BEFORE THE

UNITED STATES NUCLEAR REGULATORY COMMISSION

In the Matter of	:	
	:	Docket No. 50-352
PHILADELPHIA ELECTRIC COMPANY		

APPLICATION FOR AMENDMENT

OF

FACILITY OPERATING LICENSE

NPF-39

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Philadelphia Electric Company, Licensee under Facility Operating License NPF-39 for Limerick Generating Station Unit 1, hereby requests that the Technical Specifications contained in Appendix A to the Limerick Operating License be amended as indicated by a vertical bar in the margin of the attached pages B3/4 9-1, 3/4 3-58, 3/4 3-59, 3/4 9-3 and 3/4 9-4.

Licensee has scheduled the first refueling outage to begin May 16, 1987. During the outage, complete core offloading is planned in order to more efficiently complete and accommodate refueling outage work. The fuel assemblies adjacent to the Source Range Monitors (SRMs), being the last fuel assemblies to

be removed, would cause the loss of SRM detector count rate contrary to the requirements of Specification 3/4 3.9.2, Surveillance Requirement 4.9.2.c, requiring a minimum SRM detector count rate be maintained at all times during core alterations. This application requests a revision to the requirement for a minimum SRM count rate when sixteen or fewer assemblies are in the core so as to permit complete core offloading. Previous safety evaluations which support the revisions requested by this application are provided in the NRC Safety Evaluation Reports for Amendments 65 and 64 to Facility License Nos. DPR-44 and DPR-56 (Philadelphia Electric Company, Peach Bottom Atomic Power Station dated March 26, 1980); Supporting Amendment Nos. 33 and 30 to Facility License Nos. DPR-33 and DPR-52 (TVA, Browns Ferry Nuclear Plant dated September 13, 1977); and Supporting Amendment No. 66 to Facility License No. DPR-57 (Georgia Power Company, Hatch I, dated June 12, 1979). A minimum required SRM detector count rate is presently required at all times during core alterations by Specification 3/4 3.9.2 Surveillance Requirement 4.9.2.C.

Two categories of changes are proposed:

The first category of change consists of a footnote to be added to the bottom of pages 3/4 3-59, 3/4 9-3 and 3/4 9-4. The footnote allows the SRM count rate to decrease below 3.0 cps (0.7 cps when the signal-to-noise ratio is $\geq$ 2) whenever sixteen or fewer fuel assemblies are in the core adjacent to the SRMs.

The second category of change consists of a paragraph insertion to the Bases, page B 3/4 9-1, paragraph 3/4 9.2, with further descriptions of how the fuel is offloaded and reloaded without the minimum required SRM count rate.

Both categories are interrelated and the safety evaluations and justifications for both categories are the same.

Safety Analysis:

The SRM system provides neutron flux information during startup and low flux level operations. The SRM also monitors neutron flux level during refueling operations, provides protection against high neutron flux during the approach to criticality and monitors neutron flux through the overlap into the Intermediate Range. The SRM system provides four channels of neutron flux information from 0.1 to 10(P6) counts per second (CPS) and four channels of reactor period from -100 to +10 seconds. The SRM system initiates a Rod Withdrawal Block via the Reactor Manual Control System (RMCS) at 1 X 10(P5) CPS in any single SRM channel while in the refuel mode.

Minimum Flux in the Core

The necessity for maintaining a minimum count on the SRMs at all times is based on the most conservative evaluation which includes fresh fuel loaded in the initial fuel cycle. A multiplying medium with no neutrons present forms the basis for an accident scenario in which reactivity is gradually but

inadvertently added until the medium is highly supercritical. No neutron flux will be evident since there are no neutrons present to be multiplied. The introduction of some neutrons at this point would cause the core to undergo a sudden power burst, rather than a gradual startup, with no warning from the nuclear instrumentation.

