ATTACHMENT 2
LICENSE AMENDMENT REQUEST
EXTENDED POWER UPRATE

SUPPLEMENTAL ENVIRONMENTAL REPORT

FLORIDA POWER & LIGHT
ST. LUCIE NUCLEAR PLANT, UNITS 1 AND 2

This coversheet plus 33 pages

1.0 EXECUTIVE SUMMARY

This Supplemental Environmental Report presents Florida Power & Light's (FPL) assessment of the environmental impacts associated with St. Lucie Units 1 and 2 extended power uprate (EPU) from the current licensed core rated power level of 2700 MWt to an uprated core power level of 3020 MWt. Unless otherwise noted, evaluations are based on an analyzed NSSS power level of 3050 MWt, which includes 20 MWt for reactor coolant pump (RCP) heat input, as well as, an adjustment for measurement uncertainty. The intent of this Supplemental Environmental Report is to provide sufficient information for the NRC to evaluate the environmental impact of the EPU in accordance with the requirements of 10 CFR 51. This report is applicable to both St. Lucie Units 1 and 2, unless otherwise discussed herein.

FPL obtained approval for the uprate project under the Florida Electrical Power Plant Siting Act (PPSA), Chapter 403, Part II, Florida Statutes (F.S.). The PPSA provides a centralized review process for new electrical generating facilities in Florida, involving a balancing of "the increasing demand for electrical power plants with the broad interests of the public." The Florida Public Service Commission (FPSC) is the sole forum for the determination of need for a proposed facility. The Florida Department of Environmental Protection (FDEP) acts as the coordinator for the remainder of the site certification process, with input from various state, regional, and local agencies, along with interested citizens. The Governor and Cabinet, sitting as the Siting Board or the Secretary of the FDEP, made the final positive determination on January 7, 2008 approving the uprate project need and on the human and natural environmental and socioeconomic impact.

The EPU will be implemented without making extensive changes to plant systems that directly or indirectly interface with the environment. Plant modifications will be implemented within existing buildings and structures. Transmission line modifications are proposed along the existing transmission line right of way (ROW). These modifications include the addition of subconductor spacers, as well as, installation of an overhead ground wire which will provide a fiber optic communication path for relay protection of the transmission lines. Both of these transmission line modifications will be installed via helicopter. The only interface with the ground along the ROW will be the periodic need to park a truck/trailer containing a spool of ground wire that will be utilized for stringing. The helicopter will be used to perform the stringing operation. Existing ROW permits and licenses cover this type of maintenance activity. In addition, the associated relay protection electronics will be replaced. The EPU will require the uprate of the 230 kV disconnect switches associated with the switchyard breakers to increase their ampere ratings.

None of the proposed modifications will involve land disturbance or new construction outside of the established facility areas.

The generation of low-level radioactive waste will not increase significantly over the current generation rate and is comparable to the Final Environmental Statement (FES) values (References 1.1 and 1.2). There will be minimal changes in the volume of radioactive effluents (liquid and gaseous) released to the environment; however, the radioactive content of the liquid and gaseous releases will increase slightly, but will remain bounded by the FES analysis. All offsite radiation doses will remain small and within applicable regulatory requirements.

This Supplemental Environmental Report is intended to provide sufficient detail on both the radiological and non-radiological environmental impacts of the proposed EPU to allow the NRC

to make an informed decision regarding the proposed action. It does not reassess the current environmental licensing basis or justify the environmental impacts of operating at the current licensed core rated power level of 2700 megawatts. Rather, this document demonstrates that the effects of operating under EPU conditions are bounded by the original analyses documented in the FES, the more recent Supplement 11 of the Generic Environmental Impact Statement (GEIS) (Reference 1.3), or by other current regulatory limits. This Supplemental Environmental Report demonstrates that the EPU will not significantly affect human health or the natural environment.

References

1.1 U.S. Atomic Energy Commission (AEC), 1973, Final Environmental Statement (FES) related to the St. Lucie Plant No. 1; Florida Power & Light Company, Docket No. 50-335, Directorate of Licensing, Washington, D.C.NRC (Nuclear Regulatory Commission).

1.2 U.S. Atomic Energy Commission (AEC), 1974, Final Environmental Statement (FES) related to Construction of St. Lucie Plant Unit 2; Florida Power & Light Company, Docket No. 50-389, Washington, D.C., NRC (Nuclear Regulatory Commission).

1.3 NRC (Nuclear Regulatory Commission), 2003, NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 11, Regarding St. Lucie Units 1 and 2, Final report, Division of Regulatory Improvement Programs, May 2003, Supplement to: 1988, Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, issued in 1988 (NUREG-0586), NRC, 2002.

2.0 INTRODUCTION

St. Lucie Unit 1 is fully owned by FPL. St. Lucie Unit 2 is co-owned by FPL, Orlando Utilities Commission (OUC), and Florida Municipal Power Agency (FMPA). Together, OUC and FMPA own 14.9 percent of St. Lucie Unit 2. FPL has had sole responsibility for operation of St. Lucie Units 1 and 2 since March 1, 1976, and April 6, 1983, respectively.

St. Lucie Units 1 and 2 are located on Hutchinson Island in St. Lucie County, Florida. The nearest municipalities are Fort Pierce, approximately four miles northwest of the plant; Port St. Lucie, approximately two and a half miles to the west; and Stuart, approximately eight miles to the south.

FPL is committed to operating St. Lucie Units 1 and 2 in an environmentally responsible manner. Plant activities, including design, construction, maintenance, and operations are executed in a manner so as to protect the environment and to responsibly manage natural resources. FPL has operated at this site for more than 33 years while providing safe, reliable, and economical electrical power to their customers throughout Florida.

In keeping with this commitment to environmental stewardship and in accordance with regulatory requirements, FPL has conducted an environmental evaluation of the proposed EPU objective to add electrical generation resources to its generating facilities located at the St. Lucie site. The additional electric capacity will be provided without instituting a major construction project which would result in the addition of operational air emissions to the environment. The proposed uprate would serve the future power requirements of the State of Florida and the region.

This environmental evaluation is provided pursuant to 10 CFR 51.41 (Regulations to Submit Environmental Information) and is intended to support the NRC environmental review of the proposed uprate. The proposed EPU License Amendment Request (LAR) will require the issuance of an operating license amendment.

The regulation (10 CFR 51.41) requires that applications to the NRC be in compliance with Section 102(2) of the National Environmental Policy Act (NEPA) and consistent with the procedural provisions of NEPA (40 CFR 1500-1508).

In 1973 and in 1974, the U.S. Atomic Energy Commission (AEC; predecessor agency to NRC) published the Final Environmental Statements Related to the St. Lucie Nuclear Power Plant Units 1 and 2 (FES; AEC 1973, and FES; AEC, 1974) (References 2.1 and 2.2). The AEC concluded that the issuance of the full term operating license, subject to certain conditions including planting trees and monitoring, was the appropriate course of action under NEPA. This decision was based on the analysis presented in the FES and the weight of environmental, economic, and technical information reviewed by the AEC. The NRC subsequently issued the operating license which authorized operation of St. Lucie Units 1 and 2 up to the maximum licensed reactor core thermal power level of 2700 MWt.

In May 2003, the NRC published Supplement 11 of the Generic Environmental Impact Statement for the License Renewal of Nuclear Power Plants that addressed the license renewal of St. Lucie Units 1 and 2 (Reference 2.3). The NRC determined that the adverse environmental impacts of license renewal (i.e., operating an additional 20 years) are not so great that preserving the option of license renewal for energy-planning decision makers would be unreasonable. The decision

was based upon the analysis presented in NUREG-1437, Generic Environmental Impact Statement for the Renewal of Nuclear Power Plants (GEIS; NRC 1996), Supplement 11 (Reference 2.4).

General information about the design and operational features of St. Lucie Units 1 and 2 that are of interest from an environmental impact standpoint is available in several documents. In addition to the FES and Supplement 11 of the GEIS discussed above, other comprehensive sources of information include the Updated Final Safety Analysis Report (UFSAR) prepared and maintained by FPL and the "FPL 2007 Site Certification Application St. Lucie Uprate Project," dated December 2007 (Reference 2.5).

This Supplemental Environmental Report is intended to provide sufficient detail on both the radiological and non-radiological environmental impacts of the proposed EPU to allow the NRC to make an informed decision regarding the proposed action. It does not reassess the current environmental licensing basis or justify the environmental impacts of operating at the current licensed reactor core thermal power level of 2700 megawatts each. Rather; this document demonstrates that the effects of operating under EPU conditions are bounded by the original analyses documented in the FES, the more recent Supplement 11 of the GEIS, or by other current regulatory limits.

References

2.1 U.S. Atomic Energy Commission (AEC), 1973, Final Environmental Statement related to the St. Lucie Plant Unit No. 1; Florida Power & Light Company, Docket No. 50-335, Directorate of Licensing, Washington, D.C., NRC (Nuclear Regulatory Commission).

2.2 U.S. Atomic Energy Commission (AEC), 1974, Final Environmental Statement related to Construction of St. Lucie Plant Unit 2; Florida Power & Light Company, Docket No. 50-389, Washington, D.C., NRC (Nuclear Regulatory Commission).

2.3 NRC (Nuclear Regulatory Commission), 1996, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437, Washington, D.C.

2.4 NRC (Nuclear Regulatory Commission), 2003, NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 11, Regarding St. Lucie Units 1 and 2, Final report, Division of Regulatory Improvement Programs, May 2003.

2.5 Florida Power & Light Company, 2007, Site Certification Application (SCA) St. Lucie Uprate Project, December 2007.

3.0 PROPOSED ACTION AND NEED

The discussion below of the proposed action and need for power comes primarily from the 2007 St. Lucie Uprate Project Site Certification Application (SCA Reference 3.1) and the Public Service Commission Order (Reference 3.2) on that application.

St. Lucie Units 1 and 2 are located on Hutchinson Island in unincorporated St. Lucie County, Florida. The plant consists of approximately 1130 acres of land on the widest section of Hutchinson Island in an area previously degraded by mosquito control projects in Sections 16 and 17, Township 36 South, Range 41 East (Figures 3-1 and 3-2). Port St. Lucie is approximately 2.5 miles southwest, and Fort Pierce is approximately 4 miles northwest of the site. The FPL property boundary is depicted in Figure 3-3.

