APPENDIX C. THREATENED AND ENDANGERED SPECIES CORRESPONDENCE

FPL = Florida Power & Light Company

FWCC = Florida Fish and Wildlife Conservation Commission

FWS = U.S. Fish and Wildlife Service

NMFS = National Marine Fisheries Service

Florida Power & Light Company, 6501 South Ocean Drive, Jensen Beach, FL 34957

PSL-LR-01-0053

Mr. James J. Slack
Field Supervisor
US Fish and Wildlife Service
P. O. Box 2676
Vero Beach, FL 32961-2676

Subject: St. Lucie Plant
License Renewal Project
NRC Informal Consultation Preparation

Dear Mr. Slack:

Florida Power & Light Company (FPL) is preparing an application to renew the operating licenses for St. Lucie Units 1 and 2, and we intend the application to be consistent with your agency's interests and the priorities of our community. As part of the license renewal process, the Nuclear Regulatory Commission (NRC) requires that applicants identify adverse impacts to threatened and endangered species resulting from continued operation of the facility or refurbishment activities associated with license renewal.

FPL believes that continued operation of the St. Lucie Plant will have no adverse impact on any protected species. Environmental Protection Plans (EPPs) are included in the St. Lucie Units 1 and 2 Operating Licenses. Specifically, FPL's compliance with the EPPs ensures the continued protection of sea turtles. In addition, there are no planned operational or refurbishment activities for the period of extended operations that would invalidate this conclusion. The NRC may request an informal consultation from your agency on this matter.

To assist you in making your determination, two figures are enclosed which depict the St. Lucie Plant site and the associated vicinity.

It is our intent that, by contacting you at this point in the process, we can identify any concerns or data needed so that those areas identified can be addressed to ensure that the consultation process proceeds smoothly and efficiently.

an FPL Group company

Florida Power & Light Company, 6501 South Ocean Drive, Jensen Beach, FL 34957

We would appreciate it if you would provide your comments and any additional information or actions that might be required from FPL to expedite the upcoming consultation process.

If you have any comments or questions, please contact T. V. Abbatiello at (561) 467-7316.

Sincerely yours,

R. S. Kundalkar
Vice President
St. Lucie Plant

EAT/TVA/sap

Enclosures: Figure 1 - St. Lucie Units 1 & 2, 6-Mile Vicinity
Figure 2 - St. Lucie Site Boundary

an FPL Group company

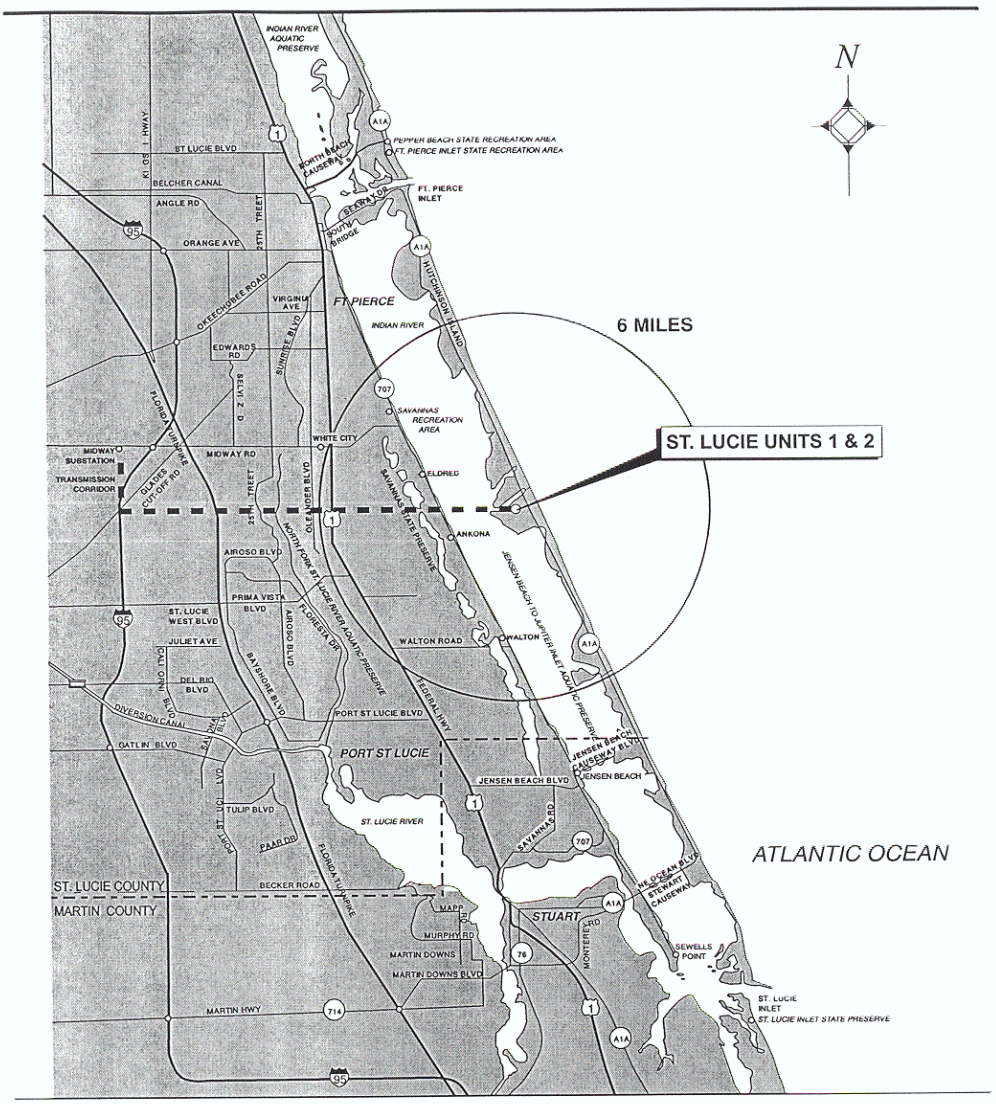

FIGURE 1
St. Lucie Units 1 & 2, 6-Mile Vicinity

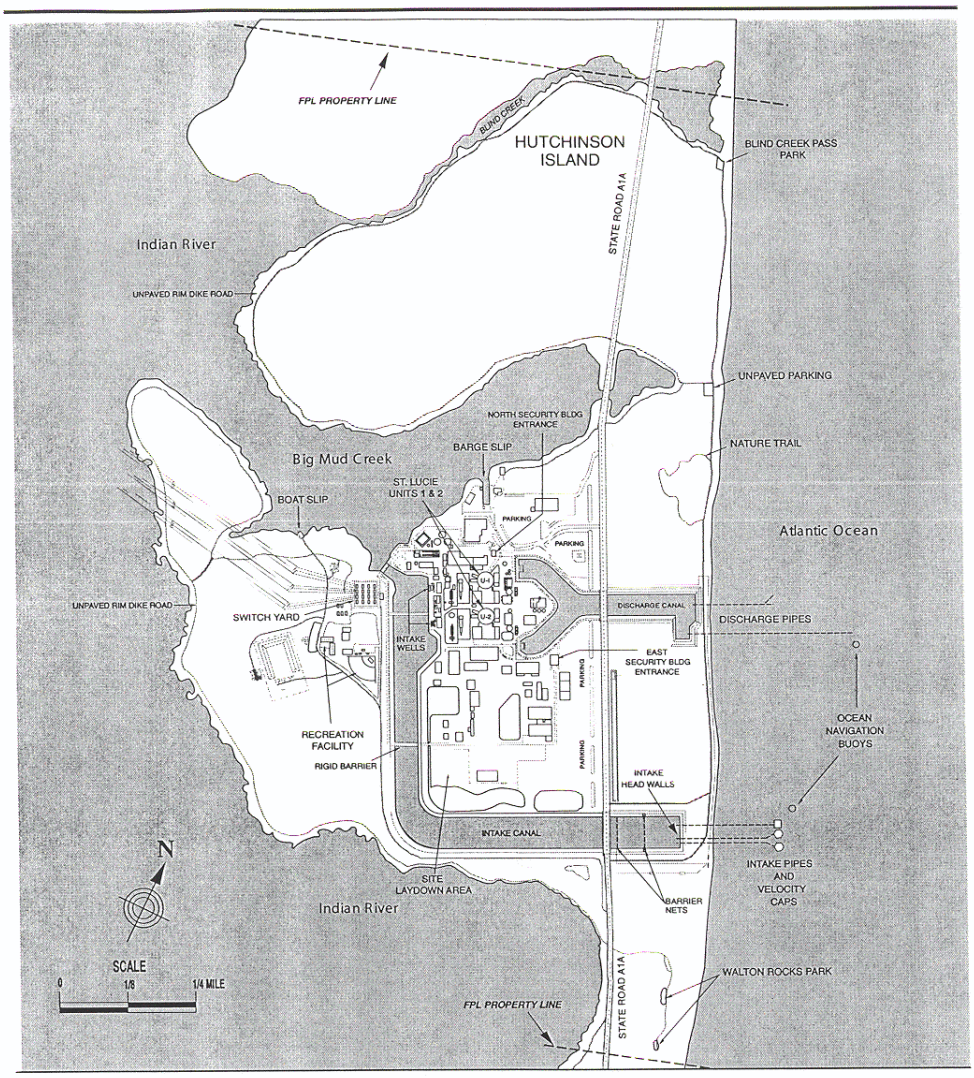

FIGURE 2
St. Lucie Site Boundary

Florida Power & Light Company, 6501 South Ocean Drive, Jensen Beach, FL 34957

PSL-LR-01-0054

Mr. Robert Hoffman
National Marine Fisheries Service
9721 Executive Center Drive, North
St. Petersburg, FL 33702

Subject: St. Lucie Plant
License Renewal Project
NRC Informal Consultation Preparation

Dear Mr. Hoffman:

Florida Power & Light Company (FPL) is preparing an application to renew the operating licenses for St. Lucie Units 1 and 2, and we intend the application to be consistent with your agency's interests and the priorities of our community. As part of the license renewal process, the Nuclear Regulatory Commission (NRC) requires that applicants identify adverse impacts to threatened and endangered species resulting from continued operation of the facility or refurbishment activities associated with license renewal.

