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

ENVIRONMENTAL ASSESSMENT

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO THE EXPANSION OF THE SPENT FUEL POOL

FACILITY OPERATING LICENSE NO. NPF-11

COMMONWEALTH EDISON COMPANY

LASALLE COUNTY STATION, UNIT 1

DOCKET NO. 50-373

1.0 INTRODUCTION

1.1 Description of Proposed Action

By letter dated June 5, 1992, as supplemented July 7, July 20, and November 4, 1992, the Commonwealth Edison Company (CECo or the licensee) requested an amendment to Facility Operating License No. NPF-11 for LaSalle County Station, Unit 1, to allow the expansion of the capacity of the spent fuel pool. Specifically, the amendment would authorize the licensee to increase the capacity of the spent fuel pool from the currently approved capacity of 1120 fuel assemblies to the proposed capacity of 3982 fuel assemblies plus four defective fuel storage cells. The proposed expansion would be achieved by removing the current spent fuel storage racks from the pool and replacing them with new racks (i.e., reracking), in which the cells for the spent fuel assemblies are more closely spaced. The proposed arrangement would make use of free standing racks.

There are two spent fuel storage pools at the LaSalle County Station. The existing racks in the Unit 2 spent fuel pool can accommodate 4073 fuel assemblies, while the Unit 1 spent fuel pool contains 1080 fuel storage cells. In the 2002 time frame, the station will no longer have full core discharge reserve, and if reracking is not accomplished prior to 1996, it will not be physically practical to perform. Consequently, CECo proposes to replace the existing spent fuel racks for LaSalle, Unit 1, with racks of a high density design. These free standing racks will have capacity for the storage of 3982 fuel assemblies and 47 special storage cells. The special storage racks consist of four locations for storing control rod guide tubes or defective fuel containers, and 43 cells for control rods and other miscellaneous items.

These spent fuel storage racks provide smooth full length square storage cells of stainless steel in a welded honeycomb structure. Each storage cell is comprised of a stainless steel and Boral™ array. Each rack is supported on the pool floor by four or five pedestal structures welded to the bottom of the

rack. A screw adjustable pad is provided in this structure to be used for rack leveling. U.S. Tool and Die provides the appropriate tool to make these adjustments from the surface through the cells over the pedestals. The height of the bottom of the rack above the pool floor, resulting from the necessary vertical dimension of the pedestal structure, provides adequate space underneath the racks for cooling water flow.

1.2 Need for Increased Storage Capacity

LaSalle, Unit 1, received a full power operating license on August 13, 1982. At the time of licensing, the racks in its spent fuel pool had 1080 fuel storage cells. In order to maintain a full core reserve discharge capability beyond 2002, the licensee proposed to replace the existing racks with high-density racks which will have capacity for the storage of 3982 fuel assemblies and 47 special storage cells.

The Nuclear Waste Policy Act of 1982 (NWPA) provided for limited away-from-reactor storage, and stipulated that a spent fuel repository would be available by 1998. Whereas the generic DOE contract still reflects a 1988 fuel "pickup" date, the most recent DOE announcement was that the repository will be ready no sooner than the year 2010. Therefore, in the interim, CECo needs to provide more storage capacity.

1.3 Alternatives

Commercial reprocessing of spent fuel has not developed as originally anticipated. In 1975, the Nuclear Regulatory Commission directed its staff to prepare a Generic Environmental Impact Statement (GEIS) of spent fuel storage. The Commission directed the staff to analyze alternatives for the handling and storage of spent light water power reactor fuel with particular emphasis on developing long-range policy. The GEIS was to consider alternative methods of spent fuel storage, as well as the possible restriction or termination of the generation of spent fuel through nuclear power plant shutdown.

