HOPE CREEK GENERATING STATION

Application for License

For

Storage Only of

Unirradiated Nuclear Fuel

Revision 2

Public Service Electric and Gas Company, pursuant to Title 10, Code of Federal Regulations, Part 70, hereby applies for a license to permit the receipt, possession, inspection, and storage of special nuclear materials in the form of unirradiated nuclear fuel.

CHAPTER 1 - GENERAL INFORMATION

1.1 REACTOR AND FUEL

1.1.1 Identification of Reactor, Parties to the Licensing Action, Geographic Location, Docket and Construction Permit Numbers

The application for Special Nuclear Material (SNM) License is submitted by the Public Service Electric and Gas Company (PSE&G) for the nuclear power facility designated "Hope Creek Generating Station" (HCGS). This station is a one-unit nuclear power plant utilizing a General Electric (GE) Mark I Containment and BWR 4/5 Nuclear Steam Supply System (NSSS) with rated core thermal power of 3293 MWt @ 100% steam flow, with gross electrical output of approximately 1118 MWe and net electrical output of approximately 1067 MWe. Additional general information pertaining to HCGS is located in Chapter 1 of the HCGS FSAR, with specific information reference provided therein.

PSE&G is incorporated in the State of New Jersey with its' principal office located at 80 Park Plaza, Newark, New Jersey 07101. All directors and principal officers names are listed in Table 1.1.1-1; All are American citizens. To the best knowledge of the applicant PSE&G is not owned or controlled by any alien, foreign corporation or foreign government. PSE&G owns an undivided 95% interest in the HCGS. Atlantic City Electric Company owns an undivided 5% interest in the facility.

Atlantic City Electric Company is incorporated in the State of New Jersey with principal offices located at 1199 Blackhorse Pike, Pleasantville, New Jersey 08232. All directors and principal officers for the Atlantic City Electric Company are identified in Table 1.1.1-2, all are American Citizens. To the best knowledge of the applicant Atlantic City Electric Company is not owned or controlled by any alien, foreign corporation or foreign government.

The HCGS is located on the southern part of Artificial Island on the east bank of the Delaware River in Lower Alloways Creek Township, Salem County, New Jersey. While called Artificial Island, the site is actually connected to the mainland of New Jersey by a strip of tideland formed by hydraulic fill from dredging operations on the Delaware River by the U.S. Army Corps of Engineers. The site is 15 miles south of the Delaware Memorial Bridge, 18 miles south of Wilmington, Delaware, 30 miles southwest of Philadelphia, Pennsylvania, and 7-1/2 miles southwest of Salem, New Jersey.

On November 4, 1974, the Atomic Energy Commission, predecessor to the Nuclear Regulatory Commission ("NRC") issued Construction Permit No. CPPR-120 to PSE&G and the Atlantic City Electric Company in Docket Number 50-354 for the Hope Creek Generating Station.

1.1.2 Fuel Assemblies

Each fuel assembly consists of a square channel enclosing an 8 x 8 array (bundle) of Zircaloy rods. Each bundle consists of sixty-two fuel rods and two water rods for a total of sixty-four rods per bundle. The rods are supported by an upper and lower tie plate cast from Type 304 stainless steel. Eight of the fuel rods on the bundle periphery are tie rods. Both threaded ends of these rods pass through the tie plates and are bolted to support and maintain bundle geometry. Finger springs are located between the lower tie plate and the channel for controlling bypass flow. Each bundle contains two centrally located water rods, one of which is a spacer capture rod designed to provide axial support for seven Zircaloy-4 fuel rod spacers. The fuel spacers are fabricated from Zircaloy-4 with Inconel-X spring. The fuel rod spacers laterally support the bundle rods, maintain rod spacing and geometry, as well as dampen any flow induced vibrations.

The fuel channels are fabricated from Zircaloy-4. The channels prevent cross-flow between bundles, guide and provide a bearing surface for control rods, and provide rigid lateral support for the fuel bundles. The channel is open at the bottom and makes a sliding seal fit on the lower tie plate surface. At the top of the channel, two diagonally opposite corners have welded tabs, one of which serves as the attachment point to a raised post on the upper tie plate. The post has a threaded hole to which is attached a channel fastener assembly.

Other pertinent data as required by Regulatory Guide 3.15 "Standard Format and Content of License Applications for Storage Only of Unirradiated Power Reactor Fuel and Associated Radioactive Material" is identified in Table 1.1.2-1.

Additional descriptive information pertaining to fuel assembly design, including materials of construction can be located in HCGS FSAR Section 4.2 "Fuel System Design" and references noted therein.

