





JULY 10 1989

L-89-246

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D. C. 20555

Gentlemen:

Re: St. Lucie Unit 1  
Docket No. 50-335  
Spent Fuel Pool Boraflex Panels  
Integrity Assessment Program

By letter L-87-245, dated June 12, 1987, Florida Power & Light Company (FPL) submitted a proposed License Amendment to permit the reracking of the Spent Fuel Pool at St. Lucie Unit 1. The proposed License Amendment was intended to increase the storage capacity in the Spent Fuel Pool from 728 fuel assemblies to 1706 fuel assemblies. The increased storage capacity was necessary to provide continued adequate spent fuel storage capacity for St. Lucie Unit 1.

On March 11, 1988, the NRC approved FPL's proposal and issued Amendment 91 to Facility Operating License No. DPR-67 for St. Lucie Unit 1. As a result of a hearing request, an Atomic Safety and Licensing Board (ASLB) (ASLB No. 88-560-01-LA) was convened.

Following the hearing, held in early 1989, the ASLB issued its initial decision on May 9, 1989. The decision ruled that the license permitting reracking St. Lucie Unit 1 shall remain in full force and effect as issued. The ASLB, however, in its decision imposed a condition. That condition states:

That in the event that any of the Region 1 Boraflex test coupons are subjected to gamma irradiation equal to or greater than  $1 \times 10^8$  rads, licensee is directed to prepare within 30 days a study program to be approved by the NRC staff and performed by the licensee to assess the effect of the irradiation on the integrity of the Boraflex panels. The study program should include Blackness Testing or state-of-the-art equivalent approved by the NRC Staff.

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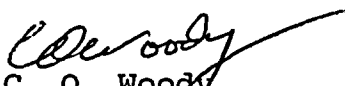
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The attached outlines the study program to be conducted by FPL to meet the condition imposed by the ASLB.

If there should be any questions, please contact us.

Very truly yours,



C. O. Woody  
Acting Senior Vice President - Nuclear

COW/EJW/gp  
Attachment

cc: Stewart D. Ebnetter, Regional Administrator, Region II, USNRC  
Senior Resident Inspector, USNRC, St. Lucie Plant

## ATTACHMENT

### ST. LUCIE UNIT 1 SPENT FUEL POOL BORAFLEX PANELS INTEGRITY ASSESSMENT PROGRAM

A one time Blackness Test (neutron logging) will be performed on selected Region 1 storage cells. The program, will test twenty (20) storage cells by neutron logging. The cells to be tested will be the fifteen (15) Region 1 cells which currently have stored fuel or Boraflex coupon trees for the normal surveillance program, and five (5) non-irradiated storage cells, which will be used to obtain baseline data. The testing program will be controlled through the use of Florida Power & Light Company (FPL) approved guidelines, and will meet or exceed industry standards at the time of the testing.

This one time neutron logging will be performed coincident with the long term testing required after the Boraflex coupons have been subjected to an irradiation period of one year. This one year surveillance is scheduled for September 1989.

#### Description of Blackness Testing (Neutron Logging)

Neutron logging is a method used to measure the thermal neutron attenuation in the walls of high density spent fuel storage racks. The technique (a derivative of well-logging used in the oil industry) uses a sealed neutron source (Cf-252) and four (4) thermal neutron detectors (BF<sub>3</sub>) to verify the continued presence and integrity of the neutron absorbing material (Boraflex) in the storage racks.

During the neutron logging operation, the testing tool (containing the source and the four (4) detectors) is lowered into the storage pool and vertically traverses selected storage cells. As the test tool traverses the cell, fast neutrons from the source pass through the cell walls and are moderated (thermalized) in the water adjacent to the cell. The back scatter thermal neutrons are absorbed in areas of the rack where the absorber material is present and intact. However, in areas where the absorber material is missing or significantly degraded, the thermal neutrons will pass through the cell wall and be registered as counts by the detectors inside the test tool. Increases in counting rates are interpreted as indicating missing absorber material in the storage cells being measured.

#### Bases of Program

The proposed program has three (3) variables:

- Frequency of Testing
- Time of Testing
- Number of Cells Tested

The testing frequency proposed is a one time neutron logging. A one time test is adequate since the intent of the test is to detect gaps resulting from the shrinkage of Boraflex. Radiation is the dominant contributor to shrinkage. Gamma radiation induces cross-linkage of the polymer in Boraflex which leads to shrinkage. As the accumulated radiation doses increase, cross-linkage becomes saturated, and no more shrinkage will occur. Tests performed on Boraflex show no significant changes in Boraflex shrinkage at cumulative doses between  $5 \times 10^9$  and  $1 \times 10^{10}$  rads. Also, Electric Power Research Institute (EPRI) studies conclude that cross-linking saturates at approximately  $1 \times 10^{10}$  rads, and, therefore, shrinkage stops.

