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Matthew M. Childs, P.A.

July 26, 1996

ORIGINAL  
FILE COPY

Ms. Blanca S. Bayó, Director  
Division of Records and Reporting  
Florida Public Service Commission  
4075 Esplanade Way, Room 110  
Tallahassee, FL 32399

RE: DOCKET NO. 960001-EI

Dear Ms. Bayó:

Enclosed for filing please find the original and fifteen (15) copies of Florida Power & Light Company's Supplemental Testimony of R. Silva and R.L. Wade in the above-referenced docket.

Very truly yours,

*Matthew M. Childs*  
Matthew M. Childs, P.A.

ACK  MMC:ml  
~~AFA~~  cc: All Parties of Record  
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EAG 5-Buss  
LEG 1  
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305.577.7000  
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**CERTIFICATE OF SERVICE  
DOCKET NO. 960001-EI**

**I HEREBY CERTIFY** that a true and correct copy of Florida Power & Light Company's Supplemental Testimony of R. Silva and R.L. Wade has been furnished by Hand Delivery,\*\* or U.S. Mail this 26th day of July, 1996, to the following:

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Matthew M. Childs, P.A.

**BEFORE THE FLORIDA  
PUBLIC SERVICE COMMISSION**

**DOCKET NO. 960001-EI  
FLORIDA POWER & LIGHT COMPANY**

**JULY 26, 1996**

**IN RE: LEVELIZED FUEL COST RECOVERY**

**SUPPLEMENTAL TESTIMONY & EXHIBITS OF:**

**R. SILVA  
R. L. WADE**

DOCUMENT NUMBER-DATE

07865 JUL 26 96

FPSC-RECORDS/REPORTING

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

FLORIDA POWER & LIGHT COMPANY

SUPPLEMENTAL TESTIMONY OF RENE SILVA

DOCKET NO. 960001-EI

July 26, 1996

1 Q Please state your name and address.

2 A. My name is Rene Silva. My business address is 9250 W. Flagler  
3 Street, Miami, Florida 33174.

4

5 Q. By whom are you employed and what is your position?

6 A. I am employed by Florida Power & Light Company (FPL) as Manager  
7 of Forecasting and Regulatory Response in the Power Generation  
8 Business Unit.

9

10 Q. Have you previously testified in this docket?

11 A. Yes.

12

13 Q. What is the purpose of your supplemental testimony?

14 A. The purpose of my supplemental testimony is to provide additional

1 information regarding FPL's response to Interrogatory No. 19 and 21  
2 in Staff's 3rd Set of Interrogatories. The response to Interrogatory  
3 No. 19 explains how the outages that occurred since April 1995 at the  
4 St. Lucie plant affected FPL's Generating Performance Incentive  
5 Factor reward/penalty amount for the period April through September  
6 1995. The response to Interrogatory No. 21 provides the replacement  
7 energy and cost of the replacement energy associated with the outages  
8 that occurred from September 1994 through September 1995 at the St.  
9 Lucie plant.

10  
11 **Q. Have you prepared or caused to be prepared under your**  
12 **supervision, direction and control an Exhibit in this proceeding?**

13 **A. Yes, I have. It consists of Document No. 1.**  
14

15 **Q. Were the outages at the St. Lucie Units 1 and 2 during the period**  
16 **September 1994 through September 1995 an issue during the**  
17 **February 1996 Fuel proceedings?**

18 **A. Yes. During the February 1996 Fuel proceedings, the issue: Should**  
19 **FPL recover replacement energy costs resulting from outages at the St.**  
20 **Lucie Plant during the period September 1994 through September**  
21 **1995, was raised by the Commission Staff. The issue was deferred**

1 from the February 1996 hearing to allow time for additional discovery.  
2 FPL originally filed responses to Staff's Third Set of Interrogatories  
3 on November 3, 1995. Interrogatory No. 19 is attached to my  
4 supplemental testimony as Document No 1. Recently the Commission  
5 Staff asked additional questions regarding the interrogatory response.  
6 These questions and FPL's responses to them are provided below.

7  
8 **Q. In your response to Interrogatory No. 19, Pages 7 and 9,**  
9 **adjustments have been made to the Actual Equivalent Availability.**  
10 **Is there some document or order which allows these adjustments**  
11 **to be made?**

12 **A. Yes.** Adjustments to a GPIF unit's Actual Equivalent Availability  
13 are permitted as described in the GPIF Implementation Manual  
14 established by the FPSC on July 28, 1981 in Order No. 10168 for  
15 Docket No. 810001-CI. Section 4.3.1 of the manual provides for the  
16 adjustment of Equivalent Availability upon review by the  
17 Commission. The Commission recognized adjustments for the  
18 following categories:

- 19 ■ Natural or externally caused disaster
- 20 ■ Unforeseen shutdown due to regulatory agency action
- 21 ■ Rescheduling of planned maintenance

- 1                   ■ Changes in the work scope of planned outages
- 2                   ■ Differences between actual and forecast reserve shutdowns
- 3                   (if reserve shutdowns are used in setting the Equivalent
- 4                   Availability target)

5

6    **Q.**    For your response to Interrogatory No. 19, Pages 3 and 7, please spell

7           out or define the abbreviated descriptions.

8    **A.**    Interrogatory No. 19, Page 3 of 11, April 7, 1995 "Control Rod Drive

9           PO." - control rod drive power supply.

10

11           Interrogatory 19, Page 3 of 11, April 9, 1995 "Chemistry hold" - Chemistry

12           hold during plant start up for chemistry analysis.

13

14           Interrogatory 19, Page 3 of 11, August 2, 1995 "NE Intercept Valve" - North

15           East turbine intercept valve.

16

17           Interrogatory No. 19, Page 7 of 11, June 11, 1995 "DC saf. sys. pwr. supp."

18           - Direct current safety system power supply. Outage was a PFO (Partial

19           Forced Outage) because the unit remained online at 40% power to make

20           necessary repairs.

21

22           Interrogatory No. 19, Page 7 of 11, July 9, 1995 "RPS "C" wide range NI" -

1 Reactor Protection System Channel "C" wide range nuclear instrumentation.

2

3 Interrogatory No. 19, Page 7 of 11, August 9, 1995 "PORVS" - Power

4 Operated Relief Valves. This outage is explained in detail in FPL Witness

5 R. L. Wade's Supplemental Testimony, Document No. 1, Page 9 of 18.

6

7 Q. In your response to Interrogatory No. 19, Page 9, the description  
8 "waterbox cleaning" is used a number of times. Please define waterbox  
9 cleaning and why is it done so often?

10 A. The condensers use salt water from the Atlantic Ocean as the source of  
11 cooling water. Marine growth and sediment can deposit on the tube sheets  
12 reducing the condensers' heat transfer capacity. Frequent cleanings are  
13 required to remove these obstructions from the tube sheet.

14

15 Q. In your response to Interrogatory No. 21, page 2, Assumption No. 3  
16 states that the average cost of PSL energy was assumed to be \$5.58 and  
17 \$6.75 for St. Lucie Units 1 and 2 respectively. What are these figures  
18 based on?

19 A. They are the actual average fuel cost of each unit for the period September  
20 1994 through September 1995.

21

22 Q. Does this conclude your testimony?

23 A. Yes, it does.



**DOCUMENT NO. 1  
FLORIDA POWER AND LIGHT COMPANY  
RESPONSE TO STAFF'S THIRD SET  
INTERROGATORY NO. 19**

RS-4  
DOCKET NO. 960001-EI  
FPL WITNESS: R. SILVA  
EXHIBIT \_\_\_\_\_  
PAGES 1 - 11

19. Q. How will the outages since April 1995 at the St. Lucie nuclear units affect Florida Power and Light Company's Generating Performance Incentive Factor reward/penalty amount for the period April through September 1995? The response should include all assumptions and calculations.

