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SUBJECT: Application for amend to license NPF-22, requesting rev to permit loading of ATRIUM-10 fuel in Unit 2 core during Operational Condition 5, Refueling.

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U. S. Nuclear Regulatory Commission
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**SUSQUEHANNA STEAM ELECTRIC STATION
PROPOSED AMENDMENT NO. 167 TO LICENSE NPF-22:
CHANGES TO SUPPORT OPERATIONAL CONDITION 5
FUEL LOADING OF ATRIUM™-10
PLA-4587**

FILES R41-1/A17-2

Docket No. 50-388

- References:
1. PLA-4527, "Proposed Amendment No.166 to License NPF-22: Unit 2 Technical Specification Changes for ATRIUM™-10 Fuel," December 18, 1996.
 2. PLA-4582, "Addendum to Proposed Amendment No.166 to License NPF-22: Revised ANFB Methodology and Core Flow Dependent MCPR Safety Limits," March 12, 1997.
 3. ANF-89-98(P)(A) Revision 1 and Revision 1 Supplement 1, "Generic Mechanical Design Criteria for BWR Fuel Designs," Advanced Nuclear Fuels Corporation, May 1995.

The purpose of the letter is to propose interim changes to the Susquehanna Steam Electric Station (SSES) Unit 2 Technical Specifications necessary to permit loading of ATRIUM™-10 fuel in the Unit 2 core during Operational Condition 5, Refueling. References 1 and 2 describe proposed changes to the Unit 2 Technical Specifications to support the scheduled use of Siemens Power Corporation (SPC) ATRIUM™-10 fuel. Upon approval of References 1 and 2, the interim changes proposed herein will be superseded. These proposed interim changes rely solely on existing NRC approved codes and methods, and only entail modifications to Section 5.3.1 of the Design Features to encompass ATRIUM™-10 fuel and to Section 6.9.3.2 to add Reference 3 (above). Reference 3 is the NRC approved report describing the criteria used by SPC for fuel mechanical design.

Background

PP&L submitted its proposal for amendment (Reference 1) to allow the use of ATRIUM™-10 in December of 1996. During its preliminary review, the NRC concluded that approval of PP&L's proposed amendment would need to be delayed until a preplanned inspection of SPC was conducted. Issues relating to the analytical basis for the use of ATRIUM™-10 have surfaced during this ongoing NRC inspection of SPC and have caused an unanticipated delay in

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completing the requested Reference 1 review. Resolution of these issues is being aggressively pursued, and upon such resolution, approval to use ATRIUM™-10 fuel is expected. However, in an attempt to mitigate the impact on the current outage schedule, PP&L is requesting an amendment of the SSES Unit 2 Operating License pursuant to the provisions of NRC regulations in 10 CFR 50.91 pertinent to exigent circumstances to allow the loading of ATRIUM™-10 fuel into the Unit 2 Reactor Vessel. The basis for PP&L's request follows.

Basis for Amendment Request Under Exigent Circumstances

PP&L's request for a License Amendment under exigent circumstances has primarily resulted from an unanticipated delay in the review and approval of the Reference 1 proposed amendment. This delay causes a threat to PP&L's ability to complete the Unit 2 8th Refueling and Inspection Outage as planned, and return Unit 2 to operation. Current schedules call for commencing of fuel loading on April 5, 1997. Delay in beginning this operation can be expected to result in a delay to SSES Unit 2 operation. To support the current Unit 2 outage schedule and to minimize the scope of this proposed amendment, PP&L is only seeking approval to change Section 5.3.1 to encompass the description of ATRIUM™-10 fuel, and to add Reference 3 to Section 6.9.3.2. In addition, the Applicability of these interim changes is limited to Operational Condition 5, Refueling.

Exigent circumstances have arisen as a result of the fact that, during the original Unit 2 outage scoping process, PP&L did not anticipate the need for a NRC inspection of SPC to support the NRC review and approval of the Reference 1 proposed amendment. Even after learning of this planned activity, PP&L reasonably expected that all results would be satisfactory and not impact the current Unit 2 outage schedule. However, as indicated above, preliminary results of the NRC inspection, which is still ongoing, have raised issues relating to the analytical basis for the use of ATRIUM™-10 fuel and are different than anticipated by PP&L. The resultant consequences, which were only recently communicated to PP&L, have made this situation unavoidable. Further, this exigent request is to approve only those changes that are applicable to allow fuel loading during Operational Condition 5. The changes that support Unit 2 operation (References 1 and 2) will receive the full notice and comment period. Additionally, upon issuance of the final reload approval, the NRC is requested to supersede this interim change with those proposed in References 1 and 2. Therefore, in order to load the ATRIUM™-10 fuel in Unit 2 consistent with the current outage schedule, PP&L is submitting this separate exigent request for changes to support fuel load in Operational Condition 5, Refueling.

