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October 16, 1980

Director
Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUSQUEHANNA STEAM ELECTRIC STATION — Docket #50-387
SPECIAL NUCLEAR MATERIALS LICENSE APPLICATION
NEW FUEL STORAGE AND RECEIPT
ER 100450 — FILE 841-06
PLA-558

This application is filed pursuant to Title 10 Code of Federal Regulations, Part 70 for authorization to receive, possess, store, inspect, and package for transport nuclear fuel bundle/assemblies.* It is requested that the Special Nuclear Materials License remain in effect until receipt of the Operating License.

Any questions concerning this application should be forwarded to Mr. Thomas E. Gangloff, (215)-821-5543) of the Nuclear Licensing Group.

The following information is submitted in support of the application.

1.0 APPLICANT

Pennsylvania Power & Light Company
P.O. Box 1870
Allentown, PA. 18105

2.0 ADDRESS OF STORAGE SITE

Unit 1 of the Susquehanna Steam Electric Station (SSES) is located in Salem Township, Luzerne County, in east central Pennsylvania, about five miles northeast of Berwick, Pennsylvania.

3.0 CORPORATE INFORMATION

The information set forth in the application for Construction Permit and Operating License, Docket No. 50-387 dated July 20, 1978 for the Susquehanna Steam Electric Station Unit 1, is hereby incorporated by reference. Information concerning control and ownership of the

*bundle - that which is received from the fuel manufacturer
assembly - fuel bundle with channel affixed.

applicant is also set forth in the application for Construction Permit and Operating License.

4.0 RADIOACTIVE MATERIAL

Initial Core Fuel Assemblies

Maximum square dimension of fuel bundle/assembly	5.47 in.		
Active fuel length	150 in.		
Overall fuel bundle/assembly length	176.16 in.		
Maximum square dimension of fuel channel	5.44 in.		
Overall channel length	166.91 in.		
Channel wall thickness	.080 in.		
Rod array type	8 x 8 = 64 rods 62 fuel rods 2 water rods		
Fuel rod clad thickness	0.032 in.		
Rod clad material	Zircaloy - 2		
Fuel rod outside diameter	.483 in.		
Fuel pellet diameter	.410 in.		
Fuel pellet material	UO_2		
Total number of fuel assemblies	764 (3 types)		
Average U-235 enrichment (%)	1.88		
Average U-235 enrichment (%) per assembly type	.711	1.76	2.19
Number of assemblies per type	92	240	432
UO_2 weight per assembly (kg)	207.58	207.31	207.00
Gd_2O_3 weight per assembly (kg)	0.0	0.20	0.44
Average UO_2 weight per fuel rod (kg)	----------- 3.34----------		
U weight per assembly (kg)	182.96	182.73	182.45
(lb)	403.36	402.85	402.23

The maximum amount of special nuclear material, as kilograms of U-235, which may be possessed at any one time is 3,043 kilograms. This represents the initial core and fifty additional assemblies per enrichment type.

5.0 TRANSPORTATION

All initial core fuel bundles are to be delivered to the site in accordance with shipping procedures and arragements of the General Electric Company. The fuel bundles will be shipped by the fuel manufacturer as authorized under NRC Certificate of compliance number USA/4986/B(F) Revision 8. Fuel will normally be shipped to the site by truck, with a maximum of 16 containers per truck and two bundles per container.

6.0 STORAGE CONDITIONS

The fuel bundle/assemblies will be stored on the refueling floor of the Reactor Building (see SSES Final Safety Analysis Report, Section 9.1) in either the new fuel storage vault dry, in the spent fuel pool, or in their metal shipping containers on the refueling floor. When the fuel bundle/assemblies are stored in the spent fuel pool, the pool may be dry, partially flooded, and/or completely flooded during residence in the storage rack. The refueling floor is surrounded by structural steel and metal siding and, therefore, it is considered unlikely that a fire will occur. However, the use of flammable materials on the refueling floor will be carefully controlled as an added margin of safety. In addition, the movement of the new fuel vault cover will be administratively controlled by approved plant procedures. The refueling floor is shown on SSES Final Safety Analysis Report (FSAR) Figures 1.2-23, 1.2-24, 1.2-25, and 9.1-16B.

6.1 Inspection and Handling

As soon as practicable after the fuel carrier vehicle arrives at the plant gate, it will be taken to a predetermined unloading area where the shipping containers will be unloaded from the carrier vehicle. The wooden containers will then be taken to the unloading bay on the ground floor of the Reactor Building (EL672). The metal inner shipping containers will be removed from the wooden outer shipping containers. The metal containers, holding the fuel bundles, will be lifted to the refueling floor of the Reactor Building, where they can be stored for an interim period of time. The metal containers will be placed in a near vertical position, and the bundles are then removed from the containers. The fuel bundles may be placed in the new fuel inspection stand to be checked for integrity and numbering, or placed in an appropriate storage location for future inspection. All activities of unloading; surveying, inspecting, moving and storing of the fuel bundles will be performed in accordance with approved written procedures.