FPL believes that continued operation of the St. Lucie Plant will have no adverse impact on any protected species. Environmental Protection Plans (EPPs) are included in the St. Lucie Units 1 and 2 Operating Licenses. Specifically, FPL's compliance with the EPPs ensures the continued protection of sea turtles. In addition, there are no planned operational or refurbishment activities for the period of extended operations that would invalidate this conclusion. The NRC may request an informal consultation from your agency on this matter.

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an FPL Group company

Florida Power & Light Company, 6501 South Ocean Drive, Jensen Beach, FL 34957

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If you have any comments or questions, please contact T. V. Abbatiello at (561) 467-7316.

Sincerely yours,

R. S. Kundalkar
Vice President
St. Lucie Plant

EAT/TVA/sap

Enclosures: Figure 1 - St. Lucie Units 1 & 2, 6-Mile Vicinity
Figure 2 - St. Lucie Site Boundary

an FPL Group company

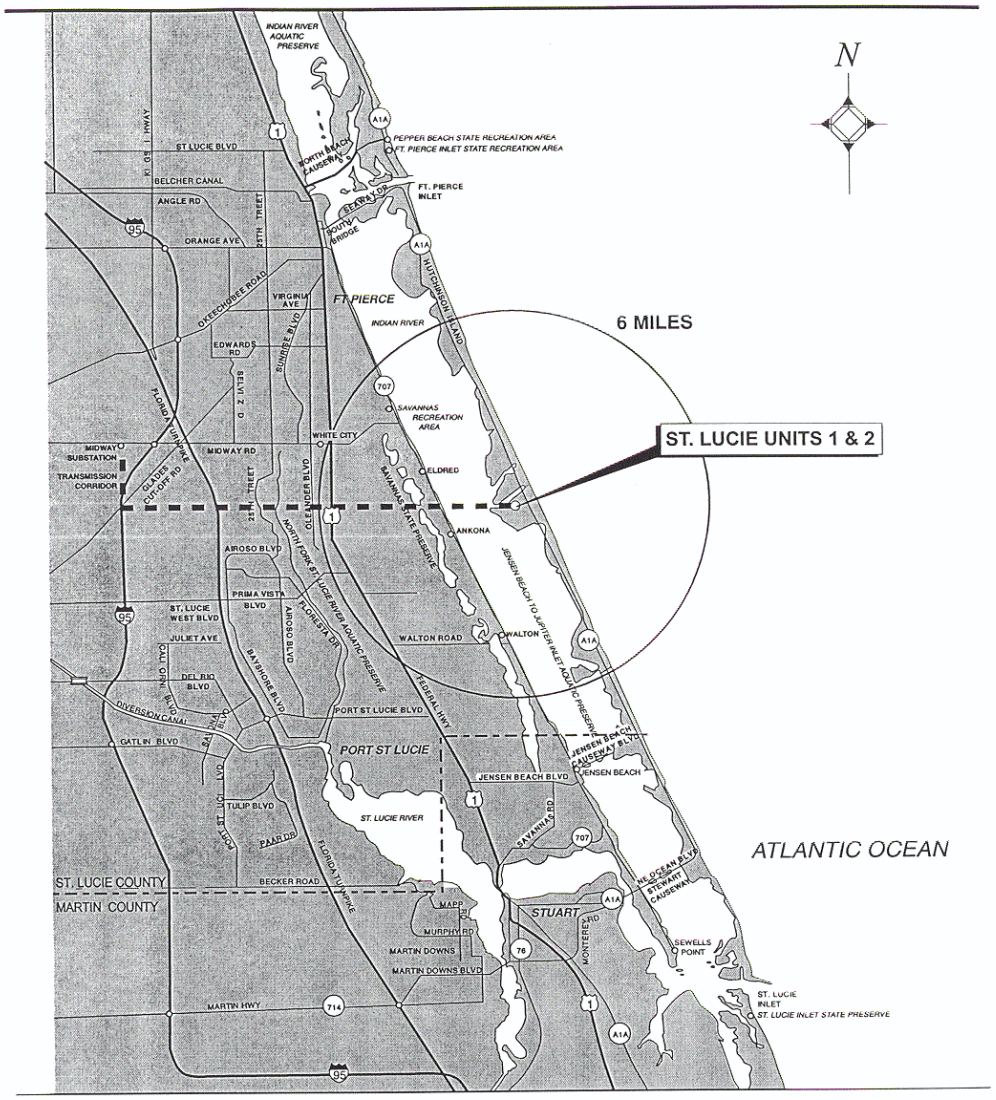


FIGURE 1
St. Lucie Units 1 & 2, 6-Mile Vicinity

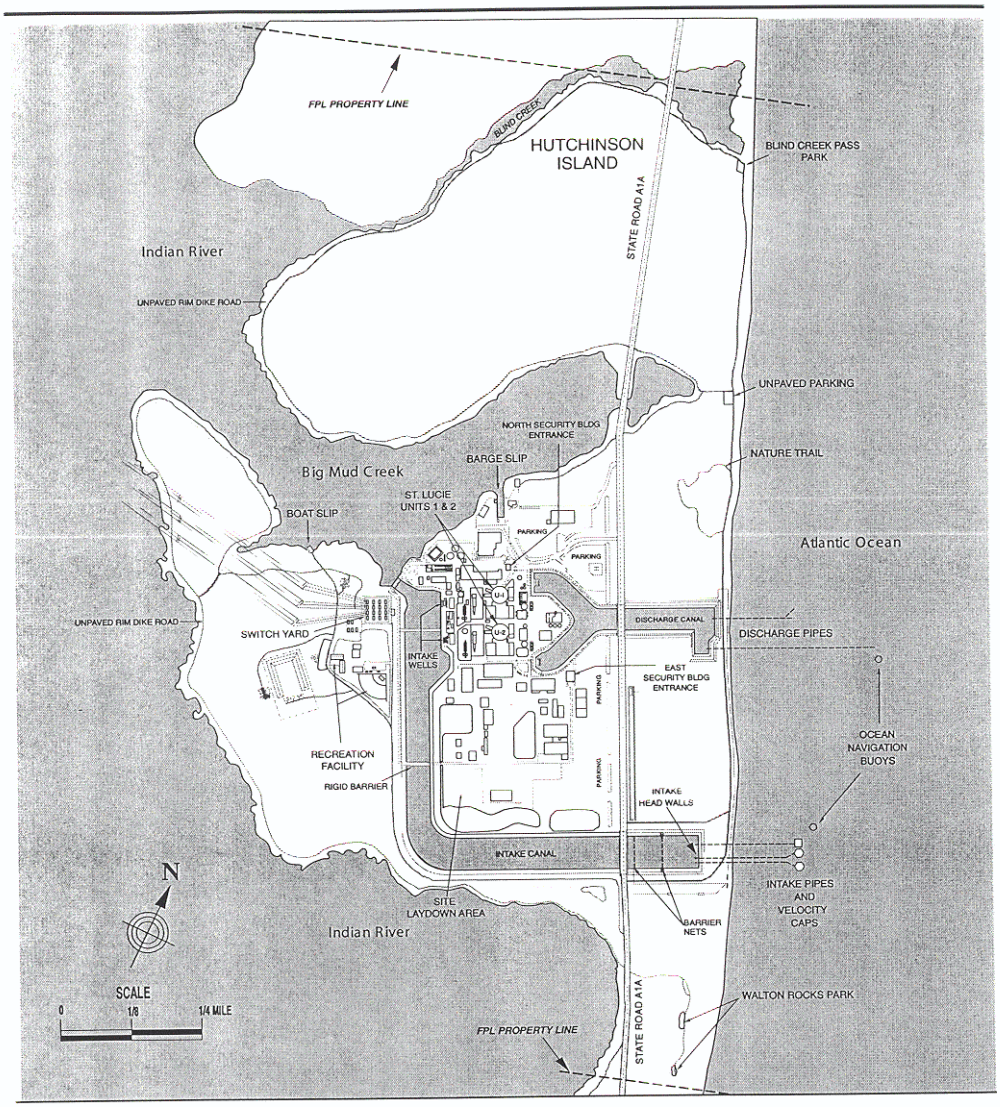


FIGURE 2
St. Lucie Site Boundary

Florida Power & Light Company, 6501 South Ocean Drive, Jensen Beach, FL 34957

PSL-LR-01-0052

Dr. Allan Egbert
Executive Director
Florida Fish and Wildlife Conservation Commission
620 South Meridian Street
Tallahassee, FL 32399

Subject: St. Lucie Plant
License Renewal Project
NRC Informal Consultation Preparation

Dear Dr. Egbert:

Florida Power & Light Company (FPL) is preparing an application to renew the operating licenses for St. Lucie Units 1 and 2, and we intend the application to be consistent with your agency's interests and the priorities of our community. As part of the license renewal process, the Nuclear Regulatory Commission (NRC) requires that applicants identify adverse impacts to threatened and endangered species resulting from continued operation of the facility or refurbishment activities associated with license renewal.

FPL believes that continued operation of the St. Lucie Plant will have no adverse impact on any protected species. Environmental Protection Plans (EPPs) are included in the St. Lucie Units 1 and 2 Operating Licenses. Specifically, FPL's compliance with the EPPs ensures the continued protection of sea turtles. In addition, there are no planned operational or refurbishment activities for the period of extended operations that would invalidate this conclusion. The NRC may request an informal consultation from your agency on this matter.

To assist you in making your determination, two figures are enclosed which depict the St. Lucie Plant site and the associated vicinity.

