located in EMF -2158(P)(A) (TS 5.6.5.b.13). It should be noted that for this submittal, only some of the fuel related uncertainties (as referenced in response to Question 3) are different than those used in the previously approved U2C12 MCPRSL (Reference 2).

The CPR correlation uncertainties for ANFB-10 are provided in EMF-1997(P)(A) (TS 5.6.5.b.9). These did not change from those used in the previously approved U2C12 MCPRSL (Reference 2).

c) The bundle flow vs. bundle power relationship developed using XCOBRA as documented in ANF-524(P)(A) (TS 5.6.5.b.4).

d) The radial, axial, and local power profiles generated by PPL as documented in PL-NF-90-001-A (TS 5.6.5.b.1), that conservatively represent power distributions at the MCPR Operating Limit.

4) The MCPRSL calculation begins by raising core power such that MCPR for the limiting bundle is equal to the proposed MCPRSL per ANF-524(P)(A) (TS 5.6.5.b.4).

5) Monte Carlo analysis is performed by varying the input parameters according to the magnitude of their uncertainties per ANF-524(P)(A) (TS 5.6.5.b.4).

6) The number of pins in boiling transition is calculated. If the number of pins < 0.01%, then the MCPRSL is valid. Otherwise, a larger MCPRSL is chosen and the process is repeated in accordance with ANF-524(P)(A) (TS 5.6.5.b.4).

The resulting MCPRSL ensures that at least 99.9% of the pins are expected to avoid boiling transition when MCPR is greater than or equal to the MCPRSL. The MCPRSL analysis includes all the uncertainties associated with the calculation of MCPR in the core monitoring system.

FANP performed both the original and revised U2C12 MCPRSL calculations. FANP Calculation, E-4046-872-1, "Susquehanna Unit 2 Cycle 12 MCPR Safety Limit Analysis" and FANP Calculation, E-4046-872-2, "Susquehanna Unit 2 Cycle 12 Revised MCPR Safety Limit Analysis" document the results of the original and revised MCPRSL calculations. The following tables provide a summary of the input MCPRSL vs. the percentage of pins in boiling transition from each calculation:

U2C12 MCPR SL Results
Percentage Fuel Rods in Boiling Transition
Original Results (FANP Calculation E-4046-872-1)

Operating Condition	MCPR SL	% of Pins in BT*
Two Loop	1.11	0.0565
	1.10	0.0874
	1.09	0.1296
Single Loop	1.12	0.0648
	1.11	0.0850
	1.10	0.1450

U2C12 MCPR SL Results
Percentage Fuel Rods in Boiling Transition
Revised Results (FANP Calculation E-4046-872-2)

Operating Condition	MCPR SL	% of Pins in BT*
Two Loop	1.10	0.0333
	1.09	0.0452
	1.08	0.0761
	1.07	0.1165
Single Loop	1.11	0.0410
	1.10	0.0594
	1.09	0.0880
	1.08	0.1355

*Total number of fuel pins in core = 69524.

NRC Question 3:

Provide a detailed description of the differences in calculating the mid-cycle U2C12 MCPRSL relative to the beginning of cycle U2C12 MCPRSL in terms of power distribution uncertainties and neutronic codes/methodologies used, and provide a detailed explanation of how the decrease in the MCPRSL is largely due to the incorporation of smaller power distribution uncertainties. Justify that the proposed MCPRSL reduction of 0.02 is conservative.

PPL Response:

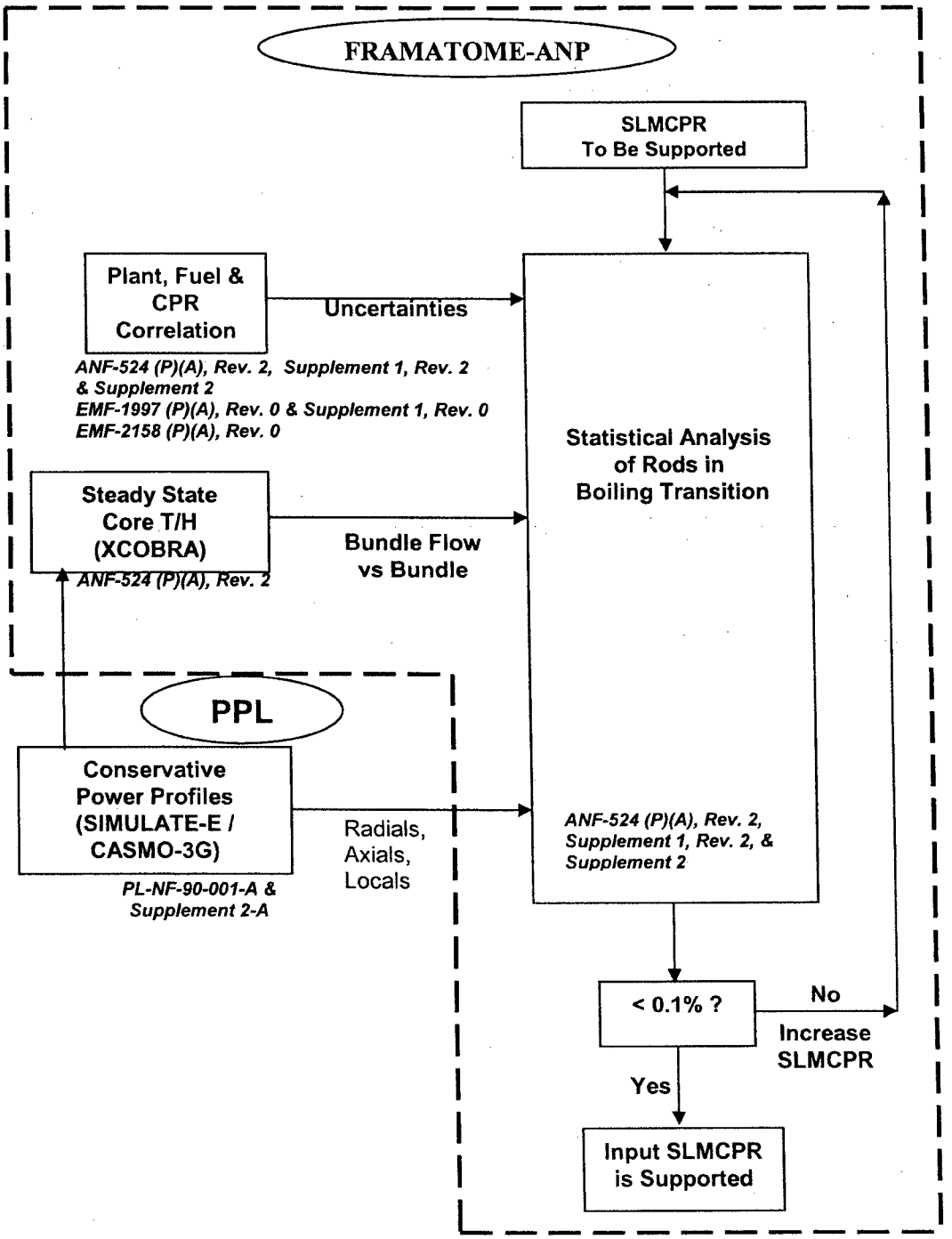
As described in Section 4.0 of the enclosure to Reference 3, the proposed change to the U2C12 MCPRSL is due solely to a change in the radial and local power distribution uncertainties. The current MCPRSL values approved in Reference 2 are based on the CASMO-3/MICROBURN-B code system implemented in the POWERPLEX-II core monitoring system. CASMO-3 performs the lattice physics calculations to determine fuel assembly cross sections and base pin power distributions. MICROBURN-B uses the CASMO-3 input and reactor conditions to determine fuel assembly power distributions and thermal limits. The NRC has previously approved the CASMO-3/MICROBURN-B code system as documented in XN-NF-80-19(P)(A) incorporated in TS 5.6.5.b.2.

The proposed U2C12 MCPRSL values (Reference 3) are based on the CASMO-4/MICROBURN-B2 code system implemented in the POWERPLEX-III core monitoring system currently in use for U2C12. In the new code system, CASMO-4 replaces CASMO-3 and MICROBURN-B2 replaces MICROBURN-B. The NRC has previously approved the CASMO-4/MICROBURN-B2 code system as documented in EMF-2158(P)(A) incorporated in TS 5.6.5.b.13.

The only differences between the analyses supporting the current and the proposed U2C12 MCPRSL values are the radial and local power distribution uncertainties. The U2C12 fuel and core design documented in the Susquehanna FSAR remains unchanged, and the methodology used to calculate the MCPRSL is unchanged. A comparison of the power distribution uncertainties for two loop operation follows:

The proposed U2C12 MCPRSL was calculated using methods previously approved by the NRC and listed in Section 5.6.5 of the Unit 2 Technical Specifications. The CASMO-4/MICROBURN-B2 code system represents an improvement in accuracy over the previous code system. CASMO-4/MICROBURN-B2 has been benchmarked to a wide range of conditions from standard industry benchmarks to in-reactor conditions. As part of the review of the CASMO-4/MICROBURN-B2 code system, the NRC placed conditions on the use of the code system. PPL has verified that the NRC conditions have been met through Susquehanna specific benchmarking calculations of previous cycles and ongoing comparisons to current operating conditions. Therefore, the proposed reduction in the MCPRSL due to the reduction in monitoring system uncertainties results in a MCPRSL which remains conservative.

Figure 1


FRAMATOME-ANP
SLMCPR
To Be Supported
Plant, Fuel &
CPR
Correlation
Uncertainties
ANF-524 (P)(A), Rev. 2, Supplement 1, Rev. 2
& Supplement 2
EMF-1997 (P)(A), Rev. 0 & Supplement 1, Rev. 0
EMF-2158 (P)(A), Rev. 0
Statistical Analysis
of Rods in
Boiling Transition
Steady State
Core T/H
(XCOBRA)
Bundle Flow
vs Bundle
ANF-524 (P)(A), Rev. 2
PPL
Conservative
Power Profiles
(SIMULATE-E /
CASMO-3G)
Radials,
Axials,
Locals
PL-NF-90-001-A &
Supplement 2-A
ANF-524 (P)(A), Rev. 2,
Supplement 1, Rev. 2, &
Supplement 2
< 0.1% ?
No
Increase
SLMCPR
Yes
Input SLMCPR
is Supported

Attachment 5 to PLA-6199

Resubmitted PLA-5860

(NONPROPRIETARY)

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February 1, 2005

U. S. Nuclear Regulatory Commission
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Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
REQUEST FOR ADDITIONAL INFORMATION
REGARDING PROPOSED AMENDMENT NO. 233
TO UNIT 2 LICENSE NPF-22: MCPR SAFETY LIMITS
AND REFERENCE CHANGES
PLA-5860 **Docket No. 50-388**

Reference: 1) PLA-5793, B. T. McKinney (PPL) to USNRC, "Proposed Amendment No. 233 to Unit 2 License NPF-22: MCPR Safety Limits and Reference Changes," dated September 08, 2004.

