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RELATED CORRESPONDENCE

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

August 7, 1984

DOCKETED  
USNRC

Lawrence Brenner, Esq., Chairman  
Administrative Judge  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Dr. Richard F. Cole  
Administrative Judge  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

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Dr. Peter A. Morris  
Administrative Judge  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

In the Matter of  
PHILADELPHIA ELECTRIC COMPANY  
(Limerick Generating Station, Units 1 and 2)  
Docket Nos. 50-352 and 50-353

Dear Administrative Judges:

Counsel for the NRC staff hereby furnishes to the Board and the parties a copy of NRC Amendment No. 1, to SNM-1926, dated July 27, 1984, in connection with the captioned matter. Also enclosed is a copy of the Staff's safety evaluation report in support of the amendment.

Sincerely,

Benjamin H. Vogler  
Counsel for NRC Staff

Enclosures: As stated

cc w/enclosures: See page 2

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cc w/enclosures:

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Timothy R. S. Campbell, Director	Docketing and Service Section
Atomic Safety and Licensing	
Appeal Board Panel	

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FCUP:BLS  
Docket No. 70-2988  
SNM-1926, Amendment No. 1

Philadelphia Electric Company  
ATTN: Mr. Edward G. Bauer, Jr.  
Vice President and General Counsel  
2301 Market Street  
P.O. Box 8699  
Philadelphia, PA 19101

Gentlemen:

In accordance with your application dated January 24, 1984, and its supplement dated June 7, 1984, and pursuant to Title 10, Code of Federal Regulations, Parts 40 and 70, Materials License No. SNM-1926 is hereby amended as follows:

I. Add Items C, D, and E to Conditions 6, 7, and 8.

6. <u>Type</u>	7. <u>Form</u>	8. <u>Quantity</u>
C. Pu-239	C. Two plated calibration sources	C. 50 micrograms
D. Depleted Uranium	D. Two plated calibration sources	D. 1500 g
E. Th-230	E. Seven plated calibration sources	E. 10 micrograms

II. Add the date June 7, 1984, to Condition 9.

III. Delete Condition 15.

IV. Revise Condition 17 and add Conditions 18-19, which shall read as follows:

Condition 17. The "Physical Security Plan for Protection of Special Nuclear Material of Low Strategic Significance" submitted by your letter dated June 1, 1983, as revised by your letters dated November 29, 1983, and March 9, 1984, shall remain in effect whenever fresh fuel is stored onsite.

Condition 18. Fuel assemblies stored in the Spent Fuel Pool shall be stored in such a manner that water would drain freely from the assemblies.

Condition 19. The licensee shall conduct a leak test on plutonium calibration sources in accordance with the enclosed Annex A, "License Condition for Plutonium Alpha Sources."

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All other conditions of this license shall remain the same.

The conditions imposed by this amendment were discussed with your Mr. Steven Payton on July 2, 1984.

Enclosed is our safety evaluation report in support of this amendment.

FOR THE NUCLEAR REGULATORY COMMISSION,

R. G. Page, Chief  
Uranium Fuel Licensing Branch  
Division of Fuel Cycle and  
Material Safety, NMSS

Enclosure: As stated

Distribution List  
Docket No. 70-2988  
Docket No. 50-352

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Docket No: 70-2988

Applicant: Philadelphia Electric Company

Facility: Limerick Generating Station, Unit No. 1

Subject: Safety Evaluation Report - Review of Application for Materials License Dated January 24, 1984, and its Supplement Dated June 7, 1984.

I. Background

By application dated January 24, 1984, Philadelphia Electric Company (PEC) requested authorization to receive, possess, inspect, and store fuel assemblies, containing enriched uranium, for eventual use at the Limerick Station. By supplement dated June 7, 1984, PEC requested authorization to receive and use gram quantities of materials to be used as calibration sources and submitted additional information related to their application.

PEC was issued NRC Materials License No. SNM-1926 on September 23, 1983, authorizing them to receive, possess, store, and use gram quantities of uranium enriched in the U-235 isotope contained in fission detectors at the Limerick Generating Station, Unit No. 1. On April 3, 1984, Materials License No. SNM-1926 was revised to authorize PEC to receive, possess, and store fuel assemblies in their shipping containers (RA model container) in a designated outdoor New Fuel Storage Area because the indoor areas were not ready to receive fuel. This amendment will authorize PEC to remove the fuel assemblies from the shipping containers and store them in the Spent Fuel Pool (SFP).

