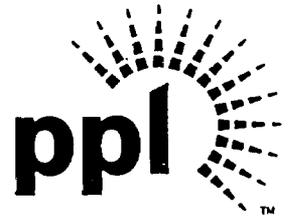


**Britt T. McKinney**  
Sr. Vice President & Chief Nuclear Officer

**PPL Susquehanna, LLC**  
769 Salem Boulevard  
Berwick, PA 18603  
Tel. 570.542.3149 Fax 570.542.1504  
btmckinney@pplweb.com



OCT 14 2005

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Mail Stop OP1-17  
Washington, DC 20555-0001

**SUSQUEHANNA STEAM ELECTRIC STATION  
PROPOSED AMENDMENT NO. 282 TO  
FACILITY OPERATING LICENSE NPF-14:  
PROPOSED CHANGE TO TECHNICAL SPECIFICATION 2.1.1.2  
MCPR SAFETY LIMIT  
PLA-5967**

**Docket No. 50-387**

In accordance with the provisions of 10 CFR 50.90, PPL Susquehanna, LLC is submitting a request for amendment to the Technical Specifications (TS) for Susquehanna Unit 1.

This amendment request is being made because the current Unit 1 Cycle 14 (U1C14) Minimum Critical Power Ratio Safety Limit (MCPR SL) in Technical Specification (TS) 2.1.1.2 has been determined to require a mid-cycle revision due to a mid-cycle core redesign necessitated by planned actions to resolve control cell friction issues. The revised MCPR SL is based on a conservative value for channel bow that is expected to bound operation for the balance of the U1C14 operating cycle. PPL will obtain fuel channel measurements and necessary data during an upcoming maintenance outage to confirm that the adequacy of the as-left core design is within the safety analysis assumptions prior to unit restart.

In accordance with the provisions of 10 CFR 50.91(a)(6), PPL Susquehanna, LLC requests this amendment be processed on an exigent basis. PPL recently determined, based in part on testing performed the weekend of September 30, that a mid-cycle core redesign was the most prudent course of action to ensure safe, reliable operation for the remainder of U1C14. Therefore, this request is timely. NRC review and approval of this request on an exigent basis is necessary to avoid unnecessary delays in unit restart following the upcoming maintenance outage.

The enclosure to this letter contains PPL's evaluation of this proposed change. Included are a description of the proposed change, technical analysis of the change, regulatory analysis of the change (No Significant Hazards Consideration and the Applicable Regulatory Requirements), and the environmental considerations associated with the change.

A001

Attachment 1 to this letter contains the applicable page of the Susquehanna SES Unit 1 TS, marked to show the proposed change.

There are no changes to the Susquehanna SES Unit 1 Technical Specification Bases as a result of this proposed TS license amendment.

PPL commits to confirm the adequacy of the channel bow assumption used in the redesigned core prior to restart as a condition of this proposed amendment. (Attachment 3). Based on a meeting with NRC on October 12, 2005 and discussion with the NRC Project Manager, PPL will provide additional information related to this commitment by October 21, 2005.

Both the Susquehanna SES Plant Operations Review Committee and the Susquehanna Review Committee have reviewed this MCPR SL change.

We request NRC complete its review and approval of the proposed change to support unit startup immediately following implementation of the redesigned U1C14 core. We will provide pertinent schedule information on an ongoing basis to the NRC Project Manager for Susquehanna.

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: 10-14-05



B. T. McKinney

Enclosure:

PPL Susquehanna Evaluation of the Proposed Change

Attachment:

- Attachment 1 - Proposed Technical Specification Change (Mark-ups)
- Attachment 2 – Proposed Core Loading Pattern
- Attachment 3 – List of Regulatory Commitments

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

---

**ENCLOSURE TO PLA-5967**

**PPL SUSQUEHANNA EVALUATION OF  
PROPOSED CHANGE TO  
UNIT 1  
TECHNICAL SPECIFICATION 2.1.1.2**

---

1. DESCRIPTION
2. PROPOSED CHANGE
3. BACKGROUND
4. TECHNICAL ANALYSIS
5. REGULATORY ANALYSIS
  - 5.1 No Significant Hazards Consideration
  - 5.2 Applicable Regulatory Requirements/Criteria
6. ENVIRONMENTAL CONSIDERATIONS

# PPL EVALUATION

**Subject: CHANGE TO UNIT 1 TECHNICAL SPECIFICATION 2.1.1.2**

## **1.0 DESCRIPTION**

This letter is a request to amend Operating License NPF-14 for PPL Susquehanna, LLC (PPL), Susquehanna Steam Electric Station Unit 1 (SSES) on an exigent basis.