It is our intent that, by contacting you at this point in the process, we can identify any concerns or data needed so that those areas identified can be addressed to ensure that the consultation process proceeds smoothly and efficiently.

an FPL Group company

Florida Power & Light Company, 6501 South Ocean Drive, Jensen Beach, FL 34957

We would appreciate it if you would provide your comments and any additional information or actions that might be required from FPL to expedite the upcoming consultation process.

If you have any comments or questions, please contact T. V. Abbatiello at (561) 467-7316.

Sincerely yours,

R. S. Kundalkar
Vice President
St. Lucie Plant

EAT/TVA/sap

Enclosures: Figure 1 - St. Lucie Units 1 & 2, 6-Mile Vicinity
Figure 2 - St. Lucie Site Boundary

an FPL Group company

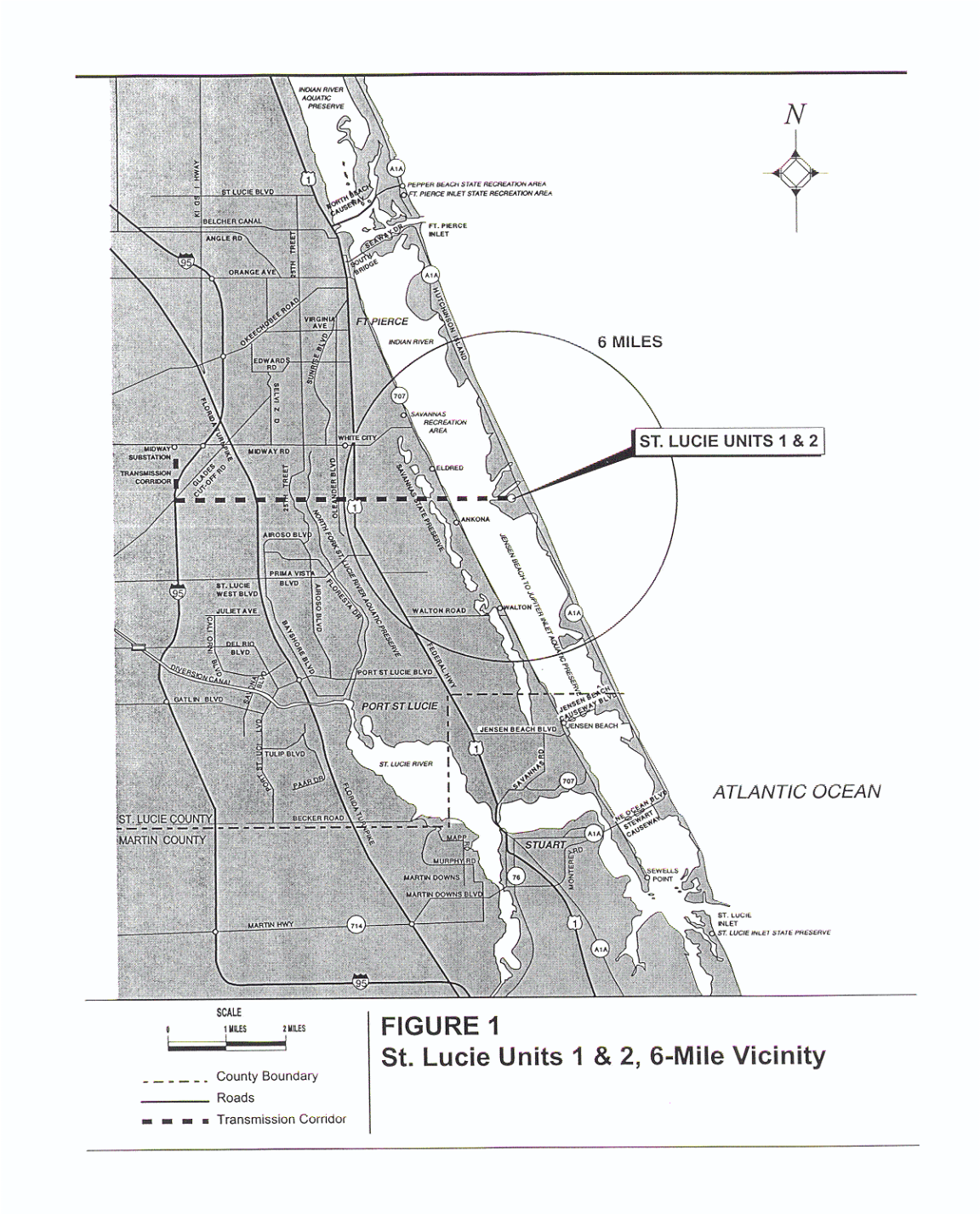


FIGURE 1
St. Lucie Units 1 & 2, 6-Mile Vicinity

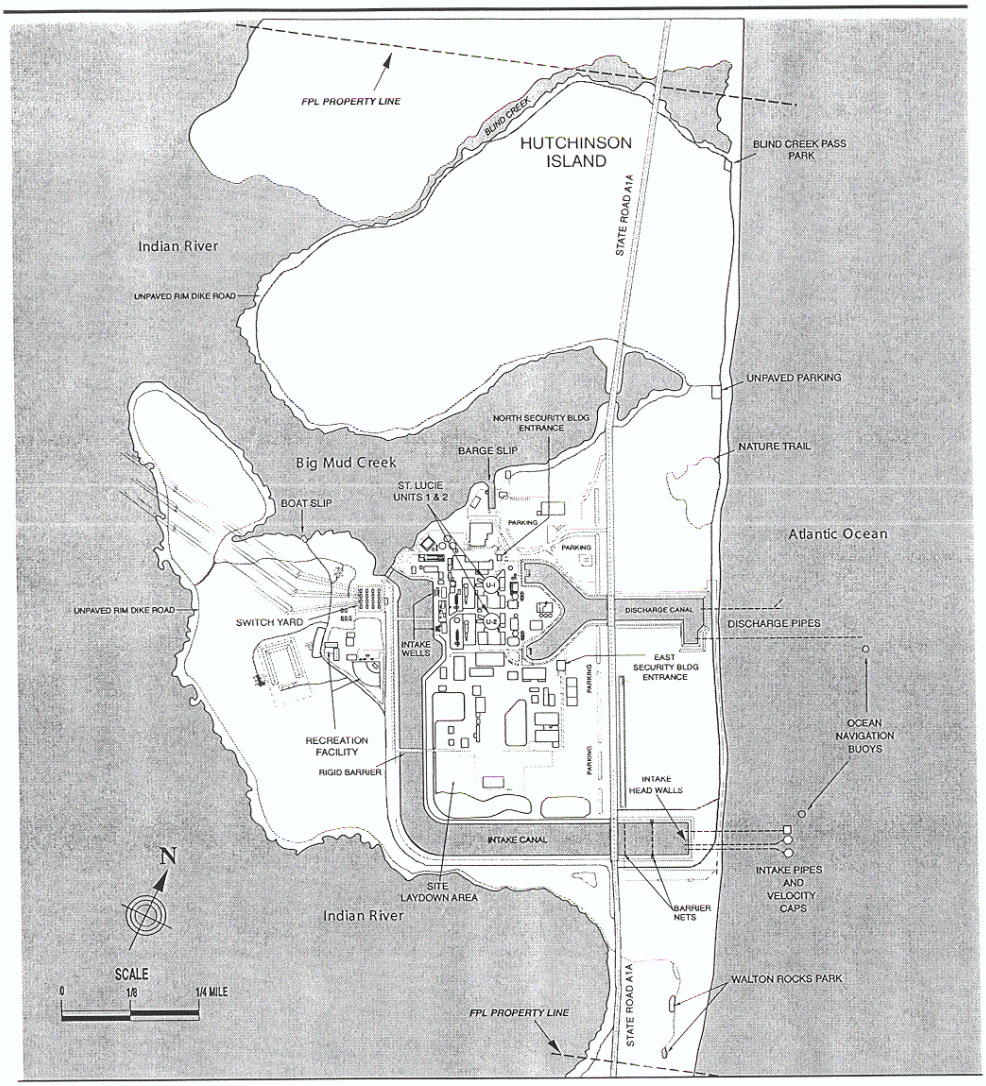


FIGURE 2
St. Lucie Site Boundary

June 22, 2001

Mr. R.S. Kundalkar, Vice President
Florida Power & Light Company
St. Lucie Plant
6501 South Ocean Drive
Jensen Beach, FL 34957

RE: St. Lucie Plant, License Renewal
NRC Informal Consultation
Preparation

Dear Mr. Kundalkar:

I have reviewed your recent request for early identification and resolution of protected species concerns relative to the operation of Florida Power & Light (FPL) Company's St. Lucie Plant. Our staff has worked closely with employees at the St. Lucie Plant to ensure that impacts to threatened and endangered species, particularly manatees and sea turtles, are minimized. We recognize the effort FPL has put into ensuring protection of these species during plant operation. While protected species issues may involve staff time and other costs for the plant, continuation and improvement of ongoing measures should be a major focus for this facility.

The St. Lucie Plant currently has active programs for stranding and salvage of sea turtles entrained in the intake canal, as well as nesting surveys and protection on adjacent beaches. Operation of the plant does cause take of sea turtles that become trapped in the intake canal. This incidental take has been authorized under the Federal Endangered Species Act, provided all Terms and Conditions in the Biological Opinion are met. Captured turtles should be marked using the most up-to-date technologies so that recapture events can be monitored. Currently, turtles are tagged with conventional metal tags on their front flippers. These tags can be lost or torn. More reliable internal tags, such as PIT-tags, should be used for marking turtles that are captured in the intake canal. Efforts should also be made to collect tissue samples from each captured animal for DNA work. This procedure, which requires relatively little

time or supplies, would allow identification of origin for the different turtles captured and add substantially to our existing knowledge about Florida's sea turtles.

