UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket Nos. 50-250-OLA-2
	)	50-251-OLA-2
FLORIDA POWER AND LIGHT COMPANY	)	
	)	
(Turkey Point Nuclear Generating Units 3 & 4)	)	(Spent Fuel Pool Expansion)

AFFIDAVIT OF REBECCA K. CARR
ON CONTENTION NO. 6

1. My name is Rebecca K. Carr. I am employed by Bechtel Power Corporation, Eastern Power Division, as an engineer in the Operating Services nuclear licensing group. As part of my previous duties as Group Leader within the Radiation Analysis Group of the Nuclear Engineering Staff, I supervised radiological evaluations performed in support of the expansion of spent fuel storage capacity at Turkey Point Units 3 and 4. A summary of my professional qualifications and experience is attached as Exhibit A and is incorporated herein by reference.

2. The purpose of my affidavit is to address Contention 6. Contention 6 and the bases for the Contention are as follows:

Contention 6

The Licensee and Staff have not adequately considered or analyzed materials deterioration or failure in materials integrity resulting from the increased generation and heat and radioactivity, as a result of increased capacity and long term storage, in the spent fuel pool.

Bases for Contention

The spent fuel facility at Turkey Point was originally designed to store a lesser amount of fuel for a short period of time. Some of the problems that have not been analyzed properly are:

(a) deterioration of fuel cladding as a result of increased exposure and decay heat and radiation levels during extended periods of pool storage.

(b) loss of materials integrity of storage rack and pool liner as a result of exposure to higher levels of radiation over longer periods.

(c) deterioration of concrete pool structure as a result of exposure to increased heat over extended periods of time.

Specifically, the purpose of my affidavit is to address the potential for materials deterioration or failure of the pool liner and concrete pool structure due to radiation from the increased storage capacity of the Turkey Point spent fuel pools. Other issues raised by Contention 6 are addressed in the Affidavit of Daniel C. Patton on Contention Nos. 6 and 8 (heat generation in the spent fuel pool), Affidavit of Eugene W. Thomas on Contention No. 6 (deterioration or failure of the pool liner and concrete due to the heat load in the spent fuel pool), and Affidavit of Dr.

Gerald R. Kilp on Contention No. 6 (radiation loads in the spent fuel pool and deterioration or failure of the fuel cladding and storage racks due to these loads).

3. Gamma and neutron radiation levels expected in the Turkey Point spent fuel pool following the rerack have been calculated by Westinghouse. The integrated radiation doses, calculated for a 40-year exposure, are 1.9×10^{10} Rads of gamma radiation and a neutron fluence of 4.8×10^{13} neutrons/cm^2. 1/ The impact of these loads on the Turkey Point spent fuel pool liner plate and concrete pool structure are discussed below.

Liner Plate

4. The spent fuel pool liner plate is ASTM (American Society for Testing and Materials) A-240 Type 304 stainless steel. Stainless steel was chosen for the liner plate in part because of its demonstrated ability to perform in various nuclear power plant applications, including those subject to radiation environments much more severe than those encountered in a spent fuel pool (e.g., fuel assemblies, incore supports, pressure piping). To support its widespread use in nuclear power plants, stainless steels have been the subject of extensive research and radiation testing.

5. Gamma radiation, which is the predominant source of exposure in the spent fuel pool, has been shown to have a negligible effect on the mechanical properties of non-organic

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1/ Affidavit of Dr. Gerald R. Kilp on Contention No. 6.

materials such as stainless steel. The results of neutron irradiation tests have demonstrated the ability of stainless steels to withstand, without loss of material integrity, neutron fluences which are orders of magnitude higher than those predicted for the pool storage environment. This research has shown that neutron radiation levels significantly higher than those produced in a reactor core would have to be present before the radiation would begin to affect the physical properties of stainless steel. The expected radiation levels in the spent fuel pool are well below the damage threshold. Consequently, no appreciable deterioration or loss of integrity of the spent fuel pool liner will occur as a result of the long-term exposure of the liner to radiation levels expected in the spent fuel pool.

Concrete Pool Structure

6. Concrete is used throughout a nuclear power plant for its inherent structural support and radiation shielding characteristics. As discussed previously, the mechanical properties of non-organic materials (such as concrete) are not significantly affected by gamma radiation. A concrete shield/structure can withstand neutron fluences up to 10^{21} n/cm^2 without loss of material integrity, which is many orders of magnitude higher than the 4.8×10^{13} n/cm^2 expected in the Turkey Point spent fuel pool. Reports on the maintenance and dismantling of reactors with concrete shields have not identified any effects in concrete which would be directly traced to radiation damage.

Consequently, no appreciable deterioration or loss of integrity of the concrete pool structure will result from the long-term exposure to discharged fuel assemblies in the spent fuel pool.

Conclusion

7. The spent fuel pool liner consists of stainless steel and the pool structure consists of concrete. These materials are commonly used in nuclear applications and have a proven ability to withstand large amounts of exposure to radiation. The radiation levels expected in the Turkey Point spent fuel pool are relatively small and are orders of magnitude below the levels predicted to cause any damage to stainless steel and concrete. Consequently, no appreciable deterioration or loss of integrity of the Turkey Point spent fuel pool liner or concrete structure are expected to occur as a result of the spent fuel pool expansion.

FURTHER AFFIANT SAYETH NOT

The foregoing is true and correct to the best of my knowledge, information and belief.

Rebecca K. Carr
Rebecca K. Carr

STATE OF MARYLAND)
COUNTY OF MONTGOMERY)

Subscribed and sworn to before me this 22 day of January, 1986. My commission expires:

My Commission Expires July 1, 1986

Roberta B. Curren
NOTARY PUBLIC

EXHIBIT A

STATEMENT OF PROFESSIONAL QUALIFICATIONS OF
REBECCA K. CARR

POSITION Project Licensing Engineer, Bechtel Power Corporation

EDUCATION BS, Nuclear Engineering, Pennsylvania State University, 1980

SUMMARY OF EXPERIENCE WITH BECHTEL:

Project licensing engineer, 1984-Present

Staff group leader, shielding, 1983-1984

Staff engineer, radiation analysis, 1980-1983

EXPERIENCE WITH BECHTEL

Ms. Carr is currently serving as licensing engineer with the Operating Services Group. This group provides engineering services to utilities with operating nuclear power plants, including the North Anna Power Station, Surry Power Station, and Millstone Nuclear Power Station. Her responsibilities include safety reviews of design changes to ensure compliance with NRC requirements, FSAR criteria, and plant technical specifications. Ms. Carr is also involved with licensing the steam generator replacement at Indian Point Station Unit 3, the independent spent fuel storage installation at Surry Power Station, and the spent fuel pool reracking at Turkey Point Plant.

Prior to this, Ms. Carr served as an engineer in the nuclear licensing group for the two-unit Grand Gulf Nuclear Station (Mark III). She was responsible for coordinating implementation of regulatory requirements, safety reviews and staff analyses for the operating Unit 1. While supporting the Unit 2 design effort, she was the lead engineer for the computer based licensing commitment tracking system.

Previously, Ms. Carr served as group leader - radiation analysis, on the Nuclear Engineering Department staff. In this capacity, she was responsible for shielding and dose analyses in support of both BWR and PWR projects in the construction and operating phases. Plants included the Grand Gulf Nuclear Station, Edwin I. Hatch Nuclear Plant, Wolf Creek Generating Station, Callaway Plant, Joseph M.

Farley Nuclear Plant, Turkey Point Plant, and Calvert Cliffs Nuclear Power Plant. Work included operating and accident doses, equipment qualification (radiation), spent fuel pool reracking, low level waste processing and storage, and steam generator replacement.

As a staff engineer, Ms. Carr was involved in the analysis of airborne radiation releases and doses within plants and in the environment resulting from normal operation and postulated accidents. This included control rooms and emergency facilities. She also performed shielding analyses, including neutron streaming, and fulfilled a licensing assignment at the Three Mile Island jobsite. In addition, Ms. Carr participated in several audits of design and analysis work done by projects.

PROFESSIONAL MEMBERSHIPS

American Nuclear Society and Society of Women Engineers