A "Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel," NUREG-0575, Volumes 1 through 3 (the FGEIS) was issued by the NRC in August of 1979. The finding of the FGEIS was that the environmental impact costs of interim storage are essentially negligible, regardless of where such spent fuel is stored. A comparison of the impact cost of various alternatives reflects the advantage of continued generation of nuclear power versus its replacement by coal-fired power generation. Continued nuclear generation of power versus its replacement by oil-fired generation provides an even greater economic advantage. In the bounding case considered in the FGEIS, that of shutting down the reactor when the existing spent fuel storage capacity is filled, the cost of replacing nuclear stations before the end of their normal lifetime makes this alternative uneconomical. 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 alternative considered in detail in the FGEIS is the expansion of the onsite fuel storage capacity by modification of the existing spent fuel pools. Applications for more than 100 spent fuel pool expansions have been received and have been approved or are under review by the NRC. The finding in each case 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 the spent fuel already stored in some of 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 spent fuel pool expansion. The staff has evaluated these and certain other alternatives with respect to the need for the proposed action as discussed in Section 1.2 of this assessment. The following alternatives were considered:

(1) Shipment of spent fuel to a permanent federal fuel storage/disposal facility.

(2) Shipment of fuel to a reprocessing facility.

(3) Shipment of fuel to another utility or site for storage.

(4) Reduction of spent fuel generation.

(5) Construction of a new independent spent fuel storage installation.

(6) No action taken.

Each of these alternatives is discussed below.

1.3.1 Shipment of Spent Fuel to a Permanent Federal Fuel Storage/Disposal Facility

Shipment to a permanent federal fuel storage disposal facility is a preferred alternative to increasing the onsite spent fuel storage capacity. DOE is developing a repository under the NWPA. However, the facility is not likely to be ready to receive spent fuel until the year 2010, at the earliest.

As an interim measure, shipment to a Monitored Retrievable Storage (MRS) facility is another alternative to increasing the onsite spent fuel storage capacity. DOE, under the NWPA, has submitted its MRS proposal to Congress. However, because Congress has not authorized the construction of an MRS facility, and because one is not projected to be available until 1998, this alternative does not meet the near-term storage needs of LaSalle, Unit 1.

Under the NWPA, the federal government has the responsibility to provide not more than 1900 metric tons capacity for the interim storage of spent fuel. The impacts of storing fuel at a Federal Interim Storage (FIS) facility fall within those already assessed by the NRC in NUREG-0575. In passing the NWPA, Congress found that the owners and operators of nuclear power stations have the primary responsibility for providing interim storage of spent nuclear

fuel. In accordance with the NWPA and 10 CFR Part 53, the shipping of spent fuel to a FIS facility is considered a last resort alternative. At this time, the licensee can not take advantage of a FIS because existing storage capacity at the station is not maximized. Therefore, CECo has been diligently pursuing this application for the spent fuel pool expansion at this time. The alternative of shipment of spent fuel to an FIS is not available.

1.3.2 Shipment of Fuel to a Reprocessing Facility

Reprocessing of spent fuel from LaSalle is not a viable alternative because there is presently no operating commercial fuel reprocessing facility in the United States, nor is there any prospect for the opening of such a facility in the foreseeable future.

1.3.3 Shipment of Fuel to Another Utility or Site for Storage

The shipment of spent fuel from LaSalle to the storage facility of another utility company could provide short-term relief from the storage capacity problem. However, the NWPA and 10 CFR Part 53 both clearly place the responsibility for the interim storage of spent nuclear fuel with the owner or operator of each nuclear power plant. Moreover, transshipment of spent fuel to, and its storage at, another site would entail potential environmental impacts greater than those associated with the proposed increased storage capacity at the LaSalle site. Therefore, this is not considered to be a practical or reasonable alternative.

1.3.4 Reduction of Spent Fuel Generation

Improved usage of fuel in the reactor and/or operation at a reduced power level would extend the life of the fuel in the reactor. In the case of extended burn up of fuel assemblies, the fuel cycle would be extended and fewer off loads would take place. However, the current storage capacity would still be exhausted as discussed in Section 1.2. Operation at reduced power would not make effective use of available resources and would, thus, result in economic penalties.