Proposed Interim Changes Rely Solely On Existing NRC Approved Codes And Methods.

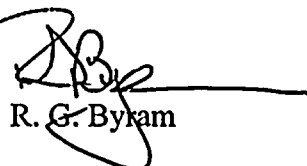
In support of this request, PP&L has completed the necessary evaluations and determined that the ability to load fuel in Operational Condition 5 only requires amendment of the Technical Specifications in Sections 5.3.1 and 6.9.3.2, and consideration of two factors: (1) Core Shutdown Margin (SDM), and (2) fuel bundle mechanical integrity. The NRC approved methodology for calculation of SDM is currently incorporated in Section 6.9.3.2 of the SSES Unit 2 Technical Specifications as References 3 and 21. Core shutdown margin calculations performed using this NRC approved methodology for the Unit 2 Cycle 9 (U2C9) core configuration, demonstrate that the ATRIUM™-10 fuel can be placed in the U2C9 core configuration with assurance that the core will remain subcritical with the strongest worth control rod withdrawn.

Reference 3 to this letter contains SPC's NRC approved mechanical design criteria for ensuring fuel bundle integrity. SPC mechanical design calculations have demonstrated that ATRIUM™-10 fuel complies with these NRC approved criteria.

Enclosure A to this letter is the "Safety Assessment" supporting this change. Enclosure B is the "No Significant Hazards Considerations" determination performed in accordance with the criteria of 10 CFR 50.92. Enclosure C to this letter contains the applicable pages of the SSES Unit 2 Technical Specifications, marked to show the proposed changes. The proposed changes have been approved by the SSES Plant Operations Review Committee and reviewed by the Susquehanna Review Committee.

PP&L plans to implement the proposed changes April 5, 1997 to support Cycle 9 core loading. Therefore, we request NRC complete its review of this change request by April 4, 1997 to support our scheduled implementation dates. Any questions regarding this exigent request should be directed to Mr. A. K. Maron at (610) 774-7727.

Very truly yours,



R. G. Byram

Attachments

copy: NRC Region I
Mr. C. Poslusny, Jr., NRC Sr. Project Manager - OWFN
Mr. K. M. Jenison, NRC Sr. Resident Inspector - SSES
Mr. W. P. Dornsife, Pa. DEP

**BEFORE THE
UNITED STATES NUCLEAR REGULATORY COMMISSION**

In the Matter of

:

Docket No. 50-388

PENNSYLVANIA POWER &
LIGHT COMPANY

:

**PROPOSED AMENDMENT NO. 167
FACILITY OPERATING LICENSE NO. NPF-22
SUSQUEHANNA STEAM ELECTRIC STATION
UNIT NO. 2**

Licensee, Pennsylvania Power & Light Company, hereby files proposed Amendment No. 167 to its Facility Operating License No. NPF-22 dated March 23, 1984.

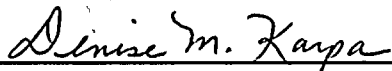
This amendment contains a revision to the Susquehanna SES Unit 2 Technical Specifications.

PENNSYLVANIA POWER & LIGHT COMPANY
BY:



R. G. Byram
Sr. Vice President - Nuclear

Sworn to and subscribed before me
this 17th of March, 1997.



Notary Public

NOTARIAL SEAL
DENISE M. KARPA, Notary Public
City of Allentown, Lehigh County, PA
My Commission Expires Dec. 31, 1998

SAFETY ASSESSMENT

CHANGES TO SUPPORT OPERATIONAL CONDITION 5 FUEL LOADING OF ATRIUM™-10

BACKGROUND

Susquehanna Steam Electric Station Unit 2, Cycle 9 will utilize the advanced design Siemens Power Corporation (SPC) ATRIUM™-10 fuel. The ATRIUM™-10 fuel design is a 10x10 lattice design which contains 83 full length fuel rods, 8 part length fuel rods, and a central water channel. The mechanical design has been analyzed according to SPC's NRC approved generic mechanical design criteria (Reference 3). PP&L has reviewed the SPC mechanical design calculations (performed according to SPC's QA program), and the results demonstrate that ATRIUM™-10 complies with NRC approved criteria.

