AFFIDAVIT OF ROBERT P. DOUGLAS
LICENSING MANAGER
PUBLIC SERVICE ELECTRIC AND GAS COMPANY

STATE OF NEW JERSEY)
) SS.
COUNTY OF ESSEX)

ROBERT P. DOUGLAS, of full age, being duly sworn according to law, upon his oath deposes and says:

1. I am Licensing Manager, Licensing and Environment Department, Public Service Electric and Gas Company ("PSE&G" or the "Company"). In that position, I am familiar with the design, operation and environmental studies associated with the circulating and service water intakes at Salem Nuclear Generating Station ("Salem Station"), and the service water intake at Hope Creek Generating Station ("Hope Creek Station") My department sponsors the ecological studies programs for the Salem and Hope Creek Stations carried out by Ichthyological Associates, a consultant to the Company. A statement of my professional qualifications is attached.

2. I have studied the petition filed on October 18, 1979 by Alfred C. Coleman, Jr. and Eleanor G. Coleman, seeking certain actions by the Nuclear Regulatory Commission and citing as a basis the potential for the Salem and Hope Creek Stations through their operations to affect the shortnose sturgeon (Acipenser brevirostrum Lesueur), an endangered species.

Salem Nuclear Generating Station

3. The Salem Station is a fully constructed, 2-unit electric generating station utilizing pressurized water reactors, electric turbine generators, condensers and associated buildings, switchyard and other equipment, including circulating and service water intakes located on Artificial Island, Lower Alloways Creek Township, Salem County, New Jersey. Unit 1 has been operational since December 1976. Unit 2 is complete, but has not been issued an operating license by the NRC.

4. Each unit of the Salem Station utilizes once-through cooling of its condenser, with circulating water withdrawn from and returned directly to the Delaware River at approximately River Mile 50 at which point the River is approximately 2.5 miles wide. There is no intake canal or channel. Under normal operating conditions, six circulating water pumps supply the required flow to each unit, approximately 1,100,000 gallons per minute. Each unit also uses a once through service water system, with a normal flow of approximately 42,000 gallons per minute to each unit. Circulating water and service water are supplied by separate shoreline surface intakes located on the southwestern shoreline of Artificial Island.

5. The design intake velocity for water approaching the circulating water intake is 1.0 feet per second at mean low tide. Actual tests during operation have shown that

mean low tide intake velocities are below 1.0 feet per second.

6. At the time the operating license was applied for, the circulating water intake structure was to consist of trash racks followed by conventional travelling screens whose primary purpose was to collect and remove debris and detritus from intake water via a front wash high pressure spray system. In proposing to grant the Salem operating licenses, the (then) Atomic Energy Commission advised:

> In spite of what appears to be a favorable design for this intake structure, it cannot be assured that it will be entirely trouble free. Consequently, the numbers and kinds of fish that die on the screens should be monitored during the first several years of operation and the results reviewed to determine whether a design modification is needed. */

As discussed in detail below, in response to concerns regarding the circulating water intake design and the recommendations of our consultants, modifications have been made to the original installation adding horizontal water-filled fish survival buckets on the travelling screen baskets; a low pressure rear spray wash fish removal system; enlarged rear fish and trash sluiceways; the capability to return fish to the river from the north and south ends of the circulating water intake structure depending on tidal flow;

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*/ Atomic Energy Commission, Final Environmental Statement, Salem Nuclear Generating Station, April 1973, p. 5-9.

continuous travelling screen operation; fish counting pools; and virtual elimination of the need to dewater travelling screen washings containing debris and detritus for transportation offsite to land disposal. The description of the intake system in Paragraphs 7-10, below, is given as the system is installed and operated today.

