

**BEFORE THE  
FLORIDA PUBLIC SERVICE COMMISSION**

**DOCKET NO. 070602-EI  
FLORIDA POWER & LIGHT COMPANY**

**IN RE: FLORIDA POWER & LIGHT COMPANY'S  
PETITION TO DETERMINE NEED FOR  
EXPANSION OF ELECTRICAL POWER PLANTS**

**DIRECT TESTIMONY & EXHIBITS OF:**

**STEPHEN T. HALE**

DOCUMENT NUMBER - DATE

08446 SEP 17 5

CPSC-COMMISSION CLERK

1                                   **BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION**

2                                   **FLORIDA POWER & LIGHT COMPANY**

3                                   **DIRECT TESTIMONY OF STEPHEN T. HALE**

4                                   **DOCKET NO. 07\_\_\_\_\_ - EI**

5                                   **SEPTEMBER 17, 2007**

6  
7           **Q.     Please state your name and business address.**

8           A.     My name is Stephen T. Hale, and my business address is 700 Universe  
9                    Boulevard, Juno Beach, FL 33408.

10          **Q.     By whom are you employed and what position do you hold?**

11          A.     I am employed by Florida Power & Light Company (FPL or the Company) as  
12                    Senior Project Manager in the Nuclear Division.

13          **Q.     Please describe your duties and responsibilities in that position.**

14          A.     I am responsible for the power uprates and license renewal activities for the  
15                    FPL nuclear fleet as well as the nuclear fleet of FPL's affiliate, FPL Energy,  
16                    LLC (FPL Energy).

17          **Q.     Please describe your education and professional experience.**

18          A.     I graduated from the University of Tennessee in 1973 with a Bachelors of  
19                    Science degree in Nuclear Engineering. I obtained Professional Engineering  
20                    Registration for the State of Florida in 1988. Since my graduation, I have  
21                    worked for FPL in numerous capacities, including Engineering Manager for  
22                    the Turkey Point Plant, License Renewal Project Manager for the St. Lucie  
23                    Plant and Manager of the uprate project for FPL Energy's Seabrook Nuclear

1 Station. I am also directing the license renewal efforts for FPL Energy's  
2 Duane Arnold plant.

3 **Q. Are you sponsoring any exhibits in this case?**

4 A. Yes. I am sponsoring Exhibits STH-1 through STH-4, which are attached to  
5 my direct testimony.

6 Exhibit STH-1 Turkey Point Plant Site

7 Exhibit STH-2 Turkey Point Nuclear Electric Generating System

8 Exhibit STH-3 St. Lucie Plant Site

9 Exhibit STH-4 St. Lucie Nuclear Electric Generating System

10 **Q. What is the scope and purpose of your testimony?**

11 A. My testimony describes the proposed power uprate to Turkey Point (PTN)  
12 and St. Lucie (PSL) nuclear power plants (hereinafter referred to as PTN and  
13 PSL Uprates), which is proposed to be implemented in 2011 for PSL Unit 1  
14 and in 2012 for PTN Unit 3, PTN Unit 4 and PSL Unit 2. First, I will  
15 generally describe the current PTN and PSL power plant sites, including the  
16 units that are the subject of the uprates. I will further explain how the uprates  
17 will be implemented in order to add approximately 400 MW of total electrical  
18 output to the PTN and PSL plants without changing the footprint of the  
19 existing plants. I will further present the Company's cost estimates for the  
20 PTN and PSL Uprates and explain the procedures in place to ensure the costs  
21 incurred for the project are managed and controlled.

1       **Q.     Please summarize your testimony.**

2       **A.**     The power uprates at PTN and PSL will be implemented in 2011 and 2012.  
3             At PTN, each unit is expected to increase gross power by about 14%. The net  
4             increase will be about 104 MW per unit for a two-unit total of about 208 MW.  
5             At PSL, each unit is expected to increase gross power by about 11%. The net  
6             increase will be 103 MW per unit for a two-unit total of 206 MW.