DESCRIPTION OF THE PROPOSED CHANGE

The proposed Unit 2 Technical Specification changes to allow fuel loading in Operational Condition 5 consist of:

- (1) changes to Design Features Section 5.3.1 to reflect the ATRIUM™-10 design, and
- (2) inclusion of Siemens Power Corporation topical report (Reference 3) in Section 6.9.3.2,

A summary of the Technical Specification changes is provided below.

Design Features (Section 5.3.1)

Section 5.3.1 is revised to reflect the fact that ATRIUM™-10 contains a central water channel. Reference to a 150 inch active fuel length is removed. Also, the maximum enrichment is increased from 4.0 to 4.5 weight percent U₂₃₅.

Addition of Siemens Topical Report Reference (Section 6.9.3.2)

Included in the revised Technical Specifications via reference (Section 6.9.3.2) is the NRC approved topical report describing the criteria used by SPC to design BWR fuel assemblies.

SAFETY ANALYSIS

This section discusses the safety implications of the proposed action.

Design Features (Section 5.3.1)

The description of a fuel assembly (Section 5.3.1) is revised to reflect the fact that ATRIUM™-10 contains a central water channel. Since the active fuel length of ATRIUM™-10 is different from that of 9x9-2, reference to an active fuel length of 150 inches was deleted. There is no safety significance to these changes -- they merely revise the Design Features Section to accommodate ATRIUM™-10 fuel.

In addition, the maximum allowed enrichment (Section 5.3.1) is increased from 4.0 to 4.5 weight percent U_{235} . Criticality calculations (Technical Specification 5.6) were performed to ensure that ATRIUM™-10 fuel with a lattice average enrichment of 4.5 weight percent U_{235} can be safely stored in both the new fuel vault and the spent fuel storage pool at Susquehanna. These SPC analyses used the KENO Monte Carlo code. These calculations demonstrated that the maximum k -effective of both the new fuel vault and spent fuel storage pool will not exceed 0.95 under the worst credible storage array or accident conditions. The calculations included allowances for statistical uncertainty associated with the analytical method, computer code benchmark calculations, and both fuel and rack manufacturing tolerances. The analyses demonstrate that maximum fuel lattice average enrichments up to and including 4.50 weight percent U_{235} can be allowed.

Addition of Siemens Topical Report Reference (Section 6.9.3.2)

Included in the revised Technical Specifications via reference (Section 6.9.3.2) is the NRC approved topical report describing the criteria used by SPC to design BWR fuel assemblies. The ATRIUM™-10 mechanical design has been analyzed according to SPC's NRC approved generic mechanical design criteria (Reference 3). PP&L has reviewed the SPC mechanical design calculations (performed according to SPC's QA program), and the results demonstrate that ATRIUM™-10 complies with the NRC approved criteria.

Core Loading Evaluation

Support of fuel load in Operational Condition 5 requires consideration of two factors: Core Shutdown Margin (SDM) and fuel bundle mechanical integrity.

Core shutdown margin is defined as the amount of shutdown core reactivity with all the control rods inserted and with the strongest worth control rod fully withdrawn at 68° F and at zero Xenon poison concentration. PP&L's NRC approved methodology for calculating SDM is contained in References 1 and 2. Validation of the methodology as it applies to ATRIUM™-10 is described in Reference 2. Core shutdown margin calculations have been performed using NRC approved methodology for the Unit 2 Cycle 9 (U2C9) final core configuration. Core shutdown margin was

evaluated conservatively by using a lower cycle 8 energy, thereby making the resident SPC 9x9-2 fuel more reactive. Calculated core shutdown margin for the beginning of cycle core loading is greater than 1.00% $\Delta k/k$ which far exceeds the Technical Specification value of 0.38 % $\Delta k/k$. Therefore, the ATRIUMTM-10 fuel can be loaded and placed in its planned U2C9 final core configuration with assurance that the core will remain subcritical with the strongest worth rod withdrawn.

The Fuel and Equipment Handling Accidents were also considered. Since the ATRIUMTM-10 fuel is unexposed and the bundle weight is approximately the same as for the 9x9-2 design, the Fuel Handling Accident involving the drop of an ATRIUMTM-10 bundle is bounded by the current 9x9-2 analysis.

