UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket Nos. 50-250 OLA-2
FLORIDA POWER & LIGHT COMPANY	)	50-251 OLA-2
	)	
(Turkey Point Plant, Units 3 and 4)	)	(SFP Expansion)

AFFIDAVIT OF JOHN N. RIDGELY REGARDING CONTENTION 8

I, John N. Ridgely, being duly sworn, state as follows:

1. I am employed by the U.S. Nuclear Regulatory Commission as a Mechanical Engineer in the Plant Systems Branch, Division of BWR Licensing, Office of Nuclear Reactor Regulation. Prior to November 24, 1985, I was a Mechanical Engineer in the Auxiliary Systems Branch, Division of Systems Integration, Office of Nuclear Reactor Regulation. A summary of my professional qualifications and experience is attached.

2. The purpose of this affidavit is to address Contention 8 with regard to the issue stated by the Licensing Board in its September 16, 1985 Order. With respect to Contention 8, I have read "Licensee's Motion for Summary Disposition of Intervenors' Contentions" and "Licensee's Statement Of Material Facts As To Which There Is No Genuine Issue To Be Heard," dated January 23, 1985. Material Facts Nos. 1-11 stated in relation to Contention 8 are correct. I agree with the conclusions reached in the supporting affidavit with the following exception. The zirconium-water reaction may occur at temperatures less than 1000 degrees F, but would be insignificant with respect to the concern regarding cladding fires and explosions.

3. Contention 8 states:

> That the high density design of the fuel racks will cause higher heat loads and increase in water temperature which could cause a loss-of-cooling accident in the spent fuel pool, which could in turn cause a major release of radioactivity to the environment. And, that the decrease in the time that it takes the spent fuel to reach its boiling point in such an accident, both increases the probability of accidents previously evaluated and increase [sic] the chances accidents not previously evaluated.

As a basis for Contention 8, Intervenors allege that: (1) the normal spent fuel pool water temperature should be kept below 122 degrees F and (2) the reduction in the time to spent fuel boiling from 15 hours to 4 hours during a "loss of cooling accident" will result in a major accident.

4. The Standard Review Plan (SRP) (NUREG-0800) Section 9.1.3 states that the spent fuel pool temperature should be limited to 140 degrees F for the normal maximum spent fuel heat load conditions. The normal maximum spent fuel heat load is the heat generated when all storage cells in the storage pool are filled with spent fuel assemblies on the normal refueling schedule. The decay time of the respective batches is based on the anticipated intervals between refuelings. The decay time of the most recently discharged batches is based on the least time interval between shutdown and when refueling commences plus the minimum time required to accomplish the discharge. This is normally assumed to be 150 hours.

5. The pool temperature of 140 degrees F represents the maximum design temperature at which the spent fuel pool cleanup system can normally operate without degradation. The spent fuel pool cleanup system removes the impurities in the spent fuel pool water in order to maintain water clarity and to remove the impurities from the pool water. The component which is sensitive to a water temperature of 140 degrees F is the resin in the demineralizer of the spent fuel pool cleanup system.

6. The Staff's independent calculation, as stated in Section 2.7.2 of the NRC Safety Evaluation (SE), dated November 21, 1984, assumes a normal maximum heat load based on a half core discharge. The results show that the normal maximum pool water temperatures will be less than the 143 degrees F calculated by the Licensee. The normal maximum pool water temperature is expected to be 140.8 degrees F. We have performed a sensitivity analysis which indicates that the pool temperature is expected to remain above 140 degrees F for approximately 12 hours after the spent fuel is placed into the spent fuel pool.

7. The Licensee's calculations concerning the normal maximum pool water temperature (143°F) and the anticipated time required until the pool water temperature is less than 140 degrees F (72 hours) are both higher and more conservative than the Staff's analysis which was performed consistent with the SRP and SRP Branch Technical Position ASB 9-2. Licensee's analysis and our independent analysis using similar assumptions used half-core reloads in lieu of the normal one third core reloads. If normal one third core reloads were used, the results of both analyses would have been less than the 140 degree F guideline. As stated in SE Section 2.7.2, the short period of time that the pool water is anticipated to be above the 140 degree F temperature specified in the SRP represents adequate justification for the Staff to conclude that the Licensee complies with the guidelines of the Standard Review Plan water temperature limit of 140 degrees F.

8. The spent fuel pool contains spent fuel which has decayed for varying lengths of time. As the length of decay time increases, the amount of heat generated by the spent fuel decreases, as shown in the Standard Review Plan Branch Technical Position ASB 9-2. Therefore the ability of the

fuel to produce heat decreases with time. A total loss of cooling to the spent fuel pool would result in the pool water temperature increasing to boiling (212 degrees F).

9. As identified in Section 2.7 of the SE, the time required for the spent fuel pool to commence boiling is 7.6 hours (not 4 hours as alleged by Intervenors) assuming the normal heat load. Once boiling starts, the significant pool water loss is due to boil off. As specified in the SE, the boil off rate is approximately 37.0 gallons per minute. Based on rough calculations, it is estimated that there is approximately 193,800 gallons of water in the spent fuel pool above the top of the spent fuel storage racks. Based on this water volume it would take approximately three days and 15 hours from the time the water reaches 212 degrees F before the top of the racks are uncovered. Thus, it takes a total time of three days, 23 hours for the pool water to commence boiling and the pool water level to boil off before the top of the spent fuel racks are exposed to the atmosphere.