Currently, sea turtles in the intake canal are captured and either taken to a rehabilitation facility for treatment or released directly back into the ocean. Our staff believes it is crucial that the St. Lucie Plant maintains its current ability to respond to sea turtle entrapment and stranding events. Rehabilitation facilities in Florida often are overwhelmed with injured sea turtles. Ideally, the plant should investigate the creation and management of a small rehabilitation facility on-site to handle injured turtles that are rescued from plant property.

The St. Lucie Plant site also includes several miles of sea turtle nesting beaches along the Atlantic shoreline; threatened loggerhead, and endangered green and leatherback turtles nest here. Ongoing nesting surveys and nest inventories should continue, as well as efforts to reduce raccoon predation when needed. If possible, standardized surveys should start March 1 annually to ensure that all nests of the endangered leatherback turtle are documented and protected. This species can begin nesting as early as February on the Atlantic coast. Estimates of nest productivity are crucial for assessing the value of the plant's beaches for nesting, particularly if reproductive females are routinely entrained in the intake canal during nesting season. Any construction activities planned for plant facilities on or near the nesting beach should be scheduled to occur outside marine turtle nesting season, March 1 through October 31.

Any proposed new technologies for plant operation that could affect the marine or estuarine environment should be carefully assessed to determine potential impacts to sea turtles and manatees. Efforts to minimize loss of persistent plant-produced debris, such as sponge balls accidentally discharged into coastal ecosystems, should continue. If possible, alternate, less harmful technologies should be implemented if such impacts are identified.

Operation of the St. Lucie Plant can also impact endangered manatees. Over the past twelve years, there have been five documented instances of manatees becoming trapped in the plant's intake canal. Several of these animals exhibited lacerations and signs of trauma, perhaps due to their entrainment. In such instances, prompt and appropriate responses can ensure the animal's survival and recovery.

Thank you for the opportunity to provide input on this important issue. We look forward to continuing to work with FPL, and their St. Lucie Plant staff, for the protection of Florida's threatened and endangered wildlife. Please contact Mr. Bradley Hartman at (850)488-6661 if you require additional information on this topic.

Sincerely,

Allan L. Egbert, Ph.D.
Executive Director

ALE/BJH/RT
ENV 7-3
A:\trkr437-kundalkar.doc
cc: Mr. T.V. Abbatiello

APPENDIX D. CULTURAL RESOURCES CORRESPONDENCE

FPL = Florida Power & Light Company

SHPO = State Historic Preservation Officer

Florida Power & Light Company, 6501 South Ocean Drive, Jensen Beach, FL 34957

PSL-LR-01-0055

Ms. Janet Snyder-Matthews
State Historic Preservation Officer
Division of Historical Resources
500 South Bronough Street
Tallahassee, FL 32399-0250

Subject: St. Lucie Plant
License Renewal Project
NRC Informal Consultation Preparation

Dear Ms. Snyder-Matthews:

Florida Power and Light Company (FPL) is preparing an application to renew the operating licenses for St. Lucie Units 1 and 2, and we intend the application to be consistent with your agency's interests and the priorities of our community. As part of the license renewal process, the Nuclear Regulatory Commission (NRC) requires that applicants identify impacts to cultural resources resulting from the renewal of the licenses. The NRC will request an informal consultation with your agency. There are no land disturbing operational or refurbishment activities planned during the license renewal term. FPL, therefore, believes there will be no cultural impacts from license renewal activities.

To assist you in your determination, please find enclosed two figures that depict the St. Lucie Plant site and the associated vicinity.

It is our intent that, by contacting you at this point in the process, we can identify any concerns or data needed so that those areas identified can be addressed to ensure that the consultation process proceeds smoothly and efficiently.

After your review, we would greatly appreciate a letter confirming FPL's conclusion that there will be no impacts to cultural resources and therefore no need for mitigation.

an FPL Group company

Florida Power & Light Company, 6501 South Ocean Drive, Jensen Beach, FL 34957

If you have any comments or questions, please contact T. V. Abbatiello at (561) 467-7316.

Sincerely yours,

R. S. Kundalkar
Vice President
St. Lucie Plant

EAT/TVA/sap

Enclosures: Figure 1 - St. Lucie Units 1 & 2, 6-Mile Vicinity
Figure 2 - St. Lucie Site Boundary