1.1.3 Enrichment

There are five bundle types in the initial core loading of HCGS. The number of bundles and nominal concentrations are presented in Table 1.1.3-1. The fuel bundles contain no U-233, plutonium, depleted uranium, or thorium. The total weight of a fuel assembly is approximately 700 pounds. The weight of a fuel bundle is approximately 600 pounds.

1.1.4 Total Nuclear Fuel Material

Based upon the data presented in Table 1.1.3-1, a total of 764 assemblies containing approximately 2582 kg of U-235 will be received. As such, Public Service Electric and Gas Company hereby requests a license for

3000 kg of U-235 to allow for manufacturing tolerances and for the receipt of spare assemblies if required.

No licensing request is submitted for U-233, plutonium, depleted uranium or thorium.

1.2 STORAGE CONDITIONS

1.2.1 Storage Locations

The principal location where fuel bundles or fuel assemblies will be stored is the Spent Fuel Pool located in the Reactor Building. Appropriate descriptions and drawings of this area are provided in Sections 1.2 and 9.1.2 of the HCGS FSAR.

Circumstances may arise which could interrupt off-loading and receipt of fuel in the Railroad Access area. For example, maintenance of the polar crane or construction activities which conflict with fuel receipt could disrupt fuel receiving activities. In the event such circumstances occur, fuel may be temporarily stored in the Railroad Access Area on elevation 102' of the Reactor Building. If equipment malfunctions or other delays occur, one loaded trailer could be parked in the Railroad Access Area. In addition, there exists the possibility of unloading other containers into this area concurrent with the loaded trailer. Appropriate drawings and description of this area are provided in Sections 1.2 and 9.1.4.2.10 of the HCGS FSAR.

1.2.2 Storage Environment

The fuel will be stored channeled or unchanneled in the spent fuel racks, dry. If necessary, the fuel can be stored wet within the spent fuel racks in the spent fuel pool.

1.2.3 Adjacent Area Activities

No operations other than fuel and component inspection, handling, and storage will be

performed in the fuel storage area on elevation 201'. Crane operations will be restricted such that no more than one channeled fuel assembly or equivalent weight per crane will be allowed over storage areas containing fuel. Loaded fuel shipping containers or properly designed overload test weights may be handled in these areas provided that they are at no time suspended over the fuel arrays in storage. Any non-fuel related activities which must be conducted in the fuel handling area will be reviewed and approved by the Shift Supervisor, or his designee.

Any non-fuel activities in the Railroad Access area on elevation 102'-0" of the Reactor Building will be restricted as follows during fuel handling:

a. No painting, grinding, sandblasting, or similar activities are allowed.
b. No overhead work is allowed.
c. No crane operations other than those required for fuel handling and inspection are allowed.
d. No construction or test activities which may adversely affect fire protection in the fuel handling area are allowed.

When fuel handling activities are not in progress, selected activities such as those above may be performed provided the fuel is protected and the activities are reviewed and approved by the Shift Supervisor or Maintenance Supervisor or their designee.

Activities in other areas of the Reactor Building need not be restricted during any of these periods.

1.2.4 <u>Description of Storage Facilities</u>

1.2.4.1 Spent Fuel Pool - Reactor Building

The spent fuel pool in the Reactor Building contains a storage space sufficient for 4084 fuel assemblies.

The spent fuel storage racks are constructed in accordance with Seismic Category I requirements. The applicable code for the design of racks is ASME Section III, Subsection NF. The spent fuel racks are constructed of ASTM A-240 and ASTM A-564 stainless steel. The A-240 and A-564 material specifications are identical to the ASME SA-240 and SA-564 material specifications. All rack steel is supplied with certified material test reports. The spent fuel storage racks use a neutron absorber to maintain subcriticality in a high density array.

A sufficient quantity of racks will be installed prior to receipt of new fuel on site so that the initial core load can be stored.

The racks are designed to protect the fuel assemblies from excessive physical damage under normal or abnormal conditions.

The racks are constructed in accordance with the QA requirements of 10 CFR 50, Appendix B.

Brooks & Perkins Corp. manufactures the Boral utilized by PSE&G in the Hope Creek Generating Station Spent Fuel Racks. Assurance that the Boral composition meets design specifications is achieved through use of B&P's procedure BP-10053QAP.

Material traceability is maintained for the aluminum skins, the boron carbide and the aluminum powder from the raw material stage through manufacturing. Work order numbers, weight of B_4C and aluminum used, control numbers, and batch numbers are recorded on data sheets that are part of this procedure. Samples of each batch are lab analyzed to prove homogeneity of the Boral matrix. After manufacture of the sheets, the sheet serial number and the B_4C lot numbers are inputted into a computer. This computer data base assures traceability of the materials used at Hope Creek throughout its life cycle.