7  
8             The PTN and PSL Uprates will be directed by a core team that successfully  
9             carried out the license renewal efforts for PTN and PSL and the Seabrook  
10            Nuclear Station Power Uprate in 2006. The applications and amendment  
11            requests for all these projects were completed on schedule and under budget.

12  
13            In order to increase reactor power, a license amendment will have to be issued  
14            by the Nuclear Regulatory Commission (NRC) for each unit. Detailed  
15            engineering analyses will be required for the uprate effort. The license  
16            amendment requests and NRC reviews will examine all essential safety and  
17            technical aspects of the uprate project. Based on our substantial experience  
18            with uprates, all units will require significant modifications to the turbine-  
19            generator systems and the attendant support and control systems.

20  
21            The estimated cost of the uprate at PTN is approximately \$750 million  
22            (nominal dollars). The estimated cost of the uprate at PSL is approximately  
23            \$651 million (nominal dollars). In addition to the uprate, the cost of changes

1 to the transmission system that are needed to support the project is estimated  
2 at \$45 million. As described in the testimony of FPL witness Sim, the PTN  
3 and PSL Uprates will provide FPL's customers with economic benefits that  
4 are expected to exceed the estimated costs of the project in 8 of 9 scenarios.  
5 Further, no substantial environmental impacts have been identified associated  
6 with the addition of this non-greenhouse gas emitting generation that will be  
7 constructed within the existing plant footprints.

8  
9 FPL plans to perform the physical work associated with the PTN and PSL  
10 Uprates at the time of normally scheduled refueling outages in 2010, 2011 and  
11 2012. Because of this, FPL must commence equipment orders now in order to  
12 complete the necessary work on schedule. Thus, there is a limited window of  
13 opportunity to obtain the full benefits of the PTN and PSL Uprates.

14  
15 **I. FPL's Turkey Point and PSL Plant Sites**

16  
17 **Q. Please describe the Turkey Point plant site.**

18 A. PTN is located in Miami-Dade County on a FPL-owned 24,000 acre site in  
19 South Florida. Located on this site are two nuclear-powered units and three  
20 fossil-powered units. The maximum electrical output of the site is currently  
21 3,300 MW. Of that 3,300 MW, each of the nuclear units has a net capability  
22 of about 700 MW for a total nuclear net summer output rating of about  
23 1,400 MW. The nuclear units are cooled by a closed cooling canal system

1 that occupies approximately 6,700 acres. Output from the five units is routed  
2 through one switchyard. From the switchyard, power leaves the site in two  
3 corridors consisting of eight transmission lines. Exhibit STH-1 shows the  
4 Turkey Point Plant Site.

5 **Q. Please describe the generating units at the Turkey Point plant site that**  
6 **will be the subject of the uprate project.**

7 A. PTN Units 3 and 4 are pressurized light water reactors that were designed and  
8 manufactured by Westinghouse Electric Company. Each consists of a  
9 primary and secondary system. The primary system that resides within a  
10 containment building serves to cool the reactor core and is comprised of a  
11 nuclear reactor pressure vessel, a pressurizer, three reactor coolant pumps and  
12 three steam generators. The primary system coolant carries the heat from the  
13 reactor core to steam generators. There it transfers the heat energy to the  
14 secondary systems. The secondary side is made up of a main steam system, a  
15 feedwater system, and a turbine generator system. The heat from the reactor  
16 is converted to steam in the steam generators. That steam, after leaving the  
17 steam generator, is carried by the main steam system outside the containment  
18 building to the turbines where it is converted to mechanical energy by the  
19 rotation of the turbine shaft. The rotation of the shaft causes the generator to  
20 produce electrical megawatts. The output of each electrical generator is  
21 routed to the main transformer where it is converted from 22 kilovolts (kV) to  
22 230 kV. The 230 kV is then sent to the switchyard. Exhibit STH-2 shows the  
23 Turkey Point Nuclear Electric Generating System.