1.3.5 Construction of a New Independent Spent Fuel Storage Installation

Additional storage capacity could be developed by building a new, independent spent fuel storage installation (ISFSI), similar either to the existing pool or a dry storage installation. The NRC staff has generically assessed the impacts of the pool alternative and found, as reported in NUREG-0575, that "the storage of light water reactor spent fuels in water pools has an insignificant impact on the environment." A generic assessment for the dry storage alternative has not been made by the staff. However, assessments for the dry cask ISFSI at the Surry Power Station and the dry modular concrete ISFSIs at the H.B. Robinson Steam Electric Plant, Unit 2, and the Oconee Nuclear Station, among others, resulted in Findings of No Significant Impact.

While these alternatives are environmentally acceptable, such a new storage facility, either at LaSalle or at a location off site, would require new

site-specific design and construction, including equipment for the transfer of spent fuel. NRC review, evaluation and licensing of such a facility would also be required. It is not likely that this entire effort would be completed in time to meet the need for additional capacity as discussed in Section 1.2. Furthermore, such construction would not utilize the existing expansion capabilities of the exiting pool and, thus, would waste resources.

1.3.6 No Action Taken

If no action were taken, i.e., the spent fuel pool storage capacity remains at 1080 locations, the storage capacity would become exhausted in the very near future and LaSalle, Unit 1, would have to be shut down. Such termination of operations would result in no further generation of spent fuel, thereby eliminating the need for increased spent fuel storage capacity. The impacts of terminating the generation of spent fuel by ceasing the operation of existing nuclear power plants (i.e., ceasing generation of electric power) when their spent fuel pools become filled was evaluated in NUREG-0575 and found to be undesirable. This alternative would be a waste of an available resource, LaSalle Unit 1 itself, and is not considered viable.

1.4 Fuel Reprocessing History

Currently, spent fuel is not being reprocessed on a commercial basis in the United States. The Nuclear Fuel Services (NFS) plant at West Valley, New York, was shut down in 1972 for alterations and expansion. In September 1976, NFS informed the Commission that it was withdrawing from the nuclear fuel reprocessing business. The Allied General Nuclear Services (AGNS) proposed plant in Barnwell, South Carolina, is not licensed to operate. The General Electric Company (GE) Morris Operation (formerly Midwest Recovery Plant) in Morris, Illinois, is in a decommissioned condition.

In 1977, President Carter issued a policy statement on commercial reprocessing of spent nuclear fuel, which effectively eliminated reprocessing as part of the relatively near-term nuclear fuel cycle.

Although no plants are licensed for reprocessing fuel, the storage pools at Morris and at West Valley are licensed to store spent fuel. The storage pool at West Valley is not full, but the licensee (the current licensee is New York Energy Research and Development Authority) is presently not accepting any additional spent fuel for storage, even from those power generating facilities that had contractual arrangements with West Valley. (In fact, spent fuel is being removed from NFS and returned to its owners.) On May 4, 1982, the license held by GE for spent fuel storage activities at its Morris operation was renewed for another 20 years; however, GE is committed to accept only limited quantities of additional spent fuel for storage at this facility from Cooper and San Onofre Unit 1.

2.0 RADIOACTIVE WASTES

LaSalle, Unit 1, contains radioactive waste treatment systems designed to collect and process the gaseous, liquid, and solid wastes that might contain

radioactive material. The radioactive waste treatment systems are evaluated in the Final Environmental Statement (FES) dated November 1978. There will be no change in the waste treatment systems described in the FES because of the proposed spent fuel pool rerack.

2.1 Radioactive Material Released to the Atmosphere

The principal radioactive materials that are considered with respect to non-accident releases are the noble gases, the halogens, and tritium. Of these, the only radioactive gas of any significance is Krypton-85 (Kr-85). This is the principal radioactive gas that is associated with the long-term storage of the additional spent fuel assemblies. It is released through fuel cladding defects. Experience has shown that after spent fuel has decayed 4 to 5 months, there is no longer any significant release of fission products, including Kr-85, from stored spent fuel. To determine the average annual release of Kr-85, we assume that all of the Kr-85 released to the spent fuel pool (SFP) will be released prior to the next refueling. That is, the release associated with a batch of discharged fuel, not with the total inventory of the SFP. The enlarged capacity of the pool, therefore, has no effect on the calculated average annual guaranties of Kr-85 released to the atmosphere each year.