Boral is a clad composite of boron carbide (B_4C) and 1100 alloy aluminum. The boral panel consists of three distinct layers. The outer protective layers are solid aluminum. The central layer contains a uniform aggregate of fine boron carbide particles tightly held within an aluminum alloy matrix. The boron carbide particles in the central layer average 85 microns in diameter with an average spacial separation of 1.25 to 1.50 particle diameters.

The chemical composition of aluminum (1100 alloy) is as shown in Table 1. The chemical composition of Boron Carbide is as shown in Table 2. The minimum weight percent B_4C is shown in Table 2 as 94.0. The minimum Boral density is 2.51 gm/cc - 0.0907 lb/cu. in.

Table 1

Chemical Composition - Aluminum (1100 Alloy)

99.00% min.	Aluminum
1.00% max.	Silicon and Iron
.05-.20% max.	Copper
.05% max.	Manganese
.10% max.	Zinc
.15% max.	others each

Table 2

Boron Carbide Chemical Composition, Weight %

Total Boron	70.0 min.
B^{10} isotopic content in natural boron	18.0 min.
Boric oxide	3.0 max.
Iron	2.0 max.
Total boron plus total carbon	94.0 min.

Programmed and Remote Systems/GCA Corporation (PaR) designed and fabricated the spent fuel racks for Hope Creek. The quality assurance program utilized by PaR to assure that the Boral is securely encapsulated into the stainless steel wall of the specified storage cell in accordance with storage rack design is PaR-QCP-64-9028 entitled "Inspection Procedure for Square Stainless Steel Tubes, Cavity Weldments, and Module Assembly."

The procedure establishes guidelines for traceability of material and fabrication and inspection of welds. This includes welds on the wrapper, the boral containing portion of the spent fuel rack.

Record of the material, welder, inspection, and needed repairs is made on inspection record sheets that are a part of the PAR procedure.

One modified storage rack has the capability of storing fuel assemblies and 14 defective fuel bundles.

The spent fuel racks are designed to handle irradiated or unirradiated fuel assemblies. The shielding for the stored spent fuel assemblies is designed to protect plant personnel from exposure to direct radiation greater than that permitted for continuous occupational exposure during normal operations.

The center-to-center spacing for the fuel assembly between rows is 6.308 inches. The center-to-center spacing within rows is 6.308 inches. Fuel assembly placement between rows is not possible.

Lead-in and lead-out guides at the top of the racks provide guidance of the fuel assembly during insertion or withdrawal.

The spent fuel storage racks are designed to withstand a pullup force of 4,000 lb. and a horizontal force of 1,000 lb. There are no readily available forces in excess of 1,000 lb. The racks are designed with lead-outs to prevent sticking. However, in the event of

a stuck fuel assembly, the maximum lifting force of the refueling platform grapple (assuming limit switches fail) is 3,000 lb.

A complete description of the spent fuel storage racks is contained in Section 9.1.2 and Appendix 9B of the HCGS FSAR.

1.2.4.2 Fuel Handling System

All required fuel handling equipment will be preoperationally tested for safe operation prior to its use for fuel handling activities. The fuel handling equipment and fuel bundles and assemblies are specifically designed for all fuel handling activities described in this application.

A complete description of the Fuel Handling System is contained in Subsection 9.1.4 of the Hope Creek FSAR.

1.2.4.3 Fuel Handling Activities

Upon arrival of a shipment of fuel the following will take place:

1. When the new fuel delivery truck arrives on site, the Senior Nuclear Shift Supervisor and Reactor Engineering Department representative will be notified. Radiation Protection personnel will perform a radiation survey of the delivery truck. The Senior Nuclear Shift Supervisor and Reactor Engineer will be notified of any unsatisfactory survey results.

2. The shipment is then directed from the gate to the Railroad Access door located on the south face of the Reactor Building under escort of Radiation Protection personnel.

3. Maintenance personnel will locate the truck and direct the removal of tarps and chains.

4. Radiation Protection personnel will survey the wooden crates.

5. The shipment and shipping containers will be verified to comply with shipping papers presented by the carrier. Reactor Engineering is responsible for evaluation and resolution of discrepancies.

6. Upon proper acceptance of shipping papers and radiation surveys, the truck may be unloaded. If the shipping papers are incorrect, the truck may be unloaded, provided the containers are properly tagged and treated as nonconforming material.

The metal shipping containers will be removed from their outer wooden containers and hoisted to the 201' elevation, of the Reactor Building using the Reactor Building Crane Auxiliary Hoist. During removal of the metal shipping containers from the wooden shipping crates, Radiation Protection personnel will survey the metal containers. The fuel may now be readied for inspection, channeling, and storage or inspection and storage. All personnel involved in the

inspection operation will be trained and will have reviewed the procedures for fuel receipt, handling, storage and criticality safety. Inspection, channeling, and storage will proceed in accordance with written procedures as follows:

1. Unpack fuel bundles from the metal shipping containers. Remove the polyethylene sleeves from the fuel bundles prior to inspection.