A. The unplanned outages at St. Lucie Unit 1 during August and September, 1995, which followed the shutdown caused by Hurricane Erin, will result in Florida Power & Light receiving a GPIF maximum Equivalent Availability Factor (EAF) penalty of approximately \$1.3 million for St. Lucie Unit 1. Please note that during the period of April 1995 to July 1995, prior to the hurricane, St. Lucie Unit 1 had performed well above its approved EAF target. Consequently, if Unit 1 had performed at its target level during August and September, FPL would have received a maximum reward of \$1.3 million for Unit 1. Therefore the net "loss" to FPL for the outages at St. Lucie Unit 1 is more than \$2.6 million. Consistent with previous periods, the Equivalent Availability Factors (EAF's) of the St. Lucie units have been adjusted to remove the effects of externally caused events. Therefore, the hours offline due to Hurricane Erin as well as the delay in unit start up due to the vehicle lodged in the discharge canal have been removed from the EAF calculations

During the same April 1995 through September 1995 GPIF period, St. Lucie Unit 2 performed well above its approved EAF target and achieved a GPIF maximum EAF reward of almost \$1.1 million. Therefore the combined EAF performance of the St. Lucie nuclear plant was a penalty of more than \$0.2 million. The FPL nuclear units at the Turkey Point site also performed well above their approved targets during the same period with maximum rewards for each unit's EAF performance

During the 1990's FPL's nuclear units have exceeded nuclear industry standards. Since 1991, all four of FPL's nuclear units have consistently performed above the nuclear industry average for forced (unplanned) outages. For example, while the industry average for forced outages was approximately 10.6%, FPL's nuclear units had forced outage rates of less than 4%. Other significant gains in nuclear unit availability were achieved through the reduction in the length of planned outages. Between 1992 and 1994 the average number of days off line for planned outages at FPL's nuclear sites has decreased from more than 63 days to less than 44 days. In contrast, the nuclear industry average for planned outages was approximately 65 days in 1992 and 56 days in 1994. FPL's excellent nuclear performance has provided substantial savings to our customers in replacement fuel costs.

The GPIF program has rewarded FPL for having its nuclear units perform well. In this instance, the GPIF program (as intended) has penalized FPL at St. Lucie Unit 1, as a result of its outages during August and September.

VERSION # 15.0  
 ORIGINAL SHEET NO. 6.202.033

ACTUAL PERFORMANCE DATA  
 COMPANY: FLORIDA POWER AND LIGHT  
 PERIOD OF: APRIL 1995 THRU SEPTEMBER 1995

	PLANT / UNIT: TURKEY POINT #3							6 MON.
	APR.	MAY	JUN.	JUL.	AUG.	SEP.		
1. LEAF (%)	94.2	100.0	97.1	100.0	99.5	10.0	83.7	
2. IPH	719.0	744.0	720.0	744.0	744.0	720.0	4391.0	
3. ISH	679.00	744.00	720.00	744.00	744.00	72.17	3703.17	
4. IRSH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
5. IUK	40.0	0.0	0.0	0.0	0.0	647.8	687.8	
6. IPGW	0.0	0.0	0.0	0.0	0.0	647.8	647.8	
7. IFOH	40.0	0.0	0.0	0.0	0.0	0.0	40.0	
8. IMOH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
9. IPPOH	0.00	0.00	3.33	0.00	0.00	0.00	3.33	
10. ILR PP (MW)	0.00	0.00	421.00	0.00	0.00	0.00	421.00	
11. IFFOH	2.48	0.00	0.00	0.00	11.72	0.00	14.20	
12. ILR PP (MW)	544.00	0.00	0.00	0.00	210.00	0.00	268.41	
13. IPHOH	0.00	0.00	39.63	0.00	0.00	0.00	39.63	
14. ILR PH (MW)	0.00	0.00	319.92	0.00	0.00	0.00	319.92	
15. INSC (MW)	666.0	666.0	666.0	666.0	666.0	666.0	666.0	

NOTE: LINE 17 IS DATA WHEN THE UNIT IS SYNCHRONIZED TO THE SYSTEM

16. IOPER BTU (MBTU)	5030162	5557946	5248244	5577594	5529768	458174	27401888
17. INET GEN	456014	495002	466379	495897	492271	38755	2444318
18. IANOH (BTU/KWH)	11031	11228	11253	11247	11233	11822	11710
19. INOP (%)	100.8	99.9	97.3	100.1	99.3	80.6	99.1
20. INPC (MW)	680	680	666	666	666	666	671

21. IAN-HR EQUATION

$$\text{ANOH} = A * B \text{ (N.O.F.)}$$

$$A = 13193. \quad B = -20.59$$

ISSUED BY: FLORIDA POWER & LIGHT CO.

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VERSION # 15.0  
ORIGINAL SHEET NO. 6.202.035

ACTUAL PERFORMANCE DATA  
COMPANY: FLORIDA POWER AND LIGHT  
PERIOD OF: APRIL 1995 THRU SEPTEMBER 1995

	PLANT / UNIT: TURKEY POINT #4						
	PTP4						
	APR.	MAY	JUN.	JUL.	AUG.	SEP.	6 MON.
1. EAF (%)	100.0	100.0	96.9	100.0	97.7	100.0	99.1

2. PH	719.0	744.0	720.0	744.0	744.0	720.0	4391.0
3. SH	719.00	744.00	720.00	744.00	744.00	720.00	4391.00
4. IRSH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5. IUN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6. IPOH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7. IFOH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8. IMOH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9. PPOH	0.00	0.00	1.67	0.00	3.50	0.00	5.17
10. LR PP (MW)	0.00	0.00	453.00	0.00	286.00	0.00	339.87
11. PPOH	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12. LR PP (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13. PMOH	0.00	0.00	33.97	0.00	28.47	0.00	62.43
14. LR PM (MW)	0.00	0.00	418.48	0.00	363.12	0.00	393.24
15. INSC (MW)	666.0	666.0	666.0	666.0	666.0	666.0	666.0

NOTE: LINE 17 IS DATA WHEN THE UNIT IS SYNCHRONIZED TO THE SYSTEM

16. IOPER BTU (MBTU)	5387320	5578233	5243310	5580955	5454415	5398764	32642997
17. INET GEN	491394	499404	469438	498158	485227	485159	2928780
18. ANOHR (BTU/KWH)	10963	11170	11169	11203	11241	11128	11146
19. INOP (%)	102.6	100.8	97.9	100.5	97.9	101.2	100.1
20. INPC (MW)	680	680	666	666	666	666	671

21. ANOHR EQUATION

$$\text{ANOHR} = A - B \text{ (N.O.P.)}$$

$$A = 13479. \quad B = -22.62$$

ISSUED BY: FLORIDA POWER & LIGHT CO.

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VERSION # 15.0  
ORIGINAL SHEET NO. 6.202.037

ACTUAL PERFORMANCE DATA  
COMPANY: FLORIDA POWER AND LIGHT  
PERIOD OF: APRIL 1995 THRU SEPTEMBER 1995

	PLANT / UNIT: ST LUCIE #1							6 MON.
	APR.	MAY	JUN.	JUL.	AUG.	SEP.	PSL1	
1. EAF (%)	100.0	100.0	99.5	88.6	2.11	0.0	65.9	
2. IPH	719.0	744.0	720.0	744.0	717.0	720.0	4329.8	
3. ISH	719.00	744.00	720.00	658.82	14.97	0.18	2856.97	
4. IRSH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
5. IUH	0.0	0.0	0.0	85.2	702.0	719.8	1472.8	
6. IPOH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
7. FPOH	0.0	0.0	0.0	85.2	702.0	719.8	1472.8	
8. IMOH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
9. IFFOH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
10. ILR PP (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
11. IFFOH	0.00	0.00	6.60	0.00	0.00	0.00	6.60	
12. ILR PP (MW)	0.00	0.00	442.00	0.00	0.00	0.00	442.00	
13. IPMOH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
14. ILR PM (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15. INSC (MW)	839.0	839.0	839.0	839.0	839.0	839.0	839.0	
NOTE: LINE 17 IS DATA WHEN THE UNIT IS SYNCHRONIZED TO THE SYSTEM								
16. IOPER BTU (MBTU)	6634400	6855194	6584639	6012842	123389	0	26210464	
17. INET GEN	611582	628354	598998	544598	10948	0	2394480	
18. IANHR (BTU/KWH)	10848	10910	10993	11041	11270	0	10946	
19. INOP (%)	101.4	100.7	99.2	98.5	87.2	0.0	99.9	
20. INPC (MW)	848	848	839	839	839	839	842	

21. IANHR EQUATION

$$\text{ANHR} = A + B \text{ (N.O.F.)}$$

$$A = 13019. \quad B = -21.38$$

ISSUED BY: FLORIDA POWER & LIGHT CO.