3.1 Proposed Action

The proposed action is to increase the licensed core thermal power for St. Lucie Units 1 and 2 from the current licensed core rated power level of 2700 MWt to an uprated core power level of 3020 MWt which represents an increase of approximately 11.85 percent. This change in core thermal power level will require the NRC to amend the facility's operating license.

The proposed action is considered an EPU by the NRC since the modifications that are required to be made to St. Lucie Units 1 and 2 are significant and the power uprate is greater than 7 percent. Refer to LR Section 1.0 of this Licensing Report for a description of the uprate related modifications. The proposed modifications will be implemented within the existing buildings and structures at St. Lucie Units 1 and 2 or to existing transmission and distribution facilities external to the buildings. The proposed modifications will not involve any land disturbance outside of the established facility areas, or visual alteration to the appearance of the site.

The modifications necessary to support the power uprates at St. Lucie Units 1 and 2 will be implemented during the 2010, 2011 and 2012 refueling outages. Upon approval of the EPU LAR and following completion of the scheduled outage periods, completion of power ascension and testing, St. Lucie Unit 1 is expected to begin operating at the EPU licensed core rated power level of 3020 MWt in the fall of 2011, St. Lucie Unit 2 is expected to begin operating at the EPU licensed core rated power level of 3020 MWt in the spring of 2012.

3.2 Need for Action

The proposed action is intended to provide an additional supply of electric generation in the State of Florida without the need to site and construct new facilities, or to impose new sources of air or water discharges to the environment. FPL has determined that increasing the electrical output of St. Lucie Units 1 and 2 is the most cost-effective option to meet the demand for electrical energy while enhancing fuel diversity and minimizing environmental impacts, including the avoidance of greenhouse gas (GHG) emissions.

On September 17, 2007, FPL submitted a separate Petition to Determine Need for Expansion of Electrical Power Plants, including St. Lucie Units 1 and 2, to the Florida Public Service Commission (FPSC) pursuant to Section 403.519, Florida Statutes (F.S.) That Petition, along with supporting documentation, addressed the manner in which the project will meet the need for electric system reliability and integrity and the need for adequate electricity at reasonable cost,

whether the project is the most cost-effective alternative available, and whether there is energy conservation available to mitigate the need for all or a portion of the project (Reference 3.1).

On December 10, 2007, the FPSC held a hearing on FPL's Petition to Determine Need and approved the petition. The FPSC approved the stipulated positions by bench decision and granted FPL's petition for a determination of need (Reference 3.2).

References

3.1 Florida Power & Light Company (FPL), 2007, Site Certification Application (SCA), St. Lucie Uprate Project, December 2007.