1       **Q.     Please describe the St. Lucie plant site.**

2       A.     PSL is located in St. Lucie County on Hutchinson Island on a FPL owned  
3             1,130 acre site. The plant site is bordered by the Atlantic Ocean to the east  
4             and the Indian River Lagoon to the west. Located on the site are two nuclear  
5             powered units. Water from the Atlantic Ocean is used to remove heat from  
6             the main condensers and other auxiliary equipment. Water is drawn through  
7             three ocean intake structures into the intake canal. The water is then pumped  
8             from the intake canal through the main condensers to the discharge canal. The  
9             water is heated by the rejected heat from the plant and is discharged back to  
10            the Atlantic Ocean through offshore diffusers. The maximum net electrical  
11            output for each unit is about 840 MW. The total site net summer output rating  
12            is about 1,680 MW with FPL's share of the PSL plant summer output at 1,553  
13            MW. The generated power leaves the switchyard going west in one corridor  
14            through three transmission lines to the Midway substation. Exhibit     STH-3  
15            depicts the St. Lucie Plant Site.

16       **Q.     Please describe the generating units at the St. Lucie plant site that will be**  
17            **the subject of the uprate.**

18       A.     PSL Units 1 and 2 are pressurized light water reactors that were designed and  
19             manufactured by Combustion Engineering Corporation (now owned by  
20             Westinghouse Electric Company). Each consists of a primary and secondary  
21             system. The function of the primary and secondary systems is the same as  
22             described above with respect to PTN. The primary system resides within a  
23             containment building. The primary is comprised of a nuclear reactor pressure

1 vessel, a pressurizer, four reactor coolant pumps and two steam generators.  
2 The secondary side is made up of a main steam system, a feedwater system,  
3 and a turbine generator system. The heat from the reactor is converted to  
4 steam in the steam generators and is then transported by the main steam  
5 system to the turbines. There the heat energy that started in the reactor is  
6 converted to mechanical energy by the rotation of the turbine shaft. The  
7 rotation of the shaft causes the generator to produce electrical megawatts. The  
8 output of each electrical generator is routed to the main transformer where it is  
9 converted from 22 kV to 230 kV. The 230 kV is then routed to the switchyard.  
10 Exhibit STH-4 shows the St. Lucie Nuclear Electric Generating System.

## 11 12 **II. Implementation of the PTN and PSL Uprates**

### 13 14 **Q. What is the power uprate project?**

15 **A.** The PTN and PSL Uprates will increase power at PTN Units 3 and 4 and PSL  
16 Units 1 and 2 without changing the footprint of the existing plants.

17  
18 At PTN, each unit is expected to increase gross power by about 14%. Net  
19 electrical generation per unit is expected to increase from about 700 MW to  
20 about 804 MW. The net increase will be about 104 MW per unit for a two  
21 unit total of about 208 MW. At PSL, each unit is expected to increase gross  
22 power by about 11%. Net electrical generation per unit is expected to increase

1 from about 840 MW to about 943 MW. The net increase will be 103 MW per  
2 unit for a two-unit total of 206 MW.

3 **Q. What is the schedule for completing the power uprate project?**

4 A. FPL's schedule is an aggressive one. The proposed schedule calls for the  
5 following in-service dates; PSL Unit 1 in Fall 2011, PTN Unit 3 and PSL Unit  
6 2 in Spring 2012 and PTN Unit 4 in Fall 2012. FPL plans to perform the  
7 physical work associated with these uprates at the time of normally scheduled  
8 refueling outages.

9 **Q. Could there be delays in FPL's schedule for completing the uprates?**

10 A. Yes. For example, the uprates project requires site certification approval from  
11 the Florida Department of Environmental Protection, as well as the NRC  
12 approvals addressed below. There could be delays in receiving these  
13 approvals. Any delays in receiving these approvals could affect the schedule  
14 for implementation of the uprates.

