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SUBJECT: Forwards response to GL 96-04, "Boraflex Degradation in Spent Fuel Pool Storage Racks.".

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FPL

OCT 18 1996

L-96-258
10 CFR §50.54(f)

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

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Response to Generic Letter 96-04
Boraflex Degradation in
Spent Fuel Pool Storage Racks

On June 26, 1996, the NRC issued Generic Letter (GL) 96-04, "Boraflex Degradation in Spent Fuel Pool Storage Racks," requesting licensees to (1) assess the capability of the Boraflex to maintain a 5-percent subcriticality margin and (2) submit to the NRC a plan describing its proposed actions if this subcriticality margin cannot be maintained by Boraflex material because of current or projected future Boraflex degradation. Florida Power and Light Co.'s response to GL 96-04 for Turkey Point Units 3 and 4 is attached.

Should there be any questions on this response, please contact us.

Very truly yours,

R. J. Hovey
Vice President
Turkey Point Plant

OIH

cc: S. D. Ebneter, Regional Administrator, Region II, USNRC
T. P. Johnson, Senior Resident Inspector, USNRC, Turkey Point

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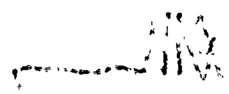

L-96-258
Response to Generic Letter 96-04
Boraflex Degradation in
Spent Fuel Pool Storage Racks

STATE OF FLORIDA)
) ss.
COUNTY OF DADE)

R. J. Hovey being first duly sworn, deposes and says:

That he is Vice President, Turkey Point Plant, of Florida Power and Light Company, the Licensee herein;

That he has executed the foregoing document; that the statements made in this document are true and correct to the best of his knowledge, information and belief, and that he is authorized to execute the document on behalf of said Licensee.

R. J. Hovey

Subscribed and sworn to before me this
18th day of October 1996.

OLGA HANEK
MY COMMISSION # CC 562742
EXPIRES: June 18, 2000
Bonded Thru Notary Public Underwriters

Olga Hanek
Name of Notary Public (Type or Print)
NOTARY PUBLIC, in and for the County of Dade, State of Florida

R. J. Hovey is personally known to me.

1.0 INTRODUCTION

There are two spent fuel pools (SFPs) for Turkey Point Units 3 and 4; one for each unit. Both SFPs are identical with respect to pool (wet) geometry, storage rack design, and storage capacity. Each SFP contains two discrete fuel storage regions; Regions 1 and 2. Each Region has its own specially designed high density fuel storage racks. Region 1 has three high density storage rack modules with storage cell capacity for 286 fuel assemblies. Region 2 contains nine high density storage rack modules for 1118 fuel assemblies. The design of the SFP high density storage racks includes the use of Boraflex materials to maintain the 5 percent subcriticality margin requirement for Regions 1 and 2 of both Units.

The Region 1 fuel storage racks were designed to accommodate

1) fresh fuel assemblies with uranium enrichment up to 4.5 w/o U-235, and
2) burned fuel assemblies with initial uranium enrichment up to 4.5 w/o U-235 that have not accumulated adequate burnup for Region 2 storage.

The Region 2 racks are capable of storing spent fuel assemblies with various initial uranium enrichments which have achieved minimum burnups that ensure subcriticality in the region. Under administrative controls, Region 2 is also capable of storing Region 1 fuel assemblies in a checkerboard storage pattern.

The Boraflex panels at Turkey Point were constructed from a single sheet of Boraflex which is held in the stainless steel cell wall by enclosing it with a stainless steel wrapper plate. This design provides an enclosure that protects the installed Boraflex from the dissolution effects of the pool water environment.

2.0 ASSESSMENT OF BORAFLEX DEGRADATION

FPL has an on-going in-service Boraflex verification program. The goals of the program are to confirm the in-service Boraflex panels' physical presence in the storage racks, and to provide in-service Boraflex panel performance data in terms of gap formation, gap distribution, and gap size. The program accomplishes these goals through the performance of blackness testing. Blackness testing is performed on a frequency of one test every five years on specific Boraflex panels in either SFP. Boraflex degradation evaluations are performed based on the results of the blackness testing.

