UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

FURTHER TESTIMONY OF WALTER F. PASEDAG
IN RESPONSE TO BOARD QUESTION NO. 5

Question:

In the event of a gross loss of water from the spent fuel storage pool at Salem 1, what would be the difference in consequences between those occasioned by the pool with the expanded storage proposed by the Licensee and those occasioned by the present pool?

Answer:

I have performed additional investigations of the phenomena associated with the postulated gross loss of water. The following additional testimony is offered to correct and clarify my testimony dated April 10, 1980.

Our original estimates of fuel heatup in a dry fuel pool were based on the results reported in NUREG/CR-0649 for a well ventilated fuel pool. I have subsequently asked Dr. Benjamin of Sandia to provide me with additional calculations for ventilation rates equal to those at Salem. His calculations indicate that the decay time required to assure that the fuel's decay heat generation will not result in oxidation temperatures above 900°C is about one year.

In addition to the work by Dr. Benjamin mentioned above, the Staff has also looked at whether a "zirconium fire" could propagate. The Staff recognizes that the new storage configuration results in less natural convection, and hence a higher likelihood of reaching oxidation temperatures and possible clad melting for recently discharged fuel. Although heating of fuel assemblies stored adjacent to the most recently discharged assemblies would occur, the Staff has not identified any credible mechanism for the propagation of a "zirconium fire" to the four year old or older fuel stored in the pool as a result of its expansion. It is possible to postulate radiant heat transfer from the recently discharged elements to adjacent bundles causing clad oxidation temperatures. For this reason the heatup of older fuel assemblies stored immediately next to the most recently discharged assemblies, resulting in the creation of a substantial layer of zirconium oxide on the outside of these rods, cannot be ruled out. The modeling and computation of such effect would be extremely complex. However, the Staff believes that this would not result in more than limited oxidation of four year old (or older) fuel. Such limited oxidation of four year old (or older) fuel would not lead to a substantial release of fission products beyond those released from the freshly discharged 1/3 core. This is a result of several factors, including the decay of volatile fission products (other than Cs-137), the fact that the primary source of energy is external to the rods, the thermal insulating property of the zirconium oxide layer which would reduce heat conduction to the interior of the rod, and the formation of temperature gradients opposed to the direction of diffusion. Although some eutectic formation would occur after heating the rod to the zirconium melting temperature, the UO_2 matrix cannot be expected to reach its melting point.

Although it is difficult to quantify these parameters we conclude that the fission products released by this process would be a small fraction of those resulting from the meltdown of the recently discharged 1/3 core which would have to be postulated in order to achieve the heating (to temperatures above 900°C) of the older fuel. The total release of fission products, therefore, would not exceed the releases calculated for reactor accidents in WASH-1400. The consequences of this postulated Class 9 accident in the spent fuel pool, therefore, would be bounded by those calculated in WASH-1400, so that there would not be any additional risk to the health and safety of the public beyond that identified in WASH-1400.

Although additional postulations concerning possible scenarios for a gross loss of water worse than the 710 gpm leakage described in the Staff's testimony were investigated, no possible mechanisms which would cause a total loss of water, as well as a prevention of make-up water, could be found. The reactor accident scenario postulated by Dr. Webb was considered, and it was concluded that, based on the WASH-1400 estimates of the consequences of such accidents, that there is no reason to expect that the make-up water sources would not be available, or that access to the spent fuel pool would not be readily available with routine radiation protection and shielding provisions. Even if a total loss of water is postulated (although no mechanism for such a loss was identified), the spent fuel pool could be re-filled with the existing make-up water capacity.