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ORIGINAL SHEET NO. 6.202.038  
PAGE 1 OF 1 PAGES

ACTUAL PERFORMANCE DATA  
COMPANY: FLORIDA POWER AND LIGHT  
PERIOD OF: APRIL 1995 THRU SEPTEMBER 1995  
PLANT/UNIT: ST LUCIE #1 PSL1

DATE	OUTAGE TYPE (1)	HOURS (AFFECTED)	(MW)	DESCRIPTION
6-11	FPO	6.61	442	DC SAF. SYS. MGR. SUPP.
7- 8	FPO	19.41	839	RX TRIP-OPERATOR ERR
7- 9	FPO	31.51	839	RPS'C*WIDE RANGE NI
7-10	FPO	34.21	839	ENT. HIGH VEH. DISCH.
8- 1	FPO	23.11	839	HURRICANE ERIN
8- 2	FPO	171.61	839	1A2 RCP SEAL
8- 9	FPO	188.51	839	FORVS
8-17	FPO	341.91	839	CONT. SPRAY SYSTEM
9- 1	FPO	1.61	839	CONT. SPRAY SYSTEM
9- 1	FPO	123.01	839	1B2 EMERG. DIESEL GEN
9- 6	FPO	109.31	839	1A DIESEL GENERATOR
9-10	FPO	25.81	839	1B1 SIT (ACCUMULATOR)
9-11	FPO	115.71	839	SAFETY VALVE V1201
9-15	FPO	36.41	839	SAF. VLV. V1200/V1202
9-18	FPO	21.21	839	CVCS VLV. V2427/V2428
9-19	FPO	71.41	839	1B DIESEL GENERATOR
9-22	FPO	48.31	839	1A DIESEL GENERATOR
9-24	FPO	15.61	839	1B DIESEL GENERATOR
9-24	FPO	2.31	839	1B1 RCP BREAKER
9-24	FPO	149.11	839	SAFETY VALVE V1202

(1) FPO - FULL FORCED OUTAGE  
FPO - PARTIAL FORCED OUTAGE  
FMO - FULL MAINTENANCE OUTAGE  
PMO - PARTIAL MAINTENANCE OUTAGE  
PO - PLANNED OUTAGE  
FPO - PARTIAL PLANNED OUTAGE  
ISSUED BY: FLORIDA POWER & LIGHT CO.

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VERSION # 15.0  
ORIGINAL SHEET NO. 6.202.039

ACTUAL PERFORMANCE DATA  
COMPANY: FLORIDA POWER AND LIGHT  
PERIOD OF: APRIL 1995 THRU SEPTEMBER 1995

	PLANT / UNIT: ST LUCIE #2							6 MON.
	APR.	MAY	JUN.	JUL.	AUG.	SEP.		
1. EAF (%)	99.0	99.7	98.6	93.8	92.1	93.9	96.2	
2. PH	719.0	744.0	720.0	744.0	672.7	720.0	4319.7	
3. RSH	711.82	744.00	720.00	744.00	658.62	720.00	4298.43	
4. RSH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
5. UH	7.2	0.0	0.0	0.0	14.1	0.0	21.3	
6. FCH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
7. FCH	0.0	0.0	0.0	0.0	14.1	0.0	14.1	
8. MCH	7.2	0.0	0.0	0.0	0.0	0.0	7.2	
9. PPOH	1.52	1.32	0.00	1.33	7.50	1.67	13.33	
10. LR PP (MW)	63.00	89.00	0.00	85.00	97.00	105.00	92.14	
11. PPOH	0.00	2.28	4.10	171.25	240.15	193.37	611.15	
12. LR PF (MW)	0.00	234.00	109.00	50.00	82.58	103.20	80.72	
13. PMCH	0.00	4.45	30.55	107.27	31.83	47.30	221.40	
14. LR PM (MW)	0.00	244.00	263.33	279.00	386.00	349.00	306.47	
15. INSC (MW)	839.0	839.0	839.0	839.0	839.0	839.0	839.0	
NOTE: LINE 17 IS DATA WHEN THE UNIT IS SYNCHRONIZED TO THE SYSTEM								
16. IOPER BTU (MBTU)	6488157	6835013	6514148	6517646	5701417	6310619	38367000	
17. INET GEN	587039	612852	583558	574803	504416	557750	3420418	
18. ANOHR (BTU/KWH)	11052	11153	11163	11339	11303	11314	11217	
19. INOF (%)	98.3	98.2	96.6	92.1	91.3	92.3	94.8	
20. INPC (MW)	848	848	839	839	839	839	842	
21. ANOHR EQUATION	ANOHR = A * B (N.O.F.)							
	A = 13837. B = -29.60							

ISSUED BY: FLORIDA POWER & LIGHT CO.

FILED:  
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ORDER NO. 1



GENERATING PERFORMANCE INCENTIVE FACTOR  
CALCULATION OF MAXIMUM ALLOWED INCENTIVE DOLLARS

ACTUAL

FLORIDA POWER & LIGHT COMPANY

PERIOD OF: APRIL 1995 THRU SEPTEMBER 1995

LINE 1	BEGINNING OF PERIOD BALANCE OF COMMON EQUITY END OF MONTH BALANCE OF COMMON EQUITY:	\$ 4197244000
LINE 2	MONTH OF APRIL 95	\$ 4215102000
LINE 3	MONTH OF MAY 95	\$ 4231264000
LINE 4	MONTH OF JUNE 95	\$ 4234180000
LINE 5	MONTH OF JULY 95	\$ 4363578000
LINE 6	MONTH OF AUGUST 95	\$ 4470114000
LINE 7	MONTH OF SEPTEMBER 95	\$ 4438818000
LINE 8	AVERAGE COMMON EQUITY FOR THE PERIOD (SUMMATION OF LINE 1 THROUGH LINE 7 DIVIDED BY 7)	\$ 4307185000
LINE 9	25 BASIS POINTS	0.0025
LINE 10	REVENUE EXPANSION FACTOR	60.4525%
LINE 11	MAXIMUM ALLOWED INCENTIVE DOLLARS (LINE 8 TIMES LINE 9 DIVIDED BY LINE 10 TIMES 0.5)	\$ 8906128
LINE 12	JURISDICTIONAL SALES	40705736000 KWH
LINE 13	TOTAL SALES	41507892000 KWH
LINE 14	JURISDICTIONAL SEPARATION FACTOR (LINE 12 DIVIDED BY LINE 13)	98.07%
LINE 15	MAXIMUM ALLOWED JURISDICTIONAL INCENTIVE DOLLARS (LINE 11 TIMES LINE 14)	\$ 8734239