15  
16 In addition, there could be delays in receiving necessary materials and  
17 equipment from FPL's third-party vendors. Any such delays could affect  
18 FPL's planned implementation schedule.

19 **Q. Have there been uprates at these units in the past?**

20 A. Yes. All four of the units have had power uprates. The PSL units were  
21 uprated 5.5% in 1981 (Unit 1) and 1985 (Unit 2). The PTN units were  
22 uprated 4.5% in 1996.

1       **Q.     Will these uprates be different from the previous uprates at PTN and**  
2       **PSL?**

3       A.     Yes.  Because of the inherent design margins in the original plant, few  
4       modifications or replacements were required at the time of the earlier uprates.  
5       However, at the new uprated power levels, a number of components affecting  
6       the primary and secondary systems will be at or beyond design capability.  
7       These components will have to be modified or replaced.  As a part of these  
8       changes, we will use improved turbine-generator technologies that provide  
9       higher efficiencies in the conversion of nuclear fuel to electricity.  This will  
10      result in lower fuel costs over the long term.

11      **Q.     What other changes to the existing plants are required to implement the**  
12      **PTN and PSL Uprates?**

13      A.     The uprates will also require an increase in reactor power or thermal  
14      megawatts.  The increased reactor power will manifest itself in a higher  
15      reactor coolant exit temperature and the heat transfer through the steam  
16      generators will increase.  The main steam flow to the turbines will increase for  
17      all units.

18  
19      In addition, based on our experience with uprates at the PTN, PSL, and  
20      Seabrook Nuclear Stations, all units will require significant modifications to  
21      the turbine-generators and attendant support and control systems.  For  
22      example, at PTN, replacements or modifications are expected to be needed for  
23      the following: the high pressure turbine steam path, the turbine throttle valve

1 and control system, and the generator rotor and stator. A partial list of the  
2 affected secondary components includes: the moisture separator reheaters,  
3 feedwater heaters, the main condensers, the main transformers and various  
4 cooling systems. For PSL, a similar list exists. In addition, the current PSL  
5 low pressure turbines are not capable of handling the uprate steam flows.  
6 Therefore, the low pressure turbine internals will need to be modified along  
7 with upgrades to the feedwater and condensate pumps. All turbine  
8 modifications will incorporate state-of-the-art technology that will provide  
9 greater efficiency in the turbines resulting in fuel savings over the long term.  
10 The economic benefits of the PTN and PSL Uprates are addressed in further  
11 detail in the testimony of FPL witness Sim.

12 **Q. How will FPL ensure the safety and technical viability of the units will be**  
13 **maintained once the uprates are complete?**

14 A. Detailed engineering analyses required for the uprate effort and the NRC  
15 license amendment requests will examine all essential safety and technical  
16 aspects of the uprate project, as well as ensure existing operating margins are  
17 preserved. An accident analyses will confirm current safety systems are  
18 adequate at the higher power level or will identify modifications needed to  
19 assure the safety of the plant and the public.

20 **Q. How will FPL staff this uprate project?**

21 A. FPL has significant power uprate experience in that successful uprate projects  
22 have been previously carried out at the four FPL nuclear units in Florida. In  
23 addition, the PTN and PSL Uprates will be staffed by a core team that

1           successfully completed the technical work and obtained the NRC approval for  
2           the Seabrook Nuclear Station Power Uprate in 2006. This same team also  
3           recently obtained NRC approval for renewals of the operating licenses for  
4           PTN and PSL. All required regulatory approvals were obtained for these  
5           projects, which were all completed on schedule and under budget.

6           **Q. Has a power uprate of this kind ever been performed?**

7           A. Yes. There have been similar extended power uprates approved for both the  
8           Westinghouse and Combustion Engineering Nuclear Steam Supply Systems at  
9           the Ginna Plant in New York and the Waterford Plant in Louisiana,  
10          respectively.

