November 16 1994

Mr. George A. Hunger, Jr.
Director-Licensing, MC 62A-1
PECO Energy Company
Nuclear Group Headquarters
Correspondence Control Desk
P.O. Box No. 195
Wayne, PA 19087-0195

SUBJECT: ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT, SPENT FUEL POOL MODIFICATION, LIMERICK GENERATING STATION, UNITS 1 AND 2 (TAC NOS. M88610 AND M88657)

Dear Mr. Hunger:

By letter dated January 14, 1994, and supplements dated March 22, July 14, September 1, and October 21, 1994, you requested a license amendment to change the Technical Specifications to accommodate a proposed spent fuel pool (SFP) modification to Limerick Generating Station, Units 1 and 2. Enclosed is our Environmental Assessment related to this proposed action. Based on our assessment, we have concluded that there is no significant radiological or nonradiological impacts associated with the proposed SFP modification and it will have no significant impact on the environment.

We have also enclosed a Notice of Issuance of Environmental Assessment and Finding of No Significant Impact. This notice is being forwarded to the Federal Register for publication.

Sincerely,
/S/
Frank Rinaldi, Project Manager
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket Nos. 50-352/353

Enclosures:
1. Environmental Assessment
2. Notice of Issuance of Environmental Assessment

cc w/encls:
See next page

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NAME	MO'Brien	FRinaldi	SNewberry		JStolz
DATE	11/16/94	11/16/94	11/08/94	11/15/94	11/17/94

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

ENVIRONMENTAL ASSESSMENT

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO THE INCREASE IN THE SPENT FUEL STORAGE CAPACITY

PHILADELPHIA ELECTRIC COMPANY

FACILITY OPERATING LICENSE NOS. NPF-39 AND NPF-85

LIMERICK GENERATING STATION, UNITS 1 AND 2

DOCKET NOS. 50-352 AND 353

1.0 INTRODUCTION

1.1 Description of Proposed Amendment

By letter dated January 14, 1994, and supplements dated March 22, July 14, September 1, and October 21, 1994, Philadelphia Electric Company (PECo or the licensee) requested an amendment to change the Technical Specifications (TS) for Limerick Generating Station (LGS), Units 1 and 2. The amendment would increase the spent fuel storage capacity in each spent fuel pool (SFP) from 2040 fuel assemblies to 4117 fuel assemblies. The increase in SFP capacity would be accomplished by installing new high density spent fuel storage racks in each SFP at LGS.

1.2 Need for Increased Storage Capacity

Each SFP currently has a fuel assembly storage capacity of 2040. Since all the spent fuel generated so far from operating the LGS facility is stored onsite in the SFPs, the SFPs are approaching their maximum storage capacity. Increasing the spent fuel storage capacity from 2040 fuel assemblies to 4117 fuel assemblies will enable LGS to defer the "loss-of-full-core-reserve" year from 1998 to 2013. Since the current operating licenses for LGS, Units 1 and 2, expire in the year 2024 and 2029, respectively, it is evident that the LGS facility will be nearly capable of meeting its operating life storage requirement with some modest adjustments such as fuel consolidation.

2.0 ALTERNATIVES

Reprocessing of spent fuel has not developed as originally anticipated. In 1975, the NRC performed a Generic Environmental Impact Statement (GEIS) to evaluate alternatives for the handling and storage of spent fuel.

A "Final Generic Environmental Impact Statement (FGEIS) on Handling and Storage of Spent Light Water Power Reactor Fuel," NUREG-0575, Volumes 1-3, was issued by the Commission in August 1979. The finding of the FGEIS is that the environmental costs of interim storage are essentially negligible, regardless of where such spent fuel is stored. The storage of spent fuel, as evaluated in NUREG-0575, is considered to be an interim action, not a final solution to permanent disposal.

One spent fuel storage alternative considered in detail in the FGEIS is the expansion of the onsite fuel storage capacity by modification of the existing SFPs. Over 100 applications for SFP expansion have either been approved or are under consideration by the Commission. The finding in each has been that the environmental impact of such increased storage capacity is negligible. However, since there are variations in storage design and limitations caused by spent fuel already stored in the pools, the FGEIS recommended that licensing reviews be done on a case-by-case basis, to resolve plant-specific concerns.