2) USNRC to B. L. Shriver, "Request for Additional Information (RAI) - Regarding SSES 2 Minimum Critical Power Ratio Safety Limits and Reference Changes (TAC No. MC4431)," dated January 24, 2005.

The purpose of this letter is to provide the PPL Susquehanna, LLC (PPL) response to the NRC's January 24, 2005 request for additional information (Reference 2). On September 8, 2004 PPL proposed a revision to the Susquehanna Steam Electric Station Unit 2 Technical Specifications (Reference 1). The proposed revisions to the Technical Specifications, if approved, would update the Minimum Critical Power Ratio (MCPR) Safety Limit in Technical Specification Section 2.1.1.2 and revise Section 5.6.5.b to include NRC approved methodology used in the determination of Core Operating Limits.

The need for additional information and PPL's responses to each of the questions was discussed during a teleconference held January 19, 2005. Attachment 1 to this letter documents the additional information requested by NRC.

Any questions regarding this request should be directed to Mr. Duane L. Filchner at (610) 774-7819.

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

Executed on: 2/1/05

for B. T. McKinney

Attachments:

1. Response to NRC Request for Additional Information
2. Figure 1 - Preliminary - Susquehanna U2C13 Core Loading Pattern
3. Figure 2 - MCPR Safety Limit Methodology
4. Figure 3 - Preliminary Assembly Type 58 Reload Bundle Description
5. Figure 4 - Preliminary Assembly Type 59 Reload Bundle Description

cc: NRC Region I
Mr. S. L. Hansell, NRC Sr. Resident Inspector
Mr. R. V. Guzman, NRC Project Manager
Mr. R. Janati, DEP/BRP

Attachment 1 to PLA-5860

Response to NRC Request for Additional Information

Response to NRC Request for Additional Information

NRC Question #1

Please provide a figure to show the reference core loading pattern for Cycle 13 operation and identify any difference from Cycle 12 core design. Provide a detailed description of how to determine the final core and fuel design to achieve a 24-month fuel reload cycle.

PPL Response

The design core loading pattern for Unit 2 Cycle 13 (U2C13) is provided as Figure 1. The Figure 1 core loading pattern was used as input by Framatome-ANP (FANP) in calculating the proposed U2C13 SLMCPR. Figure 1 is marked preliminary since Unit 2 Cycle 12 (U2C12) is still in operation. PPL and FANP will evaluate any changes to the Figure 1 core loading for impacts on the SLMCPR. No changes are expected and no changes are typically warranted. The FSAR will be updated to reflect the core design at startup. The corresponding core composition for Figure 1 was provided in PLA-5793 as Attachment 5 and is provided below:

Unit 2 Cycle 13 Core Composition

Assembly Type	Operational History	Number of Assemblies
FANP ATRIUM™-10	Fresh	292
FANP ATRIUM™-10	Once-burned	284
FANP ATRIUM™-10	Twice-burned	188

FSAR Figures 4.3-8-7, 4.3-8-2, 4.3-8-3, 4.3-8-1, and 4.3-8-10 provide descriptions for each exposed bundle type to be loaded in U2C13. FSAR Figure 4.3-8-10 and attached Figures 3 and 4 provide descriptions for the fresh fuel bundle types to be loaded in U2C13.

There are no significant changes in the U2C13 core design or operating strategy compared to U2C12. Both core designs are traditional scattered loaded designs with full cores of ATRIUM-10 fuel. The U2C13 core is designed to operate similarly to the U2C12 core. Both core designs are operated using the traditional four control rod sequences. The slight increase in the number of fresh fuel assemblies for U2C13 (292 vs. 284) is due to increase in the energy requirements for U2C13 (93% vs. 91% full power capacity factors).

Fuel bundle and core designs are the result of an iterative process that balances energy requirements, licensing limits, and manufacturing constraints. PPL and FANP have established fuel bundle and core design envelopes that list all of the constraints that a fuel / core design must meet. These envelopes are controlled by the design process and factored into each cycle as warranted. Similar to all previous Susquehanna reload core designs, U2C13 has a scattered loaded core loading pattern. In a scattered loaded core loading, the fresh and once burned fuel assemblies are placed in the core in a checkerboard fashion. The exact placement of the fresh and once burned fuel is a balance between power peaking, core shutdown margin, and energy requirements. Twice burned fuel assemblies are placed in the periphery of the core to minimize neutron flux leakage and interior locations of the core to control radial peaking and core shutdown margin. The fresh ATRIUM-10 fuel bundle design is similar to past fuel bundle designs.

NRC Question #2

In Technical Specification (TS) 5.6.5.b, "Core Operating Limits Report," there are 11 of 19 approved methodologies to support TS 3.2.2. Please identify the input parameters in a flow chart (as shown in Figure 1 of your letter dated April 27, 2004) supported by the appropriate approved methodologies to support TS 3.2.2 calculations for this MCPR safety limit analysis for Cycle 13 operation. Also identify the design record file to support this TS amendment.

PPL Response

As stated in PLA-5793 (Reference 1), PPL is now using FANP methods to develop the core operating limits. The use of the FANP methods requires that TS 5.6.5.b be revised to remove PPL's methodology reports and add FANP methodology reports that are now required to support the core operating limits.