an FPL Group company

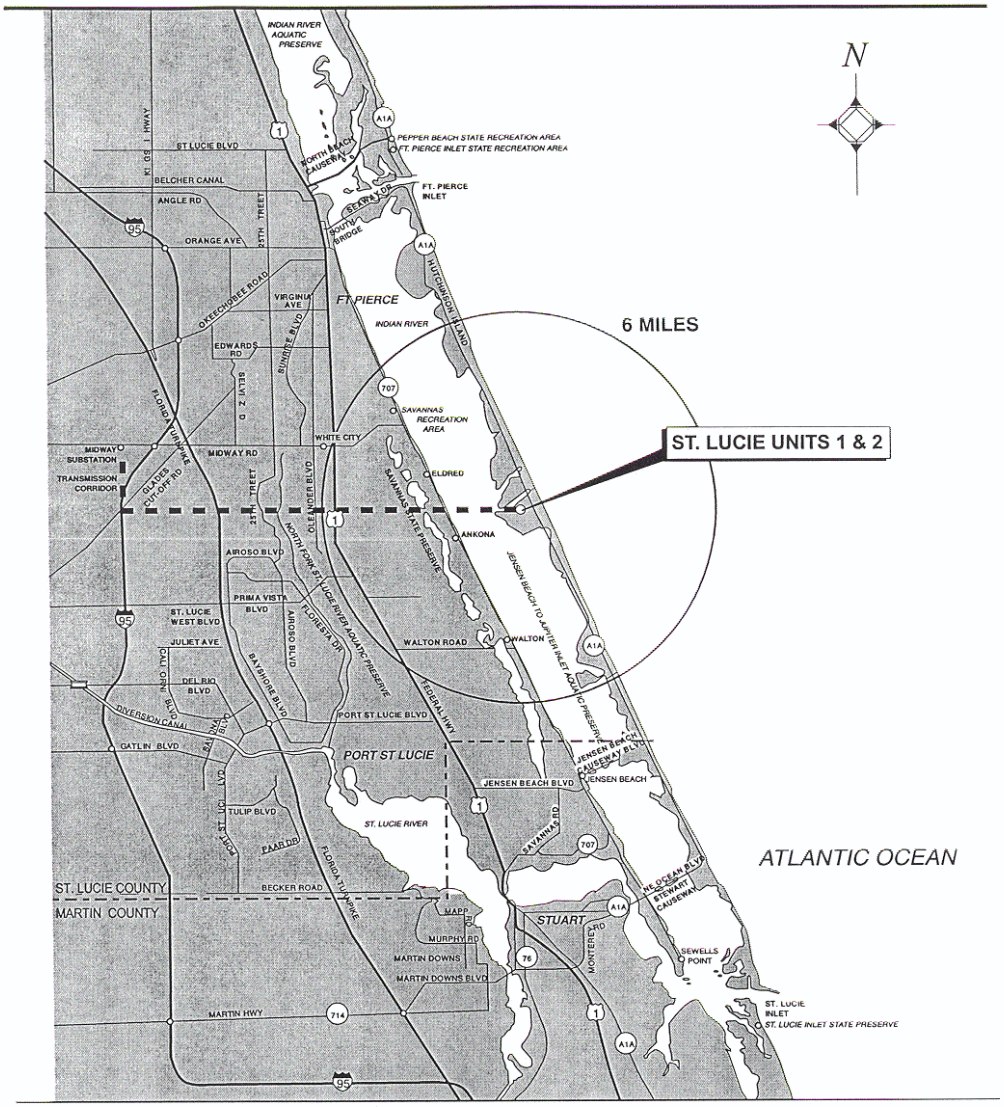


FIGURE 1
St. Lucie Units 1 & 2, 6-Mile Vicinity

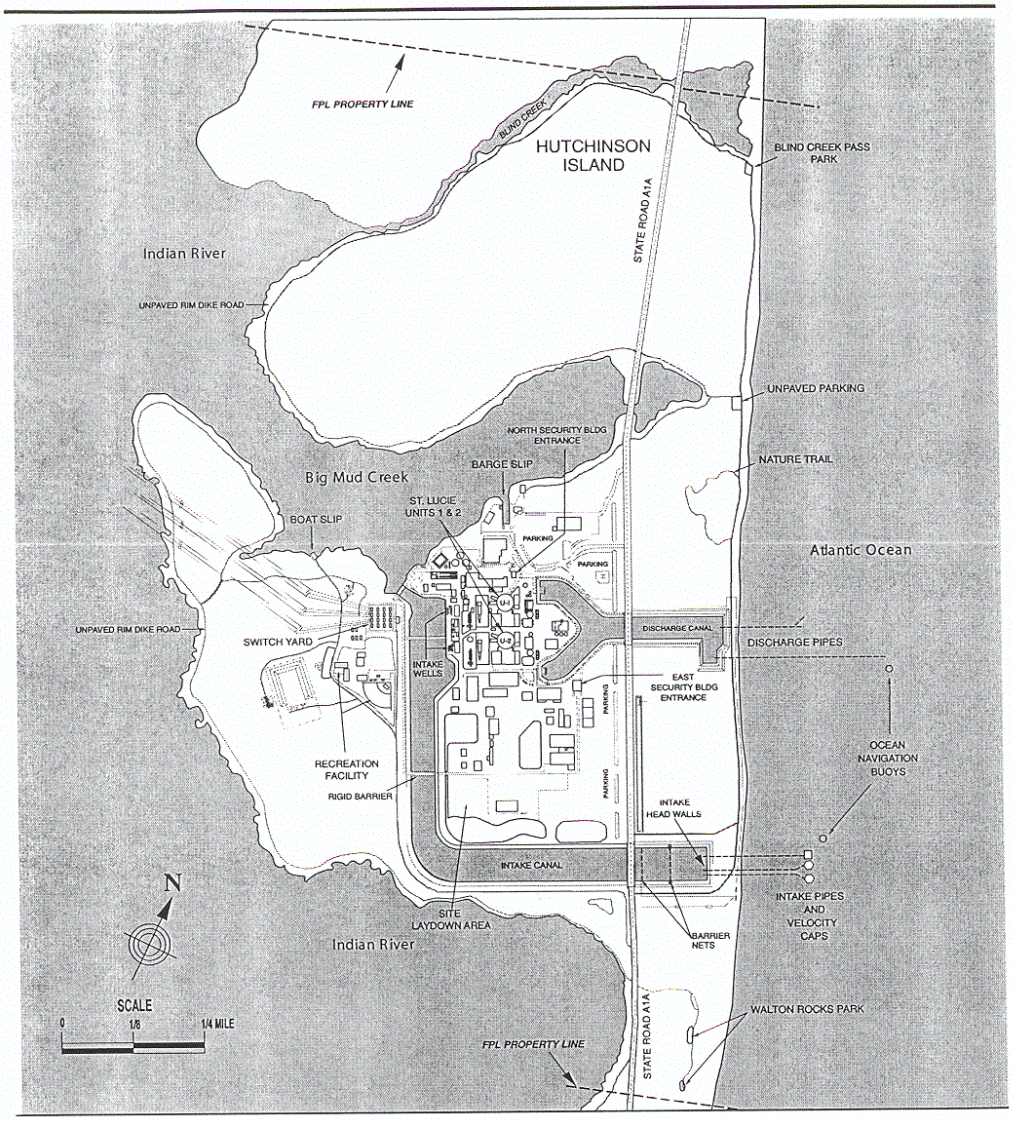


FIGURE 2
St. Lucie Site Boundary

DIVISIONS OF FLORIDA DEPARTMENT OF STATE
Office of the Secretary
Office of International Relations
Division of Elections
Division of Corporations
Division of Cultural Affairs
Division of Historical Resources
Division of Library and Information Services
Division of Licensing
Division of Administrative Services

FLORIDA DEPARTMENT OF STATE
Katherine Harris
Secretary of State
DIVISION OF HISTORICAL RESOURCES

MEMBER OF THE FLORIDA CABINET
State Board of Education
Trustees of the Internal Improvement Trust Fund
Administration Commission
Florida Land and Water Adjudicatory Commission
Siting Board
Division of Bond Finance
Department of Revenue
Department of Law Enforcement
Department of Highway Safety and Motor Vehicles
Department of Veterans' Affairs

May 22, 2001

Mr. R.S. Kundalkar
Florida Power & Light Company
6501 South Ocean Drive
Jensen Beach, Florida 34957

RE: DHR Project File No. 2001-04066
Received by SHPO on April 25, 2001
Nuclear Regulatory Commission
St. Lucie Nuclear Plant License Renewal Project
St. Lucie County, Florida

Dear Mr. Kundalkar:

Our office received and reviewed the above referenced project in accordance with Section 106 of the *National Historic Preservation Act of 1966*, as amended and *36 CFR Part 800: Protection of Historic Properties*. The State Historic Preservation Officer (SHPO) is to advise Federal agencies as they identify historic properties (listed or eligible for listing, in the *National Register of Historic Places*), assess effects upon them, and consider alternatives to avoid or minimize adverse effects.

Based on the information provided, it is the opinion of this office that that because of the project nature (license renewal) no historic properties will be affected by this undertaking.

However, a review of the Florida Master Site File and our records indicated that there is one archaeological site (8SL33) recorded within the property and one archaeological site (8SL44) recorded within close proximity to the property (see map). Based upon comparison with environmentally similar areas of St. Lucie County, it is our opinion that there is a medium to high probability of encountering additional prehistoric archaeological site(s) within the property boundaries.

Therefore, since potentially significant archaeological and historic sites may be present, it is our recommendation that the Plant should incorporate this information into planning documents. Prior to initiating any future land clearing or ground disturbing activities within the undeveloped areas of plant property, the project area should be subjected to a systematic, professional archaeological and historical survey. The purpose of this survey will be to locate and assess the significance of any sites that are encountered. This office will provide guidance regarding any significant sites identified

R.A. Gray Building • 500 South Bronough Street • Tallahassee, Florida 32399-0250 • http://www.flheritage.com
☐ Director's Office (850) 488-1480 • FAX: 488-3355
☐ Archaeological Research (850) 487-2299 • FAX: 414-2207
☑ Historic Preservation (850) 487-2333 • FAX: 922-0496
☐ Historical Museums (850) 488-1484 • FAX: 921-2503
☐ Historic Pensacola Preservation Board (850) 595-5985 • FAX: 595-5989
☐ Palm Beach Regional Office (561) 279-1475 • FAX: 279-1476
☐ St. Augustine Regional Office (904) 825-5045 • FAX: 825-5044
☐ Tampa Regional Office (813) 272-3843 • FAX: 272-2340

Mr. Kundalkar
May 18, 2001
Page 2

If you have any questions concerning our comments, please contact Scott Edwards, Historic Preservation Planner, by electronic mail sedwards@mail.dos.state.fl.us, or at 850-487-2333 or 800-847-7278.

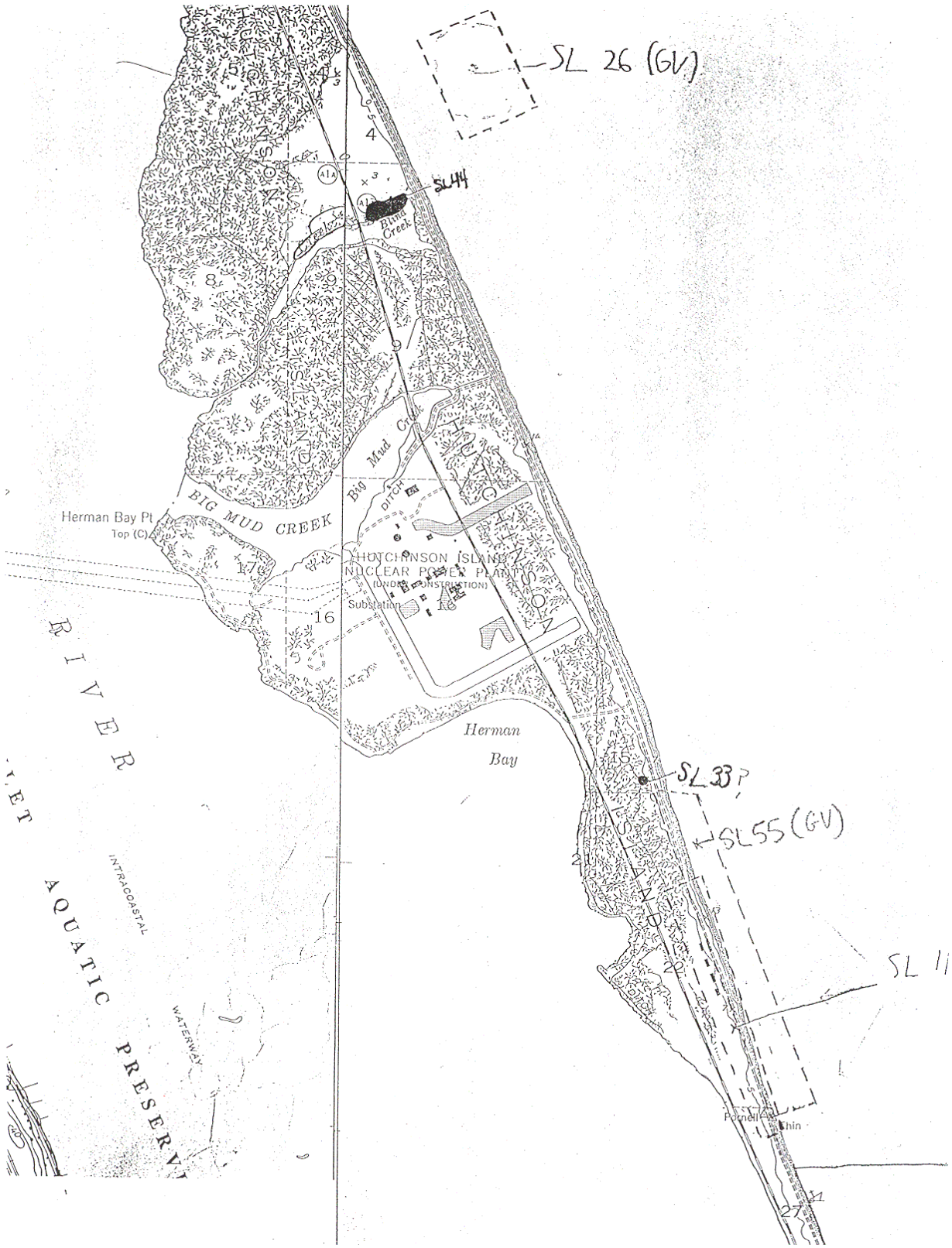
Sincerely,

Janet Snyder Matthews

Janet Snyder Matthews, Ph.D., Director
Division of Historical Resources
State Historic Preservation Officer

JSM/Ese

Enclosure


SL 26 (GV)
SL44
Blind Creek
Mud Creek
Big Ditch
BIG MUD CREEK
Herman Bay Pt
Top (C)
HUTCHINSON ISLAND
NUCLEAR POWER PLANT
(UNDER CONSTRUCTION)
Substation
Herman
Bay
SL 33?
SL55 (GV)
SL 11
INTRACOASTAL
WATERWAY
AQUATIC PRESERVE
RIVER

APPENDIX E. SEVERE ACCIDENT MITIGATION ALTERNATIVES ANALYSIS

Appendix E contains the following sections:

E.1 ST. LUCIE UNITS 1 & 2 PSA MODEL

E.1.1 LEVEL 1 AND 2 MODEL DESCRIPTION

The severe accident mitigation alternative (SAMA) evaluations utilize a separate baseline Level 1 and Level 2 probabilistic safety assessment (PSA) model for each Unit. St. Lucie Unit 1 plant damage state (PDS) and St. Lucie Unit 2 PDS models incorporate Level 1 and Level 2 internal event results. Level 2 results are calculated based upon the updated containment event tree used in the Individual Plant Examination (IPE) submittal (Ref. E.1-1). Level 1 and Level 2 results were obtained using two cases for 4.16kV (kilovolt) AB-bus alignment. Case 1 is when the AB-bus is aligned to the A-bus, and Case 2 is when the AB-bus is aligned to the B-bus. The SAMA evaluation utilized the conservative cases, which were Case 2 for Unit 1 and Case 1 for Unit 2. Hence, these became the baseline models for the SAMA evaluation purposes.

