UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	
PUBLIC SERVICE ELECTRIC AND GAS COMPANY, et al.	)	Docket No. 50-272
	)	(Proposed Issuance of Amendment to Facility
(Salem Nuclear Generating Station, Unit 1)	)	Ope ating License No. DPR-70)

LICENSEE'S RESPONSE TO LICENSING BOARD QUESTION 5
REGARDING A "GROSS LOSS OF WATER" FROM THE
SALEM SPENT FUEL POOL

In its Memorandum and Order dated February 22, 1980, the Atomic Safety and Licensing Board ("Licensing Board") directed the parties to address the following question:

> In the event of a gross loss of water from the storage pool, what would be the difference in consequences between those occasioned by the pool with expanded storage and those occasioned by the present pool?

For ease of reference, this question will be referred to as Question 5.

The Fuel Handling Building is a T-shaped, reinforced concrete Seismic Class I structure located next to the reactor containment building. It is designed to store new and spent fuel, and also to provide facilities for the delivery and shipment of new and spent fuel. Its design takes into account such phenomena as seismic events, tornadoes, and high water levels. The spent fuel pool is located within the Fuel Handling Building. A design basis of the spent fuel pool is to prevent any "gross loss of water" from occuring. In this respect, the spent fuel pool is of Seismic Class I design and construction, and has a bottom foundation consisting of 11 feet of reinforced structural concrete below which is 48 feet of lean concrete. The concrete is founded upon a geological stratum known as the Vincentown Formation. The pool is lined with 1/4" welded stainless steel plates. Because there are no drains below the surface of the spent fuel pool and because anti-syphon devices have been provided as needed, inadvertent water loss which would constitute a "gross loss of water" is not possible.

The spent fuel pool is designed such that the cask handling area is not located within it, but rather within a transfer pool separated by redundant gates. Given the design of the cask handling crane, it is physically impossible to move a spent fuel shipping cask over the spent fuel pool. Moreover, when the transfer pool is empty, the crane used to remove the gates from between the spent fuel pool and cask handling area does not have sufficient lifting capacity to remove these gates. Furthermore, even if these gates were postulated to be removed, the water level could not fall below the top of the spent fuel rods, since the bottom of the gates is higher than the top of the spent fuel; thus adequate cooling would be assured.

A leak detection system has been provided to detect any water which may leak through the liner and, ultimately, to carry it off to the liquid radwaste system. The leak detection system consists of channels located below each weld seam in the spent fuel pool connected to piping which penetrates one of the walls of the spent fuel pool at its lowest elevation. Any leakage into the leak detection system flows into a trough and then into a sump located at the end of this trough. The wall through which the leak detection system piping penetrates is the thickest wall of the spent fuel pool and is approximately 9' 7" thick. The remaining walls of the spent fuel pool range from 6' to 9' 7" thick.

A system has also been incorporated into the spent fuel pool to detect and alarm a loss of water level. This system annunciates in the control room. Another level alarm has been provided in the leak detection system sump to detect leakage of water from the leak detection system. This alarm also annunciates in the control room.

The spent fuel pool is provided with a number of sources of makeup water to replenish water in the pool should the need arise. The makeup sources are from the demineralized water system, which supplies approximately 100 GPM; the refueling water storage tank, which can supply 100 GPM; the primary water storage tanks, capable of supplying 100 GPM; and the CVC Hold-Up tanks, which can supply approximately 500 GPM. Also, a portable pump is maintained under administrative control to supply at least 100 GPM of water to the spent fuel pool.

For purposes of responding to the Board's Question 5 and to explore the "gross loss of water" postulated by it, while not a design basis for the spent fuel pool as approved by the Commission and while there is no reason to make it one, the arbitrary and nonmechanistic ultraconservative assumption has been made that the Class I spent fuel liner welds covering one leak detection channel completely fail. With this assumption as a departure for analysis of the "gross loss of water" hypothesis, the resulting leak rate to the leak detection sump would only be 53 GPM, well within the capability of any of the makeup systems. Thus, even in this extreme case postulated for purposes of analysis, there would be no "gross loss of water" from the spent fuel pool.

Even were one to postulate the complete failure of all the fuel liner welds, which would be, in effect, a complete failure of the liner, the makeup sources noted above (even without inclusion of the capacity of the portable pump) would be sufficient to keep the spent fuel covered and cooled at all times. Even this simplified analysis is extremely conservative in that it neglects the decrease in leakage rate as the level of the water in the spent fuel pool would decrease. Thus even under these incredible conditions, the design of the Fuel Handling Building and the spent fuel pool precludes any consequences resulting from a "gross loss of water." Thus, there is no reason to change the design basis of the pool because of the installation of the increased capacity racks. Furthermore, there is no difference in these analyses as the result of the installation of the increased capacity racks in the spent fuel pool as compared to the present pool and no significant change in any "consequences" even were one to postulate a "gross loss of water" consisting of a failure of the spent fuel liner welds. Again, these evaluations are based upon the present design basis of the facility. Even the predicted minor consequences could be reduced by relatively modest design changes, such as installing flow restrictors on the telltales. In that case, even the above postulated events would result in only a very small water level reduction in the spent fuel pool. This is true for both cases analyzed and again independent of the type of racks installed.

Thus, because adequate cooling is achieved under any of the above described circumstances, even in the extreme cases postulated above, a "gross loss of water" in the spent fuel pool, also as defined above, would have no adverse consequences upon the public health and safety.