The proposed change would revise the Susquehanna Unit 1 Technical Specifications (TS) Section 2.1.1.2 to reflect the revised Unit 1 Cycle 14 (U1C14) Minimum Critical Power Ratio (MCPR) Safety Limits (SL) for two-loop operation following implementation of a redesigned core. SSES Unit 1 is currently operating in its 14<sup>th</sup> fuel cycle. This change to the Section 2.1.1.2 MCPR SL is necessary due to control cell friction issues which necessitated a U1C14 mid-cycle core redesign and unit shutdown to implement. As a result, the two-loop operation MCPR Safety Limit has increased relative to the existing MCPR SL value in the Unit 1 TS. The single loop operation MCPR Safety Limit is unchanged relative to the existing MCPR SL value in the Unit 1 TS.

PPL requests this proposed change receive NRC approval to support startup of Unit 1 immediately after the outage in which the redesigned core is loaded.

A detailed discussion of the change is provided in Section 4.0.

## **2.0 PROPOSED CHANGE**

The proposed change would revise Unit 1 TS Section 2.1.1.2 with regard to the Minimum Critical Power Ratio (MCPR) Safety Limit for two-loop operation from 1.08 to 1.09. This value reflects the results of the Unit 1 mid-cycle 14 core redesign and cycle specific MCPR Safety Limit analysis.

### 3.0 BACKGROUND

Excessive thermal overheating of the fuel rod cladding can result in cladding damage and the release of fission products. In order to protect the cladding against thermal overheating due to boiling transition, Safety Limits (Section 2.1.1.2 of the Susquehanna SES Unit 1 Technical Specifications) were established. This change to Section 2.1.1.2 reflects the results of the mid-cycle core redesign on the U1C14 MCPR Safety Limits.

NUREG-0800, Standard Review Plan Section 4.4, specifies an acceptable, conservative approach to define this Safety Limit. Specifically, a Minimum Critical Power Ratio (MCPR) value is specified such that at least 99.9% of the fuel rods are expected to avoid boiling transition during normal operation or Anticipated Operational Occurrences. Boiling transition is predicted using a correlation based on test data (i.e., a Critical Power Correlation). The Safety Limit MCPR calculation accounts for various uncertainties such as feedwater flow, feedwater temperature, pressure, power distribution uncertainties, channel bow, and uncertainty in the Critical Power Correlation.

The proposed Safety Limit MCPR values (two-loop and single-loop) were calculated using FANP's NRC approved analytical methods with the ANFB-10 critical power correlation for ATRIUM™-10 fuel assuming a rated core thermal power of 3489 MWt. The proposed Safety Limit MCPR values (two-loop and single-loop) assure that at least 99.9% of the fuel rods are expected to avoid boiling transition during normal operation or anticipated operational occurrences.

The MCPR Safety Limit analysis associated with this change is the first in a series of analyses that assure the core loading for the remainder of U1C14 is operated in a safe manner. Additional analyses are performed (using NRC approved methodology referenced in Technical Specification Section 5.6.5.b) to determine changes in the critical power ratio as a result of anticipated operational occurrences. These results are combined with the MCPR Safety Limit values proposed here to establish the MCPR operating limits in the U1C14 Core Operating Limits Report (COLR). The MCPR operating limits assure that the MCPR Safety Limit will not be exceeded during normal operation or anticipated operational occurrences, thus providing the required protection for the fuel rod cladding. Postulated accidents are also analyzed to confirm the NRC acceptance criteria are met.

#### 4.0 TECHNICAL SAFETY ANALYSIS OF THE PROPOSED CHANGE

This proposed Technical Specification change increases the current U1C14 two loop MCPR Safety Limit from 1.08 to 1.09 for the remainder of U1C14 operation. The following factors can impact the MCPR Safety Limit when it is compared to the current U1C14 MCPR Safety Limit:

1. Core Loading Pattern Changes - these are changes to the core loading pattern to mitigate control cell friction for successful operation to the spring 2006 refueling outage.
2. Channel Bow – the amount of channel bow assumed in the MCPR Safety Limit analysis is increased.