   After the polyethylene sleeve is removed, Radiation Protection personnel will perform a survey to ensure no external contamination is present. The sleeves will then be permanently discarded.

2. Move one bundle to the new fuel inspection stand and secure in place on the inspection stand. Move second bundle from the shipping container and secure in place on the inspection stand. Two bundles may be secured on the inspection stand concurrently.

3. The inspection will encompass the following categories:

   a. Visual examination
   b. Removal of packing spacers
   c. Dimensional check
   d. Pin enrichment and location check (also gadolinium fuel pins)
   e. Clean all outside surfaces and verify cleanliness of all visible surfaces.

4. The inspected bundles may now be channeled and transported to the spent fuel storage pool.

5. In addition to the fuel handling platform operator, an independent observer will verify the coordinates of the stored fuel in the spent fuel storage pool.

After the fuel has been stored dry in the spent fuel pool racks, the fuel will be covered until the pool is flooded for neutron source assembly and installation and fuel loading. The fuel will be covered by placing a tarp directly over the spent fuel storage racks containing the new fuel assemblies. This arrangement will not prevent water from draining from the assemblies in the event of flooding and subsequent draining of the fuel storage area.

Should a defective new fuel bundle be found, the bundle will be clearly marked and segregated from all non-defective fuel bundles in the spent fuel storage pool.

Transfer of new fuel stored in the Railroad Access area at elevation 102' to the operating deck at 201' elevation will be made as soon as possible. Every effort will be made to minimize the time of storage of new fuel in the temporary storage area.

1.2.5 Fire Protection System

1.2.5.1 General Description

The materials used in construction of the fuel storage area are

concrete and steel. The fuel assemblies and fuel racks are also constructed of non-combustible materials. Fire suppression equipment consists of manual water hose stations and portable fire extinguishers. Details of the Fire Protection System are found in the HCGS FSAR Section 9.5.1, and Appendix 9A.

Reference drawings showing the relative location of all fire protection apparatus (i.e., hose stations extinguishers, etc.) in the Reactor Building are also shown in HCGS FSAR Section 9.5.1.

The Fire Protection Program for the entire plant will not be complete and implemented at the time of the fuel delivery. However, the Fire Protection Program for the areas where new fuel is stored and handled will be complete by the time of initial fuel receipt or appropriate mitigating measures which will provide an equivalent level of protection as defined in BTP CMEB - 9.5-1 will be provided.

As a minimum, the following Fire Protection features will be available at fuel receipt:

a) Fire hose stations in the Railroad Access area (Elevation 102') and Refueling Floor (Elevation 201') will be complete and preoperationally tested, including water supplies and pumps;

b) Portable fire extinguishers will be in place and functional;

c) 24 hour per day fire watch (security guard) and fire brigade coverage to the fire protection program;

d) Administrative procedures and training related to the fire protection program complete and implemented for the fuel storage area.

e) Dedicated fire water storage of 75,00 gallons (6 hose stations for two hours).

The features should provide at least an equivalent level of fire protection for the areas related to fuel delivery as if the entire plant Fire Protection Program was implemented.

The Reactor Building Ventilation System (RBVS) will not be functional at fuel receipt. However, temporary fans located at elevation 178' shall provide clean filtered air through temporary ducts to the refueling floor at elevation 201'. The function of these fans is to aide in maintaining dust levels in the refueling floor area to acceptable levels.

1.2.6 Access Controls

A description of the controls for prevention of unauthorized access to the fuel storage areas is contained in the HCGS "Physical Security Plan for the Protection of Special Nuclear Material of Low Strategic Significance." This plan is considered security confidential and as per the requirements of 10 CFR 73.21 must be withheld from unauthorized disclosure. This security plan is submitted under separate cover.

1.3 PHYSICAL PROTECTION

The quantity of U-235 (contained in uranium enriched to 20%, or more in the U-235 isotope), to be possessed under this license is less than the quantity specified in 10CFR73.1(b) of 10CFR73. Therefore, the physical protection requirements specified therein do not apply.

1.4 TRANSFER OF SPECIAL NUCLEAR MATERIALS

The General Electric Company, the fuel fabricator, is responsible for the shipment of the new fuel assemblies from the fabrication plant at Wilmington, North Carolina to the Hope Creek plant site. The fuel will be shipped in General Electric's model RA-2 or RA-3 containers, which are certified as fissile Class I containers by the most current revision of the NRC Certificate of Compliance USA/4986/AF and are authorized for the transport of fissile radioactive material in the form of General Electric reactor fuel.