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## II. Discussion

### A. Fuel Handling

PEC plans to transport the fuel assemblies, still in their RA shipping containers, about 900 feet to the Reactor Enclosure Airlock, where the outer wooden containers will be removed. The inner metal containers, with fuel assemblies, are then transferred to the Reactor Enclosure Refueling Floor for storage where they will be stored no more than four high. The staff has previously confirmed the nuclear criticality safety of inner metal shipping container storage arrays, stacked four high.\*

PEC has stated that on the refueling floor, no more than three fuel assemblies will be out of their RA containers at any one time. The staff has shown that three BWR fuel assemblies cannot be made critical independent of the spacing, and the degree of water moderation and/or reflection. PEC has committed to maintain a minimum distance of 5 feet between the three fuel assemblies out of storage and all other fuel assemblies in storage with the exception of a single fuel assembly in an open shipping container which will be a minimum of 5 feet from at least two of the three fuel assemblies. The minimum distance between the shipping container array and the spent fuel storage racks will be at least 23 feet. Interaction between these arrays and the SFP storage arrays (see below) will be less than that between assemblies in the SFP storage rack arrays. Therefore, the staff has determined that PEC's proposed fuel handling procedures are adequate to prevent an inadvertent criticality during fuel handling.

\*Reference Amendment No. 5 to General Electric's Material License No. SNM-1097, Dated June 6, 1978, Docket No. 70-1113.

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Upon completion of the fuel assembly inspection, each assembly is channeled in the New Fuel Inspection Stand. The fuel channel is a square tube of Zircaloy-4, inside dimension 5.278-inch and 0.10-inch thick. A channel is lowered onto each fuel assembly and secured prior to storing each fuel assembly in the SFP. After each fuel assembly has been inspected and channeled, the assembly is transferred to the SFP. Fuel assemblies that do not pass acceptance inspection are returned to their shipping containers.

B. Spent Fuel Pool

The SFP will be used for the storage of fresh fuel assemblies prior to loading fuel into the reactor core. The fuel assemblies are stored under water or in air and occupy every storage location in the array. There are three array sizes in the SFP: 10 assemblies x 11 assemblies, 10 assemblies x 12 assemblies, and 11 assemblies x 12 assemblies. The nominal center-to-center spacing between fuel assemblies in an array is 6.625 inches, and the center-to-center spacing between fuel assemblies in adjacent arrays is 9.375 inches. In the criticality analysis, the staff assumed a center-to-center spacing of 6.625 inches between all adjacent assemblies in an infinite array.

The NRC staff, using KENO-V and 123 group cross sections, calculated the maximum  $k_{eff}$  for fuel assemblies enriched up to 3.90 w/o U-235. Besides the 6.625-inch spacing assumption, the staff assumed the following:

1. Full density water filled the SFP to the top of the fuel assemblies.
2. Fuel storage array is infinite in both horizontal directions and finite in length (equal to fuel length).
3. There are no neutron absorbers in the SFP, exclusive of the aluminum racks in the pool.

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The staff found the fuel storage array would be supercritical,  $k_{eff} = 1.338$ , under the aforementioned conditions. To assure nuclear criticality safety of this array of fuel assemblies, the licensee has incorporated a fixed poison in the form of aluminum poison cans containing Boral. These poison cans are in a checkerboard pattern throughout the SFP. The poison can consists of two concentric, square aluminum tubes. Between the aluminum tubes, and on each side, there is a Boral sheet 152 inches long, 5.25 inches wide, and 0.08 inch thick having a nominal B-10 areal density of 0.028 g/cm<sup>2</sup>. The Boral is positioned to overlap the fuel pellet stack length by 1 inch at the top and bottom of a fuel assembly. There is a nominal B-10 areal density of 0.028 g/cm<sup>2</sup>. The outer concentric aluminum tube is folded into the inner tube at both ends and seal welded to form the poison can. Each poison can is pressure and vacuum leak tested through a 13/64-inch hole which is then plug welded to isolate the Boral from the environment (e.g., water). The poison cans are then anodized and inserted into the SFP racks in a checkerboard pattern.