The other gases are of little radioactive significance. With respect to the halogens, Iodine-131 (I-131) is the principal contributor. Iodine-131 releases from spent fuel assemblies to the SFP water will not be significantly increased by the expansion of the fuel storage capacity. Iodine-131 inventory in the fuel will decay to negligible levels between refuelings. Hence, any significant releases are associated with a given full discharge batch, rather than with the entire inventory of the SFP, so that SFP expansion does not affect I-131 releases.

A relatively small amount of tritium is produced during reactor operation by fissioning of the reactor fuel. It is released by diffusion through the fuel and Zircaloy cladding. Tritium is released from the fuel while the fuel is hot, that is, during reactor operation and, to a limited extent, shortly after shutdown. Since its release is diminished to insignificant levels during storage in the SFP, expanding the SFP capacity will not increase significantly the tritium activity in the SFP.

Another effect on airborne activity is the potential for increased evaporation due to storing additional spent fuel assemblies in the SFP. However, this effect is not expected to be significant for the following reasons:

(1) Storing additional spent fuel assemblies in the SFP is not expected to raise the bulk water temperature above the design basis temperature identified with normal refueling. Therefore, the evaporation rate is expected to be about the same as before and the annual release of tritium or iodine by evaporation from the SFP is expected to be the same.

(2) On an annual basis, most airborne releases from LaSalle, Unit 1, are due to leakage of reactor coolant which contains tritium and radioactive iodine in higher concentrations than the SFP. Therefore, even if there were a higher evaporation rate from the SFP, the potential increase in the releases of tritium and iodine would be small compared to the amount normally released from the station and that which was previously evaluated in the Environmental Statement.

Aside from the above considerations, the station is limited in its total releases of gaseous activity by the Offsite Dose Calculation Manual.

The concentration of radionuclides in the pool water is continuously processed by the SFP cleanup demineralizer and decreased by the decay of short-lived isotopes. The activity is highest during refueling operations when reactor coolant water is introduced in the pool, and decreases as the pool water is processed through the demineralizer. Thereafter, the activity concentration has been and should continue to be dependent on the demineralizer resin replacement with no long-term build-up. The increase of radioactivity, if any, due to the proposed SFP modification should be minor, since the cleanup system can remove radioactivity continuously from the SFP water and, thus, keep it at acceptable levels.

In view of the above, the staff has assumed, for dose calculation purposes, that there will be no significant increase in the release of tritium or radioiodine due to evaporation from the SFP.

2.2 Solid Radioactive Wastes

The staff does not expect any significant increase in the amount of solid waste generated from the SFP cleanup system due to the proposed modification. Operation of the cleanup demineralizer system and frequency of resin replacement is determined primarily by requirements for water clarity rather than the loading of fission product radionuclides. The amount of suspended particulate material that must be removed to maintain the desired water clarity is determined by the frequency of refueling operations and should be independent of the number of spent fuel assemblies stored. Thus, the expanded capacity of the storage pool is not expected to significantly alter the frequency of resin or filter media replacement above what is currently experienced, or the personnel radiation exposures during maintenance operations. This would not have any significant additional environmental impact.

2.3 Radioactive Material Released to Receiving Waters

There should not be a significant increase in the liquid release of radionuclides from the plant as a result of the proposed modifications. Since the SFP cooling and cleanup systems operate as a closed system, only water originating from cleanup of SFP floors and filter-demineralizer backflush need be considered as potential sources of radioactivity. It is expected that neither the quantity nor activity of the floor cleanup water will change as a result of these modifications. The SFP filter-demineralizer resin removes

radioactive materials from the SFP water. These spent resins are periodically backflushed with water. The amount of radioactivity in the SFP filter demineralizer resin may increase slightly due to the additional spent fuel in the pool, but the spent powdered resin (backflushed) will be processed by the liquid radwaste system. After processing in the liquid radwaste system, the amount of radioactivity released to the environment as a result of the proposed modification would be negligible.