The licensee has considered several alternatives to the proposed action of the SFP expansion. The staff has evaluated these and certain other alternatives. The following alternatives were considered by the staff:

2.1 Shipment of Fuel to a Permanent Federal Fuel Storage/Disposal Facility

Shipment of spent fuel to a high-level radioactive storage facility is an alternative to increasing the onsite spent fuel storage capacity. However, the U.S. Department of Energy's (DOE's) high-level radioactive waste repository is not expected to begin receiving spent fuel until approximately 2010, at the earliest. The existing SFPs at LGS will lose full core offload capability in 1998. Therefore, shipping spent fuel to the DOE repository is not considered an alternative to increased onsite spent fuel storage capacity.

2.2 Shipment of Fuel to a Reprocessing Facility

Reprocessing of spent fuel from the LGS facility is not a viable alternative since there are no operating commercial reprocessing facilities in the United States. Therefore, spent fuel would have to be shipped to an overseas facility for reprocessing. However, this approach has never been used, and it would require approval by the Department of State.

2.3 Shipment of Fuel to Another Utility or Site for Storage

The shipment of fuel from Limerick to the storage of another utility would provide short-term relief from the storage problem. The Nuclear Waste Policy Act (NWPA) and 10 CFR Part 53, however, clearly places the responsibility for the interim storage of spent nuclear fuel with each owner or operator of a nuclear plant. The shipment of fuel to another source is not an acceptable alternative because of increased fuel handling risks and additional occupational radiation exposure, as well as the fact that no additional storage capacity would be created.

2.4 Reduction of Spent Fuel Generation

Reducing the amount of spent fuel generated by improving usage of fuel and/or operation at a reduced power level would extend the life of the fuel in the reactor. In the case of extended burnup of fuel assemblies, the fuel cycle would be extended, and fewer offloads would be necessary. The licensee has already increased its refueling cycles from 18-months to 24-months by taking advantage of new fuel design technology. However, full-core offload capability will be lost in the near future. Operating the plants at a reduced power level would not make effective use of available resources, and would cause unnecessary economic hardship on PECO and its customers. Therefore, reducing the amount of spent fuel generated is not considered a practical alternative.

2.5 In-Pool Rod Consolidation

The primary purpose of in-pool rod consolidation is to reduce the volume of spent fuel assemblies, thereby increasing the spent fuel pool capacity. Rod consolidation involves removing the spent fuel rods from their assemblies and loading them into metal canisters in a close-packed array. This process can be performed robotically or mechanically. The remaining non-fuel bearing components (NFBC) of the fuel assembly hardware (i.e., grid spacers, guide tubes, end fittings, etc.) are sheared, compacted and separately stored in another container. Both the fuel rod and NFBC canisters would be suitable for storage within the existing Limerick pool racks.

The technical issues associated with rod consolidation are primarily related to operational considerations, which in turn affect the economics of this technology. These include extracting the rods from the assemblies, loading them into canisters in a tight array, compacting the NFBC, and prudently performing all of these operations without impacting plant operations.

Under existing design conditions, the rod consolidation and NFBC compaction ratios would increase the number of available storage spaces by 8 for every 20 consolidated PWR fuel assemblies and 7 for every 20 consolidated BWR fuel bundles (BWR fuel channels must also be compacted and stored, which requires one additional storage cell). To date, rod consolidation has been demonstrated at 6 utility sites. However, although the design rod consolidation ratios have been achieved, design NFBC compaction ratios have had limited success in a production environment. Moreover, there are additional operational issues, such as spent fuel pool contamination during the rod consolidation operation, and the speed of the rod consolidation operation, that have not yet been satisfactorily resolved to make this an attractive technology for current large scale utility use.

Although this option was determined to be comparable in cost to reracking, the plant operational impact was the primary disqualifying factor.

2.6 Cask Storage

Spent fuel storage in metal casks is one of the most mature on-site dry storage methods available at the present time. It has been tested, demonstrated, licensed, and used in the United States since 1986 and it continues to gain industry acceptance. The dry storage technique involves loading intact or consolidated spent fuel into casks which would be stored on a concrete platform in a secured area. This installation would be classified as an independent spent fuel storage installation (ISFSI) and therefore, would be required to meet licensing under 10 CFR Part 72.

A dry cask ISFSI is a passive storage system requiring no auxiliary equipment such as pumps, fans, motors, etc. Aside from the casks and a cask transporter, the ISFSI would require lighting, monitored security fencing, a backup diesel generator and an alarm panel for cask monitoring, but it would not have to be staffed on a continuous basis.

Present generation casks have been designed for storage only. Dual purpose casks are currently being designed to serve both storage and transport functions. Metal cask designs, which have been used since 1986 can be modified to obtain approval under 10 CFR Part 71 for transporting spent fuel. Such a dual purpose cask would eliminate the need to prepare another shipping cask.