The NRC approved criteria for ensuring fuel bundle integrity is discussed in Reference 3. SPC mechanical design calculations, performed using NRC approved criteria, demonstrate that ATRIUMTM-10 complies with the NRC approved criteria (Reference 3).

CONCLUSIONS

The proposed change to the Susquehanna SES Unit 2 Technical Specifications supports loading of ATRIUMTM-10 fuel during Operational Condition 5. NRC approved methods are used to assure adequate shutdown margin and fuel bundle integrity during fuel loading in Operational Condition 5. Upon NRC approval of the Reference 4 and 5 submittals, the restriction to Operational Condition 5 will be removed.

REFERENCES

1. PL-NF-90-001-A, "Application of Reactor Analysis Methods for BWR Design and Analysis," July 1992.
2. PL-NF-90-001, Supplement 2-A, "Application of Reactor Analysis Methods to BWR Design and Analysis: CASMO-3G Code and ANFB Critical Power Correlation," July 1996.
3. ANF-89-98(P)(A) Revision 1 and Revision 1 Supplement 1, "Generic Mechanical Design Criteria for BWR Fuel Designs," Advanced Nuclear Fuels Corporation, May 1995.
4. PLA-4527, "Proposed Amendment No. 166 to License NPF-22: Unit 2 Technical Specification Changes for ATRIUMTM-10 Fuel," December 18, 1996.
5. PLA-4582, "Addendum to Proposed Amendment No. 166 to License NPF-22: Revised ANFB Methodology and Core Flow Dependent MCPR Safety Limits," March 13, 1997.

NO SIGNIFICANT HAZARDS CONSIDERATIONS AND ENVIRONMENTAL ANALYSIS

CHANGES TO SUPPORT OPERATIONAL CONDITION 5 FUEL LOADING OF ATRIUM™-10

NO SIGNIFICANT HAZARDS CONSIDERATIONS

Pennsylvania Power & Light Company has evaluated the proposed Technical Specification change in accordance with the criteria specified by 10 CFR 50.92 and has determined that the proposed change does not involve a significant hazards consideration. The criteria and conclusions of our evaluation are presented below.

1. The proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

The description of a fuel assembly (Section 5.3.1) is revised to reflect the fact that ATRIUM™-10 contains a central water channel. Since the active fuel length of ATRIUM™-10 is different from that of 9x9-2, reference to an active fuel length of 150 inches is no longer appropriate and was deleted. There is no safety significance to these changes.

Due to the limitation of this proposed change to Operational Condition 5, only a subset of the accident events analyzed in the FSAR needed to be addressed. All other events were considered and the addition of ATRIUM™-10 fuel to the reactor core in Operational Condition 5 did not increase the probability or consequences of an accident previously evaluated. The events considered are described below.

The maximum allowed enrichment (Section 5.3.1) is increased from 4.0 to 4.5 weight percent U_{235} . Criticality calculations were performed with a KENO Monte Carlo code to ensure that ATRIUM™-10 fuel with a lattice average enrichment of 4.5 weight percent U_{235} can be safely stored in both the new fuel vault and the spent fuel storage pool at Susquehanna. These calculations demonstrated, consistent with current Technical Specifications, that the maximum k-effective of both the new fuel vault and spent fuel storage pool will not exceed 0.95 under the worst credible storage array or accident conditions.

The ATRIUM™-10 fuel assembly is unirradiated and its weight is nearly identical to the current SPC 9x9-2 fuel assembly weight as well as being less than the fuel assembly weight used in the 9x9-2 analyses (680 lbs.). The dose consequences of the current 9x9-2 licensing analyses of the Fuel and Equipment Handling Accidents bound the dose consequences of a Fuel Handling Accident involving ATRIUM™-10 fuel.

The grappling of the ATRIUM™-10 fuel is similar to the 9x9-2, due to the similar bail handle dimensions and assembly weights. Therefore, ATRIUM™-10 fuel is completely compatible with the refueling platform main grapple. Because the assembly weights of the ATRIUM™-

10 fuel and the 9x9-2 fuel are essentially the same, the capacity of the refueling platform main hoist will be sufficient to handle the ATRIUM™-10 fuel. Also, the ATRIUM™-10 fuel uses the identical fuel channel design as the 9x9-2 fuel and the lower tie plate has very similar outside dimensions. Therefore, the ATRIUM™-10 fuel is compatible with, and can be safely inserted/placed into the reactor core.