3.2 Public Service Commission (PSC) Order Number PSC-08-0021-FOF-EI, January 7, 2008.

Figure 3-1 St. Lucie Units 1 & 2 50-Mile Region

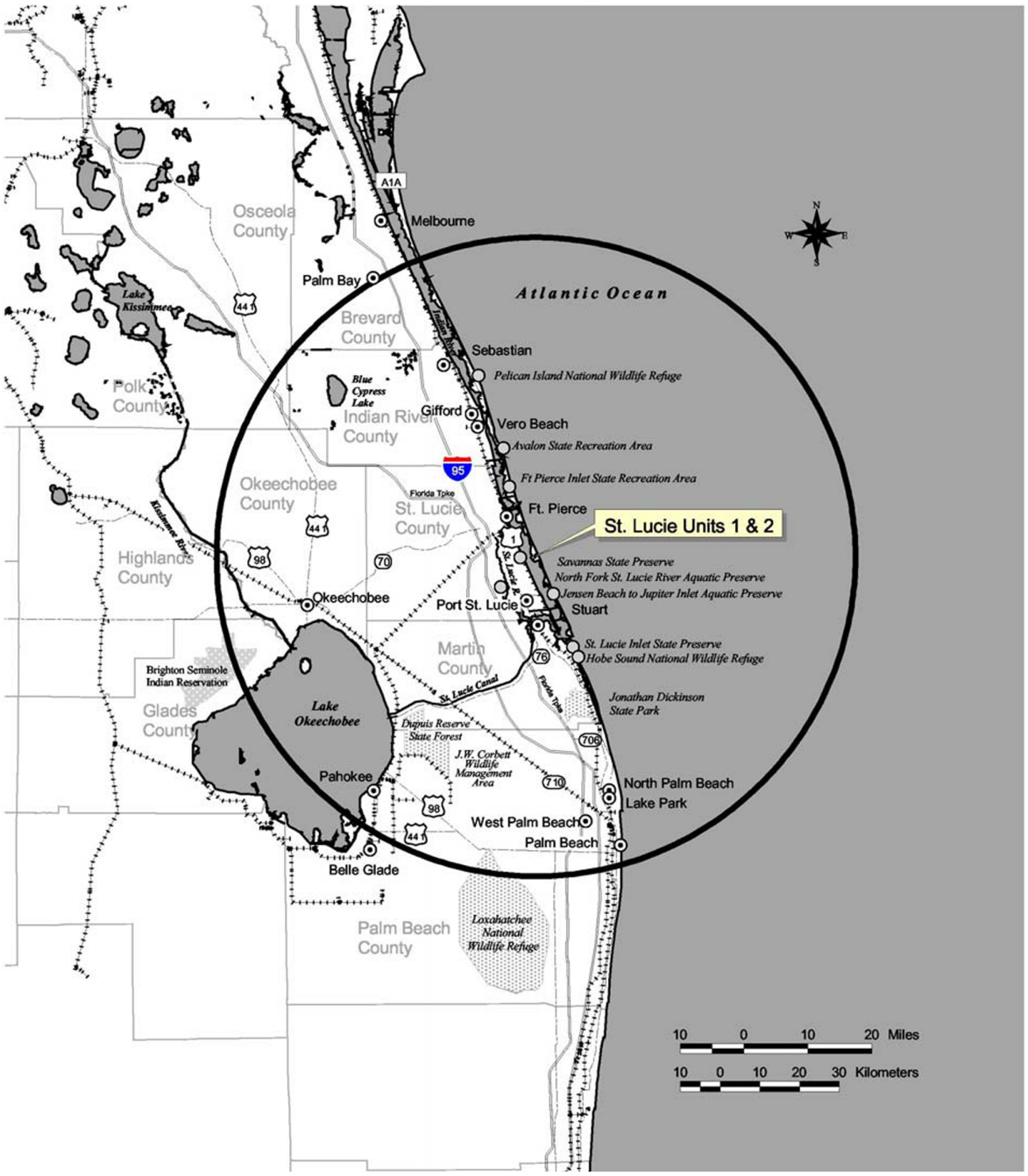


Figure 3-2 St. Lucie Units 1 & 2 6-Mile Region

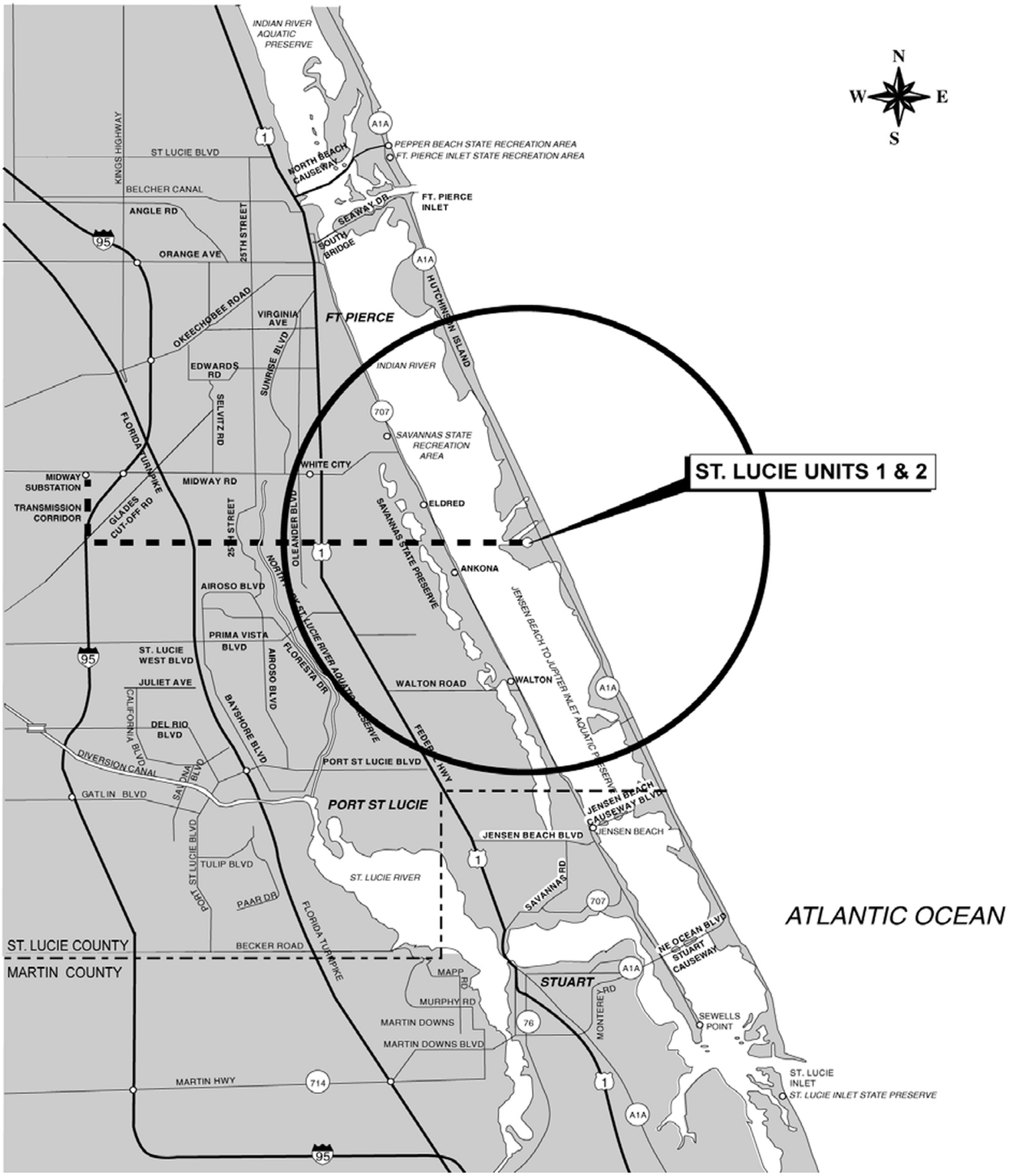
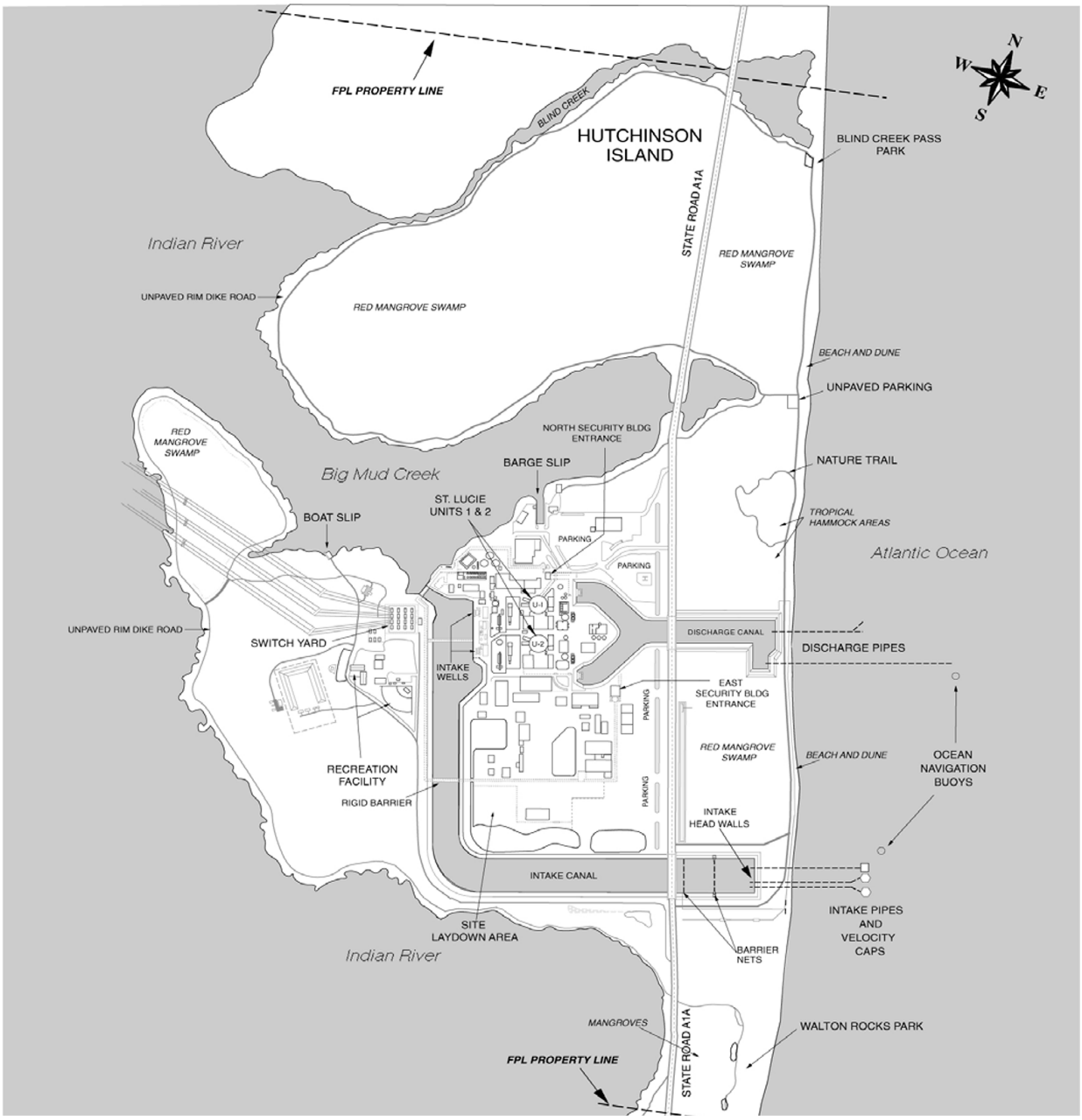


Figure 3-3 St. Lucie Units 1 & 2 Site Boundary



4.0 OVERVIEW OF OPERATIONAL AND EQUIPMENT CHANGES

The EPU will result in an increase in the electrical output of each St. Lucie unit by increasing the licensed core rated power from 2700 MWt to 3020 MWt.

The activities needed to produce the thermal power increase are a combination of those activities that directly produce more power and those activities that will accommodate the effects of the power increase. The primary means of producing more power are a change in the reactor and nuclear thermal-hydraulic parameters. The modifications associated with the EPU are discussed in LR Section 1.0 of the St. Lucie Unit 1 and 2 LAR.

Construction activities associated with the St. Lucie Unit 1 uprate are expected to begin during the Spring outage of 2010 and is scheduled to be completed with the Fall outage of 2011. Construction activities associated with the St. Lucie Unit 2 uprate are expected to begin during the Fall outage of 2010 the balance of which will be completed in the Spring outage of 2012. Certain improvements will also be made while the units are operating. (Reference 4.1)

Upon approval of the EPU LAR and following completion of the implementation of modifications during the scheduled outage periods, completion of power ascension and testing, St. Lucie Unit 1 is expected to begin operating at the EPU licensed core rated power level of 3020 MWt in the Fall of 2011, St. Lucie Unit 2 is expected to begin operating at the EPU licensed core rated power level of 3020 MWt in the Spring of 2012.

References

4.1 Florida Power & Light Company (FPL), Site Certification Application (SCA), St. Lucie Uprate Project, December 2007.

5.0 SOCIOECONOMIC CONSIDERATIONS

The primary discussion of the following socioeconomic considerations is generated from the 2007 St. Lucie Uprate Project Site Certification Application (SCA).

The project is expected to benefit the economies of St. Lucie County and surrounding areas. Direct benefits from the project include employment opportunities created by the construction and continued operation of St. Lucie Unit 1 and St. Lucie Unit 2. It is expected that the majority of the construction wages paid for the project will be spent within St. Lucie County and the surrounding region. These wages will create additional demands for goods and services. Sales tax benefits will accrue to the State of Florida as a result from the construction of the Project. The purchase of goods and services to support the construction of the project is anticipated to occur over a 3-year period beginning in 2010 and ending in 2012 (Reference 5.1).

5.1 Current Socioeconomic Status

The operational employment of both St. Lucie Units is approximately 800 people with a payroll of about $65 million which will continue after the project is complete. The ongoing operation of St. Lucie Units 1 and 2 contribute about $16 million in ad valorem revenue to St. Lucie County. This revenue directly benefits the various County agencies as well as other taxing agencies. No additional staff is required once the project is complete.

5.2 Extended Power Uprate Impacts to Socioeconomics

The proposed EPU is not anticipated to affect the size of the regular FPL workforce. The peak construction workforce is estimated to be 1400 people per outage with an average construction workforce estimated at 1000 employees per outage. Previous refueling outages at St. Lucie Units 1 and 2 have ranged from 600 to 900 construction employees. Outages involving replacement of major components have had a peak construction workforce of about 1750 people. Each outage will be of a duration and magnitude as to not adversely alter local housing availability, traffic patterns or public water supply and sewer systems in the general vicinity of St. Lucie Units 1 and 2. Employee incomes and the purchases of goods and services afforded by those incomes would continue to contribute positively to the communities in the vicinity of St. Lucie Units 1 and 2 during and after the uprate related outage periods.

Over 45,000 construction workers reside within the region, with the majority of these workers located in St. Lucie, Martin, and Palm Beach Counties. Since ample labor supply exists within commuting distance, and since a labor surplus exists within the region, it is anticipated that many workers will be hired either from within the region, or come from farther distances for the short duration outages. Consequently, construction should have no adverse effect on permanent housing.

As is typical with shorter duration construction projects, some workers commuting from longer distances may choose to live in transient accommodations (motels, hotels) on a weekly basis, returning to their permanent homes and families on some weekends. Transient accommodations are plentiful in the area.

Population and housing impacts from construction is expected to be minimal since the amount of construction for the project is within the additional labor requirements of previous outages.

Among the primary direct benefits of the project will be the increase in skilled job opportunities within the region associated with plant construction. Sales tax benefits will accrue to the State of Florida as a result from the construction of the project. These taxes will be placed in the State's general fund and will be available for any use deemed appropriate by the State.

FPL pays annual property taxes to St. Lucie County for St. Lucie Units 1 and 2. Property taxes paid to the County are distributed among such entities as the County school district, the County Board of Commissioners, the County fire district, and the South Florida Water Management District. For the years 1990 to 2000, St. Lucie Units 1 and 2 property taxes comprised about 10.6 percent of St. Lucie County's total property tax revenues. For the years 1997 to 2000, St. Lucie Units 1 and 2 property taxes comprised about 8.1 percent of St. Lucie County's total annual revenues (Reference 5.1). As can be seen in Table 5.2-1, the St. Lucie Units 1 and 2 recent property tax payments contributed from 7.8% to 17.2% of the total county property taxes.

Table 5.2-1
St. Lucie Units 1 & 2 Contribution to
County Property Tax Revenues Since 2003

Year	Total St. Lucie County Property Tax Revenues[a]	Property Tax Paid to St. Lucie County for St. Lucie 1 & 2	Percentage of Total Property Taxes
2003	$94,756,146[a]	$16,189,594	17.1
2004	$109,982,139[a]	$18,870,136	17.2
2005	$133,903,192[a]	$17,895,130	13.4
2006	$163,474,307[a]	$17,331,785	10.6
2007	$205,693,004[a]	$16,067,104	7.8
2008	$202,532,988[a]	$17,302,426	8.5

a. Reference 5.2

FPL payments to engineering and consulting firms, plant equipment suppliers, and local service industries for implementation of the proposed EPU would have a positive, though temporary impact on local and regional economies. There would also be economic benefit to both the regional and local economies of the enhanced viability of St. Lucie Units 1 and 2 long-term operation resulting from the additional electrical generation. That expanded financial viability over the long term, associated with St. Lucie Units 1 and 2 EPU operation, will help regional planners and local governments organize, plan and develop the long term sustained growth for the area.