7. Each of the six intake cells per unit is identical. Principal components of each circulating water intake cell are: an ice barrier, which in winter extends from the surface to mean low water to prevent damage and clogging of the intake structure by floe ice; a permanent steel trash rack (1" vertical bars on 4" centers) protecting the full opening of each intake cell (approximately 11.5 feet wide by 50 feet deep) to prevent large pieces of debris from entering, and which is inspected at least once per shift and cleaned as needed by a motor-driven rake to lift material into a bin; a continuously rotating vertical travelling screens to further filter the intake water before its passage through the circulating water pumps and the condenser itself; a low pressure spray system to remove fish from these screens (operated at 7 to 15 psi); and a high pressure spray debris removal system (operated at 100 psi). Common to all intake cells are sluices to return impinged organisms and debris to the river downstream of the intake, depending on tidal flow;

and counting pools at either end of the intake structure to which the flow from both fish and trash sluices may be diverted briefly for sampling purposes.

8. Each of the six travelling screens contains 62, 3/8" mesh screen baskets 121" wide by 21" high. Normal operation is continuous at a speed of 7.5 feet per minute with alternate capabilities of 9.5, 12.5 and 17.5 feet per minute, depending on debris load. The base of each screen basket or panel is fitted with a 1-1/2" deep by 2-1/2" wide lip which creates a water-filled fish survival bucket. As the basket travels upward and out of the water, impinged organisms drop a short distance down the basket face into the bucket. The bucket provides a suitable environment for transport and deters organisms from falling back into the incoming water and becoming reimpinged. As the basket travels over the head sprocket, specimens slide back onto the inverted basket face and are spray washed into a 30" wide by 16" high sluice of running water by low pressure spray headers. Heavier debris and any remaining organisms are spray washed into a larger lower sluice (60" wide x 30" high) by high pressure spray headers. To reduce recirculation of discharge material during tidal flow across the intake face, both a north and south discharge are available. This permits screen wash flow to be discharged in the direction of tidal flow, and allows released organisms the maximum opportunity to swim or drift away.

9. For sampling impinged organisms, upper and lower sluices can be diverted for a period of three minutes to either of two counting pools, located at the north and south ends of the intake. The pools have been designed to minimize collection stress. Specimens enter the pools through special slides which reduce water velocity. Trained scientific personnel capture, identify, and record the characteristics of organisms found in the impingement sample, then estimate the total number of the various organisms impinged, their survival, and the impact on area populations. This impingement study is part of a larger study carried out in accordance with a written plan of study approved by the U.S. Environmental Protection Agency and the NRC. The studies are considered sufficient to demonstrate, inter alia, whether the station's intake adequately protects the aquatic environment in the Station area. The final report on this program is scheduled to be submitted to EPA, Region 2 on June 15, 1981.

10. The capability of diverting the lower (trash) sluice contents to an inclined screen for separating solids for disposal in a dumpster has been retained for use in extraordinary circumstances only. This could include periods of critical demand for electrical power combined with heavy detritus loads on the travelling screens at a time when one or more circulating water pumps are already out of service.

It also allows repairs and maintenance to take place on the north or south sluiceways and counting pools.

Hope Creek Generating Station

11. The Hope Creek Station is a two-unit electric generating station presently under construction. It will consist of boiling water reactors, electric turbine generators, condensers, cooling towers, and associated buildings, switchyard and other equipment, including a service water intake structure, located on Artificial Island, Lower Alloways Creek Township, Salem County, New Jersey. Both units have been under construction since January, 1976.

12. Each unit of the Station utilizes a cooling tower for closed-cycle cooling of its condenser, with service water withdrawn from and cooling tower blowdown returned to the Delaware River at approximately River Mile 50. There is no intake canal or channel.

13. A total of eight service water pumps are installed at the intake structure; four are designated for each unit. Each pump has a rated flow of 16,500 gallons per minute with a maximum flow of 21,600 gallons per minute. Under various normal operating conditions, between two and four pumps will be in service simultaneously per unit. The service water intake structure is located on the west shore of Artificial Island. The design intake velocity for water approaching the service water intake is 0.5 feet per second.

14. During the early design stages, the intake structure was planned as a conventional travelling screen intake approximately 125 feet square in size with trash racks projecting beyond the shoreline in front of the structure such that the travelling screens themselves would be flush with the shoreline, allowing lateral escape by fish, to reduce potential for fish impingement. However, no provision was made for the live return of collected organisms or debris to the river.

15. As the design evolved and based upon experience with the operation of Salem Station, Unit 1, evolving intake structure technology, the environmental monitoring program and the recommendation of our consultants, PSE&G initiated modifications to improve the effectiveness of the Hope Creek intake system. The design as presently contemplated consists of the shoreline travelling screen intake, approximately 100 feet wide overall by 30 feet deep, protected by a projecting trash rack arrangement extending approximately 18 feet beyond the face of the intake structure. Allowance has been made for the possible installation of a pair of cylindrical type strainers behind the trash racks and in front of each of the eight traveling screens. If used, these 16 strainers would be fabricated of wedge wire media and would be approximately 4-1/2 feet in diameter and 6-1/2 feet long. The slot size between screen wires would be approximately 0.040

inches. A periodic backwash of the wedge wire strainer would be accomplished by the use of compressed air. The strainers' arrangement, perpendicular to tidal flood and ebb flows, could also contribute to removal of collected debris or detritus. The travelling screen, whether used as the primary system or as a backup to the cylindrical strainers, would have a screen mesh of approximately 3/8 inch and screens each having a width of approximately 7 feet, 6 inches. The travelling screens would have horizontal water filled fish buckets, a spray fish and trash removal system, a sluiceway system for fish and trash, and a fish return capability. Thus, although it will be much smaller than the circulating water intake at Salem due to the use of cooling towers, the Hope Creek intake structure will provide appropriate fish protection no matter what selection of subsystems is made. It should be emphasized that at this point in time no decision regarding the use of the wedge wire strainer has been made. Additional testing will be required to prove the system's feasibility and actual effectiveness.

Robert P. Douglas

Robert P. Douglas

Subscribed and sworn to before me
this 8th day of January, 1980.

V. L. Adams (Mrs. V. Frustieri)
Notary Public

My Commission expires

VERONICA L. ADAMS
A Notary Public of New Jersey
My Commission Expires Oct. 23, 1982

PROFESSIONAL QUALIFICATIONS
ROBERT P. DOUGLAS
LICENSING MANAGER
PUBLIC SERVICE ELECTRIC AND GAS COMPANY

My name is Robert P. Douglas. My business address is 80 Park Place, Newark, New Jersey. I am Licensing Manager in the Licensing and Environment Department of Public Service Electric and Gas Company. I also am Acting Environment Manager. In this position, I manage all the technical and administrative matters of the Licensing and Analysis Division and the Environment Division of the Licensing and Environment Department. These divisions are involved with safety analysis of nuclear and non-nuclear PSE&G facilities, coordination and preparation of reports required for the licensing activities, including permit applications, safety analysis reports, and topical technical reports, analysis of radiological impact of generating station operation, coordination of ecological, meteorological and radiological monitoring data collection programs and other licensing related responsibilities.

I was graduated from Cooper Union with a B.S. degree in Mechanical Engineering in 1964. In 1966, I received a Master of Science degree in Nuclear Engineering from Massachusetts Institute of Technology. In 1967, I received the Degree of Nuclear Engineer from Massachusetts Institute of Technology. I joined PSE&G in 1967 as an Assistant

Engineer in the Mechanical Division of the Electric Department. From 1967 to 1974, my responsibilities included the radiological evaluation of PSE&G nuclear generating stations, safety analysis, site selection studies, environmental program considerations and other areas. In 1974, I assumed responsibility as head of the Nuclear Licensing Group in the Mechanical Division. In 1977, I was promoted to my present position. I have either participated in or supervised the preparation of the impact evaluations of Salem Nuclear Generating Station and the Hope Creek Generating Station, including analyses required for the safety analysis reports, environmental reports, and I am familiar with the design of both these stations. As part of my responsibilities, I supervise the conduct of the aquatic and terrestrial ecological programs for the Salem and Hope Creek Stations.

I am a member of the American Nuclear Society, the American Society of Mechanical Engineers, and am a registered professional engineer in New Jersey.