The ASLB's order requires FPL to put in place a program once the radiation exposure of the test panels exceeds  $1 \times 10^8$  rads. Based on the exposure to date, the panels to be tested will be irradiated to about  $1 \times 10^{10}$  rads by September 1989. Therefore, the panels to be tested will have achieved their maximum shrinkage. Any additional testing performed subsequent to this testing would not provide additional information.

The time that FPL has chosen to perform the test is acceptable based on several factors. The first factor is, as stated above, that the Boraflex panels will have achieved their maximum projected shrinkage.

Secondly, by performing the tests at the scheduled one year coupon surveillance, the specific accumulated dose, dimensional changes, molecular changes, neutron attenuation, and physical characteristics will be documented as required by the long term surveillance testing. This information can be used in conjunction with the Blackness Testing results to verify the performance of the Boraflex panels. Additionally, by performing this neutron logging concurrent with the scheduled coupon surveillance, ALARA will be practiced by eliminating two separate surveillances in the Spent Fuel Pool, and thus reducing exposure to plant and contract personnel.

Finally, the number of cells to be tested is adequate since the Spent Fuel Pool for St. Lucie Unit 1 currently has only 13 fuel cells in Region 1 which have been used for spent fuel storage. These cells are part of the long term surveillance program, and are used to store spent fuel assemblies around two cells containing the surveillance coupons (see attached Figure 1). Therefore, performing the neutron logging on the fifteen (15) fuel and coupon storage cells (60 panels) will test 100% of the irradiated Boraflex panels. In addition, five (5) storage cells that do not contain a spent fuel assembly or coupon tree will be tested (20 panels). The results of these non-irradiated panels will be used as a baseline data.

### Calibration

Prior to performing neutron logging of the subject cells, the test tool calibration and sensitivity will be demonstrated using a test cell in the St. Lucie Unit 1 Spent Fuel Pool. The test tool will be traversed through the test cell located in the Spent Fuel Pool. The test will contain Boraflex panels with various known defects in the Boraflex material. The test equipment will be calibrated as necessary using the test cell prior to performing actual neutron logging. This calibration will be performed in accordance with approved plant instructions and will demonstrate that the test is capable of detecting gaps in the Boraflex panels which are larger than 0.5 inch.

### Evaluation Criteria

As noted in FPL's testimony during the rerack hearing, and restated in the May 9, 1989 ASLB decision, the St. Lucie Unit 1 spent fuel racks are designed to maintain  $K_{eff} \leq 0.95$  assuming the combination of assumptions outlined below.

- a. Four percent shrinkage distributed in 0.5 inch gaps at 12 inch intervals
- b. Gaps are at the same elevation in all panels
- c. Unborated water in the Spent Fuel Pool

Since gaps up to 0.5 inches have been evaluated and found acceptable, any gaps identified during neutron logging which are > 0.5 inches will be evaluated by FPL. If necessary, additional testing and/or evaluation will be done.

### Conclusions

The information provided above demonstrates the acceptability of FPL's proposed Blackness Testing (neutron logging) Program, to meet the requirements of the ASLB order of May 9, 1989. FPL intends to conduct neutron logging as outlined in this evaluation concurrent with the one year surveillance program scheduled for September, 1989.



These cell locations can not have Unit 2 Fuel or consolidation canisters placed in them.