As required by 10CFR70.51(c), Public Service Electric and Gas will establish, maintain, and follow written material control and accounting procedures sufficient to conduct the physical inventories required by 10 CFR 70.51(b), to maintain the accounting records required by 10CFR70.51(b), and to submit the material status reports and nuclear material transfer reports required by 10CFR70.53 and 10CFR70.54.

In the event fuel must be returned to the GE facility, PSE&G will be responsible for proper packaging of fuel for return shipment. All packaging of fuel by PSE&G for transport will be done in accordance with 10 CFR Part 71.

1.5 FINANCIAL PROTECTION AND INDEMNITY

Because Public Service is an applicant other than a Federal agency or a nonprofit educational institution, Public Service comes under the requirements of Title 10 CFR, Part 140, Subpart B, Section 140.13, which requires a holder of a construction permit, who is also a holder of a license under 10 CFR Part 70, authorizing ownership, possession, and storage of Special Nuclear Material, to have and maintain financial protection in the amount of $1,000,000. Proof of financial protection should meet the requirements of 10 CFR Part 140, Section 140.15.

Public Service intends to obtain a policy of liability insurance in the amount of $1,000,000 which is an acceptable form of financial protection as stated in 10 CFR Part 140, Section 140.14, "Types of Financial Protection." The policy will be effective prior to receipt of fuel at the Hope Creek site. Proof of financial protection will be supplied to the NRC as a copy of the liability policy, together with a certificate of authenticity provided by the insurer, as provided by 10 CFR Part 140, Section 140.15(a)(1).

2.0 HEALTH AND SAFETY

2.1 RADIATION CONTROL

2.1.1 Qualifications

The technical qualifications for personnel with Radiation Protection responsibilities are described in FSAR Section 13.1.3 and sections referenced therein.

2.1.2 Responsibilities

The responsibilities of key Radiation Protection personnel are described in Section 12.5.1.1 of the FSAR.

2.1.3 Training and Experience

The training and experience of Radiation Protection personnel is described in FSAR Sections 13.1.3, 13.2.1, and 12.5.1.2.

2.1.4 Contamination Monitoring

Radiation and contamination monitoring will be performed prior to the initial handling and storage of new fuel. All new fuel that has not been unloaded or unpacked will be handled as contaminated material with all appropriate radiological controls in effect until contamination checks are performed. New fuel will be checked for radioactive contamination by Radiation Protection personnel as part of the new fuel inspection procedure. Swipes or smears will be taken of the fuel in order to obtain a representative sample of the surface contamination of the entire assembly and will be counted for alpha and beta/gamma activity to determine the amount of contamination present. If the amount of contamination is found to exceed allowable limits, the source of contamination will be determined and appropriate decontamination steps will be initiated as required.

The Radiation Protection program outlined in FSAR Section 12.5 describes the procedures and equipment involved in radiological controls.

There should be no significant radiation hazards associated with the unirradiated fuel and the handling and storage of the fuel as outlined above should be sufficient to maintain radiation exposures ALARA.

2.1.5 Instrument Calibration

Instrumentation for detecting and measuring radiation consists of counting room equipment, portable instrumentation, and air samplers. Capabilities for detecting alpha, beta, gamma, and neutron radiation are provided. Sufficient inventory is provided to accommodate use, repairs, and calibration. Details of the onsite instrument calibration capabilities, including sources, equipment, and methods are not available to date, considering the calibration facility is in the early planning stage. Onsite calibration capability details will be available by July 1, 1985. The projected numbers and types of portable survey instruments and equipment to be utilized are presented in HCGS FSAR Table 12.5-1.

As the planning progresses, additional details of the calibration program will be included in Section 12.5.2.2 of the HCGS FSAR. All of the planning will incorporate standard health physics practices and the recommendations of the appropriate regulations and publications.

Sufficient chemical supplies, chemistry laboratory equipment, and analytical instruments are available to perform the required sample preparations and analyses in support of radiation protection functions.

2.1.6 Conformance to 10CFR20

The Radiation Protection program consists of policies, procedures, instructions, rules and practices to keep individual radiation exposure within the limits set forth in 10CFR Part 20 "Standards for Protection Against Radiation" and to maintain total radiation exposure of personnel as low as is reasonably achievable (ALARA).

The program assures that Radiation Protection training is provided, that personnel and in-plant area radiation monitoring is performed, that records of training, exposure of personnel and surveys are maintained and that proper instrumentation is available and properly calibrated. The Radiation Protection Program is discussed in Section 12.5 of the FSAR.

2.1.7 Disposal of Wastes

Any radioactive waste generated in relation to material contained in the license application will be stored on site until authorized for disposal at a commercial waste disposal facility.