As described in the sections below, the existing MCPR SL (1.08 for two loop operation) is not impacted by the core loading pattern changes alone (Table 1). When the new channel bow assumption is included, i.e., core bow is increased, the MCPR SL for two loop operation becomes 1.09 (Table 2). There is no change required in the MCPR SL for single loop operation due to either of these factors.

##### Core Loading Pattern Changes

The core loading pattern changes for the mid-cycle outage are designed to mitigate control cell friction while maintaining U1C14 reactivity and depletion characteristics (to the extent possible) to minimize impacts/changes to the current COLR limits. The core re-design will rechannel up to 77 fuel assemblies. In addition, 56 fuel assemblies will be discharged. The 56 fuel assemblies are split as follows: 32 fuel assemblies initially loaded in Unit 1 Cycle 13, and 24 fuel assemblies initially loaded in Unit 1 Cycle 12. The 56 fuel assemblies will be replaced with fuel assemblies initially loaded in Unit 1 Cycle 12 and discharged following Unit 1 Cycle 13. The proposed revised core loading pattern is provided as Attachment 2. The corresponding core composition is:

U1C14 Proposed Redesigned Core Composition

Assembly Type	Operational History	Number of Assemblies
FANP ATRIUM™-10	Initial U1C14 Fresh	280
FANP ATRIUM™-10	Once-Burned	284
FANP ATRIUM™-10	Twice-Burned	144
FANP ATRIUM™-10	Twice-Burned Reinsert	56

FANP performed MCPR Safety Limit calculations for the revised core loading pattern and determined that the core loading changes would not lead to an increase in the MCPR Safety Limit. The following table provides the percent of pins-in-boiling transition as a function of the MCPR Safety Limit for two loop and single loop operation for the redesigned core loading pattern alone.

Table 1 – Impact on MCPR of Core Loading Changes

MCPR Safety Limit	Percent of Pins in Boiling Transition for Two Loop Operation	Percent of Pins in Boiling Transition for Single Loop Operation
1.08	0.0767	N/A
1.10	N/A	0.0458

Thus, the current two loop MCPR value of 1.08 meets the acceptance criteria of assuring that at least 99.9% of the fuel rods avoid boiling transition.

#### Channel Bow

NRC Bulletin 90-02 was issued to ensure that the effects of channel bow on the critical power ratio (CPR) calculations are properly taken into account. In response to NRC Bulletin 90-02, FANP issued Supplement 1 to their CPR Methodology, ANF-524(P)(A), "ANF Critical Power Methodology for Boiling Water Reactors." The methodology described in ANF-524 has been reviewed and approved by the NRC and is incorporated in TS Section 5.6.5.b. (COLR Analytical Methods). The ANF-524 methodology incorporates the effects of channel bow on CPR through the MCPR SL calculation.

Based on fuel channel / control rod interference observed during Unit 1 Cycle 13 operation (completed February 2004), and subsequent channel bow measurements and analysis of discharged bundles, the amount of channel bow assumed for the remainder of U1C14 in the MCPR Safety Limit calculation was increased from that assumed for U1C13 and the original U1C14 analysis. This increased channel bow, assumed in the revised U1C14 MCPR Safety Limit calculation, accounts for the U1C14 observations and was chosen to bound the core average bow expected during the remaining U1C14 operation. The following table includes the effects of changes to the core loading pattern and the channel bow assumption to provide the percent of pins-in-boiling transition as a function of MCPR Safety Limit for both two loop and single loop operation.

Table 2 – Combined Impact on MCPR of Changes in Core Loading and Channel Bow

Proposed MCPR Safety Limit	Percent of Pins in Boiling Transition for Two Loop Operation	Percent of Pins in Boiling Transition for Single Loop Operation
1.08	0.1397	N/A
1.09	0.0892	N/A
1.10	0.0547	0.0886
1.11	N/A	0.0618

Selecting 1.09 as the revised two loop MCPR SL meets the acceptance criteria of assuring that at least 99.9% of the fuel rods avoid boiling transition.

Additional Discussion for MCPR SL Change

The proposed change to the MCPR Safety Limit does not directly or indirectly affect any plant system, equipment, component, or change the processes used to operate the plant. As discussed above, the analyses associated with the core redesign performed prior to the U1C14 restart will meet all applicable acceptance criteria. Therefore, the proposed change does not affect the failure modes of any systems or components, create the possibility of a previously unevaluated operator error or a new single failure, nor create the possibility of a new or different kind of accident from any accident previously evaluated.