In order to clarify the calculational flowpath and methodology reports used in the SLMCPR, PPL has revised Figure 1 from the April 27, 2004 submittal and included it as Figure 2. The changes in Figure 2 show that the entire SLMCPR calculation is based on FANP methods. The other change to Figure 2 is that CASMO-4/MICROBURN-B2 is used to develop the conservative power profiles. The CASMO-4/MICROBURN-B2 methodology is documented in EMF-2158(P)(A).

It should be noted that not all of the references supplied in PLA-5793 are used to support the SLMCPR (TS 2.1.1). References that are not used to support the SLMCPR are present since they describe initial conditions, types of transients analyzed, and transient analysis methodologies used to generate the core operating limits. Attachment 7 of

PLA-5793 provides a listing of the FANP references and their applicability to the core operating limits. Non FANP references were described in PLA-5509 dated August 23, 2002.

FANP performed the U2C13 SLMCPR analysis. The design record file is E-4456-S09-1, "Susquehanna Unit 2 Cycle 13 MCPR Safety Limit."

NRC Question #3

Please identify any significant contributing parameters such as power distribution uncertainty, channel bow, and others, which will impact the MCPR safety limit calculation in a table, and quantify their impact on the final MCPR safety limit values for Cycle 13.

PPL Response

The SLMCPR inputs are provided in Figure 2.

The inputs consist of conservative power distributions from the core design process (radial, axial, and local) and uncertainties.

The uncertainties used in the SLMCPR come from several sources (all of which are listed in Section 5.6.5 of the Technical Specifications):

System

Feedwater Flow Rate	ANF-524(P)(A)
Feedwater Temperature	ANF-524(P)(A)
Core Pressure	ANF-524(P)(A)
Total Core Flow Rate	ANF-524(P)(A)

Fuel

ANFB-10 Additive Constant	EMF-1997(P)(A) & Supplement 1
Assembly Flow Rate	ANF-524(P)(A)
Assembly Radial Peaking	EMF-2158(P)(A)
Rod Local Peaking	EMF-2158(P)(A)

In addition to the above uncertainties, the rod local peaking uncertainty specified in EMF 2158(P)(A) was modified to include channel bow effects due to SSES operating experience with channel bow.

FANP does not routinely perform sensitivity analyses for the various SLMCPR inputs or uncertainties on a cycle specific basis. However, based on previous calculations and a U2C13 calculation for channel bow, the following information is provided:

- The Fuel related uncertainties (in particular the radial peaking) have a larger impact on the SLMCPR than the System related uncertainties.

- From PLA-5702 (Unit 1 Cycle 14 SLMCPR), dated December 22, 2003, cycle-to-cycle design core loading pattern variations can affect the SLMCPR by ± 0.01.

- The table provided in PLA-5742 (U2C12 mid-cycle SLMCPR) showed the SLMCPR sensitivity to Radial Bundle Power and Local power distribution uncertainties. This table is repeated below.

[ ]

Radial and local power distribution uncertainties based on the CASMO-4/MICROBURN-B2 code system are smaller than the corresponding uncertainties based on the CASMO-3/MICROBURN-B code system. This change decreases the SLMCPR by -0.02.

- For U2C13, FANP determined that increasing the nominal channel bow by a factor of two, increased the SLMCPR by +0.01 to +0.02.