While the matter is beyond the jurisdiction of the Licensing Board and clearly beyond the scope of Question 5, Licensee wishes to add some comment to the statement made on page 15 of the Licensing Board's Memorandum and Order, to the effect that:

> Salem 1 sits on an artificial island at the head of an important estuary. It is surrounded by liquid pathways. Salem 1 does not float, but according to the analysis in Offshore Power, pathways, rather than floating, are the critical factor.

We are concerned that this statement resulted from a misunderstanding on the Board's part of the nature of the site and the actual potential for a contribution to the liquid pathway.

As previously discussed, underneath the spent fuel pool there are 11 feet of reinforced structural concrete. This concrete rests on top of an additional 48 feet of lean concrete fill that extends down to the Vincentown Formation, which is composed of silty sands, primarily quartz, feldspar and glauconite (Appendix B to Salem FSAR).

The NRC's Liquid Pathway Generic Study (NUREG-0440) recognizes a significant difference between land-based plants and floating plants as to their respective potential for dispersion of large quantities of radioactivity through a liquid pathway. For land-based plants such as Salem, NUREG-0440 estimates a one or two year delay before leaching of radioactive material could begin. Even after this one to two year period, the rate of travel of the leachate in the soils under the foundation of a land-based plant would be very slow. Both PSE&G (Section 2.6 of the FSAR) and the NRC (Section 2.5 of the Safety Evaluation Report) have concluded that at the site of the Salem Generating Station "the horizontal component of groundwater movement is quite slow, due to the low hydraulic gradient and relatively low formation permeabilities."

It is therefore reasonable to conclude that in any land-based plant including Salem, appropriate measures could be taken to monitor and install any necessary "barriers" to migration and put into effect any interdiction to effectively control the liquid pathway. By contrast, the leaching of radioactivity is expected to "begin immediately for the floating nuclear plant (p. 7-9 of NUREG-0440)." Hence, the two cases are not comparable. The reference to the Salem site as on "Artificial Island" does not in any way imply that an appropriate comparison may be made with a floating nuclear plant. Furthermore, as far as liquid pathways are concerned, the Salem site is typical of land-based sites.

EDUCATIONAL AND PROFESSIONAL QUALIFICATIONS

LAWRENCE REITER

PUBLIC SERVICE ELECTRIC AND GAS COMPANY

My name is Lawrence Reiter. My business address is 80 Park Place, Newark, New Jersey.

I am employed as a Principal Engineer in the Engineering Department of Public Service Electric and Gas Company. In this capacity, I am engaged in supervising the engineering design, installation and start-up of Nuclear Steam Supply and Associated Systems.

I was graduated from Villanova University in 1966 with a Bachelor of Mechanical Engineering degree. I have done graduate study work in Nuclear Engineering and Heat Transfer, at University of Connecticut and Stevens Institute of Technology. I received a Master of Business Administration degree from Rutgers University in 1974.

Previous to my employment with Public Service Electric and Gas Company, I was engaged in engineering design and analysis of Nuclear Components for the U.S. Navy nuclear power program, by Curtiss-Wright Corporation from 1969 to 1971. Prior to this, I was engaged in nuclear engineering design and analysis of nuclear related systems for nuclear submarines, by General Dynamics/Electric Boat Division from 1966 to 1969.

In 1971, I joined Public Service Electric and Gas Company and was assigned to the Mechanical Division of the Electric Engineering Department. I have been involved with design and specification of various nuclear and related systems for the Salem Nuclear Generating Station.

My current position is as group head of the Salem Group, Mechanical Division, Engineering Department. In this capacity, I am responsible for all mechanical engineering on nuclear systems, auxiliary systems, ventilation systems and insulation. In addition, I am responsible for all mechanical field engineering. I supervise the engineer responsible for the Increased Capacity Spent Fuel Racks.

I am a member of the American Nuclear Society and the American Society of Mechanical Engineers.

I am a registered professional engineer in the State of New Jersey.

EDUCATIONAL AND PROFESSIONAL QUALIFICATIONS

MANUEL O. BANDEIRA

PUBLIC SERVICE ELECTRIC AND GAS COMPANY

My name is Manuel O. Bandeira. My business address is 80 Park Place, Newark, New Jersey 07101.

I am employed as a Lead Engineer in the Engineering and Construction Department of Public Service Electric and Gas Company. In this capacity I am engaged in the design, analysis, installation and start-up of various nuclear power related systems.

I graduated from Newark College of Engineering in 1971 with a Bachelor of Science in Mechanical Engineering. I am currently pursuing the Master of Science in Mechanical Engineering degree at New Jersey Institute of Technology.

Upon graduating from Newark College of Engineering in 1971, I joined Public Service Electric and Gas Company. My employment with Public Service Electric and Gas Company has been diversified. From 1971 through 1974 I was responsible for the design, analysis, installation and start-up of power station turbine and auxiliary equipment. From 1974 through 1976 I was a field engineer at Salem Nuclear Generating Station responsible for the resolution of field related installation, start-up, testing and operation problems of nuclear and non-nuclear equipment and systems. From 1976 to the present, I am a member of the Salem Group, Mechanical

Division, Engineering Department engaged in the design, analysis, installation, start-up and testing of nuclear related systems; I am the engineer in charge of design, analysis and installation of the increased capacity spent fuel storage racks.

I am a registered Professional Engineer of the State of New Jersey and I am a member of The American Society of Mechanical Engineers.