2.2 NUCLEAR CRITICALITY SAFETY

2.2.1 Key Personnel Qualifications

The Technical Engineer and the Senior Reactor Supervisor are the key personnel having nuclear criticality safety and fuel handling responsibilities. The minimum qualifications for these key personnel are in accordance with Regulatory Guide 1.8 "Personnel Selection and Training." The Technical Engineer and Senior Reactor Supervisor correspond to Technical Manager and Reactor Engineering positions respectively, contained in ANSI/ANS-3.1 as endorsed in Regulatory Guide 1.8. Refer to FSAR Section 1.8.1.8 and Table 13.1-3 for additional information.

2.2.2 Key Personnel Responsibilites

The responsibilities of the Technical Engineer are as follows:

Technical Engineer - The Technical Engineer is responsible for the areas of reactor engineering, technical reports and procedures, thermal performance, equipment reliability monitoring and testing, and document control. Reporting to the Technical Engineer are the Senior Reactor Supervisor, Senior Engineer-Technical and the Senior Engineer-Technical Staff. The Senior Reactor Supervisor assumes authority and responsibility in his absence.

The responsibilities of the Senior Reactor Supervisor are as follows:

Senior Reactor Supervisor - The Senior Reactor Supervisor is responsible for Reactor Engineering and Thermal Performance and equipment reliability monitoring. Engineers are assigned to the senior reactor supervisor to develop and implement the details of the programs. The reactor engineering group assists the principal startup engineer in the development and implementation of initial criticality, low power physics and power ascension test programs and provides technical direction to the operations for thermal and nuclear operation of the reactor and initial core loading and refueling operations. The reactor engineering group also monitor, collect, trend, and analyze performance data for systems important to plant efficiency and reliability.

2.2.3 Storage of Loaded Shipping Containers

Fuel bundles may be stored temporarily in shipping containers. If they are stored in this way, the shipping containers will be

stored in an array which is no more active than the array used during shipping. Containers will be stacked no more than three containers high when fuel bundles are contained within. Array safety is based upon analyses performed by General Electric and presented in the General Electric SNM License No. 1097, Docket 70-1113, Revision 3, dated May 14, 1984. This license was approved by the NRC Division of Fuel Cycle and Material Safety dated June 29, 1984. Section 1.8.4.3 of the General Electric SNM license states "Arrays can be constructed without limit to the number of containers so stored, except that each array shall be stacked to a height of no more than four containers high with each container separated by nominal 2 inch wooden studs and with the width and length for each array and separation between arrays determined only by container handling requirements." Shipping containers will be located in limited access areas on the 201' elevation operating deck.

The fuel bundles are shipped in a steel container (179 1/2" x 17 7/8" x 11") encased in a wooden shipping crate (206 3/4" x 29 3/4" x 31"). One (1) steel container is contained in each wooden shipping crate. Two (2) fuel bundles are contained in each steel container. The container and crate are described in General Electric Company drawing numbers 769E321, 769E232, and 769E229.

2.2.4 Criticality Control/Spent Fuel Pool

The design of the spent fuel storage racks provides for a subcritical multiplication factor (k_{eff}) for both normal and abnormal storage conditions. For normal and abnormal conditions, k_{eff} is equal to or less than 0.95. Normal conditions exist when the fuel storage racks are located in the pool and are

covered with a depth of water approximately 25 feet above the stored fuel for radiation shielding and with the maximum number of fuel assemblies or bundles in their design storage position. An abnormal condition may result from accidental dropping of a fuel assembly or damage caused by the horizontal movement of fuel handling equipment without first disengaging the fuel from the hoisting equipment.

The spent fuel storage array is such that k_{eff} is less than 0.95 due to the presence of the neutron absorber material which is attached to the rack structure. The design of the fuel, racks, and pools ensures that water will not be retained around an assembly when the pools are flooded and then drained. The racks are designed to maintain a fuel spacing of 6.308 inches (center-to-center) within a rack module.

Neutron poison is used in the spent fuel racks. No credit is taken for burnable poisons which may be contained in any fuel bundles.

For additional information on Spent Fuel Pool refer to HCGS FSAR Section 9.1.2. The safety evaluation of the Spent Fuel Pool is provided in Subsection 9.1.2.3 of the Hope Creek FSAR. Criticality analysis is presented in subsection 9.1.2.3.3.

Each fuel movement is required by procedure to be confirmed by an independent observer before the movement is considered complete.

2.2.5 Criticality Safety Based on Other Than Maximum Enrichment of Fuel

This section of Regulatory Guide 3.15 is not applicable. Criticality safety is based on new fuel with a nominal flat U-235 enrichment of 3.4 w/o. For additional information refer

to Section 2.2.4 of this document and Subsection 9.1.2.3.3 of the HCGS FSAR.

2.2.6 Criticality Safety Based on the Reactivity Effects of Neutron Absorber Materials

Refer to Section 2.2.4 of this document and Subsection 9.1.2.3.3 of the HCGS FSAR.