6.2 Safety Evaluation

The new fuel bundle/assemblies can be stored in the new fuel storage racks in the new fuel storage vault, in high density spent fuel storage racks in the spent fuel pool and/or in their metal shipping containers. The metal shipping containers are described, and their storage without a criticality warning system authorized in Amendment #5 to GE's Special Nuclear Materials License #SNM-1097 dated June 6, 1978. The criticality control and fuel rack design criteria for the new fuel storage vault and the spent fuel storage pool is outlined as follows.

6.2.1 Criticality Control - New Fuel Storage Vault Rack

The calculations of Keff are based upon the geometrical arrangments of the fuel array and subcriticality does not depend upon the presence of neutron absorbing materials. To meet the requirements of General Design Criterion 62, geometrically-safe configurations of fuel stored in the new fuel array are employed to assure that keff will not exceed 0.95 if fuel is stored in the dry condition or if the abnormal condition of flooding (water with a density of 1 g/cc) occurs. In the dry condition, Keff is maintained <0.95 due to under-moderation. In the flooding and flooded condition, the geometry of the fuel storage array assures the Keff will remain <0.95 due to over-moderation.

No limitation is placed on the size of the new fuel storage vault rack array from a criticality standpoint since all calculations are performed on the basis of an infinite array of assemblies. The New Fuel Storage Vault will, therefore, accommodate fuel from a multi-unit facility with no safety implications. All handling conditions remain the same and there is no compromise of safety considerations.

6.2.2 New Fuel Storage Vault Rack Design

a) The New Fuel Storage Vault contains 23 sets of castings which may contain up to 10 fuel bundle/assemblies; therefore a maximum of 230 fuel bundle/assemblies may be stored in the fuel vault.

b) There are three tiers of castings which are positioned to fixed box beams. This holds the fuel bundle/assemblies in a vertical position and supported at the lower and upper tie plate with additional lateral support near the center of gravity of the fuel bundle/assembly.

c) The lower casting supports the weight of the fuel bundle/assembly and restricts the lateral movement; the center and top casting restricts lateral movement only of the fuel bundle/assembly.

d) The New Fuel Storage Vault Racks are made from aluminum. Materials used for construction are specified in accordance with ASTM-1978 specifications. The material choice is based on a consideration of the susceptibility of various metal combinations to electrochemical reaction. When considering the susceptibility of metals to galvanic corrosion, aluminum and stainless steel are relatively close together insofar as their coupled potential is concerned. The use of stainless steel fasteners in aluminum to avoid detrimental galvanic corrosion is a recommended practice and has been used successfully for many years by the aluminum industry.

e) The minimum center-to-center spacing for the fuel bundle/assembly between rows is 11.875 inches. The minimum center-to-center spacing within the rows is 6.535 inches. Fuel bundle/assembly placement between rows is not possible.

f) Lead-in and lead-out of the casting provides guidance of the fuel bundle/assembly during insertion or withdrawal.

g) The rack is designed to withstand the impact force of 4000 ftlbs while maintaining the safe design basis. This impact force could be generated by the vertical free fall of a fuel assembly from the height of 5.3 feet.

h) The rack is designed to withstand the pull-up force of 4000 lbs. and a horizontal force of 1000 lbs. The racks are designed with lead outs to prevent sticking. However, in the event of a stuck fuel bundle/assembly, the lifting bail will yield at a pull up force less than 1500 lbs.

i) The rack is designed to withstand horizontal combined loads up to 222,000 lbs, well in excess of expected loads.

j) The maximum stress in the fully loaded rack in a faulted condition is 25.9 Kip. This is significantly lower than the allowable stress.

k) The rack is designed to handle nonirradiated, low emission radioactive fuel assemblies.

6.2.3 Criticality Control - Storage of New Fuel in High Density Spent Fuel Racks

The design of the spent fuel pool storage racks assure that Keff will remain <0.95 for both normal and abnormal storage conditions. Normal conditions exist when the fuel is dry, flooding and flooded. An abnormal condition may result from accidental dropping of equipment or damage caused by the horizontal movement of fuel handling equipment without first disengaging the fuel from the hoisting equipment.

To ensure that the General Design Criteria 62 is met, the following normal and abnormal spent fuel storage conditions were analyzed.

a) normal positioning in the spent fuel storage array,

b) fuel stored in control rod racks,

c) Pool water temperature increases to 212°F,

d) normal storage array of ruptured fuel,

e) abnormal positioning in the spent fuel storage array,

f) moving fuel bundle between work rack and storage area,

g) dropped fuel bundle adjacent rack

The criticality safety analysis was performed by Nuclear Associates International (NAI 78-75 dated 5-15-79). This analysis shows that under all postulated normal and abnormal conditions, Keff will remain ≤0.95.