GPIF UNIT PERFORMANCE SUMMARY

FLORIDA POWER & LIGHT COMPANY  
PERIOD OF: APRIL 1995 THRU SEPTEMBER 1995

	WEIGHTING FACTOR (%)	TARGET (%)	EAF RANGE		MAX. FUEL SAVINGS (\$000)	MAX. FUEL LOSS (\$000)	
			MAX. (%)	MIN. (%)			
CAPE CANAVERAL	1	91.2	94.2	88.2	60.2	64.1	
CAPE CANAVERAL	2	89.8	92.8	86.8	60.2	64.1	
LAUDERDALE	4	89.5	92.0	87.0	231.2	192.2	
LAUDERDALE	5	95.7	97.7	93.7	199.4	182.4	
FORT MYERS	2	91.7	94.7	88.7	65.6	55.7	
MANATEE	2	96.0	98.0	94.0	40.4	43.5	
PORT EVERGLADES	3	85.6	88.6	82.6	34.5	4.6	
PORT EVERGLADES	4	96.0	98.0	94.0	52.5	40.5	
PUTNAM	1	96.0	98.0	94.0	71.4	66.8	
PUTNAM	2	84.2	86.7	81.7	75.3	64.4	
RIVIERA	3	93.6	96.1	91.1	47.2	42.7	
RIVIERA	4	90.9	93.9	87.9	50.1	57.6	
SANFORD	5	96.0	98.0	94.0	39.8	17.5	
TURKEY POINT	1	82.7	85.2	80.2	50.2	16.7	
TURKEY POINT	2	95.6	97.6	93.6	12.1	20.7	
TURKEY POINT	3	10.64	85.1	88.1	82.1	1323.8	1347.8
TURKEY POINT	4	12.01	93.1	96.1	90.1	1494.4	1490.9
ST. LUCIE	1	15.43	93.6	96.6	90.6	1919.6	1923.5
ST. LUCIE	2	12.36	83.3	87.8	78.8	1538.1	1548.3
SCHERER	4	0.48	96.0	98.0	94.0	59.2	85.0
		59.69			7425.2	7329.0	

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

FLORIDA POWER & LIGHT COMPANY

SUPPLEMENTAL TESTIMONY OF R. L. WADE

DOCKET NO. 960001-EI

July 26, 1996

1 Q Please state your name and address.

2 A. My name is Robert L. Wade. My business address is 700 Universe  
3 Boulevard, Juno Beach, Florida 33408.

4

5 Q. By whom are you employed and what is your position?

6 A. I am employed by Florida Power & Light Company (FPL) as Director,  
7 Business Services in the Nuclear Business Unit.

8

9 Q. Have you previously provided testimony in Docket No. 960001-EI?

10 A. Yes.

11

12 Q. What is the purpose of your supplemental testimony?

13 A. The purpose of my testimony is to discuss outages at St. Lucie Units  
14 1 and 2 during the period September 1994 through September 1995.

1 Q. Have you prepared or caused to be prepared under your  
2 supervision, direction and control an Exhibit in this proceeding?

3 A. Yes, I have. It is labelled Document No. 1.  
4

5 Q. Were the outages at St. Lucie Units 1 and 2 during the period  
6 September 1994 through September 1995 an issue during the  
7 February 1996 Fuel proceeding?

8 A. Yes. The issue: "Should FPL recover replacement energy costs  
9 resulting from outages at the St. Lucie Plant during the period  
10 September 1994 through September 1995", was raised by the  
11 Commission Staff during the February 1996 Fuel proceeding. The  
12 issue was deferred from the February 1996 hearing to allow time for  
13 additional discovery.  
14

15 Q. Has FPL filed any discovery responses with the Commission  
16 concerning this issue?

17 A. Yes. On November 3, 1995, FPL filed responses to Staff's Third Set  
18 of Interrogatories which I co-sponsored with Mr. Silva. These  
19 interrogatory responses provide a detailed description of the incidents  
20 which occurred from September 1994 through September 1995 at the  
21 St. Lucie plant that affected the operation of the units and the

1           corrective actions taken by FPL.

2

3   **Q.   Has FPL updated these discovery responses?**

4   A.   Yes. Recently the Commission Staff asked additional questions and  
5       requested updates on the interrogatory responses. Attached as my  
6       Document No. 1 is FPL's revised response to Interrogatory No. 21,  
7       which provides a detailed description of the incidents which occurred  
8       from September 1994 through September 1995 at the St. Lucie plant  
9       that affected the operation of the units and the corrective actions taken  
10      by FPL.

11

12   **Q.   In your response to Interrogatory No.21, page 6 of 18, the offline**  
13      **hours for July 10, 1995 are noted as 29.45 and in response to**  
14      **Interrogatory No. 19, Page 7, 34.2 offline hours are noted for July**  
15      **10, 1995. Why is there a difference?**

16   A.   The offline hours originally reported in response to Interrogatory No.  
17       21 excluded normal plant start up hours. Interrogatory No. 21 has  
18       been revised to reflect the total offline hours by event.

19

20

21   **Q.   Should FPL be allowed to recover the replacement fuel cost**

1 associated with the outages at the St. Lucie Plant?

2 A. Yes. FPL believes its actions regarding the outages at the St. Lucie  
3 Plant were reasonable and prudent and, therefore, FPL should recover  
4 all replacement energy costs. FPL followed proven management  
5 practices and operating procedures, and exercised reasonable diligence  
6 in operating the plant. The St. Lucie nuclear units were taken off line  
7 on August 1, 1995 due to Hurricane Erin. After the threat of the  
8 Hurricane passed, FPL began the normal process of performing  
9 various inspections before returning both units to service. Unit 2 was  
10 successfully returned to service on August 5, 1995. During the  
11 inspections of Unit 1 prior to bringing the unit to full power, FPL  
12 observed problems with equipment and procedures which required  
13 correction prior to returning the unit to service. This identification of  
14 problems prior to bringing the unit back into service is part of FPL's  
15 normal operating procedure and is, in fact, a prudent means of  
16 correcting problems before equipment fails, possibly resulting in even  
17 greater downtime.

18  
19 FPL's nuclear management made an extensive review of the events  
20 that affected the operation of the St. Lucie Plant and, where  
21 appropriate, took corrective actions to address any operational



1 problems identified. These corrective actions included expanded  
2 personnel training and procedure enhancements to address  
3 unanticipated events. The review of the events and the corrective  
4 actions are provided in detail in my Document No. 1, pages 3 through  
5 18.

6  
7 When reviewing the incidents that affected the operation of the St.  
8 Lucie Plant during a three month time period (July, August and  
9 September 1995), it is also important to review how FPL's nuclear  
10 units have performed over the years and how their performance  
11 compares to the industry. Since 1991, all four FPL's nuclear units  
12 have consistently performed above the nuclear industry average for  
13 forced (unplanned) outages. For example, while the industry average  
14 for forced outages in 1994 was approximately 10.6%, FPL's nuclear  
15 units had forced outage rates of less than 4% in 1994. The industry  
16 average for forced outages in 1995 is not yet available. FPL's 1995  
17 average nuclear forced outage rate was 6.6%. Other significant gains  
18 in nuclear unit availability were achieved through the reduction in the  
19 length of planned outages. Between 1992 and 1994 the average  
20 number of days off line for planned outages at FPL's nuclear sites has  
21 decreased from more than 63 days to less than 44 days. In contrast,

1 the nuclear industry average for planned outages was approximately  
2 65 days in 1992 and 56 days in 1994. This performance has provided  
3 substantial savings to our customers in reduced fuel costs. Therefore,  
4 FPL believes it would be patently unfair to focus on events occurring  
5 during a small subperiod to determine allowance of fuel replacement  
6 cost recovery.