3.0 RADIOLOGICAL IMPACT ASSESSMENT/OCCUPATIONAL EXPOSURE

This section contains the staff's evaluation of the estimates of the additional radiological impacts on the plant workers from the proposed operation of the modified SFP.

The occupational exposure for the proposed modification of the SFP is estimated by the licensee to be less than eight person-rems. The dose goal of eight person-rem for the Unit 1 rerack is consistent with the historical range of doses for spent fuel pool rerack operations and is less than two percent of the average yearly dose for LaSalle (averaged over the years 1989 - 1991).

On the basis of our review of the licensee's report, we conclude that the proposed storage of spent fuel in the modified SFP will not result in any significant increase in doses received by workers and can be performed in a manner that will ensure that exposure to workers will be as low as is reasonably achievable (ALARA) and within the limits of 10 CFR 20.

3.1 Conclusions

Based on its review of the proposed expansion of the SFP at LaSalle, Unit 1, the staff concludes that:

1. The severity (i.e., radiological consequences) of a fuel handling accident in the spent fuel storage pool, incorporating a high density storage configuration, would not exceed that due to the design basis analysis addressed in Section 15.7.4 of the LaSalle UFSAR. As such, the fuel handling accident analysis presented in the LaSalle UFSAR remains valid. The estimated additional radiation doses to the general public are less than those incurred during normal operation of the LaSalle County Station.

2. The licensee has taken appropriate steps to ensure that occupational dose will be maintained as low as is reasonably achievable and within the limits of 10 CFR Part 20. The total occupational dose estimated to be associated with the proposed modification of the expanded fuel pool is less than ten person-rems, which is less that two percent average annual total occupational dose at the LaSalle County Station, Unit 1.

On the basis of the foregoing evaluation, it is concluded that there would be no significant additional environmental radiological impact attributable to the proposed reracking and modification to increase the spent fuel storage capacity at the LaSalle County Station, Unit 1.

We have concluded, based on the considerations discussed above, that there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, with regard to radiation dose to the public and plant workers.

4.0 NON-RADIOLOGICAL IMPACT

The new spent fuel racks will be fabricated by U.S. Tool and Die Company in Pittsburgh, Pennsylvania. They will be shipped by truck to the LaSalle site for installation in the pool. This is not expected to impact terrestrial resources not previously disturbed during the original construction.

The only non-radiological effluent affected by the spent fuel pool expansion is the additional waste heat rejected from the plant. The worst case total heat load rejected to the environment through the cooling systems due to the increased spent fuel storage is less than 17.6×10^6 BTU/hour. This represents an increase of approximately 0.05 percent of the total heat rejected to the environment. Thus, the increase in rejected heat will have negligible impact on the environment. No impact on aquatic biota is anticipated.

The licensee has not proposed any change in the use or discharge of chemicals in conjunction with the expansion of the fuel pool. The proposed fuel pool expansion will not require any change to the NPDES permit.

Therefore, the staff concludes that the non-radiological environment impacts of expanding the spent fuel will be insignificant.

5.0 SEVERE ACCIDENT CONSIDERATIONS

The staff, in its related Safety Evaluation to be published at a later date, has addressed both the safety and environmental aspects of a fuel handling accident, an event that bounds the potential adverse consequences of accidents attributable to operation of a spent fuel pool 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. One such accident, which was investigated by an NRC contractor, involves a structural failure of a spent fuel pool resulting in a rapid loss of all contained cooling water, followed by fuel heat up and a zirconium cladding fire. The details of this severe accident are discussed in NUREG/CR-4982 (1987) entitled "Severe Accidents in Spent Fuel Pools in Support of General Safety Issue 82."