The scenario is of great concern when loading fresh fuel, but is of much lesser concern when loading irradiated fuel. Irradiated fuel continuously produces neutrons by spontaneous fission of certain plutonium isotopes, photofission, and photo disintegration of deuterium naturally present in the moderator. The neutron production in irradiated fuel is normally great enough to meet the minimum count for a full core after a refueling outage with the neutron startup source removed.

The proposed amendment guarantees the indication of the presence of neutrons in the core because it requires the first assemblies, which will always be loaded next to the SRMs, to produce the minimum required count rate on that SRM. If the first four assemblies fail to produce the minimum required count rate on that SRM, the loading operation must be stopped in that quadrant.

Reactor Period Circuit

The reactor period circuit of the Source Range Monitor system calculates the rate of change in reactor neutron flux. The period amplifier and indicator provide indication of the rate

of change of reactor power in Seconds of Reactor Period, by rate of change in the neutron count rate measured by the Source Range Monitors. The period meter provides positive (increasing power), negative (decreasing power) and infinite (steady state) period readings. The circuit provides a signal to alarm whenever the period is less than 50 seconds.

The period alarm warns the operators during reactor power increases when a reactivity anomaly occurs indicative of Reactor Period of less than 50 seconds. During fuel offloading and reloading, the Reactor Period alarm is not required or of concern. Therefore, evaluations and discussions on Reactor Period indication and alarm loss because of SRM count rate below 3.0 cps are outside the purview of this amendment request.

Refueling System Interlocks and Control Rod Design

During refueling, the refueling operations system interlocks provide the primary assurance that inadvertent criticality does not occur. Inadvertent criticality was evaluated in Chapter 15 of the Final Safety Analysis Report which analyzed and evaluated four reactivity anomalies. These are discussed below:

- A Control Rod Removal Error During Refueling

  Discussion:

Shutdown margin analysis, as required by the Technical Specifications, shows that the withdrawal of the highest worth control rod (during refueling) will not result in criticality.

o A Second Control Rod Removal or Withdrawal

Discussion:

With the refueling platform not over the core (and no fuel on the hoist) and with the mode switch in the refuel position, because of refuel system interlocks only one control rod can be withdrawn. Attempts to withdraw a second rod results in a rod block condition initiated by the refueling interlocks. Since the core is designed to meet shutdown requirements (shutdown margin analyses per Technical Specifications 3/4 1-1) even with the highest worth rod withdrawn, the core remains subcritical with the one rod withdrawn.

The Rod Block trip from the SRM system is not required during refueling because a Rod Block interlock exists in the Refueling System logic.

o Fuel Insertion with the Control Rod Withdrawn

Discussion:

To minimize the possibility of erroneously loading fuel into a cell which contains no control rod, the control

rod must be fully inserted when fuel is being loaded into that cell. When the mode switch is in the refuel position, the refueling interlocks prevent the platform from being moved over the core if a control rod is withdrawn and fuel is on the hoist. While the refueling platform is over the core with fuel on the hoist, all control rod motion is blocked by the interlocks.

SRM neutron flux information would not be required to prevent erroneously loading fuel into a cell which contains no control rod during fuel loading because the Refueling System interlocks precludes this type of inadvertent criticality.

o <u>A Control Rod Removal Without the Fuel Being Removed</u>

<u>Discussion</u>:

The control rod design incorporates a velocity limiter which will not physically permit upward removal of the control rod without prior removal of the four adjacent fuel bundles.

The lack of SRM information during offloading of the last sixteen fuel assemblies does not affect the ability to remove a control rod without first removing the fuel because the control rod design precludes control rod removal, without first removing the adjacent fuel.

As previously evaluated, the inadvertent criticality concerns during the core offloading and reloading are precluded by the control rod design and by the refueling system interlocks. Therefore, lack of the minimum required count rate on the Source Range Monitors, whenever sixteen or fewer fuel assemblies are in the core, does not decrease the margin of safety during core offloading/reloading because the control rod design rather than the SRMs precludes removal of a control rod prior to first removing the four adjacent fuel assemblies and because the refueling system interlocks, rather than the SRM, also preclude inadvertent criticality.

Finally, even the erroneous withdrawal of the highest worth control rod would not result in criticality as analyzed in the shutdown margin required by the Technical Specifications.

Fuel Loading Chambers

The Technical Specifications (3/4 3.9.2 Surveillance Requirement 4.9.2.C) presently require operability of at least two SRM channels during core alterations. The basis for maintaining two SRM channels during core alterations with eight or fewer fuel assemblies in the core depends on the successful use of "Special Movable Detectors" connected to the "normal SRM circuits". Experience at other BWR stations indicates that these "Special Movable Detectors", i.e. "Fuel Loading Chambers" do not function as originally anticipated. The Fuel Loading Chambers

tend to saturate because of gamma flux and because of a lack of fixed geometry produces unusable information.

Besides being inconvenient during refueling operations, the Fuel Loading Chambers produce signal variations because of the lack of fixed core geometry during refueling operations. Further, because the Fuel Loading Chambers are attached in a temporary manner to facilitate ease of relocation, their use increases the risk of dropping them into the vessel. The FLCs have been found to be unreliable, operationally inconvenient, and increase the probability of having a loose object fall in the reactor. All of the above forms the basis for the request for a change in the Technical Specifications.

The specific procedure for offloading without the Fuel Loading Chambers would be to unload one quadrant, starting at the core periphery and working toward the center. The remaining quadrants would then be unloaded, one at a time, in a quadrant spiral centered around the quadrant's SRM.

Other BWR Plant Practices

The Peach Bottom Atomic Power Station is one of the BWRs which relies on core offloading/reloading practices which do not include Fuel Loading Chambers (Amendment Nos. 65 and 64 to Facility License Nos. DPR-33 and DPR-56 dated March 26, 1980).

Based on the Safety Evaluation supporting Amendment Nos. 65 and 64 to the Peach Bottom Specifications discussed above and

based on the evaluations made in Chapter 15 of the FSAR, the proposed changes to the Technical Specifications, allowing the count rate of the SRM to decrease below the required minimum count once all of the fuel (except those assemblies adjacent to the SRMs) has been removed, does not pose a safety question.

Significant Hazards Considerations:

The proposed changes to the Unit 1 specifications are required in order to allow core offloading during the first refueling outage, scheduled to commence on May 16, 1987.

The purpose of the proposed changes to the Technical Specifications is to permit Limerick Generating Station to complete the fuel offloading and reloading without meeting the minimum SRM count rate and without the use of Fuel Loading Chambers (FLCs), which would otherwise be required.

The proposed changes to the Technical Specifications allowing the SRM count rate to drop below the required minimum whenever there are sixteen or fewer fuel assemblies in the core, does not involve Significant Hazards Considerations. In order to support the No Significant Hazards Consideration determination, necessary background supporting information is provided below, along with an evaluation of each of the three standards set forth in 10 CFR Section 50.92.

(1) Core offloading, reloading and operation of the plant in accordance with the proposed amendment does not involve

a significant increase in the probability or consequences of an accident previously evaluated.

Inadvertent criticality concerns were evaluated in the Limerick Generating Station Final Safety Analysis Report (Chapter 15), including the following anomalies:

- A Control Rod Removal Error During Refueling
- A Second Control Rod Removal or Withdrawal
- Fuel Insertion with the Control Rod Withdrawn
- A Control Rod Removal Without the Fuel Removed

The design of the control rods, coupled with the existing refueling system interlocks, precludes inadvertent criticality in each of the above cases. The evaluation of each case did not take credit for the Source Range Monitors, nor does the control rod design or the refueling system interlocks depend on the Source Range Monitors for safe operation.

Therefore, amending the Technical Specifications to allow the SRM indication to drop below the minimum required count rate whenever there are sixteen or fewer fuel assemblies in the core does not involve a significant increase in the probability or consequences of an accident previously evaluated.

(2) Core offloading, reloading and operation of the plant in accordance with the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.