11          **Q. Will NRC approvals be required for the PTN and PSL Uprates?**

12          A. Yes. In order to increase reactor power a license amendment will have to be  
13          issued by the NRC for each unit. The license amendment requests for the  
14          PTN and PSL nuclear units are scheduled to be submitted in mid to late 2009  
15          with NRC approval expected in the early 2011. As mentioned above, the  
16          NRC will perform a thorough safety and environmental review to assess  
17          whether the Company can accomplish the uprates safely and reliably.

18          **Q. What is the likelihood of NRC license approval?**

19          A. FPL expects the power uprate license amendment requests to be approved. As  
20          was previously indicated, licensing submittals prepared by FPL for other  
21          major projects were all approved by the NRC.

1       **Q.     What are the environmental impacts of the power uprate project?**

2       A.     No significant environmental impacts have been identified at this time.  
3           Indeed, nuclear generation is non-greenhouse gas emitting. The power uprate  
4           project requires no changes to the footprint of the existing plants. The  
5           increase in the output of the plant will be accomplished by modifications to  
6           the existing plant equipment and will require no new construction.  
7           Environmental aspects of the project will be reviewed through the Site  
8           Certification Application process (SCA)

9       **Q.     What changes to the transmission system may be needed to accommodate**  
10       **the increased generation at the Turkey Point and St. Lucie plant sites?**

11       A.     The total increase in generation from the PTN and PSL uprates will be  
12           approximately 414 MW total, with 208 MW at PTN plant in Miami-Dade  
13           County, and 206 MW at PSL plant in St. Lucie County. Based on FPL's  
14           initial assessment, no new transmission lines will be required. It is expected  
15           that the transmission system, as it is currently planned for the 2011-2012 time  
16           frame, will be able to reliably deliver the additional power from the uprates to  
17           FPL's load with changes and upgrades only to plant substation equipment.  
18           The changes and upgrades include installing reactive devices at both PTN and  
19           PSL to maintain adequate voltage levels on the transmission system under all  
20           conditions, and short circuit mitigation facilities that may be needed at PTN  
21           depending upon the results of more detailed study. A System Impact Study  
22           will be performed to determine the final transmission system upgrades that  
23           will be needed to support the power uprate project. FPL believes its initial

1 estimate is reasonable based on our past experience with uprates and our  
2 extensive knowledge of the transmission system.

3

4 **III. Costs of the Uprate Project**

5

6 **Q. What are FPL's cost estimates for the power uprate project?**

7 A. The estimated cost of the uprate at PTN is approximately \$750 million  
8 (nominal dollars). The estimated cost of the uprate at PSL is approximately  
9 \$651 million (nominal dollars). In addition, the cost of changes to the  
10 transmission system is estimated at \$45 million. As described in the  
11 testimony of FPL witness Sim, the PTN and PSL Uprates will provide FPL's  
12 customers with economic benefits that are expected to exceed the estimated  
13 costs of the project in 8 of 9 scenarios.

14 **Q. What are the major cost components of the power uprate project?**

15 A. The major cost components are engineering design for the changes to the plant  
16 and the installation of major secondary plant system components. These cost  
17 components represent the majority of the estimated budget for the PTN and  
18 PSL Uprates.

19 **Q. When would FPL begin incurring costs associated with the PTN and PSL  
20 Uprates?**

21 A. FPL will incur substantial costs beginning in 2007 in order to ensure that the  
22 PTN and PSL Uprates can be completed in a timely fashion. As addressed in  
23 the testimony of FPL witness Ousdahl, the Florida nuclear cost recovery