5.3 Conclusion

Overall impacts to the economy associated with construction and operation of the project are expected to be positive. Labor demands associated with the construction of the project are not expected to create any labor shortages. Expenditures for materials and construction employment will contribute to the economy of St. Lucie County and surrounding counties. Population and housing impacts associated with the project will be slight, due to minimal in-migration into the area.

Construction activities will increase tax revenues to the county and state governments due to sales taxes from the purchase of equipment and material to support construction activities.

Since there will not be an increase in operational workforce upon completion, no changes are anticipated from the direct and indirect impacts upon the local services (e.g., schools, police). The implementation of the EPU modifications via the 2010, 2011, and 2012 outages in and of itself does not necessarily differentiate itself from other outages in terms of benefits to local and regional economies. The ad valorem revenue paid to St. Lucie County associated with St. Lucie Units 1 and 2 will continue to be greater than the cost for county-provided services. Overall, after completion of the project, the operation of St. Lucie Units 1 and 2 will continue to have a long-term economic benefit for St. Lucie County and the surrounding communities.

References

5.1 Florida Power & Light Company (FPL), Site Certification Application (SCA), St. Lucie Uprate Project, December 2007.

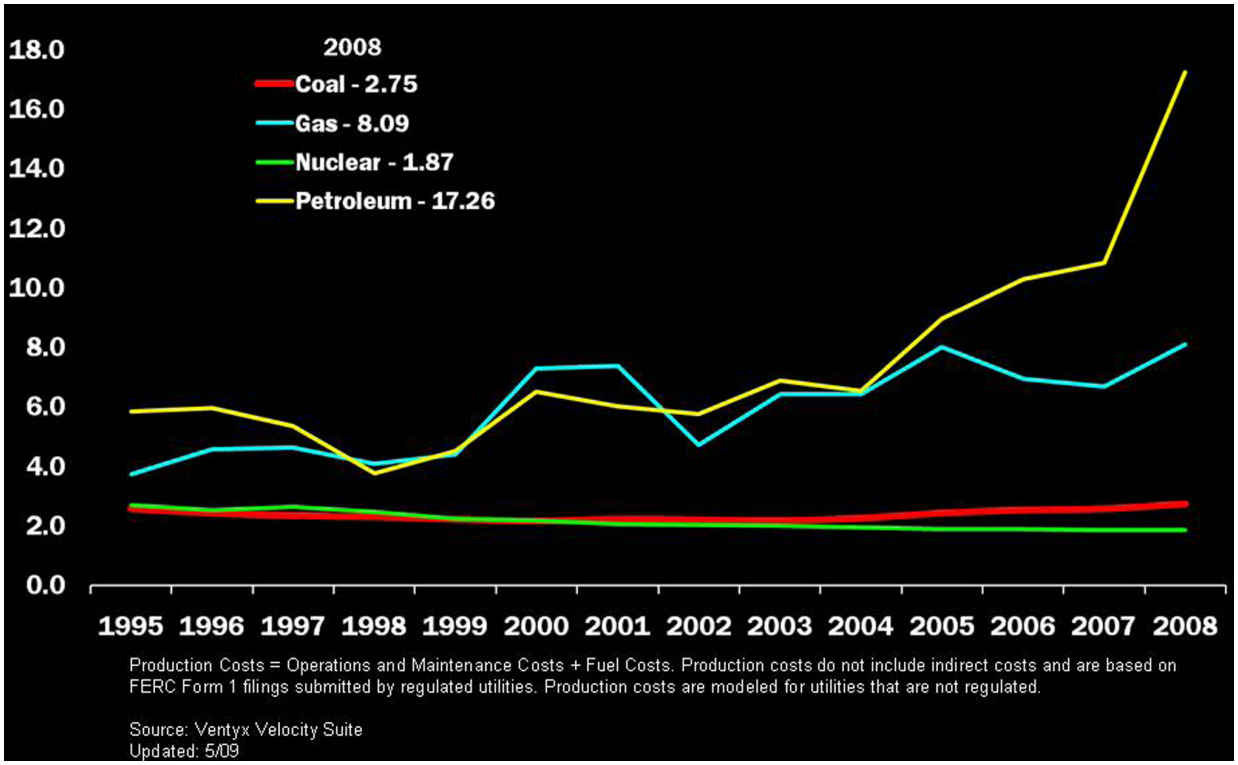
5.2 St. Lucie Fiscal Budget Books, FY2003 - FY2008. http://www.stlucieco.gov/omb/2004-2005.htm

6.0 COST – BENEFIT ANALYSIS

A direct benefit resulting from the proposed EPU to St. Lucie Units 1 and 2 is the additional supply of reliable electric power for residential and commercial customers.

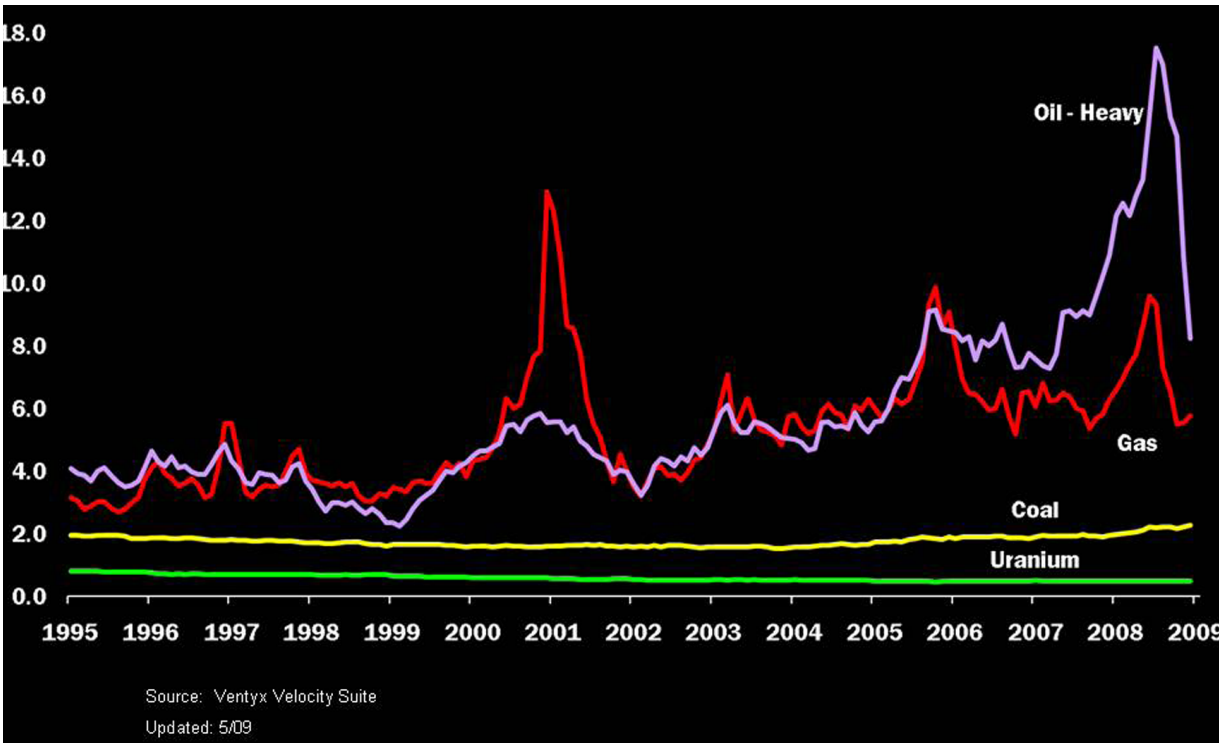
A national comparison of electric generation alternatives, updated through June of 2008, indicates that nuclear power generation production costs are lower than that of coal-fired power, oil-fired power, and natural gas-fired power production. Power production costs represent a combination of fuel, operations, and maintenance costs. The figures below, from the Nuclear Energy Institute, show that the production cost of existing nuclear generating facilities are considerably less than that of oil or natural gas fired steam electric generation sources and even less than that of coal (Reference 6.1).

Figure 6-1 U.S. Electricity Production Costs 1995-2008, In 2008 cents per kilowatt-hour



In addition, the US Nuclear industry continues to maintain and reduce the cost of nuclear fuel each year as can be seen in the graph of fuel costs associated with production of one kilowatt hour of electricity (Reference 6.2). Coal and nuclear generated electric power fuel costs are more steady and consistent and uranium costs per kilowatt-hour continue to be the lowest of the four alternatives.

Figure 6-2 Monthly Fuel Cost to U.S. Electric Utilities 1995-2008, In 2008 cents per kilowatt-hour



A quantitative evaluation of environmental costs of alternatives would not be necessary to recognize that significant new environmental impacts would be avoided by implementing an EPU at St. Lucie Units 1 and 2 compared with other new power development options to deliver additional capacity. Unlike fossil fuel plants, an EPU would not result in a significant source of nitrogen oxides, sulfur dioxide, particulates (PM10 and PM2.5), carbon dioxide, or other regulated atmospheric pollutants as a part of normal operations. Routine operation of St. Lucie Units 1 and 2 at EPU conditions would not contribute to greenhouse gases or acid rain and would likely displace operation of other fossil generating plants in the region.

The radiological effects of the uranium fuel cycle are described in 10 CFR 51.51 and 51.52 and are classified as small. St. Lucie Units 1 and 2 EPU radiological effects fall within the bounds of the tables in 10 CFR 51.52. Although the proposed action would produce additional spent nuclear fuel, this increase would be accommodated by the St. Lucie Units 1 and 2 existing spent fuel storage strategy.

Based upon these considerations, it is reasonable to conclude that the proposed St. Lucie Units 1 and 2 EPU would provide a cost-effective utilization of an existing asset, with minimal environmental impact, making it the preferred means of securing additional generating capacity to support the growing electric load in Florida.