E.1.1.1 SUMMARY OF UPDATES

The PSA models have been updated since the time of IPE submittal to the U.S. Nuclear Regulatory Commission (NRC). The major changes include going to a “One-top” model rather than solving individual sequences, and updating software to allow use of a recovery rule file that allows thorough, automatic application of recovery rules consistently to every appropriate cutset. This also allows removal of recoveries from the model (called hardwired recoveries) in many cases, which simplifies modeling since determining if a recovery in the model is appropriate for every circumstance is extremely difficult at best. Common-cause failure modeling was refined by the use of a basic event for common causes only. The original model normally used an “A” train event with the common-cause factor. This practice overemphasized the importance of the “A” train components, as all common-cause failures were tied to “A” (and none to “B” train components). Test and Maintenance basic events were added for various components as further improvements to the model. Treatment of reactor coolant pump (RCP) seal failures depending on operator action or failure to act was improved per the latest Combustion Engineering Owners Group (CEOG) information (Ref. E.1-2). The initiating event frequencies for loss-of-coolant accidents (LOCAs) and Main Steam Line Breaks were updated per the latest CEOG methodologies (Ref. E.1-3; Ref. E.1-4). Although numerous other minor improvements were made, the only other significant one was the update of the interfacing system LOCA (ISLOCA) analysis for each Unit. Due to changes in operating performance, the number of shutdowns (and valve testing opportunities) for each Unit decreased over time leading to a calculated change (increase) in the ISLOCA frequency. Additionally, Unit 2 performed a design change that increased the calculated probability of ISLOCA while reducing the probability of pressure locking of the shutdown cooling isolation valves, which would prevent the use of shutdown cooling among other things. This change is considered to be risk neutral or positive overall. As noted for ISLOCA, plant design changes were incorporated in these updates as needed. By procedure, design changes are reviewed periodically to ensure that the models reflect the actual Unit designs. Significant operating procedures, particularly the Emergency Operating Procedures, are periodically reviewed and model changes are made if needed. Although this appears to be a long list of changes, it should be noted that the St. Lucie Units 1 & 2

core damage frequency (CDF) values have always been and remain in the range of 2E-5 to 3E-5 for both Units for internal events.

E.1.1.2 QUALITY CONTROL

Florida Power & Light Company (FPL) Quality Assurance Program procedures govern engineering performance for calculations and evaluations. In addition, the FPL Reliability and Risk Assessment Group (RRAG) has developed specific standards and procedures for PSA-related evaluations and model updates. They require periodic review of plant changes so that the model is consistent with the as-built configuration of the plant.

Each PSA model change and update is documented via calculation or evaluation, and is reviewed internally by two independent reviewers in accordance with FPL Quality Assurance Program and RRAG standards.

E.1.2 EXTERNAL EVENTS RISK

To evaluate potential risks from external events, the cost of implementation of SAMAs was compared with a benefit value that was twice that calculated. This was done to represent the comparison of the cost with the benefit of reducing both internal and external event risks and shows that the doubling of risk to account for external events is a conservative approach. The following discussions provide additional information related to risks associated with external events.

E.1.2.1 SEISMIC EVENTS

The St. Lucie Individual Plant Examination of External Events (IPEEE) submittal for seismic risk was based on the seismic analysis resolving Unresolved Safety Issue (USI) A-46. The St. Lucie IPEEE submittal demonstrated that the seismic risk for St. Lucie Units 1 & 2 is low.

The FPL A-46 Seismic Program implements the NUREG-1407 approach to seismic analysis. Briefly summarized, NUREG-1407 states that, “For sites where the seismic hazard is low, a reduced scope margins method emphasizing the walkdown is adequate.” Table 3.1 of NUREG-1407 lists St. Lucie Units 1 & 2 as a reduced scope plant. This assignment recognizes a low level of seismic importance and a reduction of FPL’s analysis requirements for the plant. Therefore, seismically induced failures, including fires and floods, beyond the Safe Shutdown Earthquake (SSE) were not considered credible and were not analyzed as part of the St. Lucie Units 1 & 2 IPEEE resolution program.

Therefore, pursuant to FPL’s approach to A-46, the probabilities of seismically induced LOCAs and high-energy line breaks (HELBs) were judged to be low enough at the maxiumum postulated SSE at St. Lucie Units 1 & 2 that further consideration was not warranted. This analysis was also applied to systems, structures, and components for mitigating the effects of LOCAs and HELBs.

E.1.2.2 EXTERNAL FLOODS

The St. Lucie IPEEE (Ref. E.1-5) contains the following conclusions with respect to external flooding risks: “As stated in NUREG-1407 [2], plants designed to the criteria described in [Regulatory Guide] RG 1.59 and applicable [Standard Review Plan] SRP sections pose no significant threat of a severe accident. St. Lucie Units 1 & 2 designs meet the NRC Regulatory Guide 1.59 and SRP criteria, and thus pose no significant risk of a severe

accident as the result of external flooding." Note that RG 1.59 assigns a Probable Maximum Surge (PMS) of 16.7 feet above Mean Low Water (MLW), and the surge assumed by the St. Lucie Units 1 & 2 Final Safety Analysis Report (FSAR) analyses is 17.2 feet above MLW. Plant design features conservatively include flood protection to 19.5 feet above MLW.

E.1.2.3 HURRICANES

As stated in Section 3.3.1 for Unit 1 and Section 3.3.1.1 for Unit 2 of the respective St. Lucie Updated Final Safety Analysis Reports (UFSARs), the design hurricane wind speed is 194 miles per hour (mph). The design wind speed selected is greater than the Probable Maximum Hurricane (PMH) related to the St. Lucie Units 1 & 2 region. Wind loads were determined and applied to all seismic Category I structures based on the design hurricane wind speed. From a severe accident risk perspective, hurricanes are much less significant than other external events because hurricanes develop slowly and enable advance warning that allows both preparation and elimination of many accident sequences.

After the 1992 hurricane experience at the Turkey Point site, FPL made procedural improvements to further reduce flooding risks due to hurricanes. FPL established new and revised existing administrative and operations procedures to address hurricane and severe weather preparations. Actions to be taken, among others, include:

- Installing intake structure missile shielding if removed,
- Topping off the diesel oil storage tanks,
- Removing the stop logs from storage and preparing them for installation,
- Surveying the plant site, removing trash and debris, and securing loose equipment,
- Closing Reactor Auxiliary Building outside doors and roof hatches, and
- Placing station batteries on equalizing charge.

Additionally, St. Lucie Units 1 & 2 procedures were established with criteria to shut down both Units if a hurricane watch goes into effect. These criteria include:

- For storms projected to reach a Category 1 or 2, the Unit(s) shall be placed in HOT STANDBY (Mode 3) or below at least two (2) hours before the projected onset of sustained hurricane-force winds at the site and both Units shall remain off-line for the duration of the hurricane-force winds (or restoration of reliable offsite power).
- For storms projected to reach Category 3, 4, and 5 prior to landfall, the Units shall be shut down to an average temperature of less than 350 degrees Fahrenheit at least two (2) hours before the projected onset of sustained hurricane-force winds at the site and both Units shall remain off-line for the duration of the hurricane-force winds (or restoration of reliable offsite power).

E.1.2.4 TORNADOES AND HIGH WINDS

The St. Lucie Units 1 & 2 site area is affected by passage of high winds and tropical storms with various intensities. These activities are more likely to occur during the months of September and October. However, tornadoes and waterspouts have been observed throughout the year around the site.

FPL's IPEEE analysis concluded for High Winds/Tornadoes that the designs of St. Lucie Units 1 & 2 either conform to the SRP criteria (NUREG-0800 paragraphs 3.3.1 and 3.3.2) or have demonstrated that the tornado and high winds hazard frequency is acceptably low. Therefore, the risk significance of a severe accident due to tornadoes and high wind threats is extremely low.

E.1.2.5 FIRES

At the outset, it should be noted that the CDF estimates for fires in the 1994 St. Lucie IPEEE were extremely conservative and overestimated risk for screening purposes. On January 19, 2001, and April 26, 2001, respectively, the St. Lucie Units 1 & 2 operating licenses were amended to extend the allowable outage time (AOT) for the emergency diesel generators (EDGs). Preparatory work for these amendments refined and revised the fire risk estimates for the cable spreading rooms and the Control Rooms. Specific risk insights from refining the St. Lucie Units 1 & 2 fire risks for the cable spreading rooms and Control Rooms provide reasonable assurance that the fire risk for those areas is very low. The revised fire risk estimates for the cable spreading rooms and Control Rooms are about two orders of magnitude lower than that reported in the original St. Lucie IPEEE. Due to concerns about potential fires in the cable spreading rooms, FPL has committed to perform the following actions for each Unit if an EDG is to be removed from service for maintenance for extended AOT (i.e., greater than 72 hours) during Modes 1, 2, and 3:

- External fires: CONTACT the system load dispatcher to determine if there are existing fires that could impact offsite power to the St. Lucie plant. If there are existing fires that have a significant potential of affecting offsite power to St. Lucie Units 1 & 2, an EDG should only be removed from service for surveillance testing or corrective maintenance. The final decision to remove an EDG from service for an extended AOT should also consider whether there is a significant potential fire threat during the time the EDG will be out of service.
- CONDUCT a plant fire protection walkdown of the area that could impact EDG availability, offsite power availability, or the ability to use the station blackout cross-tie prior to entering the extended AOT, and
- PERFORM a thermographic examination of high-risk potential ignition sources in the cable spreading room and the Control Room prior to entering the extended AOT, and
- RESTRICT planned hot work in the cable spreading room and Control Room during the extended AOT, and
- ESTABLISH a continuous fire watch in the cable spreading room when in the extended AOT.