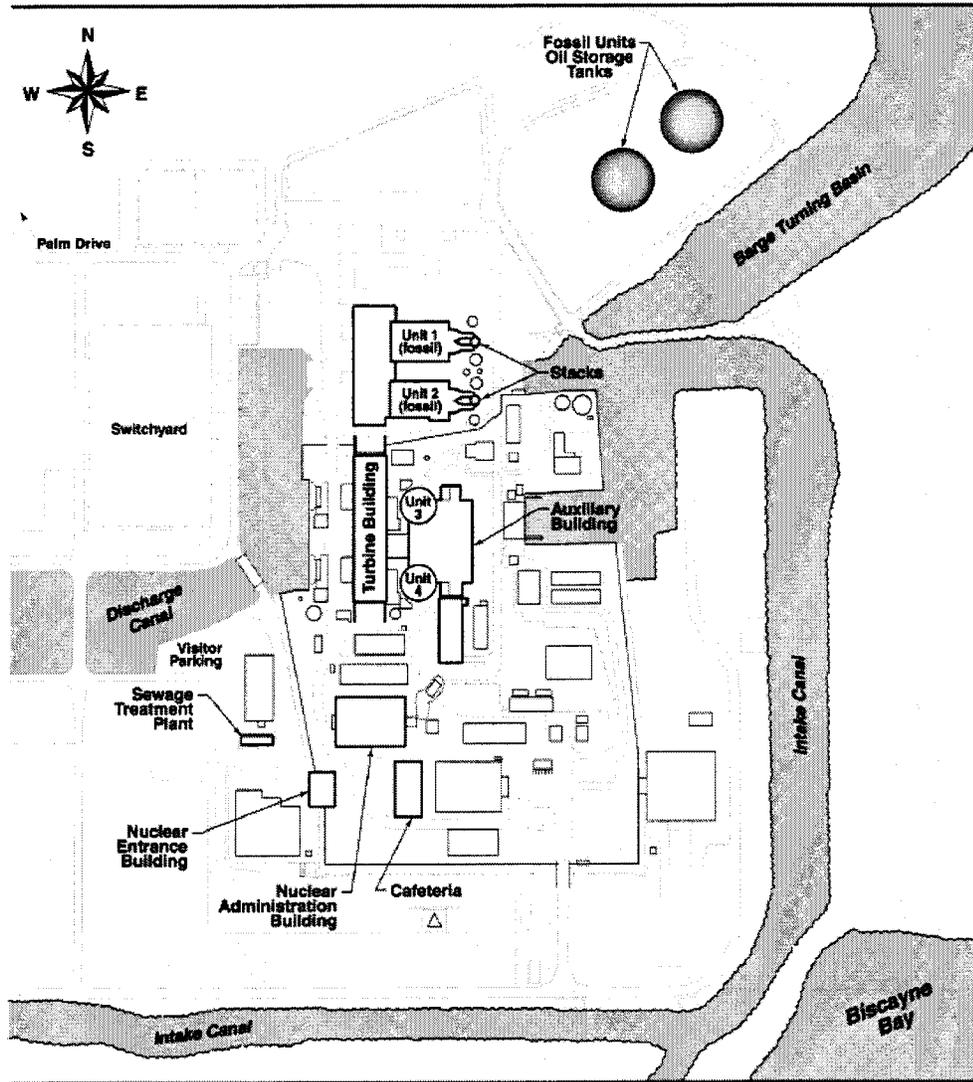
1 statute and rule provide a regulatory framework that encourages this sizable  
2 investment by FPL's investors for the benefit of FPL's customers.

3 **Q. How can the Commission be assured that FPL's costs are effectively**  
4 **managed and controlled?**

5 A. FPL will use strong project management controls similar to the controls used  
6 on the PTN and PSL license renewals and the Seabrook Nuclear Station  
7 uprate, all of which were completed on schedule and under budget. FPL will  
8 utilize competitive bidding for major equipment and services suppliers. FPL  
9 has considerable experience undertaking complex projects and the requisite  
10 purchasing. The significant amount of purchasing that FPL does for projects  
11 both within and outside Florida provides good leverage for obtaining  
12 competitive prices for goods and services.