6.2.4 High Density Spent Fuel Rack Design

Spent fuel storage racks provide a place in the fuel pool for storing new and spent fuel. The high density spent fuel racks are of a bolted anodized aluminum construction containing a neutron-absorbing medium of natural boron carbide (B_4C) in an aluminum matrix core clad with 1100 series aluminum. This neutron absorber is marketed under the trade name of Boral. The core has a thickness of 80 mils and a minimum B-10 density of 0.0232g/cm . The Boral is sealed within two concentric square aluminum tubes hereinafter called "poison cans".

Each rack consists of six basic components:

1) top grid casting

2) bottom grid casting

3) poison can assemblies

4) side plates

5) corner angle clips

6) adjustable foot assemblies

Each component is anodized separately. The top and bottom grids are machined to maintain nominal fuel spacing of 6.625" inches center to center within the rack and a spacing of 9.375" inches between centers of cavities in adjacent racks. Poison cans nest in pockets which are cast in every other cavity opening of the grids. This arrangement ensures that no structural loads will be imposed on the poison cans. The poison cans consist of two concentric square tubes with four Boral plates located in the annular gap. The Boral is positioned so it overlaps the fuel pellet stack length in the fuel assemblies by 1 inch at the top and at the bottom. The outer can is formed into the inner can at each end and seal welded to isolate the Boral from the SFP water. Each can is pressure and vacuum leak tested. The grid structures are bolted and riveted together during fabrication by four corner angles and four side shear panels. Leveling screws are located at the rack corners to allow adjustment for variations in pool floor level of up to $\pm$.75 inch. To maintain a flat, uniform contact area, the bearing pad at the bottom of each leveling screw is free to pivot. The bottoms of the racks are at least 7 inches above the floor to allow for coolant flow under the racks. Provisions are made for coolant flow in the corner cavities between the foot assembly and the bottom of the casting. These are top entry racks designed to maintain the spent fuel in boron-carbide/anodized aluminum poison compartments that preclude the possibility of criticality under normal and abnormal conditions. Lateral support is provided along the length of the storage cells in a manner that minimizes the application of lateral and bending loads to the fuel assembly during handling and storage. The weight of the fuel asembly is supported in a chamber hole by the bottom casting.

The location of the spent fuel storage facility within the station complex is shown in Section 1.2 of the SSES FSAR. The racks are connected to wall embedments on the pool walls and shown in FSAR Figure 9.1-2b. Each pool has 24 racks for a storage capacity of 2840 fuel bundle/assemblies plus 10 multipurpose cavities for storage of control rods, control road guide tubes, and defective fuel containers.

The rack arrangement is designed to prevent accidental insertion of fuel bundle/assemblies between adjacent racks.

6.3 Radiation Monitoring

The training and experience of the Radiation Protection Officer are attached.

6.3.1 Personnel Monitoring

Personnel authorized to uncrate, survey, store, and inspect new fuel assemblies shall carry personnel monitoring devices. Records of exposure will be maintained on Form NRC-5 or equivalent.

6.3.2 New Fuel Assembly Monitoring

Each new fuel assembly will be monitored for removable alpha and beta contamination following unpackaging. In addition, a beta-gamma dose rate survey will be taken on each assembly. Records of results will be maintained in accordance with station procedures.

6.3.3 Area Monitoring

Fuel unpackaging and storage areas will be routinely monitored for removable contamination levels and general radiation levels as applicable. Survey frequency, posting, and record keeping will be performed in accordance with Health Physics procedures.

6.3.4 Instrumentation

The following instrumentation, or equivalent, will be available to support the receipt and inspection of new fuel bundle/assemblies:

Type	Model	Range	Use
Gas Flow Counter	Eberline FC-2	NA	Removable contamination survey
Ionization	Victoreen 470-A	0 mR/hr-1000 R/hr	Radiation level survey

These instruments will be calibrated on a quarterly basis.

6.3.5 Emergency Actions

Precautionary measures will be included in applicable procedures which will state actions to be followed in the event a fuel bundle/assembly is dropped and the fuel racks damaged.

The SSES Operations Shift Supervisor or designated alternate is responsible for initiation, direction, and termination of any emergency response.

6.3.6 Request for Exemption

Applicant requests exemption from the monitoring and emergency procedures requirements of 10CFR70.24. This exemption is requested because the nature of the special nuclear material, storage arrangements, and procedural controls which Applicant proposes to employ preclude any possibility of accidental criticality during receipt, unloading, inspection and storage of new fuel assemblies.