Spent fuel cask storage provides many benefits. The fuel loading and cask placement on an on-site storage pad is not expected to be technically complex. It would not require large amounts of station labor and the accumulated radiation dose from these activities is expected to be a very small fraction of the total station radiation dose. Cask storage has little effect on plant operations and would require minimal plant support. This technology also allows modular expansion of the on-site storage facility which will spread out the high expenditures. This degree-of-freedom would also allow PECO to take advantage of technological progress in cask design. Furthermore, cask storage is expected to reduce compatibility concerns with the eventual DOE system.

The cost uncertainties associated with metal casks are primarily due to market conditions rather than technical factors. As the concrete and dual purpose cask technologies continue to evolve, their estimated costs are subject to some uncertainty. In general, cask costs are expected to come down with competition and demand, but presently they are not considered the best alternative.

2.7 Horizontal Concrete Modules or Vaults

In the horizontal concrete module dry storage option, the spent fuel is kept in the fuel basket of a stainless steel canister which is shielded, vacuum dried, sealed, and filled with helium or nitrogen to prevent fuel oxidation. These canisters are then stored in concrete modules or vaults which provide

adequate shielding during storage. The heat generated by the spent fuel is removed via radiation, conduction and natural convection through air channels in the concrete module. The NUTECH Horizontal Modular Storage (NUHOMS) system is presently the only system utilized to facilitate this type of storage option. Its major components include the concrete horizontal storage module, a spent fuel transfer cask, and a special purpose cask transfer trailer.

This storage option would require an ISFSI and would have to meet the licensing criteria of 10 CFR Part 72. This NUHOMS system ISFSI could be located on-site and meet the integrated spent fuel storage needs of the Limerick units. However, the seismic qualifications required for the concrete pad and the storage modules place this option at a disadvantage compared to other options. The PECO site-specific geology would make construction of such a facility costly because of the need for deep geologic drilling, excavation, dewatering, pouring concrete foundation, etc.

Transferring spent fuel from the storage pool into the horizontal modules is a technically complex operation compared to cask storage. A cask would also be needed to facilitate transportation of the spent fuel canister to a DOE offsite facility and therefore, would have to closely interface with the eventual DOE system to eliminate the need for secondary fuel handling. Additionally, even though this option allows for modular expansion, like cask storage, it is not expected to be easily expandable because of the need to reactivate on-site construction.

2.8 Vertical Concrete Modules or Vaults

The vertical concrete module or vault option stores spent fuel in sealed metal tubes housed in a concrete structure. Each tube is vertically arranged and stores one fuel assembly under a cover of nitrogen. The tubes are shielded and protected on all sides by the concrete structure. A group of such tubes makes up one module. The current design allows storage of 83 PWR fuel assemblies or 150 BWR fuel bundles. Each fuel tube penetrates the upper concrete shield that opens into the floor of a fuel handling bay and is sealed by a removable plug. A shielded fuel handling machine is used to transfer the fuel assemblies from cask to fuel tube. The bottom of each fuel tube is connected to a common manifold of a cover gas filling system. The spent fuel is cooled via convection facilitated by the cooling channels built into the concrete structure.

Nominal costs are expected to be comparable to those for the metal cask and horizontal concrete vault options. Seismic qualification requirements for the concrete housing structure raise similar concerns to those for horizontal concrete modules because of the PECO site geology. This also increases cost estimate uncertainties. Moreover, although the design allows for modular expansion, the intense construction involved would make this a difficult task.

No clear benefits appear from the postulated use of this technology. There are no striking features which make it more desirable than the other dry storage options like ease of construction, simplicity of operation, low cost,

etc. Furthermore, the uncertainties associated with its high cost estimates would not make this a prudent choice. Therefore, this option was disqualified, but, it can be reevaluated as the technology progresses and cost uncertainties decrease.

2.9 NO ACTION TAKEN

If no action were taken, the storage capacity would become exhausted in the near future and Limerick would have to shut down. This alternative is considered a waste of available resources and is not considered viable.

3.0 ENVIRONMENTAL IMPACTS

3.1 RADIOLOGICAL IMPACT

The waste treatment systems for LGS, Units 1 and 2, are designed to collect and process gaseous, liquid, and solid waste that may contain radioactive material. The proposed TS changes to support implementation of the modification to install new high density spent fuel storage racks in each SFP at LGS will not impact the ability of the waste treatment systems to perform their intended design functions.