In addition to blackness testing, SFP water silica levels are tracked as supplemental information that can be used to monitor Boraflex degradation.

2.1 Boraflex Panel Gamma Dose Estimates

The integrated gamma dose to the Boraflex panels is used in conjunction with the blackness test results to assess the Boraflex degradation. The integrated gamma dose for the Unit 3 SFP Boraflex panels were conservatively calculated in 1989. The integrated gamma dose for the Unit 3 SFP Boraflex panels was calculated to be 1.95×10^{10} and 3.03×10^{10} rads for Regions 1 and 2, respectively. The Unit 3 SFP Boraflex panel

estimated gamma dose data is representative of the Unit 4 SFP Boraflex panel gamma dose since both Units are run under the same plant operational strategy.

The saturation gamma dose level for the Boraflex degradation mechanism has been reported by EPRI to be between $9x10^9$ and $1.5x10^{10}$ rads. The calculated gamma dose to the irradiated Boraflex panels in the Turkey Point Units 3 and 4 SFPs are beyond the saturation gamma dose level for the Boraflex degradation mechanism. Therefore, no significant additional shrinkage is expected due to gamma exposure beyond the saturation level.

2.2 Blackness Testing

Three blackness tests have been performed on the Unit 3 SFP (1987, 1989, and 1993). One blackness test was performed on the Unit 4 SFP in 1995. FPL performed an evaluation of the blackness tests results for the Units 3 and 4 SFPs, and determined that the number of gaps in a single panel range from zero to seven. At least 95% of all panels tested showed that there were 3 gaps or less. The gap width is randomly distributed with the probability for the formation of large gaps being less than the probability of formation of small gaps. The largest gaps observed were 1.84 inches and 2.40 inches, for Units 3 and 4 respectively. The smallest gap measurable was less than 0.5 inch. At least 95% of the gaps have a width of 1.5 inches or less. The axial location of these gaps along the panel is randomly distributed such that the median distance between gaps is 44 inches.

Additionally, the axial length of the Boraflex panels in the Unit 4 SFP were measured. The results show that the nominal panel length has decreased by 2 inches (similar measurements have not been made for the Unit 3 SFP Boraflex panels).

The above results have been used to evaluate the adequacy of the Boraflex panels to maintain the required 5 percent subcriticality margin. Criticality analysis performed by Westinghouse for the Turkey Point Units 3 and 4 SFPs included sensitivity studies of K-effective versus Boraflex panel shrinkage and gap size. Evaluation of the blackness test results with respect to the criticality analysis confirms that the requirement of $K_{eff} \leq 0.95$ is still satisfied for Regions 1 and 2 of both Units.

Based on the blackness tests results, the Boraflex degradation events reported at Palisades, South Texas, and Fort Calhoun power stations have not been observed at Turkey Point Units 3 and 4.

2.3 SFP Silica Level Monitoring

Boraflex is a boron carbide impregnated polymer-based material with silica as a major component. Industry experience has shown that higher than normal silica levels in SFP water are indicative of Boraflex degradation. However, this experience offers no quantitative relationship between silica level and the degree of Boraflex degradation. Even though a quantitative relationship between the silica level and the degree of Boraflex degradation is currently not available, monitoring of silica concentrations in SFP water is still considered to be an indicator of Boraflex degradation.

The rate of silica release from the Boraflex panels observed at Turkey Point has been relatively low because of the Boraflex enclosure rack design. The Boraflex panels are constructed from a single sheet of Boraflex which is held in the stainless steel cell wall by enclosing it with a stainless steel wrapper plate. This design provides an enclosure that protects the installed Boraflex from the dissolution effects of forced coolant flow conditions.