7.0 Security

Fuel elements will be stored in a designated area which will be posted as a restricted access area. Entry to the area will be controlled by an administrative procedure, which will allow only authorized personnel to enter the area. Entry will be through a single, designated entry point. The Security Section will provide 24-hour a day surveillance of the fuel storage area. This will be accomplished by assigning a Foot Patrol/Access Controller to this area.

8.0 IDEMNITY

Application will be made by Pennsylvania Power & Light Company to American Nuclear Insurers for insurance in the amount of $1,000,000 for the period from first shipment of fuel assemblies from General Electrics manufacturing facilities in Wilmington, North Carolina, until the first fuel assembly is loaded into the reactor. Proof of financial protection will be furnished prior to fuel shipment.

PENNSYLVANIA POWER & LIGHT COMPANY

By: NW Curtis

Norman W. Curtis
Vice President
Engineering and Construction-Nuclear

TEG#149:5

RADIATION PROTECTION OFFICER - TRAINING AND EXPERIENCE

NAME: Dennis J. Trout

WORK EXPERIENCE:

NUCLEAR WORK:

Position: Acting Health Physics Supervisor
Pennsylvania Power & Light Company
Susquehanna SES

Dates: July 31, 1979 to Present

Location: Susquehanna Steam Electric Station - Berwick, PA

Duties: Supervise Health Physics Section activities. Direct development of Health Physics Programs and Procedures to assure implementation of FSAR commitments and regulatory requirements. Selection of qualified Health Physics personnel and implementation of required training programs. Develop equipment and manpower budgets to meet program requirements. Assist in Emergency Plan and implementing procedure development. Serve as member of Corporate ALARA Review Committee, and Radiation Monitoring Review Committee.

Position: Health Physics Engineer
Pennsylvania Power & Light Company
Susquehanna SES

Dates: March 22, 1976 - July 31, 1979

Location: July 12, 1977 to July 31, 1979
Susquehanna Steam Electric Station - Berwick, PA

March 22, 1979 to July 12, 1977
Susquehanna Steam Electric Station Plant Staff
Two North Ninth Street, Allentown, PA

Duties: Developed Nuclear Station "as low as reasonable achievable" (ALARA) Program. Assisted Health Physics Supervisor in the evaluation and/or direction of Health Physics Program and acted for Health Physics Supervisor in his absence. Participated in the preparation of FSAR Section 12, developed Health Physics procedures, organized the external and internal radiation exposure program, evaluated in selected Station Health Physics equipment, participated in various Health Physics Training Programs for Station personnel. Served as Chairman of the Station ALARA Review Committee. Directed emergency on-site and off-site monitoring teams in response to March 28, 1979 accident at Three Mile Island.

Position: Assistant Engineer - Nuclear - Three Mile Island (TMI) Nuclear Station - Metropolitan Edison Company

Dates: March 1, 1974 - March 12, 1976

Location: Three Mile Island Nuclear Station - Middletown, PA

Duties: Developed Health Physics procedures and implemented reporting requirements. Performed release rate and dose calculations. Implemented training programs for Station personnel and Rad/Chem. Technicians. Organized radiation exposure program and directed in-house TLD operations. Implemented the Station Health Physics Program through first line supervision of Rad/Chem. Technicians. Supervised technicians and assisted with Health Physics evaluations through initial fueling, startup, and numerous maintenance estimates for various aspects of the first refueling outage of Three Mile Island Unit I.

Promoted In January, 1976 to the position of Technical Analyst III.

Position: Public Information Coordinator

Dates: June 11, 1973 - March 1, 1974

Location: Three Mile Island Nuclear Station - Middletown, PA

Duties: Lectured to public interest groups concerning various aspects of TMINS with emphasis on environmental and Health Physics concerns.

EDUCATION AND TRAINING

1969-1973 Albright College, B.S. Physics

1975	Health Physics Certification Training/Refresher
1975	Penn. State Reactor Operations Course
1976	Respiratory Protection Programs and OSHA
1976	SSES Radioactive Waste Treatment System
1977	GE Boiling Water Reactor Technology
1977	UNI Radiological Training for Maintenance Managers and Engineers
1978	GE Radiological Engineering Course
1979	Susquehanna SES Plant Systems Course
1979	Packaging and Transportation of Radioactive Waste

PROFESSIONAL SOCIETIES:

Health Physics Society
Delaware Valley Society for Radiation Safety

EXPERIENCE WITH RADIATION

Isotope	Amount	Location	Duration of Use	Type of Use
Mixed Fision, Activation, & Corrosion Products Byproduct, source & special nuclear Material	Trace-KiloCurie	Three Mile Island Nuclear Station	2 years	Reactor Health Physics Program

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