7

8 **Q. Does this conclude your supplemental testimony?**

9 **A. Yes, it does.**

10

11

12

**DOCUMENT NO. 1  
FLORIDA POWER AND LIGHT COMPANY  
REVISED RESPONSE TO STAFF'S THRID SET OF INTERROGATORIES  
INTERROGATORY NO. 21 - REVISED**

**RLW - 2  
DOCKET NO. 960001-EI  
FPL WITNESS: R. L. WADE  
EXHIBIT \_\_\_\_\_  
PAGES 1 THROUGH 18**

21. Q. Please provide a detailed description of each incident occurring from September, 1994, to the current date at the St. Lucie plant that affected the operation of either nuclear unit. The description should include, but not limited to the following:

- a. the cause of the incident
- b. the corrective action steps taken by the company:
  - i. person/company correcting the problem
  - ii. cost to correct the problem (parts and labor)
  - iii. environmental impacts
- c. a timeline that indicates when each corrective action step was completed
- d. source of replacement energy
- e. total KWH's purchased/generated of replacement energy
- f. total cost of replacement energy
- g. fuel cost of replacement energy

A. a,b,c. See pages 3 through 18 of this response (pages numbers corresponding to each event are provided in the table below)

d. During each incident that affected the operation of the St. Lucie plant, FPL's source of replacement energy was from FPL system resources. Since the replacement energy came from FPL's system output, it cannot be specifically tied to any particular FPL generating unit.

e, f, g. See table below

ST LUCIE UNIT NO.	DATE	EVENT	For (a) (b) (c) See Page	(e) REPLACEMENT ENERGY kWh	(f) & (g) COST (see notes 1,2 & 3 below)
1	Oct 26-94	Potential Transformer	3	7,210	\$120,835
1	Feb 27-95	Quench Tank In Leakage	4	163,867,000	\$2,264,639
1	Jul 8-95	Turbine Trip During Surveillance Testing	5	36,050,000	\$615,742
1	Jul 10-95	External Event, Vehicle in Discharge Canal	6	25,235,000	\$417,900
1 and 2	Aug 1-95	External Event, Hurricane Erin	7	68,571,000	\$1,054,361
1	Aug 2-95	1A2 Reactor Coolant Pump Seal Package Failure	8	124,012,000	\$2,123,006
1	Aug 9-95	Power Operated Relief Valve Failures	9	134,883,000	\$2,577,776

ST LUCIE UNIT NO.	DATE	EVENT	For (a) (b) (c) See Page	(e) REPLACEMENT ENERGY kWh	(f) & (g) COST (see notes 1, 2 & 3 below)
1	Aug 17-95	Inadvertent Spray Down of Containment	10	248,024,000	\$4,179,840
1	Sep 1-95	1B2 EDG Rocker Arm Adjusting Screw Lock Nut	11	186,739,000	\$2,844,879
1	Sep 11-95	Pressurizer Code Safety Valve Flange Leakage	12	124,733,000	\$2,086,873
1	Sep 19-95	1B Emergency Diesel Generator Hold Down Bolts	13	51,191,000	\$824,809
1	Sep 22-95	1A & 1B EDG Governor Stability	14	48,307,000	\$748,007
1	Sep 24-95	Pressurizer Code Safety Valve Alignment Modifications	15	325,892,000	\$5,208,977
2	Feb 21-95	Steam Generator Level Transmitter Failure	16	53,878,000	\$637,288
2	Apr 25-95	Digital Electro-Hydraulic Power Supply Failure	17	5,456,000	\$70,814
2	Aug 4-95	Switchyard Circuit Breaker Failure	18	9,548,000	\$186,098

Assumptions:

- 1) Total KWH replacement energy based upon net to FPL from: a) PSL1 of 776MW per hour less projected forced outage rate and projected maintenance outage rate of 3.1% and 4%, respectively and b) PSL2 of 777 megawatts per hour less projected forced outage rate and projected maintenance outage rate of 9.9% and 2.3%, respectively. The projected outage rates are taken from the Fuel Cost Recovery filing of June 1995. The resultant output (721 and 682 for PSL#1 and PSL#2) was considered the energy to be replaced for each hour the unit was off-line.
- 2) Total Cost and Fuel Cost are equal since there was no capacity purchased to replace PSL output.
- 3) The replacement fuel cost based upon the FPL hourly system lambda (cost of next megawatt) adjusted for the decremental block of energy assumed in assumption 1 above. The average cost of PSL energy (\$per megawatt hour) was assumed to be \$5.58 and \$6.75 for PSL#1 and PSL#2 respectively. The PSL cost was subtracted from the adjusted FPL hourly system lambda and was multiplied by the replacement energy.

Event: Potential Transformer

St. Lucie Unit 1

Event date: October 26, 1994

On October 26, 1994, Unit 1 was in Mode 1 and operating at 100% power. At 2:26 P.M., an arc was observed in the area of the 240 KV switchyard near the Unit 1 synchronizing potential transformer. Concurrently, Unit 1 experienced an automatic reactor trip on loss of electrical load predicated by main generator differential current condition. Standard post trip actions were performed, the normal Reactor Trip Recovery procedure was implemented and all safety functions were satisfactory. Subsequently, at 2:45 P.M., a fire was reported at the potential transformer outside the protected area. The fire was controlled and allowed to extinguish itself.

The root cause of this event was determined to be an external fault across the porcelain insulator of the synchronizing potential transformer which resulted in a flashover of the insulator. The flashover resulted from a combination of marginal basic insulation level of the transformer contributed to by salt contamination of the insulator.

A review of FPL's distribution system revealed no prior inservice failures of this type model potential transformer. The potential transformers were routinely inspected and cleaned during refueling outages. A silicone maintenance coating program was in place prior to this event but applied only to breaker bushings. Since there was no vendor recommendation to coat potential transformers nor any previous failures, the potential transformers were not included in the maintenance coating program. After this event, the potential transformers were added to the maintenance silicone coating program.

The following actions were taken by FPL to correct the problem:

1. The synchronizing potential transformer was replaced with a new 900KV basic insulation level rated model of increased strike distance for enhanced insulating capability.
2. The Unit 1 switchyard components were inspected and no other degraded components were found.
3. Schedules were established to periodically apply silicone coatings to both units synchronizing potential transformers.
4. The main transformer, main generator and isophase bus were inspected with satisfactory results.
5. An upgraded synchronizing potential transformer utilizing a 1050 KV insulation level was installed during the February 1995 Quench Tank In Leakage outage.

Initial corrective actions were completed by October 26, 1994. A total of 9:33 off-line hours were attributed to this event. There were no off-site environmental issues associated with this event.

The cost to replace the transformer and perform the required inspections was approximately \$74,000. The corrective actions were performed by FPL employees.

Event: Quench Tank In Leakage

St. Lucie Unit 1

Event date: February 27, 1995

Beginning in December 1994, the rate of in leakage to the quench tank began to trend upward. It soon became evident that the leakage rate would eventually approach the Technical Specification Reactor Coolant System (RCS) leakage limit, requiring a mid-cycle outage to correct the problem. A task team was established to identify contributing factors to the in leakage and develop and implement appropriate corrective actions. On February 27, 1995, St. Lucie Unit 1 was removed from service to implement the corrective actions identified by the task team.

The primary source of in leakage to the quench tank was determined to be associated with leakage from the Pressurizer Code Safety Valves (PCSV). The valves were leaking between their discs and seats. The major contributors to this leakage were:

1. Insufficient margin between normal system operating pressure and the valves lift set point.
2. High ambient temperature.
3. Valve body flexure from thermal stresses during plant heat up.

The following actions were taken by FPL to correct the problem:

1. All three PCSV's were replaced.
2. Pressurizer head insulation was modified to improve ambient conditions of the PCSV's.
3. The pressurizer missile shield was removed to improve the ambient conditions of the PCSV's.
4. Pressurizer pressure was raised slowly over a 24 hour period allowing the valves to soak at each step.

The cause of and corrective actions for PCSV leakage has been an issue in the nuclear industry, as well as, with FPL for some time. When new and following refurbishments, which are performed periodically, these valves operate to their design specification. FPL determined a long term solution to the leakage problems to be the replacement of PCSV's with a newly designed valve. The new valve is manufactured out of forged steel utilizing a block body design which provides greater strength and makes the new valves less susceptible to tail pipe operating stress. The new valves were installed in Unit 1 in June 1996. The new valves for Unit 2 will be installed during the next refueling outage currently scheduled for April 1997.

A total of 226:49 off-line hours, including 68:51 hours for normal start up, were attributed to this event. St. Lucie Unit 1 was successfully returned to service on March 8, 1995. There were no off site environmental issues associated with this event.

The cost to replace the pressurizer code safety valves as well as modifications to the pressurizer was approximately \$820,000. The work was performed by FPL employees as well as Crosby Valve and Gage Co. and Wyle Laboratories.