The NRC staff evaluated the nuclear criticality safety of the SFP with poison cans in a checkerboard pattern which positions one Boral sheet between adjacent fuel assemblies (proposed method of storage). The maximum  $k_{eff}$  of the fresh fuel assemblies stored in the SFP in the poisoned racks when submerged in full density water was calculated to be 0.917. The staff evaluated the  $k_{eff}$  of the storage array at lower moderator densities (e.g., mist) and found the highest  $k_{eff}$  to occur with a full density water moderator. Because of the importance of the Boral in controlling the  $k_{eff}$  of the SFP, the licensee has developed a Quality Assurance (QA) Program to ensure that Boral plates meet design specifications from the receipt of the Boral plates, to their fabrication into their containment cans, insertion into the storage racks, and to their installation at the Limerick site. The staff finds PEC's commitments to their QA Program adequate to ensure a subcritical storage array.

The fuel assemblies, as received in RA shipping containers, are inside plastic bags. The applicant may store the fuel assemblies in these plastic



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bags during dry storage to protect the fuel from its environment. PEC made no commitment to have the plastic bags open at the bottom. The opening at the bottom of the bag would prevent the assemblies from becoming internally moderated with water while air occupied the spaces between the fuel assemblies. This could occur if the bottoms of the wrappers were closed, the storage area flooded, and the area then drained. Although this scenario was not evaluated for this application, previous calculations indicated that if water was retained only within the plastic bags, the array would become more reactive, perhaps critical. The requirement to prevent such a situation will be represented by Condition 18.

Condition 18. Fuel assemblies stored in the Spent Fuel Pool shall be stored in such a manner that water would drain freely from the assemblies.

The NRC staff feels that with this added condition the licensee has established reasonable and satisfactory precautions to avoid an accidental criticality in the SFP.

C. Exemption From Criticality Alarm Requirements

The licensee was exempted from the provisions of 10 CFR 70.24 when the staff issued a revised license on April 3, 1984. The exemption was incorporated in Condition 16 in the April 3, 1984 license revision.

The licensee is presently exempt from the 10 CFR 70.24 requirements and believes that good cause exists to remain exempt. PEC's request is justified because of the inherent features associated with storage and inspection of unirradiated fuel containing uranium enriched to less than 5 w/o U-235 and the administrative controls that will be in effect during the transfer, inspection, and storage of fuel at Limerick. The staff agrees with PEC's evaluation and finds that such an exemption will not endanger life, property, or the common defense and security, is otherwise in the public interest, and is authorized by law.

D. Other Material

PEC also requests authorization to receive, store, and use the following materials: (1) 50 micrograms of Pu-239, (2) 1500 g of depleted uranium, and (3) 10 micrograms of Th-230. The materials are in the form of calibration sources and will be stored in the Calibration Source Room or other area approved by the Senior Health Physicist. Access to, and the authorized use of the materials, are controlled by procedures approved by the Plant Operations Review Committee.

E. Radiation Safety

All the radioactive materials involved in this application are either sealed or plated sources. The principle radiation pathway to an individual is via external radiation from the sources. The staff estimates the external exposure rate at one foot from any source is less than 1 mr/hr. Therefore, the radiation hazards associated with the receipt, movement and storage of the licensed material would be minimal. The staff feels that the licensee's existing management and the radiological procedures for the use of the licensed material are adequate to protect the employees and the public. The licensee has requested plated plutonium calibration sources. The microgram limit of plutonium in the mounted, plated sources do not pose a radiation hazard, and a periodic leak test should detect any possible leakage of plutonium from its mounting.

The staff, therefore, recommends the following license condition for leak testing the sources:

Condition 19. The licensee shall conduct a leak test on plutonium calibration sources in accordance with the enclosed Annex A, "License Condition for Plutonium Alpha Sources."

F. Environmental Protection

The NRC has previously evaluated the safety of new fuel storage in the SFP at the Limerick Station and has reported its findings in the Safety

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Evaluation Report related to the operation of Limerick Units 1 and 2 (NUREG-0991) dated August 1983. No safety related concerns associated with PEC's proposed new fuel storage design are identified in this document. Additionally, the NRC has issued a Final Environmental Statement for the operation of the Limerick Station (NUREG-0974 dated April 1984), which includes an evaluation of potential environmental impacts resulting from irradiated fuel storage and accidents involving irradiated fuel. The environmental risks and possible impacts resulting from the proposed handling and storage of new fuel are considered insignificant compared to those previously evaluated in the Final Environmental Statement. Therefore, in accordance with 10 CFR 51.12(b) no environmental assessment, environmental impact statement or finding of no significant impact needs to be redone for this proposed action.