All operations involved in reracking the SFPs will utilize detailed approved procedures with full consideration of As Low As Reasonably Achievable (ALARA) principles. Similar operations have been performed at a number of other facilities in the past and there is reasonable assurance that the reracking operations at LGS can be accomplished safely and efficiently, with minimum radiation exposure to personnel. The existing radiation protection program in place at LGS is adequate for the reracking operations. Work personnel traffic, and the movement of equipment will be monitored and controlled to minimize contamination and to assure that exposures are maintained ALARA.

3.2 NONRADIOLOGICAL IMPACT

Increasing the spent fuel storage capacity as proposed will result in additional heat load due to the increased spent fuel inventory. The anticipated maximum bulk SFP temperature is approximately 143 °F. The total heat load under worst case conditions is less than 37.6 million BTU/hr, which is less than 0.04% of the total heat released to the environment due to plant operation, and well within the capability of the plant cooling system (i.e., Fuel Pool Cooling and Cleanup (FPCC) and Residual Heat Removal (RHR) systems).

The increased bulk pool temperature will result in an increased SFP water evaporation rate. This has been calculated to increase Refuel Floor relative humidity as evaluated in the supporting Safety Analysis Report; however, this increase is within the capacity of the existing LGS Heating, Ventilation, and Air Conditioning (HVAC) systems and does not necessitate any hardware modifications to the HVAC systems. The environmental impact resulting from the increased heat load and water vapor emission are considered negligible.

Additionally, the SFP expansion will lead to additional spent fuel waste heat rejected from the plant. The total increase in heat load rejected to the environment will be small in comparison to the amount of total heat currently being released. No impact on aquatic life is expected. Thus, the increase in rejected heat will have a negligible effect on the environment.

The licensee has not proposed any change in the use or discharge of chemicals in conjunction with the expansion of the SFP. The proposed expansion will not require any change to the National Pollution Discharge Elimination System permit. Therefore, the staff concludes that the nonradiological environmental impacts of expanding the SFP will be insignificant.

3.3 SUMMARY

The occupational radiation dose for the proposed operation of the expanded SFP is extremely small compared to the annual occupational exposure (normally about 400 person-rem in a year, which includes a refueling outage) for a facility of this type. The small increase in radiation dose should not affect the licensee's ability to maintain individual occupational doses at LGS within the limits of 10 CFR Part 20 and as low as reasonably achievable. Furthermore, the nonradiological impacts of expanding the SFP will be insignificant and none of the alternatives are practical or reasonable.

4.0 ACCIDENT CONSIDERATIONS

The staff, in its related safety evaluation, to be issued with the TS amendment at a later date, will address both the safety and environmental aspects of a fuel handling accident. All fuel handling accidents are bound by the potential consequences of an accident attributable to the operation of a SFP with high density racks. A fuel handling accident may be viewed as a "reasonably foreseeable" design basis event which the pool and its associated structures systems and components (including the racks) are designed and constructed to prevent. The environmental impacts of the accident were found not to be significant.

The staff has considered accidents whose consequences might exceed a fuel handling accident, that is, beyond design basis events. An accident evaluated by the staff involves a structural failure of the SFP resulting in loss of all contained cooling water followed by fuel heatup and Zircaloy cladding fire.

The details of this severe accident are discussed in NUREG/CR-4982, entitled "Severe Accidents in Spent Fuel Pools in Support of Generic Issue 82." Subsequently, the staff issued NUREG/CR-5176, entitled "Seismic Failure and Cask Drop Analysis of the Spent Fuel Pools at Two Representative Nuclear Power Plants." This report considers the structural integrity of the SFP and the pool response to the circumstances considered. More recently, the staff issued NUREG/CR-5281, "Value/Impact Analysis of Accident Preventative and Mitigative Options for Spent Fuel Pools," and NUREG-1353, "Regulatory Analysis for the Resolution of Generic Issue 82: Beyond Design Basis Accidents in

Spent Fuel Pools." In NUREG-1353, the staff concluded that Generic Issue 82 concerning the possibility of Zircaloy cladding fires in SFPs was resolved and required no further study.

The staff believes that the probability of severe structural damage occurring at LGS is extremely low. This belief is based upon the Commission's requirements for the design and construction of SFPs and their contents and on the licensee's adherence to approved industry codes and standards. For example, in the LGS case, the pool is an integral part of the fuel building. The spent fuel storage racks are Seismic Category 1 and thus, are required to remain functional during and after a safe shutdown earthquake. The cooling water system is extremely reliable. In the unlikely event of a total loss of the cooling system, makeup water sources are available. Therefore, the staff concludes that the potential for environmental impact from severe accidents is negligible.

5.0 ALTERNATIVE USE OF RESOURCES

This action does not involve the use of resources not previously considered in connection with the Commission's Final Environmental Statement, dated April 1984.