The SRMs assure that neutron flux level information is always available during startup and when core alterations are being accomplished. By stipulating that fuel assemblies remain adjacent to each SRM until all other fuel assemblies have been removed from that quadrant, neutron flux information remains available until the lack of fuel eliminates the need for such information. During reloading, irradiated fuel assemblies are first placed adjacent to the SRMs so that flux information is available as fuel is loaded. Elimination of the requirement to maintain a source of information when the need for the information would no longer be required does not create the possibility of a new or different kind of accident from any accident previously evaluated.

(3) Core offloading, reloading and operation of the plant in accordance with the proposed amendment does not involve a significant reduction in a margin of safety.

After all fuel assemblies in a quadrant have been removed from the core (except for those adjacent to the SRMs), the SRMs would no longer be required in that quadrant. During reloading, two, three or four irradiated fuel assemblies are placed adjacent to each SRM until neutron flux indication is obtained.

Because of the physical configuration of the velocity limiter which was incorporated into the control rod design, removing the control rod prior to removing the adjacent fuel

assemblies is not physically possible with the existing refueling equipment. Further, the refueling system interlocks prevent a second control rod withdrawal if one control rod is already withdrawn. Shutdown margin demonstrations at the beginning of fuel cycle conditions assures subcriticality with the most reactive control rod fully withdrawn. This reactivity characteristic has been a basic assumption in the analysis of plant performance and was demonstrated at the time of initial fuel loading. (See Technical Specification Bases, page B 3/4 1-1.) All control rods must be fully inserted during reloading to preclude placing fuel in a cell which does not contain a control rod. Interlocks prevent fuel movement when a control rod is withdrawn and also blocks rod motion if the refueling platform is over the core.

Therefore, based on the discussions above, allowing the SRM count rate to drop below the minimum required count rate when there are sixteen or fewer fuel assemblies in the core, does not involve a significant reduction in a margin of safety because the control rod design and the refueling system interlocks, rather than the SRMs, preclude inadvertent criticality.

Conclusion:

Both categories of change: (1) the footnote added to pages 3/4 3-58, 3/4 3-59, 3/4 9-3 and 3/4 9-4 along with, (2) the paragraph added to the Bases, page B 3/4 9-1 (paragraph 3/4 9.2),

are interrelated and both categories of change do not involve Significant Hazards Considerations.

Environmental Consideration:

This amendment allows the SRM count rate to drop below the minimum required count rate whenever there are sixteen or fewer fuel assemblies in the core to allow offloading and reloading the entire core in a safe manner. Further, the Licensee has determined that the proposed amendment involves no increase in the amounts and no change in the types of any effluents that may be released offsite and has also determined that there is no increase in the individual or cumulative occupational radiation exposure.

It has also been determined that the NRC has previously found such amendments to be acceptable for other similarly designed boiling water reactors as indicated in amendments to the Technical Specifications for Peach Bottom Atomic Power Station, Hatch 1 Nuclear Generating Station, Browns Ferry Nuclear Station, and proposed amendments to the Susquehanna Steam Electric Station Technical Specifications.

The Plant Operations Review Committee and the Nuclear Review Board have reviewed these proposed changes to the Technical Specifications and have concluded that they do not involve unreviewed safety questions or involve Significant Hazards Considerations and will not endanger the health and safety of the public.

Respectfully submitted,
PHILADELPHIA ELECTRIC COMPANY

By J W Gallagher
Vice President

COMMONWEALTH OF PENNSYLVANIA :

: ss.

COUNTY OF PHILADELPHIA :

J. W. Gallagher, being first duly sworn, deposes and says:

That he is Vice President of Philadelphia Electric Company, the Applicant herein; that he has read the foregoing Application for Amendment of Facility Operating License and knows the contents thereof; and that the statements and matters set forth therein are true and correct to the best of his knowledge, information and belief.

J W Gallagher

Subscribed and sworn to
before me this 11th day
of February, 1987

Melanie R. Campanella

Notary Public

MELANIE R. CAMPANELLA
Notary Public, Philadelphia, Philadelphia Co.
My Commission Expires February 12, 1990