Chronological trends of SFP silica levels are presented on the attached table. Silica data vary with time due to various operations such as refueling, transfer canal activities, and SFP purification. The only noted correlation of a significant event to a change on the silica level has been the Unit 3 refueling in the early summer of 1994. The reduced level observed during this refueling has not been observed in recent refuelings. Other operations are considered to be minor events (including variations in pool water temperature and surface evaporation). There is no specific program to reduce the silica content in the SFPs. Industry experience has shown that once silica reaches equilibrium the dissolution process stops. The variations noted in the measurements since 1993 are judged to be within the normal scatter for the data.

3.0 <u>REMEDIES FOR LONG-TERM BORAFLEX DEGRADATION</u>

Should Boraflex degradation adversely impact the capability to maintain $K_{eff} \leq 0.95$, FPL will consider evaluation of the following options to address the potential effects of long-term Boraflex degradation:

a) Taking credit for the soluble boron in the SFP

b) Neutron absorbing rod inserts in the stored fuel assemblies

c) Neutron absorbing plate inserts as a replacement for deteriorating Boraflex in the storage racks

d) Intermediate fuel storage measures via checkerboard configuration storage or three out of four arrangement storage

e) On-site dry cask storage

FPL is currently planning to evaluate the Westinghouse soluble boron credit methodology for application to the Turkey Point Units 3 and 4 SFPs. This methodology is currently under NRC review for approval.

4.0 <u>SUMMARY</u>

Based on the in-service Boraflex panel performance data obtained from the blackness tests performed at the Turkey Point Units 3 and 4 SFPs, it is concluded that,

1. The wrapper enclosure design of the Boraflex at Turkey Point is resistant to the dissolution effects of the pool water. The type of Boraflex degradation reported at Palisades, South Texas, and Fort Calhoun has not been observed in the SFP storage racks at Turkey Point Units 3 and 4,

2. The effect of in-service Boraflex panel gaps and shrinkage on the SFP critical reactivity is small, and therefore, the SFP five

percent subcriticality margin has been maintained and the NRC General Design Criterion (GDC) 62 requirements for the prevention of criticality in fuel storage and handling have been met for Turkey Point Units 3 and 4, and

3. The Boraflex degradation is a slow mechanism, therefore the blackness testing program provides adequate capability for monitoring of Boraflex performance.

TURKEY POINT UNITS 3 AND 4
SPENT FUEL POOL SILICA LEVELS (PPM)

Monthly Seq. No.	DATE	UNIT 3	UNIT 4
1	Jan-93	5.66	3.4
2	Feb-93	4.15	3.85
3	Mar-93	5.27	4.63
4	Apr-93	6.97	4.26
5	May-93	7.5	4.5
6	Jun-93	7.8	5.4
7	Jul-93	8.2	4.85
8	Aug-93	7.45	4.3
9	Sep-93	7.29	3.3
10	Oct-93	6.65	4.85
11	Nov-93	7.7	1.97
12	Dec-93	5.68	3.8
13	Jan-94	8	4.2
14	Feb-94	7.4	3.71
15	Mar-94	7.12	4.13
16	Apr-94	5.1	3.8
17	May-94	4.95	3.95
18	Jun-94	2.57	5
19	Jul-94	3.25	4.7
20	Aug-94	5	4.8
21	Sep-94	5.5	5
22	Oct-94	5.4	5.3
23	Nov-94	7	4.2
24	Dec-94	7.9	4.4
25	Jan-95	4.95	4.6
26	Feb-95	5.3	4.55
27	Mar-95	5.8	5.23
28	Apr-95	8	4.54
29	May-95	7.5	4.9
30	Jun-95	7.8	5.4
31	Jul-95	8.21	4.5
32	Aug-95	7.97	4.85
33	Sep-95	7.1	5.52
34	Oct-95	6.4	5.7
35	Nov-95	7	4.8
36	Dec-95	5	4.8
37	Jan-96	6.4	4.7
38	Feb-96	5.8	4.5
39	Mar-96	6.8	4.7
40	Apr-96	8.7	5.65
41	May-96	8	6.1
42	Jun-96	5.5	4.2
	Average =	6.47	4.56