2.2.7 Criticality Safety Based on Moderation Control

Refer to Section 2.2.4 of this document and Subsection 9.1.2.3.3 of the HCGS FSAR.

2.2.8 Validation of Calculational Method for Criticality Safety

Description of the computer codes and methodology utilized in the verification of the HCGS criticality analysis is presented in FSAR Section 9.1.2.3.3.

2.2.9 Maximum Number of Fuel Assemblies Out of Authorized Locations

The maximum number of fuel assemblies that will be allowed outside a normal, approved storage location or normal shipping container is three (3). Fuel assemblies outside approved storage locations or shipping containers must maintain an edge-to-edge spacing of 12 inches or more from all other fuel. A fuel array of four or more assemblies outside approved fuel storage locations or shipping containers is prohibited.

No more than one metal shipping container containing fuel may be opened at any one time, and this container must be closed if all fuel is not immediately removed.

Removal of wooden crates is done in the Fuel Handling area at elevation 102'-0". The metal shipping container will be opened only in the fuel handling area (fuel container opening area) at elevation 201'-0".

2.2.10 Request for Exemption

Public Service Electric & Gas Company (PSE&G) requests exemption from the monitoring and emergency procedures requirements of 10CFR70.24. This exemption is requested because of the nature of the special nuclear material storage arrangements and procedural controls which PSE&G proposes to employ precludes any possibility of accidental criticality during receipt, unloading, inspection, storage, or packaging of the new fuel assemblies.

2.3 ACCIDENT ANALYSIS

2.3.1 Fuel Building & Reactor Building

Detailed accident analyses of fuel handling equipment and storage areas are provided in HCGS FSAR Sections 9.1.2 and 9.1.4. The accidents considered that could affect the safety of new fuel in the fuel handling and storage area are as follows:

Railroad Access Area

Dropping of a single container containing two fuel assemblies in the receiving area lifting bay while being lifted by the fuel building polar crane.

The consequences of this accident would be limited to impact damage to the dropped container and any container impacted in the Railroad Access area awaiting movement to the fuel container upending area. Fuel damage from this accident would be limited to the possible rupture of fuel rods in the dropped

and impacted containers. Since this accident affects only new fuel the consequences would be limited to the potential release of unirradiated uranium dioxide fuel. No potential for a criticality condition exists in this accident since the maximum number of containers is enveloped by the 10CFR71 analysis for the shipping containers.

Fuel Container Upending Area

Dropping of a single container containing two fuel assemblies to the floor at the 201'-0" elevation of the Reactor Building or falling over of an upended and open fuel container.

The consequences of these handling accidents would be limited to impact damage to the dropped container or fuel assemblies. Fuel damage from these accidents would be limited to the possible rupture of fuel rods in the dropped containers. Since this accident affects only new fuel the consequences would be limited to the potential release of unirradiated uranium dioxide fuel. No potential for a criticality condition exists in this accident since only one container containing at most two fuel assemblies is involved.

Other Accidents

All other handling accidents involve only one fuel assembly and are discussed in FSAR Sections 9.1.2 and 9.1.4. No overhead load greater than one fuel assembly will be allowed over any fuel storage array or rack which contains new fuel.

The seismic design of the Reactor Building and of cranes, racks, and pools precludes the credibility of more severe accidents. In the unlikely event of a dropped new fuel assembly in the storage areas, the consequences would be minimal. Due to the spacing of

storage arrays, a criticality condition would not be possible under these accident conditions. The consequences of these accidents would be limited to the possible rupture of new fuel rods and subsequent release of unirradiated uranium dioxide fuel.

2.3.2 Temporary Storage Area

To preclude damage from falling objects no construction loads will be allowed over the fuel in the Railroad Access area.

TABLE 1.1.1-1

PUBLIC SERVICE ELECTRIC AND GAS COMPANY

Directors

James R. Cowan	Kenneth C. Rogers
T. J. Demot Dunphy	Verdell L. Roundtree
Robert R. Ferguson, Jr.	William E. Scott
Irwin Lerner	Robert I. Smith
William E. Marfuggi	Harold W. Sonn
Marilyn M. Pfaltz	Robert V. Van Fossan
James C. Pitney	Josh S. Weston