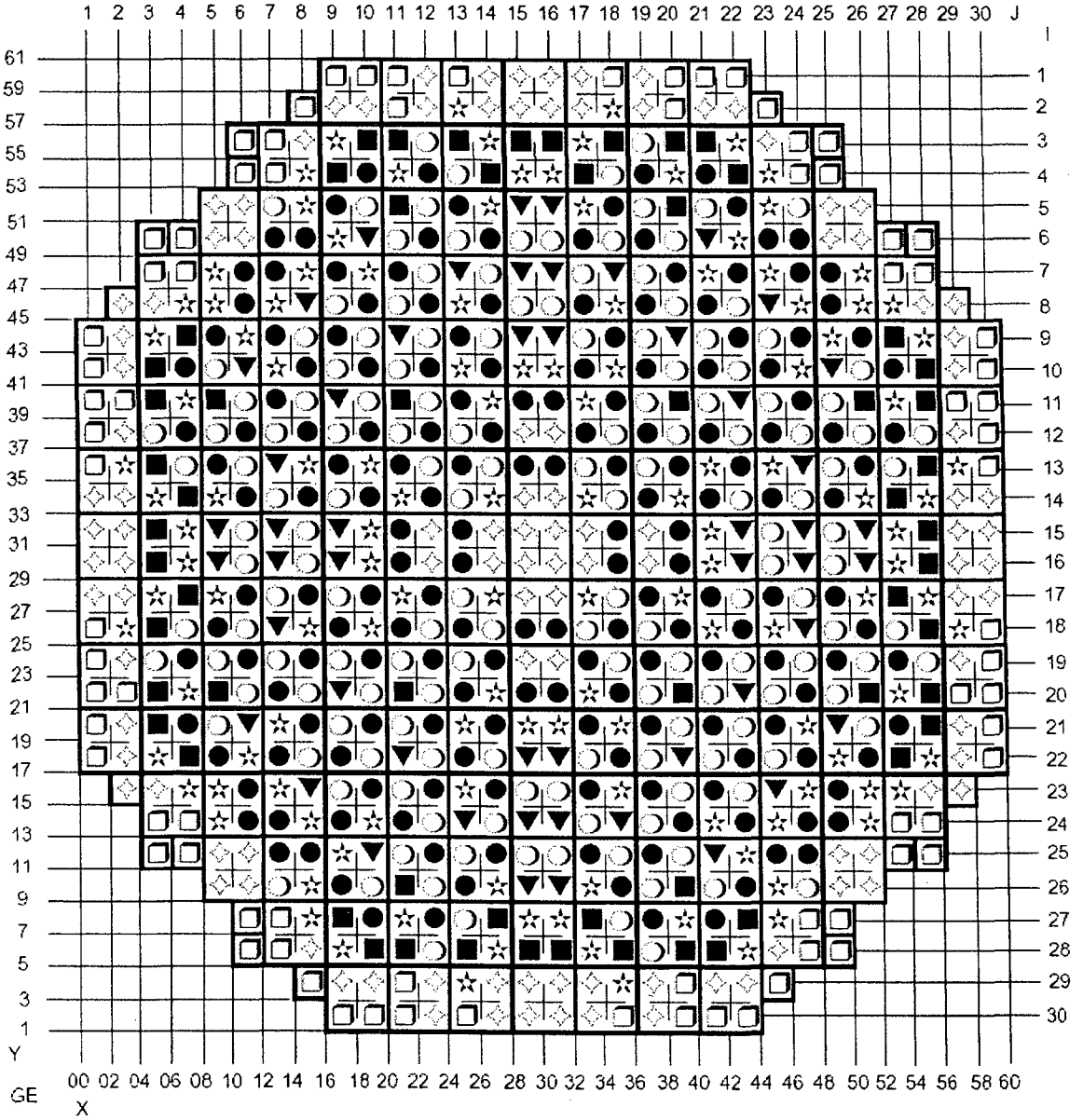
Attachment 2 to PLA-5860

Figure 1

Susquehanna U2C13 Core Loading Pattern

(Preliminary)

Figure 1
Preliminary
SUSQUEHANNA UNIT 2 CYCLE 13 CORE LOADING PATTERN



- SQB-10 TWICE BURNED (3.87)
- SQB-10 TWICE BURNED (3.75)
- SQB-11 ONCE BURNED (3.90)
- SQB-11 ONCE BURNED (4.12)
- SQB-12 FRESH (4.12)
- SQB-12 FRESH (4.12)
- SQB-12 FRESH (3.90)

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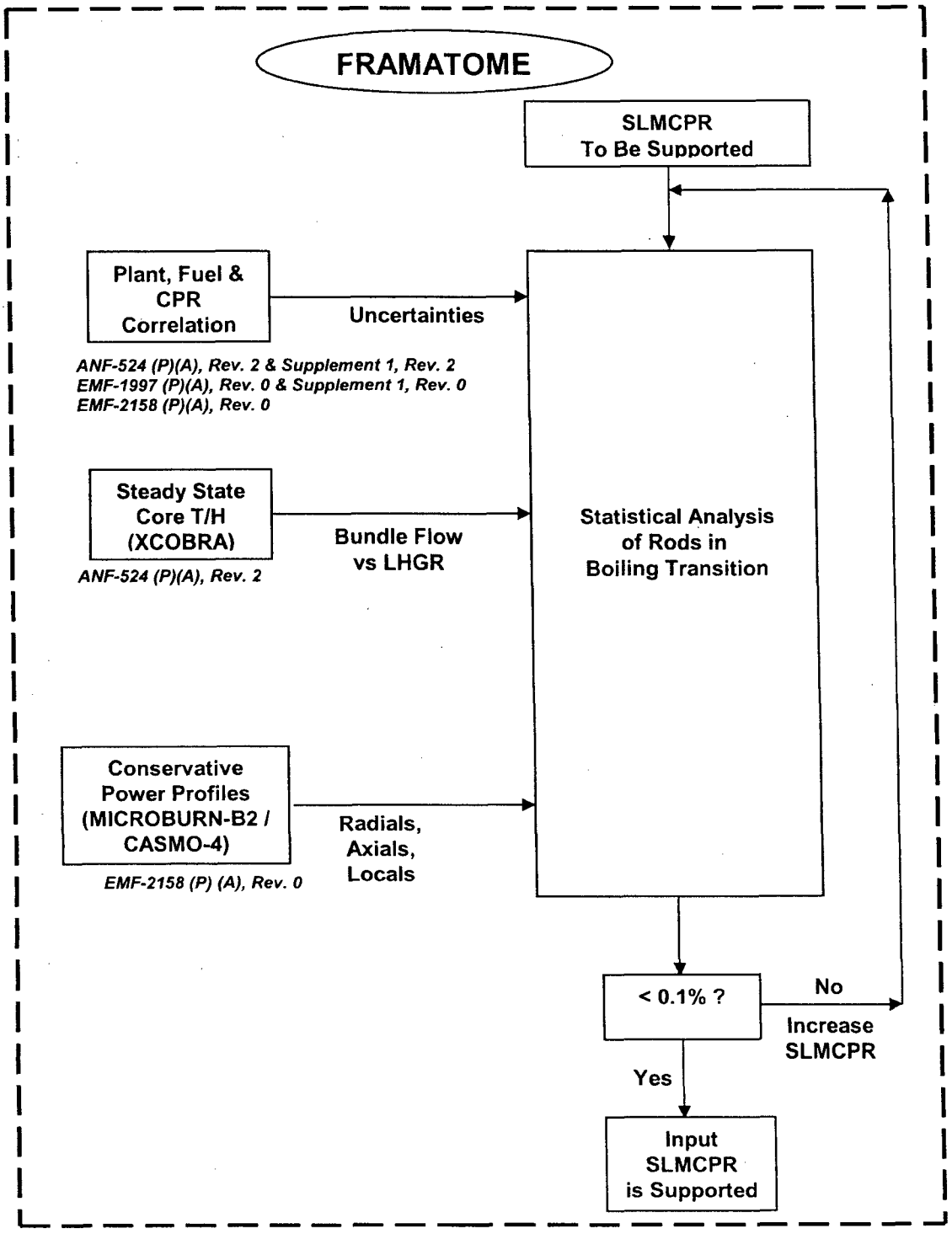
Attachment 3 to PLA-5860