Since the proposed change does not alter any plant system, equipment, or component, the proposed change will not jeopardize or degrade the function or operation of any plant system or component governed by Technical Specifications. The proposed MCPR Safety Limits do not involve a significant reduction in the margin of safety as currently defined in the Bases of the applicable Technical Specification sections, because the MCPR Safety Limits calculated for the remainder of U1C14 preserve the required margin of safety, and NRC approved methodology is used to demonstrate all applicable criteria are met.

Operator performance and procedures are unaffected by this proposed change since plant operation is unaffected by the change. The MCPR Operating Limits to be incorporated in the Core Operating Limits Report (determined from the MCPR Safety Limits and U1C14 transient analysis results) may be different from the original U1C14 limits.

## Conclusion

The proposed change to the MCPR Safety Limits is developed in accordance with NRC approved methods and does not affect any plant system, equipment, or component. Therefore, the proposed change will not jeopardize or degrade the function or operation of any plant system or component governed by Technical Specifications. The proposed MCPR Safety Limits do not involve a significant reduction in the margin of safety as currently defined in the Bases of the applicable Technical Specification sections. The MCPR Safety Limits calculated for the remainder of U1C14 preserve the required margin of safety.

Licensing analyses will be performed (using NRC approved methodology referenced in Technical Specification Section 5.6.5.b) to determine changes in the critical power ratio as a result of anticipated operational occurrences. These results are added to the MCPR Safety Limit values proposed herein to generate the revised MCPR operating limits in the U1C14 COLR. Thus, the MCPR operating limits assure that the MCPR Safety Limits will not be exceeded during normal operation or anticipated operational occurrences. The required protection for the fuel rod cladding will be provided and this proposed change to the MCPR Safety Limits will have a negligible impact on the results of postulated accident analyses. Therefore, the proposed action does not involve an increase in the probability or an increase in the consequences of an accident previously evaluated in the SAR. Finally, the proposed change is in compliance with applicable regulations. The health and safety of the public are not adversely impacted by operation of SSES as proposed by the utilization of these revised U1C14 MCPR Safety Limits.

## **5.0 REGULATORY SAFETY ANALYSIS**

### **5.1 No Significant Hazards Consideration**

PPL Susquehanna, LLC (PPL) has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

The proposed change to the Unit 1 Technical Specifications 2.1.1.2 revises the Minimum Critical Power Ratio (MCPR) Safety Limit for two-loop operation from 1.08 to 1.09 to reflect the results of the revised cycle specific MCPR Safety Limit analysis.

- 1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?**

Response: No.

The proposed change to the MCPR Safety Limits does not directly or indirectly affect any plant system, equipment, component, or change the processes used to operate the plant. Further, the revised U1C14 MCPR Safety Limits are generated using NRC approved methodology and meet the applicable acceptance criteria. In addition, the effects of channel bow were conservatively addressed by increasing the amount of channel bow assumed in the MCPR SL calculation. Thus, this proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated.

Prior to the restart of U1C14, licensing analyses will be performed on the redesigned core (using NRC approved methodology referenced in Technical Specification Section 5.6.5.b) to determine changes in the critical power ratio as a result of anticipated operational occurrences. These results will be added to the MCPR Safety Limit values proposed herein to generate the MCPR operating limits in the U1C14 Core Operating Limits Report (COLR). The COLR operating limits thus assure that the MCPR Safety Limit will not be exceeded during normal operation or anticipated operational occurrences. Postulated accidents are also analyzed to confirm NRC acceptance criteria are met.

Therefore, this proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated.

- 2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?**

Response: No.

This proposed change to the MCPR Safety Limits does not directly or indirectly affect any plant system, equipment, or component and therefore they do not affect the failure modes of any of these items. Thus, the proposed change does not create the possibility of a previously unevaluated operator error or a new single failure.

Therefore, this proposed amendment does not create the possibility of a new or different kind of accident from any previously evaluated.

**3. Does the proposed change involve a significant reduction in a margin of safety?**

Response: No.