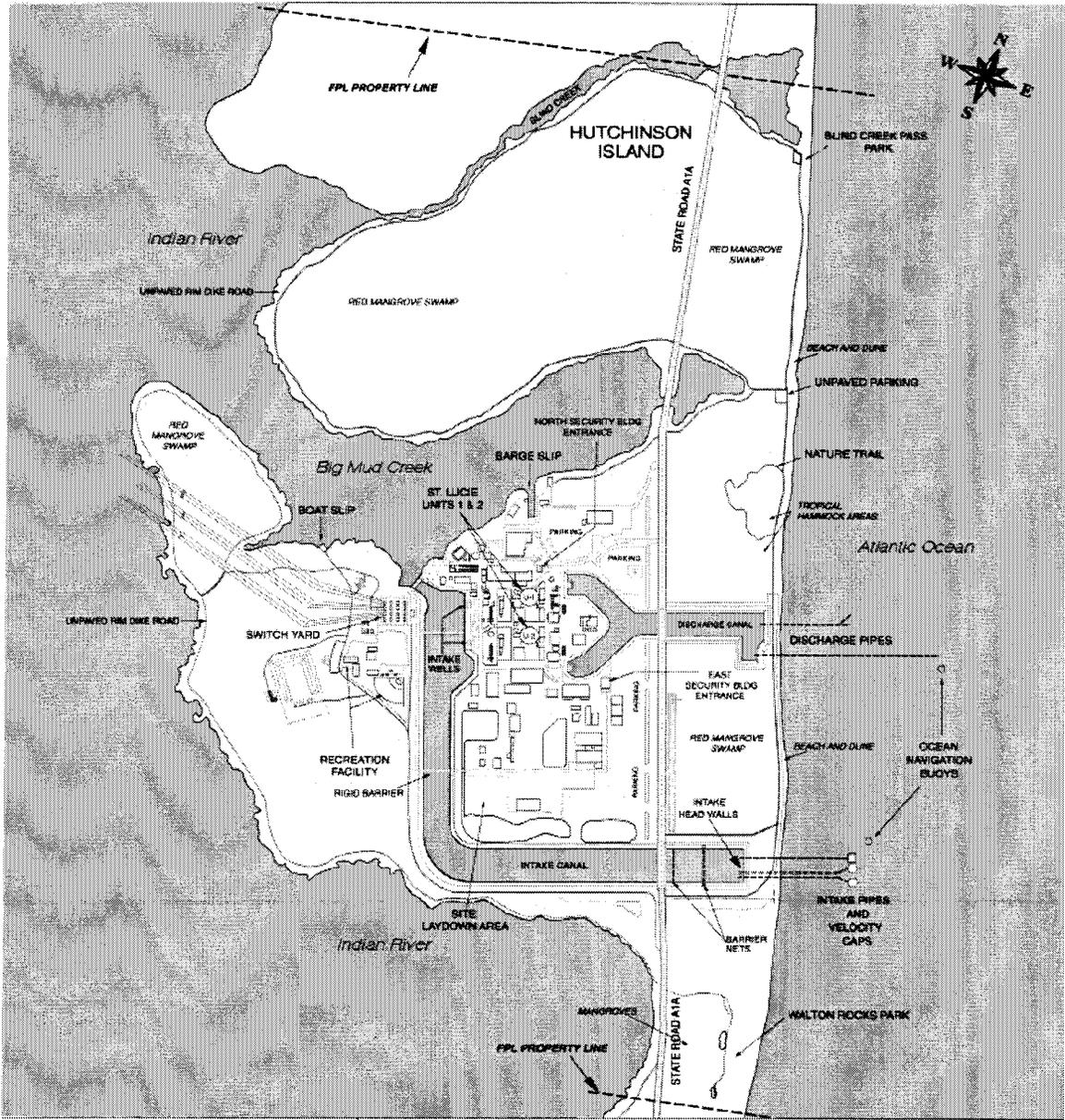
13 **Q. Does this conclude your testimony?**