Officers

Harold W. Sonn
Chairman of the Board, President and Chief Executive Officer

William E. Scott
Senior Executive Vice President

Everett L. Morris
Executive Vice President - Finance

Frederick W. Schneider
Executive Vice President - Operations

Frederick R. DeSanti
Senior Vice President - Customer Operations

Richard M. Eckert
Senior Vice President - Nuclear and Engineering

Robert W. Lockwood
Senior Vice President - Administration

Stephen A. Mallard
Senior Vice President - Planning and Research

James B. Randel, Jr.
Senior Vice President

Donald A. Anderson
Vice President - Computer Systems and Services

Lawrence R. Codey
Vice President and Corporate Rate Counsel

PUBLIC SERVICE ELECTRIC AND GAS COMPANY

Directors

Officers

Robert M. Crockett
Vice President - Fuel Supply

Robert H. Franklin
Vice President - Public Relations

Carroll D. James
Vice President - Administrative Planning

Charles E. Maginn, Jr.
Vice President - Human Resources

Wallace A. Maginn
Vice President and Treasurer

Winthrop E. Mange, Jr.
Vice President - Corporate Services

Thomas J. Martin
Vice President - Engineering and Construction

Parker C. Peterman
Vice President and Comptroller

Lousi L. Rizzi
Vice President - Customer and Marketing Services

Robert J. Selbach
Vice President - Transmission and Distribution

R. Edwin Selover
Vice President and General Counsel

Robert S. Smith
Vice President and Secretary

Rudolph D. Stys
Vice President - System Planning

Corbin A. McNeil
Vice President - Nuclear

Richard A. Uderitz
Vice President - Production

TABLE 1.1.1-1

PUBLIC SERVICE ELECTRIC AND GAS COMPANY

Directors

Officers

Edward J. Biggins, Jr.
Assistant Secretary

Marion F. Reynolds
Assistant Secretary

Rondald J. Hornak
Assistant Treasurer

Linda M. Prial
Assistant Treasurer

Donald J. Wallace
Assistant Treasurer

TABLE 1.1.1-2

ATLANTIC CITY ELECTRIC COMPANY

Directors

Eleanor S. Daniel
Richard M. Dicke
John D. Feehan
Jos. Michael Galvin, Jr.
Gerald A. Hale
Matthew Holden, Jr.
Mack C. Jones
Irving K. Kessler
Madeline H. McWhinney
John M. Miner
Frank H. Wheaton, Jr.
Richard M. Wilson

Officers

John D. Feehan
Chairman of the Board, President and Chief Executive Officer

Ernest D. Huggard
Executive Vice President

Frank J. Ficadenti
Senior Vice President - Engineering and Construction

Jerrold L. Jacobs
Senior Vice President - Operations

Michael A. Jarrett
Senior Vice President - Corporate Services

David V. Boney
Vice President - Customer and Community Services

John F. Born
Vice President - Electric Operations

Thomas E. Freeman
Vice President - Human Resources

Meredith I. Harlacher, Jr.
Vice President - Engineering

Brian A. Parent
Vice President and Treasurer

Joseph G. Salomone
Vice President - Controls

TABLE 1.1.1-2

ATLANTIC CITY ELECTRIC COMPANY

Directors

Officers

Henry C. Schwemm, Jr.
Vice President - Production

Martin R. Meyer
Secretary and Assistant Treasurer

Lance E. Cooper
Controller

Joseph T. Kelly, Jr.
Assistant Vice President - Operations and Assistant Secretary

TABLE 1.1.2-1

HOPE CREEK GENERATING STATION GENERAL FUEL DATA

FUEL ASSEMBLY DATA

Number of fuel rods	62
Number of nonfueled water rods	2
Rod array (square)	8 x 8
Rod pitch, inch	0.640
Number of fuel spacers	7
Spacer material	Zr-4 with Inconel springs

FUEL ROD DATA

Fuel material	UO_2
Pellet o.d., inch	0.410
Cladding material	Zr-2 with Zr liner
Cladding tube o.d., inch	0.483
Cladding tube wall thickness, inch	0.032
Active fuel length, inch	150.0

WATER ROD DATA

Outside Diameter, in.	.591
Inside Diameter, in.	.531

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TABLE 1.1.3-1

HOPE CREEK GENERATING STATION
FUEL ASSEMBLY TYPES

Bundle Type	Number of Bundles	Bundle Average Pin Enrichment (W/O U^{235})	Uranium per Bundle (Kg)	Bundle U^{235} (Kg)	Maximum Pin Enrichment (W/O U^{235})	Average Maximum Pin Enrichment (W/O U^{235})	Burnable Poison: Number Rods	Burnable Poison: (W/O Gd_2O_3)
1	92	0.711	183.000	1.301	0.711	0.711	0	0
2	132	0.94	182.985	1.720	1.20	1.16	0	0
3	160	1.63	182.656	2.977	2.00	1.90	2 2	5.0 2.0
4	308	2.48	182.403	4.524	3.80	3.55	4	5.0
5	72	2.78	182.660	5.078	3.60	3.37	3	3.0

TOTALS 764 Fuel Bundles
139, 546 .620 Kg Uraninum
2581.968 Kg U^{235}

IM:vw

MP84 123/17 1-vw