The staff concludes that the risk associated with such an accident is extremely low. This conclusion is based upon the Commission's requirements for the design and construction of spent fuel pools and their contents (e.g., racks) and adherence to approved industry codes and standards. See "Seismic

Failure and Drop Analyses of the Spent Fuel Pools at Two Representative Nuclear Power Plants" NUREG/CR-5176 (1989). For example, in the LaSalle case, the pool itself is an integral part of the fuel handling building, which is designed to Seismic Category I and, thus, is required to remain functional during and after a safety shutdown earthquake. In addition, the racks are extremely strong in the structural sense in maintaining proper spacing of the fuel assemblies. The water cooling system is extremely reliable; in the highly unlikely event of a total cooling system failure, make up water sources are available. The staff acknowledges that if the severe accident occurred as described above, the environmental impacts could be significant; however, this event is highly unlikely, in light of the design of the spent fuel pool system and racks. Therefore, further discussion of severe accidents is not warranted, and the staff concludes that an environmental impact statement need not be prepared.

6.0 SUMMARY

The Final Generic Environmental Impact Statement (FGEIS) on Handling and Storage of Spent Light Water Power Reactor Fuel concluded that the cost of the various alternatives reflects the advantage of continued generation of nuclear power with the accompanying spent fuel storage. Because of the differences in SFP designs, the FGEIS recommended environmental evaluation of SFP expansions on a case-by-case basis.

For the LaSalle County Station, Unit 1, the expansion of the storage capacity of the spent fuel pool will not create any significant additional radiological effects or measurable non-radiological environmental impacts. The severity (i.e., radiological consequences) of a fuel handling accident in the spent fuel storage pool, incorporating a high density storage configuration, would not exceed that due to the design basis analysis addressed in Section 7, Table 7.2 of the LaSalle FES, NUREG-0486. As such, the fuel handling accident analysis reviewed by the staff in the FES for LaSalle remains valid. These doses are small compared to the fluctuations in the annual dose this population receives from exposure to background radiation. The occupational radiation dose for the proposed preparation of the expanded spent fuel pool is estimated by the staff to be less than two percent of the total annual occupational radiation exposure for a facility of this type. The small increase in radiation dose should not affect the licensee's ability to maintain individual occupational dose at the LaSalle County Station, Unit 1, within the limits of 10 CFR Part 20, and as low as is reasonably achievable.

The only non-radiological effluent affected by the SFP expansion is the additional waste heat rejected. The increase in total plant waste heat is insignificant. Thus, there is no significant environmental impact attributable to the waste heat from the plant due to the SFP expansion.

6.1 Alternative Use of Resources

This action does not involve the use of resources not previously considered in connection with the Nuclear Regulatory Commission's Final Environmental

Statement, dated November 1978, related to the operation of the LaSalle County Station, Unit 1.

6.2 Agencies and Persons Consulted

The NRC staff reviewed the licensee's request. No other agencies or persons were consulted.

7.0 BASIS AND CONCLUSIONS FOR NOT PREPARING AN ENVIRONMENTAL IMPACT STATEMENT

The staff has reviewed the proposed spent fuel pool modification to the LaSalle County Station, Unit 1, 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 non-radiological impacts associated with the proposed action and that the proposed license amendment will not have 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 Contributor: R. Stransky

Dated: February 12, 1993

8.0 REFERENCES

U.S. Nuclear Regulatory Commission, "Final Environmental Statement Related to Operation of LaSalle County Nuclear Power Station Unit Nos. 1 & 2," November 1978.

Regulatory Guide 1.109, Revision 1, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," October 1977.

Regulatory Guide 8.8, Revision 3, "Information Relative to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable," June 1978.

NUREG-0800, "Radiation Protection," in: "Standard Review Plan," Chapter 12, July 1981 (formerly issued as NUREG-75/087).

NUREG/CR-4982, "Severe Accidents in Spent Fuel Pools in Support of General Safety Issue 82."

NUREG-0713, Volume 13 (Draft), "Occupational Radiation Exposure at Commercial Nuclear Power Reactors 1991" 1993.

NUREG/CR-5176, "Seismic Failure and Cask Drop Analyses of the Spent Fuel Pools at Two Representative Nuclear Power Plants."