Event: Turbine Trip During Surveillance Testing

St. Lucie Unit 1

Event date: July 8, 1995

On July 8, 1995, Unit 1 was in Mode One and operating at 100% power. Operations personnel were conducting a scheduled turbine overspeed trip surveillance per approved plant procedures. During the portion of the surveillance that tests a solenoid valve for overspeed protection control, an operator failed to close an isolation valve prior to continuing with the test. Failure to close the valve allowed electro-hydraulic (EH) fluid to drain from the governor and intercept valves when the solenoid valve was opened during a subsequent step. Draining the EH fluid caused closure of the main turbine governor and intercept valves, resulting in a turbine trip followed by an automatic reactor trip.

The root cause of this event was the performance of surveillance test steps out of sequence.

The following actions were taken by FPL to correct the problem:

1. Normal post trip actions were taken to ensure plant equipment responded as designed and operated properly.
2. Normal plant start up activities were performed to return the unit to service.

The employee involved in the surveillance has been an FPL employee for thirteen years. He entered the St. Lucie Plant Operations department career path in September 1986 as an Associate Nuclear Plant Operator. After successfully completing all requirements of the career path, he was sequentially promoted through the Nuclear Plant Operator classification to his current position of Senior Nuclear Plant Operator in September 1989. The Senior Nuclear Plant Operator watch station responsibilities include the operation and monitoring of various plant systems and components.

A total of 50:58 off-line hours were attributed to this event. There were no off site environmental issues associated this event.

There were no repair costs associated with this event. All reviews and analyses were performed by FPL employees.



Event: External Event, Vehicle In Discharge Canal

St. Lucie Unit 1

Event date: July 10, 1995

On July 9, 1995 with Unit 2 at 100% power and Unit 1 in start up Mode Three, a vehicle entered FPL property through an open gate off Highway A1A. Although the entrance was clearly marked with a "NO TRESPASSING VIOLATORS WILL BE PROSECUTED" sign, the driver proceeded east along the access road adjacent to the intake canal. The driver turned north until he encountered a locked gate. After making a U-turn, the vehicle proceeded up and over the berm of the discharge canal, ultimately entering the discharge canal. The occupants of the vehicle exited the vehicle prior to it submerging and climbed up a ladder located on the North side of the discharge headwall.

The vehicle was located inside the discharge pipe approximately 50 feet from the ocean end of the pipe. Flow through the discharge pipe was slowed to allow divers to enter the pipe and re-position the vehicle and extract it from the discharge pipe on July 11, 1995. The vehicle was subsequently towed, by tug boat, to a terminal dock in Ft. Pierce.

The root cause of this event was determined to be the vehicle driver's disregard of a clearly posted no trespassing sign on FPL property at the entrance to the canal area. Due to a large number of employees requiring entry into and out of this area to perform such duties as surveys for environmental and biological studies, the gate was routinely left unlocked.

A security review was conducted of areas within the owner controlled area to determine where enhanced security measures could be implemented to preclude such incidents in the future. This review led to a decision to lock the gates in the area where the incident occurred, thus denying access to FPL property.

The introduction of the vehicle into the discharge canal delayed the start up of Unit 1 a total of 34:13 hours, including 4:28 hours for normal start up. The incident did not effect the operation of Unit 2. There were no off site environmental issues resulting from this event. A report of the event was filed with the appropriate State environmental agencies.

The cost to remove the vehicle from the discharge pipe was approximately \$39,000 and was accomplished by FPL employees and Underwater Engineering Service, Inc.

Event: External Event, Hurricane Erin

St. Lucie Unit's 1 and 2

Event date: August 1, 1995

On July 31, 1995 at 11:14 A.M., with both St. Lucie nuclear units at 100% power, the National Hurricane Center issued a hurricane warning which encompassed the St. Lucie plant site. On August 1, 1995, information from the National Hurricane Center forecast sustained hurricane force winds at the St. Lucie plant site. In accordance with the Site Emergency Plan, site management directed the commencement of a controlled shut down of St. Lucie Units 1 and 2. St. Lucie unit 1 was taken off line on August 1, 1995 at 2:55 P.M. St. Lucie Unit 2 was taken off line on August 1, 1995 at 11:28 A.M. Both units were shut down by 2:00 P.M.

Hurricane Erin passed approximately 20 miles to the North of the St. Lucie plant on August 2, 1995 at 1:00 A.M. After damage assessment and emergency plan actions were concluded, the decision to return both units to service was made. Unit 2 returned to service on August 5, 1995 at 12:52 A.M. Unit 1's return to service was initially delayed by the failure of the 1A2 Reactor Coolant Pump seal.

The off-line hours directly attributable to Hurricane Erin for both units was 98:19.

The cost incurred for Hurricane Erin St. Lucie plant preparation was approximately \$281,000. The preparation efforts were performed by FPL employees and Raytheon Constructors Inc.

Event: 1A2 Reactor Coolant Pump Seal Package Failure

St. Lucie Unit 1

Event date: August 2, 1995

On August 2, 1995, while Unit 1 was in start up Mode Three following a shutdown due to Hurricane Erin, operators detected the 1A2 Reactor Coolant Pump (RCP) lower seal had failed. In accordance with approved procedures, attempts were made to return the seal to service while maintaining the unit in Mode Three. The procedure sequentially de-pressurizes the seal cavities from top to bottom in order to introduce a differential pressure across the leaking seal thereby restaging it. The attempt to restage the lower seal failed. As a result, operators cooled down and de-pressurized the reactor coolant system in accordance with plant operating procedures.

After data gathering and analysis, it was determined that there was not a clear root cause for the failure. The following are considered the most likely causes:

1. Misalignment between rotating shaft/seal and stationary seal components.
2. Reactor Coolant System (RCS) pressure/temperature transient.
3. Debris in the RCS.
4. Pump hydraulic instability.

To restore the unit to service, the seal was replaced.

A total of 171:36 off-line hours, including 42:25 hours for normal plant start up, were attributed to this event. There were no off site environmental issues associated with this event.

The cost to replace the 1A2 RCP seal was approximately \$1,100,000. The repair effort was performed by FPL employees and Raytheon Constructors.

Event: Power Operated Relief Valve Failures

St. Lucie Unit 1

Event date: August 9, 1995

On August 9, 1995, Unit 1 was in start up Mode Four following a shut down due to Hurricane Erin. Stroke testing of the Pressurizer Power Operated Relief Valves (PORV) was being performed in accordance with an approved plant procedure. During testing, operators could not confirm that the PORV's were opening as expected. The valves were declared inoperable and a plant cool down and de-pressurization was performed. Both PORV's were removed from the pressurizer. The valves were functionally tested and did not open as expected. The valves were subsequently disassembled and the main disc guides were found to be installed improperly.

The root cause of the PORV inoperability was determined to be improper re-assembly of the PORV's following overhaul during the 1994 refueling outage. The overhaul was performed by Furmanite employees, a contractor used by FPL to perform valve maintenance.

The following actions were taken by FPL to correct the problem:

1. Both PORV's were removed and re-assembled correctly. No damage or problems were noted.
2. Changes were made to the Power Operated Relief Valve maintenance procedure to verify, during bench testing, that the main valve disc actuates when test pressure is applied and to add a verification that the main disc guide is installed with the correct orientation.
3. A change was made to the procedure for conducting in service testing on the PORV's to require more positive indication of PORV main valve actuation by using quench tank and pressure parameters for confirmation during testing.
4. Other activities performed by Furmanite were reviewed. No other equipment operability issues were identified.
5. Unit 2 PORV's were determined not to be susceptible to a similar event; The valve configuration on Unit 2 PORV's does not allow for the main disc guide to be installed improperly.
6. Plant Staff and Engineering performed a review of existing procedures governing post maintenance testing on other safety related equipment to ensure the testing adequately demonstrates component operability. All post maintenance procedures reviewed were found to adequately address and demonstrate component operability.
7. A comprehensive review of and modification to procedures pertaining to control of contractors was performed.