References

6.1 NEI – Electricity production costs (1995 to 2008) access 5/21/2009 at NEI web site. http://www.nei.org/resourcesandstats/documentlibrary/reliableandaffordableenergy/graphicsandcharts/uselectricityproductioncosts/

6.2 NEI - U.S. Nuclear Industry Fuel Costs (1995 to 2009) accessed at NEI on 5/21/2009 at NEI web site. http://www.nei.org/resourcesandstats/documentlibrary/reliableandaffordableenergy/graphicsandcharts/monthlyfuelcosttouselectricutilities/

7.0 NON-RADIOLOGICAL ENVIRONMENTAL IMPACTS

The terrestrial and aquatic resources in the vicinity of St. Lucie Units 1 and 2, as discussed below, as well as potential for any significant adverse impacts to those resources from the proposed EPU, have previously been discussed in the 2007 St. Lucie Uprate Project Site Certification Application (SCA).

7.1 Terrestrial Impacts

7.1.1 Land Use

Land use impacts, transmission line impacts, noise effects and potential impacts to terrestrial biota due to the proposed uprate will be negligible. No new construction is planned outside of existing facilities, with the exception of modifications along the electric transmission ROW as described in Section 7.1.3 of this Supplemental Environmental Report. Plant operation following implementation of the EPU will not require the storage of additional types of industrial chemicals, fuels, or create the need for additional storage tanks onsite.

7.1.2 Historic and Archaeological Resources At and Near St. Lucie Units 1 and 2

FPL is not aware of any significant historical or archeological resources that have been affected to date from operation of St. Lucie Units 1 and 2. Construction activities related to the EPU project will not affect any known archaeological and historical sites in the area (Reference 7.1).

7.1.3 Transmission Facilities

Transmission line modifications are proposed along the existing transmission line ROW. These modifications include the addition of subconductor spacers as well as installation of an overhead ground wire which will provide a fiber optic communication path for relay protection of the transmission lines. Both of these transmission line modifications will be installed via helicopter. The only interface with the ground along the ROW will be the periodic need to park a truck/trailer containing a spool of ground wire that will be utilized for stringing. The helicopter will be used to perform the stringing operation. Existing ROW permits and licenses cover this type of maintenance activity. In addition, the associated relay protection electronics will be replaced. The EPU will require the uprate of the 230 kV disconnect switches associated with the switchyard breakers to increase their ampere ratings.

The increase in electrical power output would cause a corresponding increase in current on the transmission system, and this would result in an increased magnetic field. FPL adopts, by reference, the NRC conclusion that chronic effects of EMF on humans are not quantified at this time, and no significant impacts to terrestrial biota have been identified (Reference 7.5).

7.1.4 Noise

Since the changes being made to the plant are being made within the existing building and structures, the project will not result in any noticeable increase of noise levels from St. Lucie Units 1 and 2 operations. The noise levels in the daytime and nighttime were determined at six far-field and at four boundary locations in September 2007 while St. Lucie Units 1 and 2 were

operating. The results of the noise survey demonstrated that the noise levels from the plant did not exceed the maximum permissible noise levels in the St. Lucie County noise ordinance. St. Lucie Units 1 and 2 will continue to comply with the St. Lucie County noise ordinance.

Construction equipment for the project may include the use of cranes and associated devices to move and position material. However, it should be noted that these activities will be extremely intermittent and transitory, and used to move equipment into the existing St. Lucie Units 1 and 2 buildings. Therefore, overall average noise levels at noise receptors, such as residential boundaries, and noise receptors from construction activities will be either intermittent or attenuated within the existing St. Lucie Units 1 and 2 equipment, structures, or buildings.

7.2 Aquatic Impacts

The location of St. Lucie Units 1 and 2 on Hutchinson Island places it between two major aquatic ecosystems: the Atlantic Ocean to the east and the Indian River Lagoon to the west. The plant uses a once-through cooling system that uses water from the Atlantic Ocean to remove heat from the main (turbine) condensers via the circulating water system (CWS), and to remove heat from other auxiliary equipment via the intake cooling water system (ICWS). The majority of the cooling water is used for the CWS.

The three cooling water intake structures are located approximately 1200 feet (ft) offshore, where the water depth is approximately 23 ft deep. There will be no increase to the cooling water flow rates at St. Lucie Units 1 and 2 as part of the EPU Project, therefore, the current rates of entrainment and impingement of marine organisms will not change.

The cooling water discharge canal is a trapezoidal channel approximately 2200 ft long, 200 ft wide, and 30 ft deep at normal water levels. The discharge canal transports the heated cooling water beneath the beach and dune system to two discharge pipes at its eastern terminus in the Atlantic Ocean. One of the pipes, completed in 1975 to serve St. Lucie Units 1, is 12 ft in diameter and extends approximately 1500 ft offshore, terminating in a two-port “Y” diffuser. The other pipe, installed in 1981 for two unit operation, is 16 ft in diameter, extends approximately 3400 ft offshore, and features a multiport diffuser. This diffuser consists of fifty-eight 16-inch diameter ports located 24 feet apart on the easternmost 1400 feet of the pipe. The discharge of heated water through the Y-port and multiport diffusers ensure distribution over a wide area and rapid and efficient mixing with ambient waters.

The effects of the discharge of cooling water via these discharge structures were evaluated and mixing zones were established as a part of the Plant’s Industrial Wastewater Facility Permit (Reference 7.2). St. Lucie Units 1 and 2 will continue to operate post EPU in full compliance with the requirements of the Industrial Wastewater Facility Permit.

7.3 Sensitive Aquatic Species

There are a number of aquatic species that could be deemed sensitive to any potential changes. These primarily include five sea turtle species known to nest on Hutchinson Island beaches. These sea turtle species are protected and considered either threatened or endangered species. Further discussion pertaining to threatened and endangered species can be found in Section 7.4.

The effects on marine biota of increasing the T from 26°F to 28°F (and higher) were evaluated by FPL prior to St. Lucie Unit 2 becoming operational (ABI, 1980 as cited in Reference 7.1). This marine biota assessment concluded that mobile aquatic organisms would avoid the higher thermal regimes near the discharge and increasing this area would not result in measurable biological impacts. Based on the thermal modeling, after completion of the project, St. Lucie Units 1 and 2 are predicted to have a slightly larger mixing zone than pre-uprate conditions during full flow and capacity. This increase in mixing zone volume is less than 5 percent of the volume. Based on the dimensions of the receiving water (Atlantic Ocean), this increase in area of elevated temperature would not result in a measurable biological impact.

7.4 Threatened and Endangered Species

A number of threatened, endangered, or state species of special concern have been observed in St. Lucie County, on or near St. Lucie Units 1 and 2.

A list of the threatened, endangered, or state species of special concern that have been observed near St. Lucie Units 1 and 2 is provided in Site Certification Application (SCA) Table 2.3.6-1. Many of the species listed in this table are very unlikely to occur on Hutchinson Island due to the high salinity waters of the Atlantic Ocean or the Indian River Lagoon. The red-cockaded woodpecker (Picoides borealis) requires mature pine or pine-oak woods and would be very unlikely to occur in the beach-dune or mangrove habitats of Hutchinson Island.

Due to the existing developed nature of St. Lucie Units 1 and 2 and use of existing construction facilities (i.e., parking and laydown areas), adverse impacts to ecological habitat or resources of threatened or endangered species are not expected to occur as a result of the project.

No adverse impacts to federal or state-listed terrestrial plants or animals are expected during facility operations, due to the existing developed nature of the habitat. No long-term change in the populations of any threatened or endangered species is anticipated as a result of operation of St. Lucie Units 1 and 2.

7.4.1 Threatened and Endangered Terrestrial Species

According to Florida Natural Areas Inventory (FNAI) (2007), the Hutchinson Island area supports potential habitat for several threatened and endangered plant species. These include the fragrant prickly apple (Harrisia fragrans), large-flowered rosemary (Conradina grandiflora), and sand-dune spurge (Chamaesyce cumulicola). Johnson's seagrass (Halophila johnsonii) is a submerged seagrass with long, delicate stems embedded in coastal sediments. The preferred habitat is tidal deltas inside inlets, sandy shoals, and mouths of canals. Two protected plant species were recently reported by FPL (2001): inkberry (Scaevola plumieri) and common prickly pear (Opuntia stricta).

A number of the protected bird species have been observed on Hutchinson Island, including the least tern (Sterna antillarum), black skimmer (Rynchops niger), brown pelican (Pelacanus occidentalis), bald eagle (Haliaeetus leucocephalus), peregrine falcon (Flaco peregrinus), wood stork (Mycteria americana), little blue heron (Egretta caerulea), snowy egret (Egretta thula), reddish egret (Egretta rufescens), and tricolored heron (Egretta tricolor). The latter five species all nest in mangroves. The least tern, a state threatened species, and the black skimmer, a state

species of special concern, nest on the canal berms and building rooftops within the St. Lucie Plant property. The American oystercatcher (Haematopus palliateus), a state species of special concern, also nests on the canal berms. The brown pelican, white ibis (Eudocimus albus), little blue heron, and the southeastern american kestrel (Falco sparverius paulus) were observed in recent surveys at St. Lucie Plant.

Previous surveys indicated gopher tortoises (Gopherus polyphemus), a state-listed threatened species, occupy active burrows on the St. Lucie plant property. Burrows are located in the area east of the State Road A1A in the vicinity of the intake and discharge canals in areas of soft soils that are not subject to flooding. Though none have been sighted on the St. Lucie property, eastern indigo snakes (Drymarchon corias couperi) have been observed on Hutchinson Island and commonly inhabit gopher tortoise burrows.

Two state species of special concern, the gopher frog (Rana capito) and the Florida mouse (Podomys floridanus), are also known to use gopher burrows.

FNAI identified potential habitat for three mammal species, the southeastern beach mouse (Peromyscus polionotus niveiventris), the Florida mouse (Podomys floridanus), and Sherman's squirrel (Sciurus niger shermani). The southeastern beach mouse habitats consist of primary, secondary, and occasionally tertiary sand dunes with a moderate cover of grasses and forbs, including bitter panicum (Panicum amarum), beach dropseed (Sporobolus virginicus), and sea oats. Adjacent coastal palmetto flats and scrub are important habitats for this mouse during and after hurricanes (FNAI, 2004).