10. Makeup water to the spent fuel pool can be provided from the demineralized water system, the fire water system, the primary water system, or from the refueling water storage tanks. Given the number of different methods of providing makeup water, the Staff concludes that 7.6 hours is adequate time to initiate makeup to the spent fuel pool before a spent fuel pool would commence boiling. In the unlikely event that makeup water could not be provided within the 7.6 hours, there would be no detrimental effects on the spent fuel for an additional three days and 15 hours.

11. Since there is no feasible means of causing the atmospheric pressure inside of the fuel handling building to be significantly greater than normal, the maximum anticipated water temperature is 212 degrees F and

therefore the maximum anticipated fuel cladding temperature is expected to be within the 200 to 300 degree F range. The zirconium-water reaction would not be expected to be significant at temperatures less than 1800 degrees F. Thus, the anticipated fuel cladding temperature of 200 to 300 degrees F is considerably lower than the temperature necessary for a significant amount of zirconium-water reaction to occur.

12. The spent fuel pool cooling system consists of one heat exchanger with two pumps and associated valves and piping. One pump is normally operating with the second pump as a spare in the event that the first pump is not available. This cooling system is not seismic Category I, safety-related at this time. The Licensee has committed to upgrading the cooling system such that it will remain functional after a safe shutdown earthquake. When the upgrading is complete, the spent fuel pool cooling system will meet the guidelines of Regulatory Guide 1.29, Position C.1, which addresses the design of safety-related structures, systems and components with respect to their ability to withstand the safe shutdown earthquake and to remain operational. By meeting this Position, the Licensee complies with the requirements of General Design Criterion 2 of 10 CFR Part 50, Appendix A, "Design Bases for Protection Against Natural Phenomena," for protection against earthquakes.

13. The Licensee has evaluated the radiological effects of boiling in the spent fuel pool. The Staff has performed an independent accident evaluation of the offsite radiological consequences and has found the consequences to be a small fraction of the 10 CFR 100 guidelines. <u>See</u> Affidavit of Millard Wohl on Contention 4. Based on the small radiological consequences as the result of the pool boiling, the ability to take the single active failure of the spent fuel pool cooling pump, and the low probability of having an

earthquake until the cooling system is upgraded to safety related, the Staff concludes that the design meets the guidelines of Regulatory Guide 1.29, Position C.2, which addresses the seismic aspects of non-safety related equipment. Therefore, the Licensee meets the requirements of General Design Criterion 2 of 10 CFR Part 50, Appendix A.

14. In summary, although the normal maximum pool water temperature of 140.8 degrees F is slightly higher than the guidance identified in the SRP, the pool water temperature is acceptable because it is based on conservative assumptions regarding core discharge and the temperature only exceeds the 140 degree F temperature for a short period of time. In addition, if there were a loss of cooling to the spent fuel pool, the fuel cladding temperature will not increase to the temperature necessary for a significant amount of zirconium-water reaction to occur and there is adequate time for providing make up water to the pool to prevent spent fuel pool boiling.

The foregoing and the attached statement of professional qualifications are true and correct to the best of my knowledge and belief.

John N. Ridgely

John N. Ridgely

Subscribed and sworn to before me
this 18th day of February, 1986

Malinda L. McDonald

Notary Public

My commission expires: 7/1/86

environmental analysis and reviewing applications for operating licenses, proposed technical specifications, and spent fuel pool expansions. Todate. I have reviewed the design of the spent fuel storage facilities for 11 reactor sites and have performed the analytical review for six additional facilities. This represents 21 spent fuel storage facilities.

PROFESSIONAL QUALIFICATIONS
JOHN N. RIDGELY
PLANT SYSTEMS BRANCH
DIVISION OF BWR LICENSING

I am employed as a Mechanical Engineer (Auxiliary Systems) in the Plant Systems Branch, Division of BWR Licensing, Office of Nuclear Reactor Regulation, United States Nuclear Regulatory Commission, Washington, D.C. My duties consist of reviewing and evaluating the associated safety consideration on nuclear power and fuel handling systems and associated engineering fields on power reactors. I am responsible for providing technical input to various documents including Safety Evaluation Reports.

I attended the Virginia Polytechnic Institute in Blacksburg, Virginia and received a B.S. degree in Nuclear Science in 1972. In July of 1972 I joined the Philadelphia Electric Company's Mechanical Engineering Division as a mechanical engineer.

At the Philadelphia Electric Company, I worked with both fossil and nuclear power plants. I designed systems, prepared specifications, performed computer analysis, and managed contracts. During this time I developed and had patented a process for removing tritium from High Temperature Gas Cooled Reactors. I wrote purchase order specifications for high density spent fuel storage racks for Peach Bottom Atomic Power Station, reviewed the bids, awarded the contract, and performed a field audit at the manufacturer's facility. I also performed the preliminary work for the high density spent fuel storage racks for Limerick Generating Station.

From August 1977 through November 1980, I was employed by the Potomac Electric Power Company in Washington, D.C., as a mechanical engineer. During this time, I worked exclusively with fossil power plants. My duties in this position were similar to those at Philadelphia Electric Company. In addition, I have design water treatment subsystems and assisted in other system designs including water intake and discharge treatment systems.

From December 1980 to the present, I have been employed by the United States Nuclear Regulatory Commission. I have been in the Auxiliary Systems Branch of the Division of Systems Integration until November 24, 1985 when NRR was reorganized and I have been assigned to the Plants Systems Branch, Division of BWR Licensing. I have revised portions of the Standard Review Plan and have been the Task Manager for the resolution of two Generic Issues. My duties include safety reviews and evaluations of system design and operation at nuclear power plant facilities. As required, I prepare safety evaluations and make presentations to the Advisory Committee on Reactor Safeguards. I am presently managing a contract for subcompartment