Figure 2

MCPR Safety Limit Methodology

Figure 2
MCPR Safety Limit Methodology



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01/20/2005

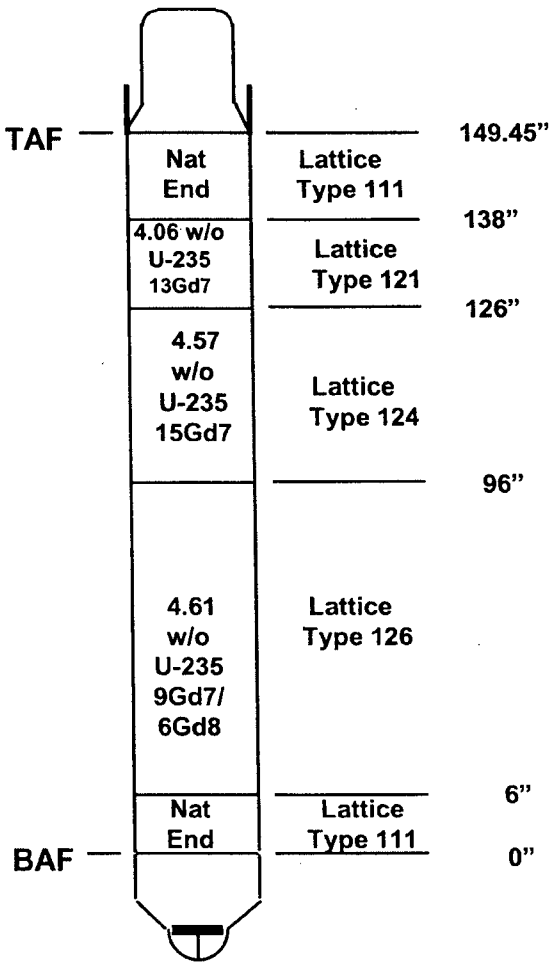
Attachment 4 to PLA-5860

Figure 3

Preliminary Assembly Type 58 Reload Bundle Description

Figure 3
Preliminary
Assembly Type 58
Reload Bundle Description
(100 mil Channel)

Bundle Average Enrichment = 4.12%



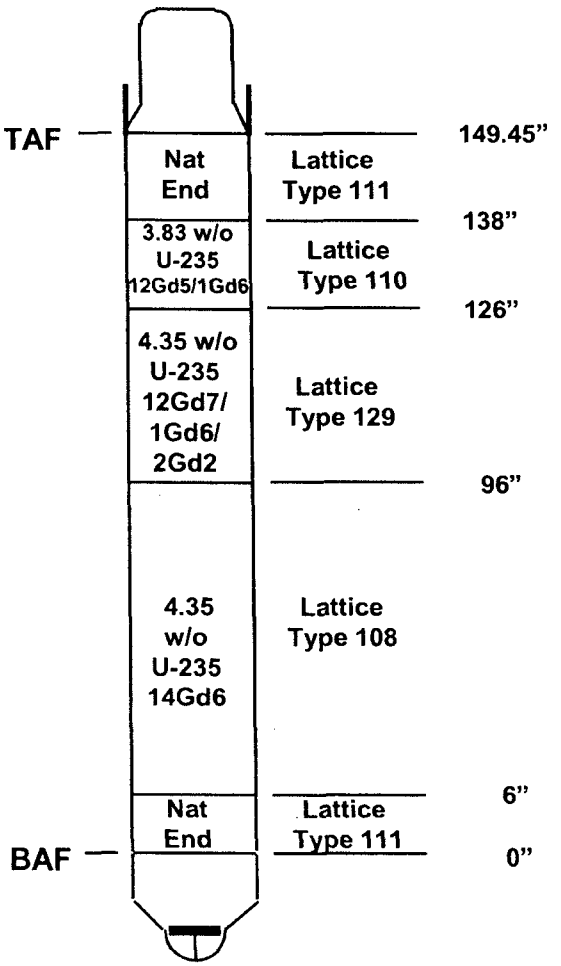
Attachment 5 to PLA-5860

Figure 4

Preliminary Assembly Type 59 Reload Bundle Description

Figure 4
Preliminary
Assembly Type 59
Reload Bundle Description
(100 mil Channel)

Bundle Average Enrichment = 3.90%



Attachment 6 to PLA-6199

Resubmitted PLA-6156

(NONPROPRIETARY)