The facility does not provide critical habitat for wildlife; therefore, the operation of St. Lucie Units 1 and 2 is not anticipated to result in the reduction of any populations of non-aquatic species after the project is completed. All of the facilities being upgraded are located upon or within previously-impacted areas, which do not provide suitable natural areas for wildlife. No adverse impacts to federal or state-listed terrestrial plants or animals are expected during facility operations following implementation of EPU due to the developed nature of the site.

No changes in wildlife populations at the adjacent undeveloped areas are anticipated, including listed species. Noise and lighting impacts will not change; the project is not anticipated to deter the continued use by wildlife of the undeveloped areas within the St. Lucie Units 1 and 2 site boundary.

7.4.2 Threatened and Endangered Aquatic Species

The most common occurrences of threatened or endangered species near St. Lucie Units 1 and 2 are several species of sea turtles that nest on Hutchinson Island beaches.

A Biological Opinion of 2001 and a Biological Assessment in 2007 identified loggerhead turtles (Caretta caretta), Atlantic green turtles (Chelonia mydas), Kemp's ridley turtles (Lepidochelys kempii), leatherback turtles (Dermochelys coriacea), and hawksbill turtles (Eretmochelys imbricata) as the primary species of concern.

Three of the five sea turtle species identified in the 2001 Biological Opinion, Kemp's ridley, leatherback, and hawksbill, are Federally listed as endangered. The loggerhead is Federally listed as threatened. Atlantic green turtles in U.S. waters are Federally listed as threatened,

except for the Florida breeding population, that is listed as endangered. Due to the inability to distinguish between the two Atlantic green turtle populations away from the nesting beaches, Atlantic green turtles are considered endangered wherever they occur in U.S. waters.

The 2007 Biological Assessment was initiated as a result of the take at the plant of an endangered smalltooth sawfish (Pristis pectinata) on May 16, 2005. (Reference 7.3). This catch of a smalltooth sawfish on the east coast of Florida is outside of the core area of abundance on the southern tip and western side of Florida (Reference 7.4).

References

7.1 Florida Power & Light Company (FPL), Site Certification Application (SCA), St. Lucie Uprate Project, December 2007.

7.2 St. Lucie Industrial Wastewater Facility Permit (Permit No. FL0002208).

7.3 NRC, Biological Assessment St. Lucie Nuclear Power Plant Units 1 and 2, Reinitiation of Section 7 Consultation to Include Sea Turtles, Docket Nos. 50-335 and 50-389, August 2007.

7.4 Draft Programmatic Environmental Assessment and Issuance of Endangered Species Act Section 10(a)(1)(A) Permits for Scientific Research on Endangered and Threatened Sea Turtles in the North Atlantic Ocean, Caribbean Sea and Gulf of Mexico, Section 3.2.2.3 Page 91 as found August 7, 2009 at URL. http://www.nmfs.noaa.gov/pr/pdfs/permits/turtle_ea_draft.pdf

7.5 NUREG-1437, Supplement 11, May 2003, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Regarding St. Lucie Units 1 and 2, Section 4.2.2.

8.0 RADIOLOGICAL ENVIRONMENTAL IMPACTS

8.1 Radiological Waste Streams

The radioactive waste systems at St. Lucie Units 1 and 2 are designed to collect, process, and dispose of radioactive wastes in a controlled and safe manner. The design basis for these systems during normal operations is to limit discharges in accordance with 10 CFR 50, Appendix I. The actual performance and operation of installed equipment, as well as reporting of actual offsite releases and doses, are controlled by the requirements of the Offsite Dose Calculation Manual (ODCM). The ODCM is subject to NRC inspection and describes the methods and parameters used for calculating offsite doses resulting from radioactive gaseous and liquid effluents and ensuring compliance with NRC regulations. Adherence to these limits and objectives would continue under the proposed EPU.

Operation at the proposed EPU conditions would not result in any physical changes to the solid waste, liquid waste, or gaseous waste systems. The safety and reliability of these systems would be unaffected by the proposed EPU. Also, the proposed action would not affect the environmental monitoring of any of these waste streams or the radiological monitoring requirements of the St. Lucie Units 1 and 2 Radiation Protection Program. Under normal operating conditions, the proposed action would not introduce any new or different radiological release pathways and would not increase the probability of an operator error or equipment malfunction that would result in an uncontrolled radioactive release from the radioactive waste streams.

LR Section 2.5.6.1, Gaseous Waste Management Systems; Section 2.5.6.2, Liquid Waste Management Systems; and Section 2.5.6.3, Solid Waste Management Systems, provide a detailed evaluation of effects that the proposed EPU may have on the gaseous, liquid and solid radioactive waste systems. LR Section 2.10.1, Occupational and Public Radiation Doses, provides an evaluation of the impact of EPU on the annual doses to the public.

The following subsections summarize the conclusions of the referenced LR sections, and compare the results against the impacts of the radiological waste system documented in the AEC FES related to the operation of St. Lucie Units 1 and 2 (References 8.1 and 8.2) and the NRC GEIS for License Renewal for St. Lucie Units 1 and 2 (Reference 8.3). It is noted that while releases reported in the FESs for St. Lucie Units 1 and 2 are per unit, the effluent releases reported in Tables 8-1, 8-2, and 8-3 and in the GEIS are for the site. Thus, the sum of the values for activity and volume, respectively, reported in the St. Lucie Unit 1 FES and St. Lucie Unit 2 FES are directly comparable to the current values reported in Tables 8-1, 8-2, and 8-3, which represent the combined operations of St. Lucie Units 1 and 2.

8.1.1 Solid Waste

Solid radioactive wastes include solids recovered from the reactor coolant systems, solids in contact with the liquids or gases associated with the reactor coolant process systems, and solids used in support of the reactor coolant system operation.

The largest volume of solid radioactive waste is low-level radioactive waste (LLRW), which includes bead resin, spent filters, and dry active waste (DAW) from outages and routine

maintenance. DAW includes paper, plastic, wood, rubber, glass, floor sweepings, cloth, metal, and other types of waste routinely generated during operation, maintenance and outages. Table 8-1 presents the average annual volume and activity of LLRW shipped offsite for burial or disposal at St. Lucie Units 1 and 2, for the five-year period between 2003 through 2007.

Table 8-1
Average Annual Low-Level Radioactive Waste Shipped Offsite from St. Lucie Units 1 and 2 2003 – 2007

	Cubic Meters	Curies
Spent Resins, Process Filters, etc.	4.57E+00	2.13E+02
Dry Active Waste (DAW)	2.22E+02	7.48E+00
Irradiated Components	0.00E+00	0.00E+00
Other	5.08E+01	1.21E+01
Overall Annual Average Using Five Years (2003 – 2007) of Solid Waste Shipment Data	2.77E+02	2.32E+02
References 8.4, 8.5, 8.6, 8.7, and 8.8		

LR Section 2.5.6.3, Solid Waste Management Systems, provides an evaluation of effects the proposed EPU may have on the solid waste management system. The results of the evaluation indicate that the proposed EPU has no significant effect on the generation of solid waste volume from the primary and secondary side systems since the systems functions are not changing and the volume of inputs remain the same.

As noted in LR Section 2.10.1.2.4, Normal Operation Radwaste Effluents and Annual Dose to the Public, the activity levels for most of the solid waste would increase proportionately to the increase in activity of long-lived radionuclides in the reactor coolant bounded by a 12.2% maximum increase based on current operation at licensed power level of 2700 MWt and EPU operation at the analyzed power level of 3030 MWt (includes a 0.3% margin for power uncertainty). The activity contained in the waste following uprate is estimated to be bounded by an increase of 14.2%, i.e., 12.2%/0.861 (average weighted capacity factor for years 2003–2007).

It is noted that the annual average activity contained in the solid waste shipped from St. Lucie Units 1 and 2 in Table 8-1 for the pre-EPU condition (232 Ci) is comparable to the activity (537 Ci) identified in Section 2.1.4.3 of the NRC GEIS (Reference 8.3) related to the operation of St. Lucie Units 1 and 2 in 2000. The annual average volume in the solid waste shipped from St. Lucie Units 1 and 2 in Table 8-1 for the pre-EPU condition (277 m^3) is greater than that identified in Section 2.1.4.3 of the NRC GEIS (78.8 m^3), primarily due to increases in DAW volumes that resulted from clean-up campaigns performed because of projected future changes in disposal capacity and costs and changes that occurred in LLW packaging and disposal processes since the NRC GEIS experience in 2000. The AEC FES for St. Lucie Unit 1 (Reference 8.1) estimated that 2000 ft^3 (56.6 m^3) of solid waste containing approximately 3000 Ci of activity will be shipped annually. The NRC FES for St. Lucie Unit 2 (Reference 8.2) did not provide estimates for the volume of solid waste or the associated activity.

Section 8.2 of this appendix addresses the impact of the EPU increase in solid waste activity on the offsite doses.

8.1.2 Liquid Waste

Liquid radioactive wastes include liquids from the reactor process systems and liquids that have become contaminated with process system liquids. Table 8-2 presents liquid releases from St. Lucie Units 1 and 2 for the five-year period from 2003 through 2007. As noted in Table 8-2, approximately 73.5 million gallons and 0.138 Ci of fission and activation products were released in an average year.

Table 8-2
Liquid Effluent Releases from St. Lucie Units 1 and 2
2003 – 2007

Year	Volume Released (gallons)	Activity Released (Ci)	Tritium (Ci)
2003	3.27E+07	9.25E-02	1.10E+03
2004	7.50E+07	1.75E-01	7.48E+02
2005	8.74E+07	2.88E-01	3.36E+02
2006	1.65E+08	9.16E-02	1.99E+02
2007	7.09E+06	4.15E-02	8.21E+02
Annual Average	7.35E+07	1.38E-01	6.42E+02
References 8.4, 8.5, 8.6, 8.7, 8.8, and 8.9			

As indicated in LR Section 2.5.6.2, Liquid Waste Management Systems, the pre-EPU volume of liquid waste is expected to be representative of future operation at EPU conditions. This conclusion is based on the observation that EPU implementation would not significantly increase the inventory of liquid normally processed by the liquid waste management system since system functions are not changing and the volume inputs remain the same.

As noted in LR Section 2.10.1.2.4, Normal Operation Radwaste Effluents and Annual Dose to the Public, the proposed EPU would result in an increase (approximately 12.2% for tritium and radionuclide with long half-lives) in the equilibrium radioactivity in the reactor coolant, which in turn would impact the concentrations of radioactive nuclides in the waste management systems. Iodines would increase by approximately 12.3%, but are a small contributor (<2%) to organ doses resulting from radioactive liquid effluent releases.