Similarly, the receipt and use of gram quantities of radioactive materials as plated calibration sources do not pose a threat to the environment and, in accordance with 10 CFR 51.22(14)(viii), an environmental assessment or an environmental impact statement is not necessary to support this authorization.

G. Physical Protection

The "Physical Security Plan for Protection of Special Nuclear Material of Low Strategic Significance" has been reviewed by the Fuel Facility Safeguards Licensing Branch. It is the staff's opinion that the plan described by letter dated June 1, 1983, and its revisions are adequate and meet the requirements of 10 CFR Part 73.67. To assure that the physical security plan remains in effect whenever fresh fuel is stored onsite, the staff has updated Condition 17 to read as follows:

Condition 17. The "Physical Security Plan for Protection of Special Nuclear Material of Low Strategic Significance" submitted by your letter dated June 1, 1983, as revised by your letters dated November 29, 1983, and March 9, 1984, shall remain in effect whenever fresh fuel is stored onsite.

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III. General

The amendment application and its supplement were discussed with Mr. James Wiggins, NRC Region I Resident Inspector, Mr. Robert Martin, NRR Project Manager, and with Messrs Robert Gallo and Larry Briggs in Region I. During the course of the review, Mr. James Wiggins, the Resident Inspector, recommended the amendment not be issued until the licensee has demonstrated its readiness to complete the transfer of fuel assemblies to the SFP. By letter dated July 24, 1984, Mr. Richard W. Starostecki, Region I Director, Division of Project and Resident Programs, informed the Division of Fuel Cycle and Material Safety, NMSS, PEC has demonstrated its readiness to complete the transfer of fuel assemblies to the SFP. Neither the Region I personnel nor the NRR Project Manager foresee any safety or environmental problems with the authorization to complete the fuel assembly transfer onto the Reactor Enclosure Refueling Floor for storage and eventual transfer to the SFP for storage.

IV. Recommendations

The NRC recommends approval of the license application and its supplement subject to the additional conditions:

6. <u>Type</u>	7. <u>Form</u>	8. <u>Quantity</u>
C. Pu-239	C. Two plated calibration sources	C. 50 micrograms
D. Depleted Uranium	D. Two plated calibration sources	D. 1500 g
E. Th-230	E. Seven plated calibration sources	E. 10 micrograms

Condition 17. The "Physical Security Plan for the Protection of Special Nuclear Material of Low Strategic Significance" submitted by your letter dated June 1, 1983, as revised by your letters dated November 29, 1983, and March 9, 1984, shall remain in effect whenever fresh fuel is stored onsite.

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Condition 18. Fuel assemblies stored in the Spent Fuel Pool shall be stored in such a manner that water would drain freely from the assemblies.

Condition 19. The licensee shall conduct a leak test on plutonium calibration sources in accordance with the enclosed Annex A, "License Condition for Plutonium Alpha Sources."

With the issuance of this amendment, Condition 15, limiting the fuel assemblies to outdoor storage, should be deleted.

*Barry L. Serini*

Barry L. Serini  
Uranium Process Licensing Section  
Uranium Fuel Licensing Branch  
Division of Fuel Cycle and  
Material Safety, NMSS

Approved by: W. T. Crow

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FCUP:SDW

DOCKET NO.: 70-2988

APPLICANT: Philadelphia Electric Company (PEC)  
Limerick Generating Station, Unit 1

SUBJECT: CATEGORICAL EXCLUSION MEMORANDUM - REQUEST DATED  
JUNE 7, 1984 TO RECEIVE AND USE CALIBRATION SOURCES

By letter dated June 7, 1984, PEC requested authorization to receive and use 50  $\mu\text{g}$  of Pu-239, 1500 g of depleted uranium and 10  $\mu\text{g}$  of Th-230 as plated calibration sources. Because of the form of the material and PEC's administrative controls to limit its access and use, the calibration sources will pose no threat to the environment. Therefore, in accordance with 10 CFR 51.22(14)(viii), an environmental assessment or an environmental impact statement is not warranted for this proposed action.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

R. G. Page, Chief  
Uranium Fuel Licensing Branch  
Division of Fuel Cycle and  
Material Safety, NMSS