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February 15, 2007

U. S. Nuclear Regulatory Commission
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SUSQUEHANNA STEAM ELECTRIC STATION
REQUEST FOR ADDITIONAL INFORMATION
REGARDING PROPOSED AMENDMENT NO. 259
TO UNIT 2 LICENSE NPF-22: MCPR SAFETY LIMITS
AND REFERENCE CHANGES
PLA-6156 **Docket No. 50-388**

References: 1) *PLA-6132, B. T. McKinney (PPL) to USNRC, "Proposed Amendment No. 259 to Unit 2 License NPF-22: MCPR Safety Limits and Reference Changes," dated November 16, 2006.*

2) *PLA-5860, B. T. McKinney (PPL) to USNRC, "Request for Additional Information Regarding Proposed Amendment No. 233 to Unit 2 License NPF-22: MCPR Safety Limits and Reference Changes," dated February 1, 2005.*

3) *PLA-5742, B. L. Shriver (PPL) to USNRC, "Supplement to Proposed Amendment No. 221 to Unit 2 License NPF-22: Revised MCPR Safety Limits," dated April 27, 2004.*

4) *PLA-5990, B. T. McKinney (PPL) to USNRC, "Proposed Amendment No. 284 to Unit 1 License NPF-14: MCPR Safety Limits and Reference Changes," dated December 1, 2005.*

Attached to this letter is the PPL Susquehanna, LLC (PPL) response to the NRC's request for additional information as discussed in teleconferences on January 24, 2007 and February 6, 2007, with regard to PPL's proposed revision to the Susquehanna Steam Electric Station Unit 2 Technical Specifications (Reference 1). These proposed revisions to the Technical Specifications, if approved, would update the Minimum Critical Power Ratio (MCPR) Safety Limit in Technical Specification Section 2.1.1.2 and revise Section 5.6.5.b to include NRC-approved methodology used in the determination of Core Operating Limits.

Any questions regarding this response should be directed to Mr. Duane L. Filchner at (610) 774-7819.

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

Executed on: 2-15-07

B. T. McKinney

Attachment: Response to NRC Request for Additional Information

cc: NRC Region I
Mr. C. R. Welch, NRC Sr. Resident Inspector
Mr. R. V. Guzman, NRC Project Manager
Mr. R. R. Janati, DEP/BRP

Attachment to PLA-6156

Response to
NRC Request for Additional Information

Response to NRC Request for Additional Information

NRC Question #1

In TS 5.6.5.b, there is an example that 10 out of 18 approved methodologies are used to support TS 3.2.2. Please confirm that the flow chart shown in Attachment 8 to PLA-6132 reflects the entire main and necessary methodologies to perform MCPR safety limit, and clarify which parameters and uncertainties each specified method provides to the CPR assessment. Provide an update of the use of the approved methodologies listed in Attachment 7 to PLA-6132 to reflect their use in establishing input data (thermal-hydraulic, neutronic, or fuel) or calculation methods, etc., in the content under Methodology/Justification because the current information does not fully identify each method's application.

PPL Response

Attachment 8 to PLA-6132, Reference 1, provides all of the necessary methodologies used to perform the MCPR Safety Limit analysis. Attachment 7 of Reference 1 lists all of AREVA's methods used to determine the core operating limits (including the MCPR Safety Limit). The methods listed in Attachment 7 have been reviewed and approved by the NRC.

PPL's reload core design and licensing analysis process is documented in procedures that fall under PPL's Quality Assurance program. The process can be divided into three main phases: planning, analysis, and implementation. During the planning phase, desired changes (core management procedures, monitoring methods, bundle design, etc.) from previous operating cycles are identified and compared to the NRC-approved methods to ensure the applicability of the methods. The results of the planning step are documented as part of the reload core design.

During the analysis phase, PPL and AREVA work to develop the reload core design and perform the licensing analyses. NRC-approved methods are used to perform design and licensing analyses per the requirements of their respective 10 CFR 50 Appendix B Quality Assurance programs. The requirements associated with these NRC approvals are implemented through Administrative Procedures and Engineering Work Practices. These address all aspects of the work performed by PPL and AREVA, e.g., methodology development, control of computer codes, analysis guidelines, personnel training, documentation, and independent review of calculations. At the conclusion of the analysis phase, PPL performs a multidiscipline review by individuals independent from those that

participated in the design of the reload core design and licensing analysis. The review, in part, confirms that NRC-approved methods were used for the analyses and that the methods are applicable to the core design.

During the implementation phase, the results of the reload core design and licensing analysis are compiled in the unit/cycle-specific Core Operating Limits Report (COLR). The COLR is incorporated in the cycle-specific Technical Requirements Manual (TRM) via the 10 CFR 50.59 process which ensures that the methods used have been previously reviewed and approved by the NRC for use at Susquehanna.

NRC Question #2

It appears that the significant contributing parameters, which will impact the Safety Limit Minimum Critical Power Ratio (SLMCPR) calculation, are fuel-related uncertainties (such as radial peaking), cycle-to-cycle design core loading pattern variations, and channel bow, etc. These uncertainties are characterized generically in Table 5.1 of Topical Report ANF-524(P)(A), "ANF Critical Power Methodology for Boiling Water Reactors." The uncertainties given are specifically for 8x8 and 9x9 fuel, and are not core- and cycle-specific. Please describe the physical phenomena as to how those parameters impact the SLMCPR calculations and quantify their impact on the final proposed SLMCPR values for Cycle 14 operation as mentioned in Enclosure to PLA-6132 (i.e., -0.01 to +0.01 for cycle-to-cycle variation, +0.01 for changing from ANFB-10 to SPCB for single-loop operation, and no impact from channel bow because of a factor of two the amount of channel bow assumed). Provide confirmation that the generic uncertainties remain applicable specifically to the SSES Unit 2, Cycle 14. Also, please justify that there is no impact on two-loop operation due to change of the critical power correlation.