It is concluded that, on average, the projected releases following EPU remain bounded by values provided in the FES for St. Lucie Unit 1 and the FES for St. Lucie Unit 2. The FES for St. Lucie Unit 1 estimated annual releases of 1000 curies of tritium and approximately 30 curies of all other nuclides. The FES for St. Lucie Unit 2 noted that while St. Lucie Unit 2 had performed the cost benefit analysis as required by Section II.D of Appendix I to 10 CFR 50, the staff elected to evaluate the final designs of the radwaste systems and the effluent control measures based on the requirements of the Annex to Appendix I, since FPL had previously elected on July 1, 1976, to show conformance to the Annex. Under this constraint, the estimated annual release was

510 Curies of tritium and 0.45 Curies of non-gaseous activity. The GEIS reported an annual release of 557 curies of tritium and 0.076 curies of all other radionuclides based on 2000 effluent data for both units which is within the range experienced in years 2003–2007.

Section 8.2 of this appendix addresses the offsite radiation dose consequences of the EPU liquid effluent releases.

8.1.3 Gaseous Waste

Gaseous radioactive wastes are principally activation gases and noble gases resulting from process operations, including continuous cleanup of the reactor coolant system, gases used for tank cover gas, and gases collected during venting. Table 8-3 presents gaseous releases from St. Lucie Units 1 and 2 from 2003 through 2007.

Table 8-3
Gaseous Effluent Releases from St. Lucie Units 1 and 2
2003 – 2007

Year	Noble Gases (Ci)	Particulates ($T_{1/2}$ > 8 days) (Ci)	Iodine-131 (Ci)	Tritium (Ci)
2003	2.43E+00	2.69E-05	1.72E-05	2.61E+01
2004	5.83E+00	8.12E-05	5.19E-04	1.45E+01
2005	7.98E+00	4.29E-05	2.96E-05	6.24E+01
2006	3.21E+01	2.52E-04	3.94E-06	2.70E+01
2007	1.56E+01	2.75E-05	4.60E-04	1.38E+02
Annual Average	1.28E+01	8.62E-05	2.06E-04	5.36E+01
References 8.4, 8.5,8.6, 8.7, and 8.8				

The evaluation presented in LR Section 2.5.6.1, Gaseous Waste Management Systems, indicates that implementation of the proposed EPU does not significantly increase the inventory of nonradioactive carrier gases normally processed in the gaseous waste management system, since plant system functions are not changing and the volume inputs remain the same.

As noted in LR Section 2.10.1.2.4, Normal Operation Radwaste Effluents and Annual Dose to the Public, for all noble gases, the proposed EPU will result in a bounding maximum 12.9% increase in effluent releases. Gaseous radionuclides with short half-lives will have increases up to a bounding value of 13.2%, whereas the increase in tritium releases is expected to be 12.2%. Though the estimated increase in iodine releases is expected to be higher, tritium is the controlling isotope (>70%) for the thyroid dose at St. Lucie Units 1 and 2.

For particulates, an approach using very conservative assumptions was dictated by the fact that the annual effluent release reports do not distinguish between the sources of particulates or iodines released. Using such conservative assumptions, secondary side moisture carryover becomes a major factor in determining the non-volatile activity in the steam. The conservatively estimated EPU multiplier (~9.89) applicable to radioactive particulates released from the turbine

building via main steam leaks and air ejector exhaust is significantly higher than the percentage of the EPU (primarily due to a conservatively estimated 8.8 fold increase in moisture carryover that results from the use of the design moisture carryover fraction of 0.1% as representative of EPU operation, coupled with a 12.2% increase in coolant concentration). This creates the potential for a shift in the critical organ from thyroid (in which tritium and iodine are the principal contributors) to bone. While it is highly unlikely that the release from steam leakage is the controlling contributor for particulates, a bounding scaling factor approach was utilized to estimate the impact of the EPU.

The projected releases would remain bounded by the AEC FES, which estimated average annual releases of 4800 Ci for noble gases and 1.0 Ci for I-131 for St. Lucie Unit 1 and 15,000 Ci for noble gases, 0.05 Ci for particulates and 0.12 Ci for I-131 for St. Lucie Unit 2. Section 2.1.4.2 of the NRC GEIS reported noble gas releases of 14 Ci, I-131 releases of 1.5E-05 Ci, particulate releases of 3.8E-04 Ci and tritium releases of 178 Ci based on the 2000 annual effluent data for both Units.

Section 8.2 addresses the offsite radiation dose consequences of the EPU effluent releases.

8.2 Radiation Levels and Offsite Doses

8.2.1 Operating and Shutdown In-Plant Levels

In-plant radiation levels and associated doses are controlled by the St. Lucie Units 1 and 2 Radiation Protection Program to ensure that internal and external radiation exposures to station personnel, and the general population will be as low as reasonably achievable (ALARA), as required by 10 CFR 20. FPL's policy is to maintain occupational doses to individuals and the sum of dose equivalents received by all exposed workers ALARA.

LR Section 2.10.1.2.1, Normal Operation Radiation Levels and Shielding Adequacy provides an analysis of the impact of the proposed EPU on radiation levels and shielding adequacy and the resulting occupational dose. The analysis considered the impact of increasing the core power level on neutron flux and gamma flux in and around the core, fission product and actinide activity inventory in the core and spent fuels, N-16 source in the reactor coolant, neutron activation source in the vicinity of the reactor core, and fission/corrosion products activity in the reactor coolant and downstream systems. The results indicate that in-plant radiation sources are anticipated to increase approximately linearly with the increase in core power level.

Shielding is used throughout St. Lucie Units 1 and 2 to protect personnel against radiation from the reactor and auxiliary systems, and to limit radiation damage to operating equipment. The evaluation of the present shielding design has determined that it is adequate for the increase in radiation levels that may occur following power operation under EPU conditions since the increase is offset by:

- conservative analytical techniques typically used to establish shielding requirements,
- conservatism in the original design basis reactor coolant source terms used to establish the radiation zones, and
- Technical Specification 3.4.8 which limits the reactor coolant concentrations to levels significantly below the original design basis source terms.

Therefore, no new dose reduction programs are planned and the ALARA program would continue in its current form.

8.2.2 Offsite Doses at Power Uprate Conditions

LR Section 2.10.1.2.4, Normal Operation Radwaste Effluents and Annual Dose to the Public, provides an analysis of the impact of the proposed EPU on offsite doses using scaling techniques based on NUREG-0017, Revision 1 methodology. This analysis conservatively projects maximum doses from normal operation under the proposed EPU conditions taking into consideration the following:

- plant core power operating history during years 2003 through 2007,
- the reported gaseous and liquid effluent and dose data during that period,
- NUREG-0017 equations and assumptions,
- conservative methodology

Pre-EPU dose estimates were calculated by taking the average five-year doses during the period from 2003 through 2007 (organ and whole body) coupled with annual core power levels and normalizing the doses to those equivalent to operation at a 100% capacity factor (100% CF). To predict doses under the proposed EPU conditions, the analysis assumes that the maximum increase in radioactivity content of the liquid and gaseous releases is proportional to the percentage increase in the primary and secondary coolants over that of the pre-EPU case.

For liquid effluents, the pre-EPU offsite dose estimates are developed by averaging and adjusting the dose information for the years 2003 through 2007. Following EPU, FPL predicts that the maximum annual total body and organ doses (all pathways) from liquid effluent releases would increase approximately 12.2%. As demonstrated in Table 8-4, the estimated EPU doses due to liquid effluents are significantly below the regulatory design objectives of 10 CFR 50, Appendix I.

Table 8-4
Average Off-Site Dose Commitments from Liquid Effluents
St. Lucie Units 1 and 2

Type of Dose	Appendix I Design Objectives (2 units)	Base Case 2003–2007 Adjusted Doses @100% CF	Scaled Post-EPU Annual Dose	Percentage of Appendix I Design Objectives for EPU Case
Liquid Effluents				
Dose to total body from all pathways	6 mrem/yr	2.89E-02 mrem/yr	3.24E-02 mrem/yr	0.54%
Dose to any organ from all pathways	20 mrem/yr	1.21E-01 mrem/yr (Lung)	1.36E-01 mrem/yr (Lung)	0.68%

Similarly, for gaseous effluents, the pre-EPU offsite dose estimates are developed by averaging and adjusting the dose information for the years 2003 through 2007. Application of the scaling

factors for various chemical/physical groups provided an estimate of the maximum dose that could be attributed to normal operation post-EPU. In the particulate and iodine category, particulates and iodines, entrained in the secondary steam, were calculated to have the highest scaling factor and were used for the bounding case. This produced a conservative but improbable shift in the limiting organ which previously had been the “thyroid” to the “bone”. Regardless, as demonstrated in Table 8-5, the estimated EPU doses due to gaseous effluents are significantly below the regulatory design objectives of 10 CFR 50, Appendix I.

Table 8-5
Average Off-Site Dose Commitments from Gaseous Effluents
St. Lucie Units 1 and 2

Type of Dose	Appendix I Design Objectives (2 units)	Base Case 2003–2007 Adjusted Doses @100% CF	Scaled Post-EPU Annual Dose	Percentage of Appendix I Design Objectives for EPU Case
Gaseous Effluents				
Gamma Dose in Air	20 mrad/yr	2.99E-03 mrad/yr	3.37E-03 mrad/yr	1.7E-02%
Beta Dose in Air	40 mrad/yr	1.66E-03 mrad/yr	1.87E-03 mrad/yr	4.7E-03%
Dose to total body of an individual	10 mrem/yr	Not Reported[a]	-	-
Dose to skin of an individual	30 mrem/yr	Not Reported[a]	-	-
Radioiodines and Particulates Released to the Atmosphere				
Dose to any organ from all pathways	30 mrem/yr	2.45E-03 mrem/yr (Thyroid)	6.94E-03 mrem/yr (Bone)	2.3E-02%
a. Not Reported values are per St. Lucie’s ODCM methodology				

The maximum average direct shine dose due to solid waste would be projected to increase by no more than 14.2% (=12.2%/0.861, where 0.861 is the average capacity factor during 2003-2007) due to the activity increase in the waste. This increase would occur over time as (a) the current waste decays and its contribution decreases, (b) stored radwaste is routinely moved offsite for disposal, and c) waste generated post EPU enters into storage.