A total of 188:28 off-line hours, including 43:11 hours for normal plant start up, were attributed to this event. There were no off site environmental issues associated with this event.

The cost to remove, re-assemble and re-install the PORV's was approximately \$381,000. The corrective measures were implemented by FPL employees.

Event: Inadvertent Spray Down Of Containment

St. Lucie Unit 1

Event date: August 17, 1995

On August 11, 1995, a containment spray (CS) header control valve failed its stroke test and was declared out of service. Pending repair of the valve, the valve was placed in its safeguards position of open.

On August 17, 1995, with Unit 1 in start up Mode Three, the Emergency Core Cooling System (ECCS) venting procedure for the Low Pressure Safety Injection System (LPSI) was started. As part of that procedure, an operator started the 1A LPSI pump and established a flow path through the Shutdown Cooling System (SDC) heat exchanger. These actions provided a direct flow path from the Refueling Water Tank (RWT) to the "A" CS header and the open header control valve. Approximately 10,000 gallons of borated water was inadvertently sprayed into containment through the "A" CS header using the 1A LPSI pump.

Operators secured the 1A LPSI pump and isolated the 1A SDC heat exchanger and drained the reactor sump to the Aerated Waste Storage Tank.

The root cause of this event was identified as a procedural deficiency in the ECCS venting procedure, which did not require operators to verify that the proper CS header isolation valves were closed prior to recirculating the water in the SDC system.

The following actions were taken by FPL to correct the problem:

1. Plant equipment impacted by the borated water spray was cleaned, inspected and repaired or replaced as required.
2. The ECCS and CS venting procedure was revised to provide limitations on plant conditions during venting.
3. The CS header isolation valve was repaired and returned to normal status.

The PSL Operations department team involved in the venting procedure consisted of two Reactor Control Operators, a Senior Reactor Control Operator and an Assistant Nuclear Plant Supervisor (ANPS). All of these positions are licensed operator positions. The ANPS is a supervisory position responsible for coordinating the activities of their assigned unit.

A total of 343:31 off-line hours were attributed to this event. There were no off site environmental issues associated with this event.

The cost of this event, including containment clean up was approximately \$899,000. The clean up effort was performed by FPL employees.

Event: 1B2 EDG Rocker Arm Adjusting Screw Lock Nut

St. Lucie Unit 1

Event date: September 1, 1995

On August 31, 1995, operations personnel were conducting a one hour Emergency Diesel Generator (EDG) surveillance run in accordance with procedures. Unit 1 was in Mode Five following the containment spray incident. After the EDG reached a rated speed of 900 RPM, the 1B EDG tripped on high crankcase pressure from the 1B2 engine. Inspections revealed that the number nine power pack piston and cylinder head had sustained damage due to separation of the exhaust valve head from its stem. The failed valve head, loose within the combustion chamber, punctured the piston and cylinder head. Damage was also observed in several exhaust valve train parts.

There is no absolute conclusive evidence which supports a specific root cause. The two most probable root causes are the rocker arm lash adjuster stuck in mid stroke or the rocker arm lash adjuster lock nut backed off.

The EDG's are inspected every eighteen months as part of the standard maintenance program. The inspections have historically been performed by the original equipment manufacturer, MKW Power Systems, Inc.

The following actions were taken by FPL to correct the problem:

1. The 1B2 EDG engine was repaired, cleaned and inspected.
2. All EDG engines were inspected for exhaust valve rocker arm lock nut torque. All lock nuts inspected met the minimum foot pound specification.
3. Technical manuals were updated to include a minimum torque check verification of 80 foot pounds for the adjusting screw lock nut.
4. Failed engine components were sent to the original manufacturer to determine root cause of the equipment failure. Although no concrete evidence exists, the original equipment manufacturer believes the rocker arm lash adjuster stuck in mid stroke. There was no evidence of a manufacturing defect.
5. The lash adjuster plunger will be checked for free rotation during routine inspections.

The corrective actions taken by FPL encompass both possible root causes and should prevent a reoccurrence of this problem.

A total of 258:11 off-line hours, commencing on September 1, 1995, were attributed to this event. There were no off site environmental issues associated with this event.

The cost to repair the 1B2 EDG was approximately \$289,000. The repair effort was performed by FPL employees and MKW Power Systems, Inc.

Event: Pressurizer Code Safety Valve Flange Leakage

St. Lucie Unit 1

Event date: September 11, 1995

On September 11, 1995, with Unit 1 in start up Mode Three, a Reactor Coolant System leak inspection was performed. During the inspection, it was noted that the inlet flange of Pressurizer Code Safety Valve (PCSV) 1201 was leaking. In order to repair the valve, the unit was cooled down and de-pressurized to Mode Five.

The apparent root cause of the leakage was found to be the use of flexicarb spiral wound model gaskets without the concurrent use of a crush stop to prevent plastic deformation in tongue and groove applications. This results in the gasket material assuming most of the pre load of the flange bolting. In addition, Engineering determined that the torque specification, developed by FPL, for the Unit 1 bolting was excessive for this application. Flexicarb spiral wound model gaskets were introduced over a period of time as a non-asbestos containing substitute for original plant equipment gaskets that contained asbestos. This change out is part of FPL's asbestos abatement program.

The following actions were taken by FPL to correct the problem:

1. PCSV 1201, as well as the other two PCSV's, were re-installed with gaskets designed to operate without a crush stop (Kammprofile gaskets).
2. A lower torque value of 500 foot pounds was incorporated into the PCSV maintenance procedure.
3. An improved PCSV bolt up process has been incorporated into maintenance procedures.
4. A review of generic applications of spiral wound gaskets without crush stops and their misuse is underway. This review is scheduled to be completed by October 30, 1996. Preliminary indication is there are a limited number of applications where spiral wound gaskets may be in use.
5. Kammprofile gaskets were installed in Unit 2 during the Fall 1995 refueling outage.

The cause of and corrective actions for PCSV leakage has been an issue in the nuclear industry, as well as, with FPL for some time. When new and following refurbishments, which are performed periodically, these valves operate to their design specification. FPL determined a long term solution to the leakage problems to be the replacement of PCSV's with a newly designed valve. The new valve is manufactured out of forged steel utilizing a block body design which provides greater strength and makes the new valves less susceptible to tail pipe operating stress. The new valves were installed in Unit 1 in June 1996. The new valves for Unit 2 will be installed during the next refueling outage currently scheduled for April 1997.

A total of 173:12 off-line hours, including 102:47 hours for normal start up, were attributed to this event. There were no off site environmental issues associated with this event.

The cost to repair the three PCSV's, as well as perform the modifications outlined in event "Pressurizer Code Safety Valve Alignment Modifications" was approximately \$190,000. The repair work was performed by FPL employees and Crosby Valve and Gage Co.

Event: 1B Emergency Diesel Generator Hold Down Bolts

St. Lucie Unit 1

Event date: September 19, 1995

On September 19, 1995, during a surveillance of the 1B Emergency Diesel Generator (EDG), an operator found a bolt head broken off. The failed bolt head was sent to the FPL metallurgical lab for evaluation. Based upon observed field conditions, EDG design knowledge and failure analysis, it was determined the bolt failed under high cycle fatigue. Contributing factors to the fracture were normal vibration energy, the mounting bolt being partially unloaded as a result of the exhaust valve rocker arm adjusting screw lock nut failing (see "1B2 EDG Rocker Arm Adjusting Screw Lock Nut" event) and the bolt being previously machined to remove threads in the base plate area.

The following actions were taken by FPL to correct the problem:

1. The failed bolt was replaced.
2. An ultrasonic evaluation was performed on all EDG engine mounting bolts. No evidence of cracking or shearing was found.
3. The torque was verified on all EDG engine mounting bolts.

A total of 71:27 off-line hours were attributed to this event. There were no off site environmental issues associated with this event.