PPL Response

Attachment 8 of PLA-6132 (Reference 1) identifies three NRC-approved topical reports where the uncertainties used for the Unit 2, Cycle 14 MCPR Safety Limit analysis were obtained. All three topical reports are listed in Section 5.6.5.b of the Unit 2 Technical Specifications and are applicable to the Susquehanna plant and AREVA's ATRIUM-10 fuel assembly design. The following table lists the various MCPR Safety Limit uncertainties and the associated topical report:

System Related Uncertainties

Feedwater Flow Rate	ANF-524(P)(A)
Feedwater Temperature	ANF-524(P)(A)
Core Pressure	ANF-524(P)(A)
Total Core Flow Rate	ANF-524(P)(A)

Fuel Related Uncertainties

SPCB Additive Constant	EMF-2209(P)(A)
Assembly Flow Rate	ANF-524(P)(A)
Assembly Radial Peaking	EMF-2158(P)(A)
Rod Local Peaking	EMF-2158(P)(A)

Pursuant to a previous PPL MCPR Technical Specification request, PLA-5860 and PLA-5742 (References 2 and 3) provided a description of the impact of various components on the MCPR Safety Limit calculation. The information described therein is applicable to this request. The information contained in PLA-5860 is summarized below including additional information regarding the impact of the SPCB correlation:

AREVA does not routinely perform sensitivity analyses for the various MCPR Safety Limit inputs or uncertainties on a cycle-specific basis. However, based on previous calculations, the following information is provided:

- The Fuel related uncertainties (in particular, the radial peaking) have a larger impact on the MCPR Safety Limit than the system-related uncertainties.
- Cycle-to-cycle design core loading pattern variations can affect the MCPR Safety Limit by ± 0.01.
- The table provided in PLA-5742, U2C12 mid-cycle SLMCPR showed the MCPR Safety Limit sensitivity to Radial Bundle Power and Local power distribution uncertainties. This table is repeated below:

[ ]

Radial and local power distribution uncertainties based on the CASMO-4/ MICROBURN-B2 code system are smaller than the corresponding uncertainties based on the CASMO-3/MICROBURN-B code system. This change decreased the U2C12 SLMCPR by 0.02.

- For Unit 2, Cycle 13, AREVA determined that increasing the nominal channel bow by a factor of two, increased the SLMCPR by +0.01 to +0.02.

- As stated in PLA-6132 (Reference 1), PPL was the only utility to utilize the ANFB-10 critical power correlation for reloads of ATRIUM-10 fuel. Therefore, the results in PLA-6132 and PLA-5990 (References 1 and 4) are the only ones available for a transition from ANFB-10 to SPCB.

  In addition, PLA-5990 indicated that the transition from ANFB-10 to SPCB does not influence the two-loop MCPR Safety Limit results. However, this letter did show that the single-loop MCPR Safety Limit results may be affected by changing to the SPCB correlation and provided additional details to support the change.

NRC Question #3

Confirm that all fuel channels in SSES Unit 2, Cycle 14 are first-lifetime. Provide current status of your channel measurement and re-channeling campaign during the refueling and inspection outage preceding Unit 2, Cycle 14 operation. Provide any generic initiatives currently undergoing to treat the channel bow issues by AREVA or through the industry (BWR owners group).

PPL Response

PPL does not re-use irradiated fuel channels. Therefore, each fuel channel placed on a fresh bundle or replaced on an exposed fuel bundle is a fresh (i.e., zero exposure) fuel channel. Attachment 4 to PLA-6132 (Reference 1) lists the preliminary core composition for Unit 2, Cycle 14. A total of 144 of the 180 twice-burned assemblies scheduled for use in U2C14 were re-channeled with fresh 100-mil Zr-4 fuel channels during a fall 2006 maintenance outage. During the spring 2007 refueling outage, PPL plans on rechanneling all of the once-burned fuel assemblies with fresh 100-mil Zr-4 fuel channels. The aggregate effect of the fall 2006 re-channeling campaign, the planned re-channeling activities for spring 2007, and loading of new fuel during the spring 2007 outage will result in a total of 728 fuel assemblies with new 100-mil Zr-4 fuel channels. The remaining 36 assemblies are not expected to be susceptible to excessive shadow

corrosion-induced channel bow due to their very low control history. Of the remaining 36 fuel bundles, 32 of the fuel bundles are scheduled to reside near the core periphery.

Regardless of the as-loaded core configuration, PPL will confirm that the actual Unit 2, Cycle 14 mean channel bow is less than or equal to the mean channel bow assumed in the MCPR SL analysis. PPL will continue to monitor fuel performance in accordance with PPL's fuel channel monitoring program. PPL does not plan on performing any fuel channel measurements during the spring 2007 outage.

Attachment 7 to PLA-6199

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 letter from Britt T. McKinney of PPL Susquehanna, LLC with the subject, *Susquehanna Steam Electric Station Resubmittal of Proprietary Information*, dated April 2007, 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(d) 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 10th

day of April, 2007.

Susan K. McCoy
NOTARY PUBLIC, STATE OF WASHINGTON
MY COMMISSION EXPIRES: 1/10/2008

SUSAN K. McCOY
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