The 40 CFR 190 whole body dose limit of 25 mrem to any member of the public includes (a) contributions from direct radiation (including skyshine) from contained radioactive sources within the facility, (b) the whole body dose from liquid release pathways, and (c) the whole body dose to an individual via airborne pathways.

As noted in the St. Lucie Units 1 and 2 Annual Radioactive Effluent Reports, “The results of direct radiation monitoring are consistent with past measurements for the specified locations. The exposure rate data show no indication of any trends attributed to effluents from the plant. The measured exposure rates are consistent with exposure rates that were observed during the

pre-operational surveillance program." Thus, the annual direct shine dose due to plant operation during the pre-EPU 5 yr period evaluated was deemed "negligible".

For the EPU, the direct shine dose due to plant operation would increase by the increase percentage of the power level, i.e., 12.2%, however, as discussed above, the direct shine contribution due to accumulation of stored solid radwaste could increase by a bounding value of 14.2%. A conservative bounding scaling factor of 14.2% would not significantly change the estimated EPU direct shine dose at the site boundary which would remain negligible. It is noted that procedures and controls in the ODCM monitor and control this component of the off-site dose and would limit, through administrative and storage controls, the offsite dose to ensure compliance with the 40 CFR 190 whole body dose limits.

Taking into consideration the magnitude of the estimated annual EPU doses due to gaseous and liquid effluent releases and the negligible direct shine dose contribution, it is concluded that the 40 CFR 190 whole body dose limit of 25 mrem/yr will not be exceeded by operation at EPU conditions.

References:

8.1 U.S. Atomic Energy Commission (AEC), June 1973, Final Environmental Statement related to the St. Lucie Plant No. 1; Florida Power and Light Company, Docket No. 50-335.

8.2 U.S. Nuclear Regulatory Commission (NRC), NUREG-0842, April 1982, Final Environmental Statement related to Operation of St. Lucie Plant Unit 2; Florida Power and Light Company, Docket No. 50-389.

8.3 NUREG-1437, Supplement 11, May 2003, Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding St. Lucie Units 1 and 2.

8.4 Florida Power & Light Company, St. Lucie Units 1 & 2 Dockets Nos. 50-335 and 50-389, 2003 Annual Radioactive Effluent Release Report, L-2004-050, February 27, 2004.

8.5 Florida Power & Light Company, St. Lucie Units 1 & 2 Dockets Nos. 50-335 and 50-389, 2004 Annual Radioactive Effluent Release Report, L-2005-038, February 28, 2005.

8.6 Florida Power & Light Company, St. Lucie Units 1 & 2 Dockets Nos. 50-335 and 50-389, 2005 Annual Radioactive Effluent Release Report, L-2006-058, February 28, 2006.

8.7 Florida Power & Light Company, St. Lucie Units 1 & 2 Dockets Nos. 50-335 and 50-389, 2006 Annual Radioactive Effluent Release Report, L-2007-030, February 27, 2007.

8.8 Florida Power & Light Company, St. Lucie Units 1 & 2 Dockets Nos. 50-335 and 50-389, 2007 Annual Radioactive Effluent Release Report, L-2008-029, February 27, 2008.

8.9 Florida Power & Light Company, St. Lucie Units 1 & 2 Dockets Nos. 50-335 and 50-389, Corrections to 2004, 2006, and 2007 Annual Radioactive Effluent Release Reports, L-2009-196, August 26, 2009.

9.0 ENVIRONMENTAL EFFECTS OF URANIUM FUEL CYCLE ACTIVITIES AND FUEL AND RADIOACTIVE WASTE TRANSPORT

NRC regulations 10 CFR 51.51 (Table S-3) provide the basis for evaluating the contribution of the environmental effects of the uranium fuel cycle to the environmental impacts of licensing a nuclear power plant. NRC regulations 10 CFR 51.52 (Table S-4) describe the environmental impacts of transporting nuclear fuel and radioactive wastes. The tables were developed in the 1970s. Since that time, most plants have increased both their uranium-235 enrichment and the fuel's burnup limits.

In 1999, in connection with the Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants, NRC reviewed transporting higher enrichment and higher burnup fuel to a geologic repository (Reference 9.1). The conclusion of that evaluation was that Table S-4 applies to spent fuel enriched up to 5 percent uranium-235 with average burnup for the peak rod to current levels approved by NRC up to 62,000 MWD/MTU, provided higher burnup fuel is cooled for at least 5 years before being shipped.

Since the fuel enrichment for the EPU will not exceed 5.0 weight percent U-235 and the rod average discharge exposure will not exceed 62,000 MWD/MTU, the potential environmental impacts of the proposed St. Lucie power uprate will remain bounded by these conclusions and will not be significant to human health or the environment.

St. Lucie Units 1 and 2 are currently licensed to use uranium-dioxide fuel that has a maximum enrichment of 4.5 percent by weight of uranium-235. The typical average enrichment for a fuel reload is currently approximately 4.0 percent by weight U-235.

For St. Lucie Units 1 and 2 operation under EPU conditions, the burnup limit is unchanged (the upper exposure limit is bounded by maintaining fuel within the NRC-approved vendor specific exposure limits), and the U-235 enrichment limit of 5% by weight is not exceeded; therefore, the St. Lucie Units 1 and 2 fuel cycles continue to remain bounded by the impacts listed in Tables S-3 and S-4 of 10 CFR 51.

Increasing the electrical output at St. Lucie Units 1 and 2 is accomplished primarily by generating higher steam flow in the steam generators and supplying it to the turbine generator. The higher steam flow is achieved by increasing the reactor power level and feedwater flow to the steam generators. The additional reactor energy requirements for EPU are mainly met by increasing the reload fuel batch size. The EPU does not require any significant changes to fuel design.

St. Lucie Units 1 and 2 manipulate the contents of their reactor cores by replacing fuel and altering fuel bundle locations in order to achieve optimal core configuration at approximately 18-month intervals. The refueling schedule would remain the same following implementation of the EPU. During the St. Lucie Unit 1 Fall 2011 refueling outage, more than 1/3 of the existing core will be replaced in support of the EPU. During the St. Lucie Unit 2 Spring 2012 refueling outage, similarly more than 1/3 core replacement will occur. For both St. Lucie Units, the fuel assembly discharge burnup would be limited such that no fuel pins exceed the maximum fuel rod limits approved by the NRC up to 62,000 MWD/MTU. Reload design goals would maintain the St. Lucie Units 1 and 2 18-month fuel cycles within the limits bounded by the impacts analyzed in Tables S-3 and S-4 of 10 CFR 51. Therefore, it is concluded that impacts to the uranium cycle

and transport of nuclear fuel from the proposed action would be insignificant and not require mitigation.

References

9.1 NRC (Nuclear Regulatory Commission), 1999, Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437, Vol. 1, Addendum 1), Division of Regulatory Improvement Programs, Office of Nuclear Reactor Regulation, August 1999.

10.0 EFFECTS OF DECOMMISSIONING

Environmental impacts from the activities associated with the decommissioning of any nuclear power reactor before or at the end of an initial or renewed license period are evaluated in the Generic Environmental Impact Statement for Decommissioning of Nuclear Facilities, NUREG-0586, Original and Supplement 1 (References 10.1 and 10.2). The conclusions of this report are that environmental impacts of decommissioning are generally small and that only two environmental issues would require site-specific evaluation, threatened and endangered species and environmental justice. The NRC procedures for all phases of decommissioning are described in NRC regulations (Title 10 of the Code of Federal Regulations, Part 20, Subpart E, and Parts 50.75, 50.82, 51.53, and 51.95).

The Section 5.12 of the FES for St. Lucie Unit 2 discusses the expected impacts of decommissioning in a brief general fashion. However, the FES for St. Lucie Unit 1 did not evaluate the environmental effects of decommissioning. In 1988, NRC published the Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities (NUREG-0586; NRC 1988) that discusses decommissioning of nuclear power plants. Procedures for decommissioning a nuclear power plant are found in NRC regulations in 10 CFR 50.75, 50.82, 51.23, and 51.95.

The incremental environmental impacts associated with decommissioning activities resulting from continued plant operation during the renewal term are evaluated in the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS), NUREG-1437, Volumes 1 and 2 (U. S. Nuclear Regulatory Commission 1996; 1999 (Reference 10.3). The evaluation in NUREG-1437 includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Supplement 11 discusses in Chapter 7, the effects of the later decommissioning on the local St. Lucie environment. For all the Category I environmental issues (radiation doses, waste management, air quality, water quality, ecological resources, and socioeconomic impacts) reviewed in Supplement 11, the NRC staff concluded that impacts of license renewal would be small and mitigation would not be sufficiently beneficial to be warranted.

Prior to any decommissioning activity at St. Lucie Unit 1 or 2, FPL would submit a post shutdown decommissioning activities report to describe planned decommissioning activities, any environmental impacts of those activities, a schedule, and estimated costs. Implementation of an EPU does not affect FPL's ability to maintain financial reserves for decommissioning nor does the EPU alter the decommissioning process.

The potential environmental impacts on decommissioning associated with the proposed EPU would be due to the increased neutron fluence. As a result, the amount of activated corrosion products could increase, and consequently, the post-shutdown radiation levels could increase. Radiation levels as a result of operations under the proposed EPU conditions to be are considered to be insignificant, and would be addressed in the post-shutdown decommissioning activities report.

References

10.1 NRC (Nuclear Regulatory Commission), 1988, Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, issued in 1988 (NUREG-0586).

10.2 NRC (Nuclear Regulatory Commission), 2002, NUREG-0586 - Generic Environmental Impact on Decommissioning of Nuclear Reactors, Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors. Main Report, Appendices A through M, Final Report, November 2002.

10.3 NRC (Nuclear Regulatory Commission), 2003, Generic Environmental Impact Assessment for License Renewal of Nuclear Plants, Supplement 11, Regarding St. Lucie Units 1 and 2, Final report, Division of Regulatory Improvement Programs, May 2003.