The St. Lucie IPEEE concluded that no St. Lucie Units 1 & 2 fire zones were found to be significant contributors that would result in failure to achieve a safe shutdown condition. Improvements continue to be made in St. Lucie Units 1 & 2 fire protection features as a result of on-going (10 CFR 50) Appendix R evaluations.

E.1.2.6 TRANSPORTATION AND OTHER EXTERNAL EVENTS

FPL's IPEEE demonstrated that there are no significant vulnerabilities to accidents at St. Lucie Units 1 & 2 related to nearby transportation routes, or nearby industrial or military facilities.

E.1.2.7 CONCLUSIONS

For St. Lucie Units 1 & 2, the severe accident risk contribution from external events is very small. The risk contribution from all external events in general is minimized as much as practical.

No specific SAMA was found to provide redundancy to plant safe shutdown capabilities in order to reduce the external event (i.e., fire, flood, etc.) contribution. Based on this review, no SAMAs were identified to be especially beneficial for reducing external event contributions.

Although the risk from the external events is not quantified with the same level of detail and accuracy as that for internal events, the risk for external events is expected to be lower than that for internal events. Therefore, it is reasonable, for SAMA evaluation purposes, to bound the risk of core damage due to all initiators at St. Lucie Units 1 & 2 by doubling the cost benefits evaluated for the internal events.

E.1.3 PLANT DAMAGE STATE TO CONTAINMENT RELEASE

For the evaluations performed in this analysis, the PDSs are considered to be parsed into containment release fractions. Given this, the baseline conditional containment event tree endstate probabilities for each of the 39 PDSs are provided in Table E.1-1. This table is presented in four parts to accommodate the 39 PDSs.

TABLE E.1-1
CONTAINMENT EVENT TREE ENDSTATE RELEASE FRACTIONS
(CONDITIONAL PROBABILITY) PART 1

CET ES	Plant Damage States									
	IA	IB	ID	IE	IF	IH	IIA	IIB	IID	IIE
A1	1.27E-02	1.54E-02	1.69E-02	3.00E-02	3.01E-02	2.47E-02	1.54E-02	1.54E-02	1.69E-02	3.01E-02
A2	5.81E-03	3.10E-03	1.93E-02	2.29E-02	6.05E-03	2.82E-02	3.10E-03	3.10E-03	1.93E-02	6.05E-03
B1	7.52E-02	9.11E-02	5.20E-04	6.30E-04	9.12E-02	5.20E-04	9.11E-02	1.56E-01	8.67E-04	1.56E-01
B2-L	3.42E-02	1.83E-02	5.91E-04	4.81E-04	1.83E-02	5.91E-04	1.83E-02	3.12E-02	9.85E-04	3.12E-02
B2-R	8.56E-05	4.58E-05	1.48E-06	1.20E-06	4.58E-05	1.48E-06	4.58E-05	7.82E-05	2.47E-06	7.83E-05
B3-L	5.15E-02	6.24E-02	0.00E+00	0.00E+00	6.25E-02	0.00E+00	6.24E-02	1.07E-01	0.00E+00	1.07E-01
B3-R	1.29E-04	1.56E-04	0.00E+00	0.00E+00	1.57E-04	0.00E+00	1.56E-04	2.67E-04	0.00E+00	2.68E-04
B4-L	2.35E-02	1.25E-02	0.00E+00	0.00E+00	1.26E-02	0.00E+00	1.25E-02	2.14E-02	0.00E+00	2.15E-02
B4-R	5.88E-05	3.14E-05	0.00E+00	0.00E+00	3.15E-05	0.00E+00	3.14E-05	5.37E-05	0.00E+00	5.38E-05
B5-L	2.86E-05	3.54E-05	1.94E-07	2.40E-07	3.54E-05	1.94E-07	3.54E-05	4.19E-05	2.26E-07	4.19E-05
B5-R	7.16E-08	8.86E-08	4.87E-10	6.02E-10	8.87E-08	4.87E-10	8.86E-08	1.05E-07	5.66E-10	1.05E-07
B6-L	1.30E-05	7.10E-06	2.21E-07	1.84E-07	7.11E-06	2.21E-07	7.10E-06	8.41E-06	2.57E-07	8.42E-06
B6-R	3.27E-08	1.78E-08	5.55E-10	4.61E-10	1.78E-08	5.55E-10	1.78E-08	2.11E-08	6.45E-10	2.11E-08
BYP-SGTR1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BYP-SGTR2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BYP-ISLOCA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C1-L	1.21E-01	1.47E-01	0.00E+00	1.78E-01	1.50E-01	0.00E+00	1.47E-01	9.27E-02	1.08E-01	9.57E-02
C1-R	3.04E-04	3.68E-04	0.00E+00	4.47E-04	3.77E-04	0.00E+00	3.68E-04	2.32E-04	2.71E-04	2.40E-04
C2-L	5.52E-02	2.95E-02	3.12E-01	1.36E-01	3.02E-02	3.15E-01	2.95E-02	1.86E-02	1.23E-01	1.92E-02
C2-R	1.38E-04	7.39E-05	7.82E-04	3.42E-04	7.57E-05	7.89E-04	7.39E-05	4.67E-05	3.08E-04	4.82E-05
C3-L	1.25E-01	1.51E-01	0.00E+00	1.45E-01	1.51E-01	0.00E+00	1.51E-01	1.07E-01	1.20E-01	1.07E-01
C3-R	3.12E-04	3.79E-04	0.00E+00	3.64E-04	3.79E-04	0.00E+00	3.79E-04	2.68E-04	3.01E-04	2.68E-04
C4-L	5.68E-02	3.04E-02	2.57E-01	1.11E-01	3.04E-02	2.57E-01	3.04E-02	2.15E-02	1.37E-01	2.15E-02
C4-R	1.42E-04	7.61E-05	6.43E-04	2.79E-04	7.61E-05	6.43E-04	7.61E-05	5.38E-05	3.42E-04	5.38E-05

TABLE E.1-1 (continued)
CONTAINMENT EVENT TREE ENDSTATE RELEASE FRACTIONS
(CONDITIONAL PROBABILITY) PART 1 (continued)

CET ES	Plant Damage States									
	IA	IB	ID	IE	IF	IH	IIA	IIB	IID	IIE
C5-L	3.78E-05	4.67E-05	0.00E+00	5.57E-05	4.67E-05	0.00E+00	4.67E-05	4.11E-05	4.50E-05	4.11E-05
C5-R	9.47E-08	1.17E-07	0.00E+00	1.39E-07	1.17E-07	0.00E+00	1.17E-07	1.03E-07	1.13E-07	1.03E-07
C6-L	1.72E-05	9.39E-06	9.62E-05	4.26E-05	9.39E-06	9.62E-05	9.39E-06	8.25E-06	5.12E-05	8.25E-06
C6-R	4.32E-08	2.35E-08	2.41E-07	1.07E-07	2.35E-08	2.41E-07	2.35E-08	2.07E-08	1.28E-07	2.07E-08
D1-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D1-R	2.88E-05	3.50E-05	2.01E-07	2.44E-07	3.50E-05	2.01E-07	3.50E-05	5.98E-05	3.30E-07	5.98E-05
D2-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D2-R	1.89E-05	1.28E-05	2.89E-07	2.46E-07	1.28E-05	2.89E-07	1.28E-05	2.19E-05	4.72E-07	2.19E-05
D3-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D3-R	2.92E-07	1.28E-07	2.04E-09	8.92E-10	1.28E-07	2.04E-09	1.28E-07	1.61E-08	2.29E-09	1.61E-08
D4-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D4-R	1.92E-07	4.69E-08	2.92E-09	8.98E-10	4.69E-08	2.92E-09	4.69E-08	5.89E-09	3.28E-09	5.89E-09
E1-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E1-R	3.98E-04	3.98E-04	2.22E-04	4.45E-04	3.98E-04	2.22E-04	3.98E-04	3.64E-04	4.45E-04	3.64E-04
E2-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E2-R	0.00E+00	0.00E+00	2.23E-04	0.00E+00	0.00E+00	2.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E3-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E3-R	3.09E-04	3.09E-04	1.54E-04	3.09E-04	3.09E-04	1.54E-04	3.09E-04	3.09E-04	3.09E-04	3.09E-04
E4-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E4-R	0.00E+00	0.00E+00	1.55E-04	0.00E+00	0.00E+00	1.55E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E5-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E5-R	2.61E-06	9.44E-07	1.54E-06	1.12E-06	9.44E-07	1.54E-06	9.44E-07	9.80E-08	3.09E-06	9.80E-08
E6-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E6-R	0.00E+00	0.00E+00	1.55E-06	0.00E+00	0.00E+00	1.55E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE E.1-1 (continued)
CONTAINMENT EVENT TREE ENDSTATE RELEASE FRACTIONS
(CONDITIONAL PROBABILITY) PART 1 (continued)

CET ES	Plant Damage States									
	IA	IB	ID	IE	IF	IH	IIA	IIB	IID	IIE
NCF	8.45E-02	8.45E-02	5.68E-02	5.39E-02	8.03E-02	5.39E-02	8.45E-02	7.19E-02	1.37E-01	6.83E-02
NCFA	3.53E-01	3.53E-01	3.35E-01	3.18E-01	3.35E-01	3.18E-01	3.53E-01	3.53E-01	3.35E-01	3.35E-01
NCFB	1.85E-04	1.85E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.85E-04	3.16E-04	0.00E+00	0.00E+00
NEG	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	1.00E+00	1.00E+00	1.00E+00	9.98E-01	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