Storage of channeled ATRIUM™-10 fuel in the Reactor Core was evaluated. Core shutdown margin calculations were performed using NRC approved methodology for the beginning of cycle core configuration. Validation of the shutdown margin methodology as it applies to ATRIUM™-10 was done through comparisons to Siemens' Power Corporation analyses and higher-order Monte Carlo calculations. Calculated core shutdown margin for the beginning of cycle core loading is greater than 1.00% $\Delta k/k$ which far exceeds the Technical Specification value of 0.38 % $\Delta k/k$. Therefore, the ATRIUM™-10 fuel can be placed into the U2C9 final core configuration with assurance that the core will remain subcritical with the strongest worth rod withdrawn. A positive core shutdown margin assures protection against the control rod removal error during refueling (FSAR Section 15.4.1.1) because subcriticality is maintained.

In addition, the ATRIUM™-10 fuel assembly dimensions critical to interface with the Spent Fuel Storage Pool and Reactor Vessel are essentially the same as the 9x9-2 design. Therefore, the ATRIUM™-10 can be properly stored.

Included in the revised Technical Specifications via reference (Section 6.9.3.2) is one NRC approved topical report containing the criteria for the design of Siemens Power Corporation fuel. SPC analyses have demonstrated that ATRIUM™-10 fuel complies with the NRC approved criteria thus assuring the structural integrity of the fuel. Compliance with the criteria applicable to Operational Condition 5 assures that ATRIUM™-10 fuel can be safely stored in the spent fuel pool and loaded in the Unit 2 reactor core during Operational Condition 5.

Based on the foregoing, the proposed action does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. The proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

The changes to the Unit 2 Technical Specifications (Design Features and inclusion of the methodology reference) to allow Operational Condition 5 loading of ATRIUM-10 fuel do not require any physical plant modifications (other than loading of the ATRIUM™-10 assemblies), physically affect any plant components, or entail changes in plant operation. ATRIUM™-10 fuel assemblies have approximately the same weight, outer dimensions, and the same basic bail handle design as 9x9-2 fuel assemblies and are handled in the

same manner as 9x9-2 fuel assemblies. Thus, the proposed change does not create the possibility of a previously unevaluated operator error.

The topical report reference added to Section 6.9.3.2 contains NRC approved acceptance criteria. SPC analyses have been performed according to their Quality Assurance Program which demonstrate compliance with these NRC approved fuel design criteria. Thus, the ATRIUMTM-10 fuel will maintain its structural integrity during core loading.

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

3. The proposed change does not involve a significant reduction in a margin of safety.

The changes to the Unit 2 Technical Specifications discussed in Item 1 above (Design Features and inclusion of the mechanical design methodology reference) will allow loading of ATRIUM-10 fuel in Operational Condition 5. The proposed change does not require any physical plant modifications (other than the loading of the ATRIUMTM-10 fuel), physically affect any plant components, or entail changes in plant operation. Therefore, the proposed change will not jeopardize or degrade the function or operation of any plant system or component governed by Technical Specifications. The analyses performed provide assurance that the ATRIUMTM-10 fuel will remain subcritical during storage and core loading and meets the requirements of Technical Specification 5.6 and, thus, an equivalent margin of safety is maintained.

ATRIUMTM-10 fuel assemblies have approximately the same weight, outer dimensions, and the same basic bail handle design as 9x9-2 fuel assemblies and are handled in the same manner as 9x9-2 fuel assemblies. The dose consequences of the Fuel and Equipment Handling Accidents are not increased and, thus, an equivalent margin of safety is maintained.

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

ENVIRONMENTAL ANALYSIS

An environmental assessment is not required for the proposed change because the requested change conforms to the criteria for actions eligible for categorical exclusion as specified in 10 CFR 51.22(c)(9). The requested change will have no impact on the environment. The proposed change does not involve a significant hazards consideration as discussed above. The proposed change does not involve a significant change in the types or significant increase in the amounts of any effluents that may be released offsite. In addition, the proposed change does not involve a significant increase in the individual or cumulative occupational radiation exposure.

ENCLOSURE C TO PLA-4587
TECHNICAL SPECIFICATION MARK-UPS