Since the proposed change does not alter any plant system, equipment, component, or the processes used to operate the plant, the proposed change will not jeopardize or degrade the function or operation of any plant system or component governed by Technical Specifications. The proposed MCPR Safety Limits do not involve a significant reduction in the margin of safety as currently defined in the Bases of the applicable Technical Specification sections, because the MCPR Safety Limits calculated for the remaining U1C14 operation preserve the required margin of safety.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based upon the above, PPL Susquehanna, LLC (PPL) concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

**5.2 Applicable Regulatory Requirements/Criteria**

Title 10 of the Code of Federal Regulations (10 CFR) establishes the fundamental regulatory requirements with respect to reactivity control systems. Specifically, General Design Criterion 10 (GDC-10), "Reactor design," in Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 states, in part, that the reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded.

The proposed MCPR Safety Limit values in TS Section 2.1.1.2 will ensure that 99.9% of the fuel rods in the core are not expected to experience boiling transition. This satisfies the requirements of GDC-10 regarding acceptable fuel design limits.

Based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

## 6.0 ENVIRONMENTAL CONSIDERATION

10 CFR 51.22(c)(9) identifies certain licensing and regulatory actions, which are eligible for categorical exclusion from the requirement to perform an environmental assessment. A proposed amendment to an operating license for a facility does not require an environmental assessment if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant hazards consideration; (2) result in a significant change in the types or significant increase in the amounts of any effluents that may be released offsite; or (3) result in a significant increase in individual or cumulative occupational radiation exposure. PPL Susquehanna, LLC has evaluated the proposed change and has determined that the proposed change meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Accordingly, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with issuance of the amendment. The basis for this determination, using the above criteria, follows:

As demonstrated in the No Significant Hazards Consideration Evaluation, the proposed amendment does not involve a significant hazards consideration.

There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite. The proposed change does not involve any physical alteration of the plant (no new or different type of equipment will be installed) or change in methods governing normal plant operation.

There is no significant increase in individual or cumulative occupational radiation exposure. The proposed change does not involve any physical alteration of the plant (no new or different type of equipment will be installed) or change in methods governing normal plant operation.

---

**Attachment 1 to PLA-5967**

**Proposed Technical Specification Change  
(Markups)**

---

2.0 SAFETY LIMITS (SLs)

---

2.1 SLs

2.1.1 Reactor Core SLs

2.1.1.1 With the reactor steam dome pressure < 785 psig or core flow < 10 million lbm/hr.

THERMAL POWER shall be  $\leq$  25% RTP.

2.1.1.2 With the reactor steam dome pressure  $\geq$  785 psig and core flow  $\geq$  10 million lbm/hr.

M CPR shall be  $\geq$  1.09 for two recirculation loop operation or  $\geq$  1.10 for single recirculation loop operation.

2.1.1.3 Reactor vessel water level shall be greater than the top of active irradiated fuel.

2.1.2 Reactor Coolant System Pressure SL

Reactor steam dome pressure shall be  $\leq$  1325 psig.

---

2.2 SL Violations

With any SL violation, the following actions shall be completed within 2 hours:

2.2.1 Restore compliance with all SLs; and

2.2.2 Insert all insertable control rods.

---

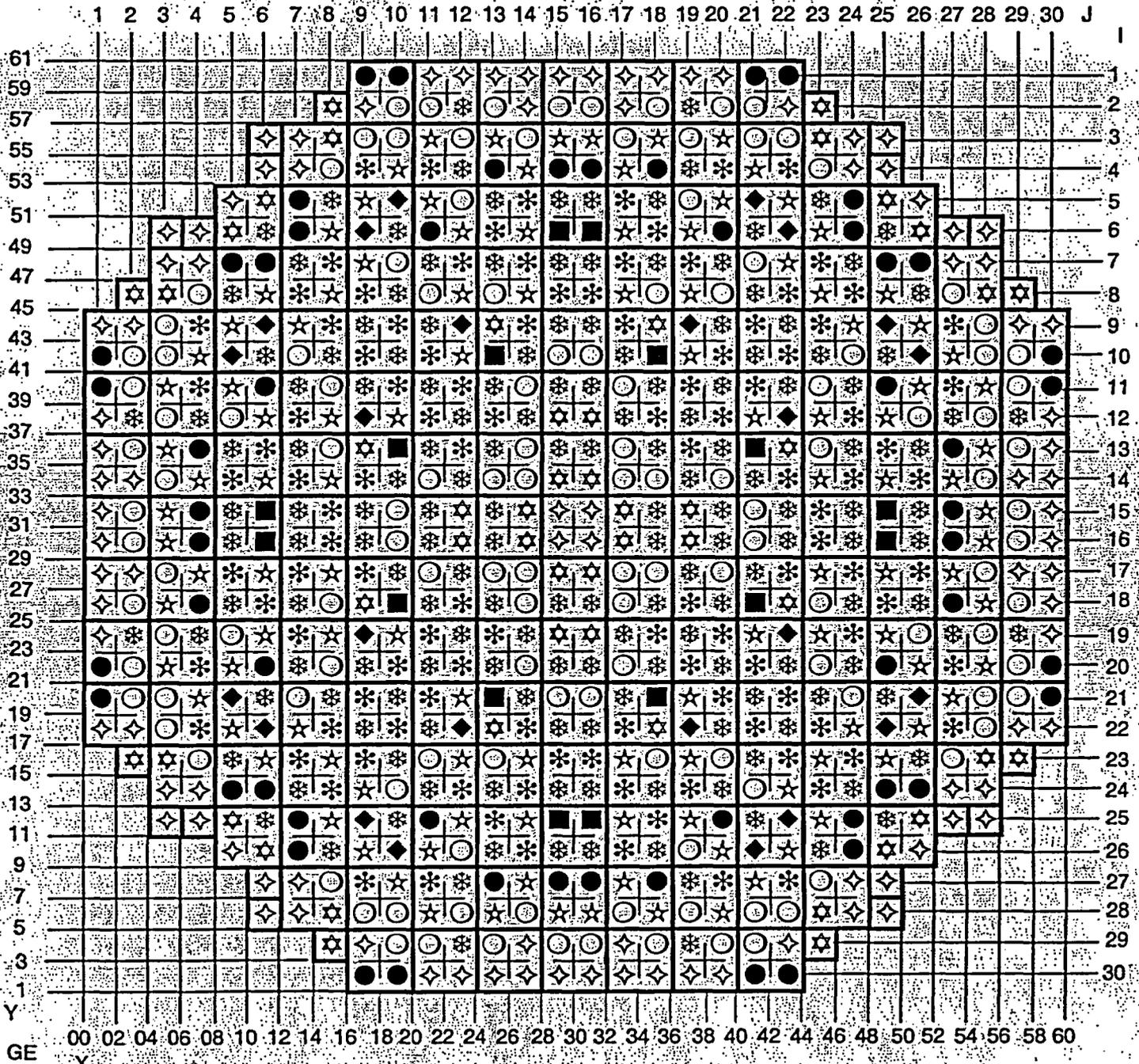
---

**Attachment 2 to PLA-5967**

**Proposed Core Loading Pattern**

---

# SUSQUEHANNA UNIT 1 CYCLE 14 MID-CYCLE REDESIGN PROPOSED CORE LOADING PATTERN



☆ SQA-11 12GdZ/1Gd7 TWICE BURNED (3.44)

☆ SQA-13 14GdZ FRESH (4.12)

☆ SQA-11 13GdZ TWICE BURNED (3.86)

☆ SQA-13 14GdZ FRESH (3.90)

○ SQA-12 12GdZ/1Gd7 ONCE BURNED (3.97)

● SQA-11 12GdZ/1Gd7 TWICE BURNED (3.44)  
(REINSERT)

⊛ SQA-12 13Gd6/12GdZ ONCE BURNED (3.75)

■ SQA-12 13Gd6/12GdZ ONCE BURNED (3.75) (SHUFFLED)

◆ SQA-12 12GdZ/1Gd7 ONCE BURNED (3.97) (SHUFFLED)

---

**Attachment 3 to PLA-5967**

**List of Regulatory Commitments**

---

**List of Regulatory Commitments**

The following table identifies those actions committed to by PPL Susquehanna in this document. Any other statements in this submittal are provided for information purposed and are not considered to be regulatory commitments. Please direct questions regarding these commitments to Mr. Duane L. Filchner.

<b>Regulatory Commitments</b>	<b>Due Date/Event</b>
PPL commits to confirm the adequacy of the channel bow assumption used in the redesigned core .	Prior to restart of Unit 1 immediately after the outage in which the redesigned core is loaded.