14 A. Yes.



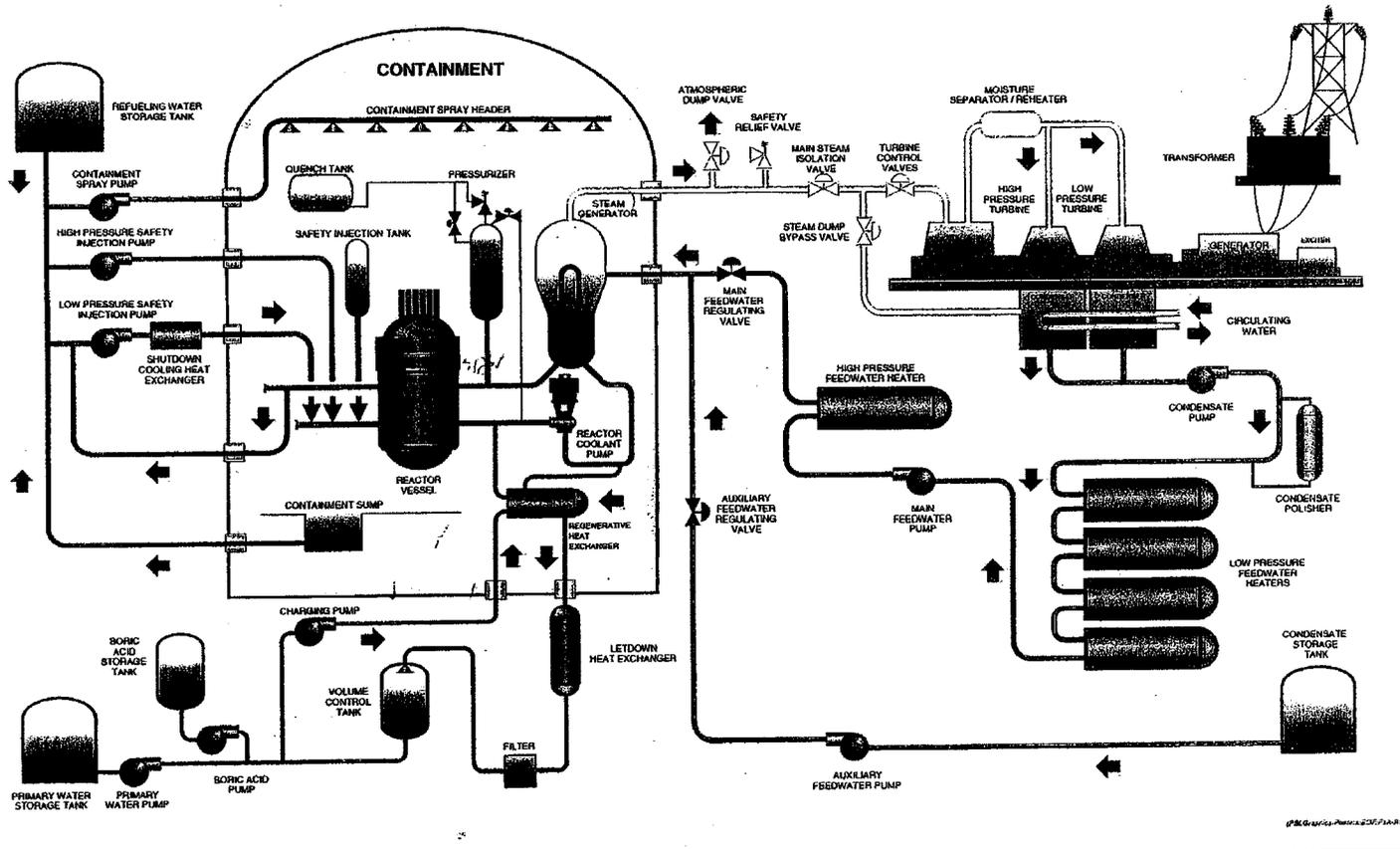


Docket No.  
St. Lucie Units 1&2 Plant Site  
Exhibit No. STH-3, Page 1 of 1





# St. Lucie Nuclear Electric Generating System



Docket No.  
St. Lucie Units 1&2 Nuclear Electric  
Generating System  
Exhibit No. STH-4, Page 1 of 1