# Florida Power & Light Company

## SPENT FUEL HIGH DENSITY STORAGE RACKS

### St. Lucie Plant Unit No. 1



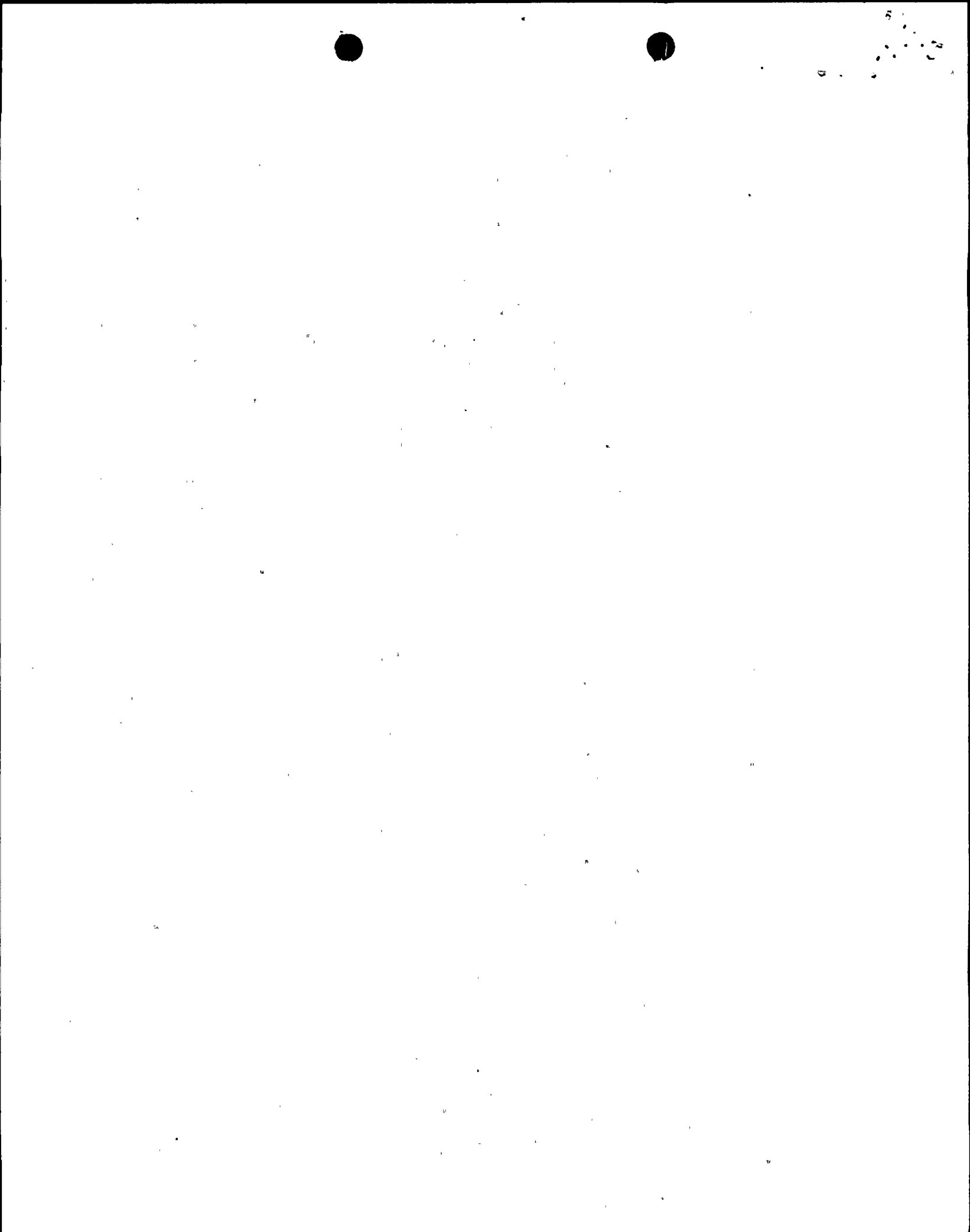
### Region 2

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### Region 1

Figure 1





July 11, 1989

DOCKET NO(S). 50-335/389  
 Mr. C. O. Woody, Acting Senior  
 Vice President-Nuclear  
 Nuclear Energy Department  
 Florida Power and Light Company  
 P.O. Box 14000  
 Juno Beach, FL 33408-0420  
 SUBJECT:

ST. LUCIE PLANT, UNIT NO. 1

The following documents concerning our review of the subject facility are transmitted for your information.

- Notice of Receipt of Application, dated \_\_\_\_\_.
- Draft/Final Environmental Statement, dated \_\_\_\_\_.
- Notice of Availability of Draft/Final Environmental Statement, dated \_\_\_\_\_.
- Safety Evaluation Report, or Supplement No. \_\_\_\_\_ dated \_\_\_\_\_.
- Environmental Assessment and Finding of No Significant Impact, dated \_\_\_\_\_.
- Notice of Consideration of Issuance of Facility Operating License or Amendment to Facility Operating License, dated \_\_\_\_\_.
- Bi-Weekly Notice; Applications and Amendments to Operating Licenses Involving No Significant Hazards Considerations, dated 06/28/89 [see page(s)] \_\_\_\_\_.
- Exemption, dated \_\_\_\_\_.
- Construction Permit No. CPPR-\_\_\_\_\_, Amendment No. \_\_\_\_\_ dated \_\_\_\_\_.
- Facility Operating License No. \_\_\_\_\_, Amendment No. \_\_\_\_\_ dated \_\_\_\_\_.
- Order Extending Construction Completion Date, dated \_\_\_\_\_.
- Monthly Operating Report for \_\_\_\_\_ transmitted by letter dated \_\_\_\_\_.
- Annual/Semi-Annual Report- \_\_\_\_\_  
 \_\_\_\_\_ transmitted by letter dated \_\_\_\_\_.

Division of Reactor Projects, I/II  
 Office of Nuclear Reactor Regulation

Enclosures:  
 As stated

cc: See next page

OFFICE	LA: PDII-2					
SURNAME	D Miller:bd					
DATE	07/14/89					