6.0 AGENCIES AND PERSONS CONSULTED

The staff reviewed the licensee's request and consulted with the Commonwealth of Pennsylvania regarding the environmental impact of the proposed action. The State official had no comments.

7.0 BASIS AND CONCLUSIONS FOR NOT PREPARING AN ENVIRONMENTAL IMPACT STATEMENT

The staff has reviewed the proposed SFP modification to LGS, Units 1 and 2, relative to the requirements set forth in 10 CFR Part 51. Based upon the environmental assessment, the staff has concluded that there are no significant radiological or nonradiological impacts associated with the proposed action and that the proposed license amendment will not have a significant effect on the quality of the human environment. Therefore, the Commission has determined, pursuant to 10 CFR 51.31, not to prepare an environmental impact statement for the proposed amendment.

Principal Contributors: J. Harold
F. Rinaldi

Date: November 16, 1994

7590-01

UNITED STATES NUCLEAR REGULATORY COMMISSION

PHILADELPHIA ELECTRIC COMPANY

LIMERICK GENERATING STATION, UNITS 1 AND 2

DOCKET NOS. 50-352 AND 50-353

NOTICE OF ISSUANCE OF ENVIRONMENTAL ASSESSMENT AND

FINDING OF NO SIGNIFICANT IMPACT

The U.S. Nuclear Regulatory Commission (the Commission) is considering issuance of amendments to Facility Operating Licenses Nos. NPF-39 and NPF-85, issued to Philadelphia Electric Company (PECo or the licensee), for the operation of the Limerick Generating Station, Units 1 and 2, located in Montgomery County, Pennsylvania.

Identification of Proposed Action

The amendment would consist of changes to the Technical Specifications (TSs) and would authorize an increase of the storage capacity in each of the spent fuel pools (SFP) from 2040 fuel assemblies to 4117 fuel assemblies.

The amendment to the TS is responsive to the licensee's application dated January 14, 1994. The NRC staff has prepared an Environmental Assessment of the Proposed Action.

Summary of Environmental Assessment

The "Final Generic Environmental Impact Statement (FGEIS) on Handling and Storage of Spent Light Water Power Reactor Fuel," NUREG-0575, Volumes 1-3, concluded that the environmental impact of interim storage of spent fuel was negligible. Because of the differences in design, the FGEIS recommended licensing SFP expansions on a case-by-case basis.

For Limerick, 1 and 2, the expansion of the storage capacity of the SFP will not create any significant additional radiological effects or nonradiological environmental impacts. The additional whole body dose that might be received by an individual at the site boundary and the estimated dose to the population within an 80 kilometer radius is believed to be too small to have any significance when compared to the fluctuations in the annual dose this population receives from exposure to background radiation. The occupational radiation dose for the proposed operation of the expanded SFP is estimated to be extremely small compared to the total annual occupational radiation exposure for this facility.

The nonradiological impacts of SFP expansion include increased heat load due to the increased spent fuel inventory and a corresponding increase in spent fuel waste heat rejected from the plant. The total increase in heat load is well within the plant cooling system capability and the additional waste heat rejected to the environment will be small in comparison to the amount of total heat currently being released. There is no significant environmental impact attributed to the waste heat from the plant due to this very small increase.

FINDING OF NO SIGNIFICANT IMPACT

The staff has reviewed the proposed SFP expansion to the facility relative to the requirements set forth in 10 CFR Part 51. Based upon the environmental assessment, the NRC staff concludes that there are no significant radiological or nonradiological impacts associated with the proposed license amendment and that the issuance of the proposed license amendment will have no significant impact on the quality of the human

environment. Therefore, the Commission has determined, pursuant to 10 CFR 51.31, not to prepare an environmental impact statement for the proposed amendment.

For further details with respect to this action, see (1) the application for amendments dated January 14, 1994, and supplements dated March 22, July 14, September 1, and October 21, 1994, (2) the FGEIS on Handling and Storage of Spent Light Water Power Reactor Fuel (NUREG-0575), (3) the Final Environmental Statement for the Limerick Generating Station, Units 1 and 2, dated April 1984, and (4) the Environmental Assessment, dated November 16, 1994.

These documents are available for public inspection at the Commission's Public Document Room, the Gelman Building, 2120 L Street, NW., Washington, DC, and at the local public document room located at the Pottstown Public Library, 500 High Street, Pottstown, Pennsylvania 19464.

Dated at Rockville, Maryland, this 16th day of November 1994.

FOR THE NUCLEAR REGULATORY COMMISSION

John F. Stolz, Director
Project Directorate 1-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation