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 Nuclear Generating Units 3 & 4)	)	(Spent Fuel Pool Expansion)

AFFIDAVIT OF JOSEPH L. DANEK
ON CONTENTION NO. 7

1. My name is Joseph L. Danek. I am a Certified Health Physicist and a plenary member of the National Health Physics Society. I have been employed by Florida Power and Light Company (FPL) since March 1978. Through March 1981, I was a member of the health physics department at the Turkey Point Nuclear Plant. Since April 1981, I have been the Corporate Health Physicist. I am personally familiar with the radiation protection programs and procedures that were and will be followed by FPL during the expansion of the capacity of the Turkey Point spent fuel pools. A statement of my professional qualifications and experience is attached as Exhibit A and is incorporated herein by reference.

2. The purpose of this affidavit is to address Contention 7. Contention 7 and the bases for the contention state as follows:

Contention 7

> That there is no assurance that the health and safety of the workers will be protected during spent fuel pool expansion, and that the NRC estimates of between 80-130 person rem will meet ALARA requirements, in particular those in 10 CFR Part 20.

Bases for Contention

> FPL's estimate of between 80-130 rem/person [sic] are much higher than the NRC's estimate for reracking of 40-50 person/rem (sic), and much higher than experience at other nuclear plants. Thus, there [sic] estimates are not ALARA.

In particular, the purpose of my affidavit is to address FPL's programs and procedures for maintaining exposures as low as is reasonably achievable (ALARA) during the expansion of the capacity of the Turkey Point spent fuel pools and to discuss the actual occupational radiation exposure incurred during the expansion of the capacity of the spent fuel pool of Turkey Point Unit 3 which was completed in March of 1985. The capacity of the spent fuel pool for Turkey Point Unit 3 was expanded through a process called "reracking," which entailed replacement of the pre-existing storage racks with new racks which have a higher density storage array. Matters related to the occupational exposure estimates performed for the reracking of the Turkey Point spent fuel pools are discussed in the Affidavit of Rebecca R. Carr on Contention No. 7.

I. FPL's Program and Procedures for Maintaining Exposures ALARA During the Turkey Point Spent Fuel Pool Expansion

3. As stated in 10 CFR § 20.1(c), "Standards For Protection Against Radiation", persons engaged in activities under licenses issued by the Nuclear Regulatory Commission (NRC) should, in addition to complying with the requirements set forth in 10 CFR Part 20, make every reasonable effort to maintain radiation exposures as low as is reasonably achievable. As defined by 10 CFR § 20.1(c), the term "'as low as is reasonably achievable' means as low as is reasonably achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to the utilization of atomic energy in the public interest."

4. FPL is committed to ensuring that radiation exposure to personnel is kept as low as reasonably achievable. FPL's radiation protection policies require the establishment and implementation of a formal ALARA program. This program includes specification of corporate and plant management responsiblities, health physics responsibilities and each individual's responsibilities. In general, the specific radiation protection measures used in the Turkey Point reracking are part of FPL's standard program for maintaining occupational exposures ALARA.

5. FPL implemented standard health physics techniques to maintain personnel exposures ALARA during the reracking of the Unit 3 spent fuel pool. In general, exposures were maintained ALARA through preplanning of activities and training of workers. More specifically, FPL's ALARA measures for the Unit 3 spent fuel pool reracking included (1) reducing levels of radiation in work areas, (2) reducing the amount of time spent by workers in radiation areas, (3) increasing the distance between workers and sources of radiation, (4) use of shielding and protective clothing, and (5) radiation monitoring. Similar measures will be used for the Unit 4 reracking. Each of these is discussed in more detail below.

Preplanning of Activities and Training of Workers

6. Prior to starting work on reracking the Turkey Point spent fuel pools, FPL sent a health physics representative to Carolina Power & Light Company's H.B. Robinson Plant during the reracking of its spent fuel pool. The reracking of the spent fuel pool for the H.B. Robinson Plant involved a process which was similar (except for the use of divers at Robinson) to that for the reracking of Turkey Point. Therefore, FPL was able to obtain pertinent radiation protection information for use during the Turkey Point reracking. Additionally, prior to the start of the reracking operation, there was a meeting of all groups involved in the modifications to discuss the sequence of work, radiological controls for various portions of the job, radiological conditions anticipated, the clarity of the water in

the spent fuel pool, and any other potential problem areas identified. Furthermore, lessons learned from the prior rerack experience at Turkey Point were considered in the present reracking program.

7. As a result of this preplanning, several actions were taken to maintain exposures ALARA. These actions included the following:

- The reracking operation in the spent fuel pool was not initiated until a minimum of 2150 hours after shutdown for the last batch of spent fuel placed in the spent fuel pool in order to allow for increased decay time and correspondingly lower doses.
- The rack removal and installation sequence was planned in detail so as to minimize the number of installation activities and spent fuel shuffles.
- The estimated number of personnel associated with the reracking operation was carefully reviewed and kept to a minimum.
- Divers were not used in the reracking. The storage racks are freestanding and therefore divers were not required for the purpose of uncoupling the racks from the spent fuel pool structure. Additionally, long handled tools were utilized to perform the activities necessary to support the reracking.

Other measures designed to maintain exposures ALARA are discussed in subsequent sections of this affidavit. In total, the measures used during the Turkey Point reracking are similar to those implemented during the reracking of other plants (except for the use of divers) and the previous reracking of Turkey Point, and FPL has not identified any additional measures which are reasonable and which could have reduced the occupational exposures appreciably during the reracking.

8. All personnel who worked on the Turkey Point reracking were trained in FPL's radiation protection program. This training consists of approximately 20 hours of instruction and demonstrations covering in detail the basic theory and practice of radiation protection principles, emergency planning, and the FPL Radiological Protection Program. Additionally, FPL's Radiation Protection Program requires workers to pass a comprehensive exam with a grade of at least 80% prior to being granted unescorted access into the Radiation Controlled Area (RCA). Personnel unable to pass the examination are required to be escorted in the work area.

9. Radiation work permits (RWP) written by health physics personnel and authorized by the Health Physics Shift Supervisor and the Nuclear Plant Supervisor were required prior to performing any activity associated with the rerack work. Each RWP describes the radiological conditions present in the work

area and radiation protection requirements to be followed during the work. Specifically, a RWP for an activity states the following:

a. Description of the Task
b. Radiological Conditions
    - Radiation levels
    - Contamination levels
    - Airborne contamination levels
c. Protective Clothing Requirements
    - Type and quantities
d. Monitoring Requirements
    - In addition to wearing a thermoluminescent dosimeter, a low range reading pocket dosimeter was required
    - Personnel were instructed to check self reading pocket dosimeters frequently
e. Special Considerations
    - Decontamination required
    - Properly bag all tools, trash, and equipment prior to removal from contaminated areas
    - Health physics coverage required for removal of any items from the spent fuel pool
    - Special notifications

The RWP is posted at the entrance to the job location. Through means of the RWP, work activities in radiation areas are controlled to ensure that personnel are knowledgeable of the task to be performed, the conditions to be expected during performance of the task, and requirements for protection against radiation exposures.

10. Detailed written procedures for the reracking were developed and approved prior to commencing the reracking project. Personnel were required to read applicable procedures prior to starting work and to comply with these procedures during the reracking.

11. Health physics technicians provided continuous on-the-job "coverage" while rerack work was in progress. This coverage is described in paragraph 12 below and helped ensure that the radiation protection program was properly implemented during the reracking.

12. The radiation protection aspects of the spent fuel pool reracking were the responsibility of the Turkey Point Plant Health Physics Supervisor. Three health physics technicians were available to ensure compliance with standard health physics procedures for activities in the spent fuel pool area. Among other things, these technicians controlled access to the work area, released tools, controlled work activities as they progressed, and ensured compliance with health physics procedures and RWPs. These technicians also monitored the replaced racks as they were removed from the pool. Three other health physics technicians were available outside the spent fuel building, who surveyed the preparation of the replaced racks for shipment and ensured that all Department of Transportation shipment regulations were met.

Reducing Levels of Radioactivity in Work Areas

13. Since the amount of radiation exposure is proportional to the radiation levels in the work areas, exposures can be maintained ALARA by reducing levels of radioactivity. FPL took several steps to reduce the levels of radioactivity in work areas during the reracking.

14. Radioactivity in the spent fuel pool water was expected to be one of the largest contributors to dose rates in work areas. Exposures from this source were reduced by clean-up of radioactivity concentrations present in the fuel pool prior to and during rerack work. This was accomplished through the operation of the spent fuel pool clean-up system, which consists of filters and demineralizers which remove radioactivity from the spent fuel pool water. During the reracking, the system was operated for sufficient times to ensure that any further reduction in the radioactivity in the water would be minimal (the clean-up system was not in use during those periods when the water level of the pool was lowered to permit installation and use of a work platform). Additionally, a skimmer system is installed which removed pool surface contamination which may not have been removed by the normal clean-up system. As with the clean-up system, it was not necessary to operate the skimmer system continuously, and the system was not in use during those periods when the water level in the pool was lowered.

15. Intermittently during the spent fuel pool reracking, the water level in the pool had to be lowered slightly to permit installation and use of a work platform for performing the reracking. Radioactivity on the uncovered walls of the spent fuel pool was also expected to be a relatively significant contributor to the dose rates in work areas. As a result, the

walls of the spent fuel pool were cleaned using long handled brushes and water sprays in order to reduce the general area radiation levels.

16. The old spent fuel storage racks were expected to contain radioactive crud as a result of their several-year storage in the spent fuel pool. In order to reduce the exposures resulting from the removal, handling, and disposal of these racks, the racks were hydrolazed under water, rinsed, and surveyed prior to transfer from the spent fuel pool.

17. Finally, contamination control measures were used to protect persons from internal exposures to radioactive material and to prevent the spread of contamination. Work, personnel traffic, and the movement of material and equipment in and out of the area were controlled so as to minimize contamination problems. Material and equipment were monitored and appropriately decontaminated and/or wrapped prior to removal from the spent fuel pool area.

Reducing the Amount of Time Spent by Workers in Radiation Areas

18. Since the amount of radiation exposure is also proportional to the time spent in a radioactive area, FPL took several actions to minimize the amount of time spent by workers in radiation areas to maintain exposures ALARA.

19. As discussed above, FPL preplanned the reracking activities, established procedures to perform the reracking activities, and trained the workers who performed the reracking.

Each of these actions was designed to improve the efficiency of the persons performing the reracking activites, thereby reducing the amount of time (and therefore the radiation exposures) necessary to complete the activities.

20. FPL also used special remote tooling during the reracking which was fabricated and tested prior to actual use. This included mock-up training and dry runs with those workers actually involved in the rerack work. Practicing with the remote tooling equipment reduced the time required to perform the actual tasks.

Increasing the Distance Between Workers and Sources of Radiation

21. Since the amount of radiation exposure decreases as the distance from the radioactive source increases, FPL took several actions to increase the distance between workers and sources of radiation to maintain exposures ALARA.

22. As discussed above, radioactivity in the spent fuel pool water was expected to be one of the largest contributors to the dose rates in work areas. By using remote tools operated from above the spent fuel pool, the distance between the workers and the radioactivity in the spent fuel pool water was increased and the need for the use of divers in the spent fuel pool water was eliminated.

23. Work equipment was preassembled in low radiation areas, when practical. Similarly, during periods of inactivity, workers were directed to low radiation areas. Both of these actions helped reduce radiation exposures.

24. Finally, access into both the RCA and the spent fuel pool area was controlled during the rerack work. This assured that only those individuals with an assigned task were in radiation areas during the spent fuel pool expansion, thereby preventing needless exposures to radiation.

Use of Shielding and Protective Clothing

25. In those cases where it is not practical to reduce further the amount of radioactivity present, dose rates experienced by individuals can be reduced through the use of shielding and protective clothing. FPL utilized both of these concepts during the spent fuel pool expansion.

26. The stored spent fuel represents a source of direct radiation. In order to shield workers from this source of radiation, approximately fifteen feet of water was maintained above the top of the spent fuel at all times. This water provided effective shielding from the spent fuel. As a result, the radioactivity in the spent fuel provided little contribution to the dose rates above the spent fuel pool.

27. Protective clothing was worn by all personnel working in the spent fuel pool area. Additionally, respirators were worn where the potential for airborne radioactivity existed. These steps protected workers from surface contamination and intake of radioactivity.

Radiation Monitoring

28. During the spent fuel pool expansion, personnel radiation exposure was monitored and radioactivity and radiation levels in areas was also monitored. This monitoring helped assure that workers would not exceed prescribed limits on radiation exposures. Additionally, the area monitors provided warning of radiation areas in order to prevent and minimize inadvertent or accidental exposures.

29. Personnel monitoring equipment was assigned to and worn by all personnel in the work area. At a minimum, this equipment consisted of a thermoluminescent dosimeter (TLD) and self-reading pocket dosimeter. Data regarding personnel radiation exposure was maintained on a real time computer system to provide current exposure information for all personnel to ensure that none exceeded exposure limits. All workers who planned to enter a radioactively contaminated area were given an initial bioassay at the start of their employment. Subsequently, workers were given bioassays, as necessary (when uptake is suspected), and upon termination of their work at Turkey Point.

30. Monitoring of radioactivity and radiation levels in work areas was accomplished by several means, including the following:

- o Permanent area radiation monitoring was present in the spent fuel pool area providing readouts and alarm capabilities in both the control room and local area.
- o Airborne radioactivity monitoring was provided by several different permanent detectors.
- o Periodic airborne and area radiation monitoring was also performed in accordance with FPL's radiation protection procedures. Specifically, where there was a potential for significant airborne radionuclide concentrations, continuous air samples were used in addition to periodic grab sampling.
- o Detailed surveys were performed throughout the rerack effort as necessary to provide proper control of radiation and contamination.

31. At one time the leakage detection and collection system for the Turkey Point spent fuel pools consisted of a monitoring trench behind the spent fuel pool liner for collecting and detecting any leaks, and a pump and piping for directing any leakage back to the spent fuel pool through a collection tank. During the reracking of Unit 3, the pump back portion of this system was not available. Since the spent fuel pools had been relined, no leakage was expected to occur. Any leakage would

have remained in the monitoring trench behind the liner until plant personnel opened valves in the system to direct the leakage to a waste disposal system. 1/ Any radioactive water in the monitoring trench would have contributed a negligible dose to workers involved in the reracking due to the distance between the trench and the workers and the shielding provided by intervening structures and objects.

II. Occupational Exposures Incurred During the Reracking of the Turkey Point Unit 3 Spent Fuel Pool

32. As a result of the actions described above, FPL was able to maintain occupational exposures ALARA during the reracking of the spent fuel pool for Turkey Point Unit 3. The actual exposure incurred during the reracking was 13.17 person-rem. This figure is far below the revised estimate of 59 person-rem and the original estimate of 88 to 130 person-rem, which indicates that actual exposures were maintained ALARA during the spent fuel pool expansion for Turkey Point Unit 3. Tables 1 and 2 provide data on the actual dose rates and exposures, respectively, experienced during the Unit 3 reracking.

III. Conclusion

33. FPL is committed to maintaining occupational exposure ALARA. During the reracking of the spent fuel pool for Turkey Point Unit 3, FPL utilized standard health physics

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1/ Current procedures require a daily check of the leakage collection and detection system for leakage from the spent fuel pool.

techniques, including preplanning of activities and training of workers, reducing levels of radioactivity in work areas, reducing the amount of time spent by workers in radiation areas, increasing the distance between workers and sources of radiation, use of shielding and protective clothing, radiation monitoring, and health physics coverage. FPL intends to use these same techniques in the reracking of the spent fuel pool for Turkey Point Unit 4. These techniques were successful in maintaining occupational exposures ALARA during the Unit 3 reracking, as demonstrated by the fact that only 13.17 person-rem were incurred during the reracking.

TABLE 1

TURKEY POINT UNIT 3 SPENT FUEL POOL AREA
DOSE RATES DURING THE RERACKING

Location	Dose Rate (mRem/hr)
General area dose rate around edge of spent fuel pool (SFP)	1-3
General area dose rate around edge of SFP during fuel shuffle	3-5
General area dose rate in SFP	4-10
General area dose rate in SFP during rack washdown	4-10
General area dose rate during decontamination of SFP walls	1-3
Contact dose rate on old racks	10 2/
Dose rate 6 feet from old racks	2

2/ The average dose rate was 10 mR/hr. Local contact dose rates were higher at some locations.

TABLE 2

OCCUPATIONAL EXPOSURE FOR RERACKING OF THE SPENT FUEL POOLS FOR TURKEY POINT UNIT 3

Phase	Person-rem	% of Total
Remove old racks	4.99	38
Transfer spent fuel	1.16	9
Install new racks	3.49	26
Support services	3.53	27
Total	13.17	100

FURTHER AFFIANT SAYETH NOT

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

Joseph L. Danek

STATE OF FLORIDA)

COUNTY OF DADE)

Subscribed and sworn to before me this 21st day of January, 1986. My commission expires: NOTARY PUBLIC STATE OF FLORIDA MY COMMISSION EXP. DEC 27,1987 BONDED THRU GENERAL INS. UND.

NOTARY PUBLIC

EXHIBIT A

STATEMENT OF PROFESSIONAL QUALIFICATIONS OF JOSEPH L. DANEK

EDUCATION

BEEE, University of Florida, 1975 (Honor Graduate)
MNES, University of Florida, 1976

EMPLOYMENT

1972-73 Florida Power and Light Company, Engineer Technologist at the Materials Test Lab with the primary responsibility of conducting laboratory tests to determine performance criteria and standards for field equipment and for the selection of that equipment of optimum value to the company.

1976-78 Oak Ridge National Laboratory, Oak Ridge, Tennessee. Practical experience in radiological surveying on an applied basis. Co-author of several papers including a protocol procedure manual involving On-Site Environmental Monitoring Procedures at ORNL. Responsible for the environmental assessment of the radiological impact in recovering uranium from phosphate in Florida.

1978-81 Florida Power and Light Company, Supervisor in the Health Physics Department at Turkey Point Nuclear Power Plant. Responsibilities included supervising initial health physics training for craft workers and training Health Physics Personnel. Also, acted as Shift Supervisor in the Radiation Controlled Area, supervising daily activities involving radiation control of plant workers. Designated to supervise all Health Physics activities for the Steam Generator Replacement Project (including budget, facility design, procurement of material, radiological protection preplanning, etc.) prior to promotion to Nuclear Energy Health Physics Supervisor.

1981-Present	Florida Power and Light Company, Corporate Health Physicist. Responsible for all staff activities in the areas of radiation protection, radiological environmental monitoring, radiochemistry, and waste management.

PROFESSIONAL AFFILIATIONS AND CERTIFICATIONS

National Health Physics Society
Certified Power Reactor Health Physicist - 1982
State of Florida Advisory Council on Radiation Protection 1985-1986
Phi Kappa Phi Honor Society