The cost to replace the failed bolting is included in the "1B2 EDG Rocker Arm Adjusting Screw Lock Nut" event. The repairs were performed by FPL employees.



Event: 1A and 1B EDG Governor Stability

St. Lucie Unit 1

Event date: September 22, 1995

On September 21, 1995, with St. Lucie Unit 1 in Mode Five, preparing for Mode Four, the 1B Emergency Diesel Generator (EDG) was started to perform a test run. After several minutes of operation, the 1B EDG governor experienced load oscillations. On September 22, 1995, the 1A EDG also experienced similar governor load swings during testing.

The root cause of the EDG governor load swings was primarily attributed to problems associated with the motor operated potentiometer within the governor.

The following actions were taken by FPL to correct the problem:

1. The motor operated potentiometer was replaced, like for like, on both the 1A and 1B EDG'S.
2. The governor amplifier, load sensor and frequency sensor were replaced on the 1A EDG.
3. Adjusted governor controls on both the 1A and 1B EDG's.
4. Cleaned and inspected EDG governor components.

The motor operated potentiometer is physically inspected every eighteen months as part of the standard maintenance program. FPL has adopted a nine month governor cabinet inspection which includes the motor operated potentiometer and has optimized governor system tuning. FPL is also analyzing a proposal to replace the existing governor electronic system with a new upgraded production system.

A total of 66:13 off-line hours, commencing on September 22, 1995, were attributed to this event. The 1A EDG was returned to service on September 23, 1995. The 1B EDG was returned to service on September 24, 1995. There were no off site environmental issues associated with this event.

The cost to repair the 1A EDG and the 1B EDG is included in the "1B2 EDG Rocker Arm Adjusting Screw Lock Nut" event. The repair effort was performed by FPL employees.

Event: Pressurizer Code Safety Valve Alignment Modifications

St. Lucie Unit 1

Event date: September 24, 1995

On September 26, 1995, during Unit 1 heat up, instrumentation indicated leakage from Pressurizer Code Safety Valve (PCSV) 1202. Reactor Coolant System (RCS) pressure was reduced and PCSV 1202 appeared to reseal. On September 27, 1995, with (RCS) pressure at 2230 psia, a minimal amount of leakage was identified in PCSV's 1201 and 1202. As RCS pressure increased, the leakage rate accelerated. A unit cool down and de-pressurization was initiated.

The primary root cause of the valve leakage was determined to be operating load stress placed on the valve by associated tail piping. This piping configuration has been present since original construction of St. Lucie Unit 1.

The following actions were taken by FPL to correct the problem:

1. All three PCSV's were replaced with valves which had recently been refurbished.
2. The tail pipe supports were modified to reduce operating loads placed on the PCSV's.
3. The refurbished PCSV's were installed in locations where the unit operated without leakage in the past.
4. Heat up procedures were revised to allow additional time for associated piping to achieve thermal equilibrium.

The cause of and corrective actions for PCSV leakage has been an issue in the nuclear industry, as well as, with FPL for some time. When new and following refurbishments, which are performed periodically, these valves operate to their design specification. FPL determined a long term solution to the leakage problems to be the replacement of PCSV's with a newly designed valve. The new valve is manufactured out of forged steel utilizing a block body design which provides greater strength and makes the new valves less susceptible to tail pipe operating stress. The new valves were installed in Unit 1 in June 1996. The new valves for Unit 2 will be installed during the next refueling outage currently scheduled for April 1997.

A total of 452:08 off-line hours, commencing on September 24, 1995, including 110:53 hours for normal plant start up, were attributed to this event. St. Lucie Unit 1 was successfully returned to service on October 13, 1995. There were no off site environmental issues associated with this event.

The cost to replace the PCSV's and perform the modifications to the tail pipe supports is included in event "Pressurizer Code Safety Valve Flange Leakage". The repairs were performed by FPL employees and Crosby Valve and Gage Co.

Event: Steam Generator Level Transmitter Failure

St. Lucie Unit 2

Event date: February 21, 1995

On February 21, 1995, Unit 2 was in Mode One at 100% power. At 1:17 PM, Unit 2 automatically tripped due to low feedwater level in the 2A Steam Generator. In accordance with plant procedures, standard post trip and reactor trip activities were performed. Normal steam generator water levels were regained and Unit 2 was stabilized in Mode Three.

The low feedwater level in the 2A Steam Generator was due to a level transmitter which had failed. The most likely root cause of the level transmitter failure, as determined by the design vendor, was contaminates in the sensing element of the transmitter.

The following actions were taken by FPL to correct the problem:

1. The level transmitter was replaced with a newly manufactured transmitter. The manufacturer has made several improvements in the manufacturing process to reduce the likelihood of contaminates in the sensing cell.
2. The corresponding level transmitter on the 2B Steam Generator was also replaced.
3. The failure was reviewed to prevent similar failures on other plant transmitters. It was determined that the transmitter problem was a random failure. The manufacturer has made several improvements to the transmitter to reduce the possibility of future failures.
4. Engineering packages were completed to provide for additional margins in steam generator low level pre-trip alarms.

A total of 78:43 off-line hours were attributed to this event. There were no off site environmental issues associated with this event.

The cost to replace the failed level transmitter was approximately \$223,000. The repairs were performed by FPL employees.

Event: Digital Electro-Hydraulic Power Supply Failure

St. Lucie Unit 2

Event date: April 25, 1995

On April 12, 1995, with Unit 2 in Mode One at 100% power, annunciation in the control room indicated trouble with one of the six power supply units within the Digital Electro-Hydraulic (DEH) cabinet. Site personnel investigated and found the output of one of the power supply units was zero. Since the replacement of the power supply unit at full power may have resulted in a unit trip, the plant was taken out of service on April 25, 1995 to replace the DEH power supply unit.

The root cause of the DEH power supply unit failure was determined to be the failure of a resistor within the power supply unit. The failure was determined to be an isolated incident as analysis revealed no such failure of this type of power supply in approximately 50 years of industry use.

The following actions were taken by FPL to correct the problem:

1. The DEH power supply unit was replaced along with the associated crow bar circuit and in-line fuse holder.
2. An inspection was made of the remaining power supply units.

A total of 7:21 off-line hours were attributed to this event. St. Lucie Unit 2 was successfully returned to service on April 25, 1995. There were no off site environmental issues associated with this event.

The cost to replace the failed power supply and associated hardware was approximately \$4,000. The repairs were performed by FPL employees.

Event: Switchyard Circuit Breaker Failure

St. Lucie Unit 2

Event date: August 4, 1995

With St. Lucie Unit 2 in Mode One during start up after Hurricane Erin, plant operators attempted unsuccessfully to automatically synchronize the main generator to the grid. During a second synchronization attempt, a generator circuit breaker momentarily closed, re-opening when the synchroscope needle indicated the generator was approximately 30 degrees out of phase with the grid's frequency.

The most likely root cause of this event was a slowly opening solenoid operated pilot valve on the pneumatic actuator on a generator circuit breaker. The pilot valve probably had its plug momentarily stick, causing the circuit breaker to operate too slowly and close in after the generator and the grid had gone out of phase.

The following actions were taken by FPL to correct the problem:

1. The pilot valve for the generator circuit breaker was replaced.
2. Troubleshooting on the main generator automatic synchronization circuitry and relays was performed with satisfactory results.
3. Circuit breakers were tested for satisfactory operation.
4. The incident was evaluated for Unit 1 considerations but was determined not to be applicable to the Unit 1 generator.
5. Westinghouse Electric evaluated the potential damage to the main generator and determined that the conditions experienced during the event were within the design ratings of the generator.
6. Replaced the air operated pilot valves with a different model during the Fall 1995 Unit 2 refueling outage.

Corrective actions were completed by August 5, 1995. A total of 14:08 off-line hours were attributed to this event. St. Lucie Unit 2 was successfully returned to service on August 5, 1995. There were no off site environmental issues concerning this event.

The cost to replace the original pilot valves was approximately \$4,000. The corrective actions were performed by FPL employees.