TABLE E.1-1 (continued)
CONTAINMENT EVENT TREE ENDSTATE RELEASE FRACTIONS
(CONDITIONAL PROBABILITY) PART 2

CET ES	Plant Damage States									
	IIF	IIH	IIIA	IIIB	IIID	IIIE	IIIF	IIIH	IVA	IVB
A1	3.01E-02	2.47E-02	1.54E-02	1.54E-02	2.05E-02	3.01E-02	3.01E-02	3.00E-02	1.54E-02	1.54E-02
A2	6.05E-03	2.82E-02	3.10E-03	3.10E-03	1.57E-02	6.05E-03	6.05E-03	2.29E-02	3.10E-03	3.10E-03
B1	1.56E-01	8.67E-04	9.11E-02	1.56E-01	1.05E-03	1.56E-01	1.56E-01	1.05E-03	9.11E-02	1.56E-01
B2-L	3.12E-02	9.85E-04	1.83E-02	3.12E-02	8.01E-04	3.12E-02	3.12E-02	8.01E-04	1.83E-02	3.12E-02
B2-R	7.83E-05	2.47E-06	4.58E-05	7.82E-05	2.01E-06	7.83E-05	7.83E-05	2.01E-06	4.58E-05	7.82E-05
B3-L	1.07E-01	0.00E+00	6.24E-02	1.07E-01	0.00E+00	1.07E-01	1.07E-01	0.00E+00	6.24E-02	1.07E-01
B3-R	2.68E-04	0.00E+00	1.56E-04	2.67E-04	0.00E+00	2.68E-04	2.68E-04	0.00E+00	1.56E-04	2.67E-04
B4-L	2.15E-02	0.00E+00	1.25E-02	2.14E-02	0.00E+00	2.15E-02	2.15E-02	0.00E+00	1.25E-02	2.14E-02
B4-R	5.38E-05	0.00E+00	3.14E-05	5.37E-05	0.00E+00	5.38E-05	5.38E-05	0.00E+00	3.14E-05	5.37E-05
B5-L	4.19E-05	2.26E-07	4.23E-05	1.64E-05	1.11E-07	1.64E-05	1.64E-05	1.11E-07	3.54E-05	4.19E-05
B5-R	1.05E-07	5.66E-10	1.06E-07	4.11E-08	2.77E-10	4.11E-08	4.11E-08	2.77E-10	8.86E-08	1.05E-07
B6-L	8.42E-06	2.57E-07	8.50E-06	3.29E-06	8.45E-08	3.30E-06	3.30E-06	8.45E-08	7.10E-06	8.41E-06
B6-R	2.11E-08	6.45E-10	2.13E-08	8.25E-09	2.12E-10	8.26E-09	8.26E-09	2.12E-10	1.78E-08	2.11E-08
BYP-SGTR1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BYP-SGTR2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BYP-ISLOCA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C1-L	9.57E-02	0.00E+00	1.47E-01	9.27E-02	1.31E-01	9.57E-02	9.57E-02	0.00E+00	1.47E-01	9.27E-02
C1-R	2.40E-04	0.00E+00	3.68E-04	2.32E-04	3.28E-04	2.40E-04	2.40E-04	0.00E+00	3.68E-04	2.32E-04
C2-L	1.92E-02	2.38E-01	2.95E-02	1.86E-02	1.00E-01	1.92E-02	1.92E-02	2.38E-01	2.95E-02	1.86E-02
C2-R	4.82E-05	5.96E-04	7.39E-05	4.67E-05	2.51E-04	4.82E-05	4.82E-05	5.96E-04	7.39E-05	4.67E-05
C3-L	1.07E-01	0.00E+00	1.51E-01	1.07E-01	1.45E-01	1.07E-01	1.07E-01	0.00E+00	1.51E-01	1.07E-01
C3-R	2.68E-04	0.00E+00	3.79E-04	2.68E-04	3.64E-04	2.68E-04	2.68E-04	0.00E+00	3.79E-04	2.68E-04
C4-L	2.15E-02	2.57E-01	3.04E-02	2.15E-02	1.11E-01	2.15E-02	2.15E-02	2.57E-01	3.04E-02	2.15E-02
C4-R	5.38E-05	6.43E-04	7.61E-05	5.38E-05	2.79E-04	5.38E-05	5.38E-05	6.43E-04	7.61E-05	5.38E-05

TABLE E.1-1 (continued)
CONTAINMENT EVENT TREE ENDSTATE RELEASE FRACTIONS
(CONDITIONAL PROBABILITY) PART 2 (continued)

CET ES	Plant Damage States									
	IIF	IIH	IIIA	IIIB	IIID	IIIE	IIIF	IIIH	IVA	IVB
C5-L	4.11E-05	0.00E+00	5.59E-05	1.61E-05	2.20E-05	1.61E-05	1.61E-05	0.00E+00	4.67E-05	4.11E-05
C5-R	1.03E-07	0.00E+00	1.40E-07	4.03E-08	5.51E-08	4.03E-08	4.03E-08	0.00E+00	1.17E-07	1.03E-07
C6-L	8.25E-06	9.62E-05	1.12E-05	3.23E-06	1.68E-05	3.23E-06	3.23E-06	3.88E-05	9.39E-06	8.25E-06
C6-R	2.07E-08	2.41E-07	2.81E-08	8.10E-09	4.21E-08	8.10E-09	8.10E-09	9.73E-08	2.35E-08	2.07E-08
D1-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D1-R	5.98E-05	3.30E-07	3.50E-05	5.98E-05	4.00E-07	5.98E-05	5.98E-05	4.00E-07	3.50E-05	5.98E-05
D2-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D2-R	2.19E-05	4.72E-07	1.28E-05	2.19E-05	4.02E-07	2.19E-05	2.19E-05	4.02E-07	1.28E-05	2.19E-05
D3-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D3-R	1.61E-08	2.29E-09	1.53E-07	6.30E-09	4.21E-11	6.30E-09	6.30E-09	4.21E-11	1.28E-07	1.61E-08
D4-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D4-R	5.89E-09	3.28E-09	5.61E-08	2.31E-09	4.24E-11	2.31E-09	2.31E-09	4.24E-11	4.69E-08	5.89E-09
E1-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E1-R	3.64E-04	2.22E-04	3.98E-04	3.64E-04	4.45E-04	3.64E-04	3.64E-04	2.22E-04	3.98E-04	3.64E-04
E2-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E2-R	0.00E+00	2.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.23E-04	0.00E+00	0.00E+00
E3-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E3-R	3.09E-04	1.54E-04	3.09E-04	3.09E-04	3.09E-04	3.09E-04	3.09E-04	1.54E-04	3.09E-04	3.09E-04
E4-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E4-R	0.00E+00	1.55E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E-04	0.00E+00	0.00E+00
E5-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E5-R	9.80E-08	1.54E-06	1.13E-06	3.84E-08	4.69E-08	3.84E-08	3.84E-08	2.34E-08	9.44E-07	9.80E-08
E6-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E6-R	0.00E+00	1.55E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.35E-08	0.00E+00	0.00E+00

TABLE E.1-1 (continued)
CONTAINMENT EVENT TREE ENDSTATE RELEASE FRACTIONS
(CONDITIONAL PROBABILITY) PART 2 (continued)

CET ES	Plant Damage States									
	IIF	IIH	IIIA	IIIB	IIID	IIIE	IIIF	IIIH	IVA	IVB
NCF	6.83E-02	1.31E-01	8.45E-02	7.19E-02	1.37E-01	6.84E-02	6.84E-02	1.31E-01	8.45E-02	7.19E-02
NCFA	3.35E-01	3.18E-01	3.53E-01	3.53E-01	3.35E-01	3.35E-01	3.35E-01	3.18E-01	3.53E-01	3.53E-01
NCFB	0.00E+00	0.00E+00	1.85E-04	3.16E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.85E-04	3.16E-04
NEG	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	1.00E+00	1.00E+00	1.00E+00	1.00E+00	9.99E-01	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

TABLE E.1-1 (continued)
CONTAINMENT EVENT TREE ENDSTATE RELEASE FRACTIONS
(CONDITIONAL PROBABILITY) PART 3

CET ES	Plant Damage States									
	IVD	IVE	IVF	IVH	VA	VB	VD	VE	VF	VH
A1	1.69E-02	3.01E-02	3.01E-02	2.47E-02	1.54E-02	1.54E-02	2.05E-02	3.01E-02	3.01E-02	3.00E-02
A2	1.93E-02	6.05E-03	6.05E-03	2.82E-02	3.10E-03	3.10E-03	1.57E-02	6.05E-03	6.05E-03	2.29E-02
B1	8.67E-04	1.56E-01	1.56E-01	8.67E-04	9.11E-02	1.56E-01	1.05E-03	1.56E-01	1.56E-01	1.05E-03
B2-L	9.85E-04	3.12E-02	3.12E-02	9.85E-04	1.83E-02	3.12E-02	8.01E-04	3.12E-02	3.12E-02	8.01E-04
B2-R	2.47E-06	7.83E-05	7.83E-05	2.47E-06	4.58E-05	7.82E-05	2.01E-06	7.83E-05	7.83E-05	2.01E-06
B3-L	0.00E+00	1.07E-01	1.07E-01	0.00E+00	6.24E-02	1.07E-01	0.00E+00	1.07E-01	1.07E-01	0.00E+00
B3-R	0.00E+00	2.68E-04	2.68E-04	0.00E+00	1.56E-04	2.67E-04	0.00E+00	2.68E-04	2.68E-04	0.00E+00
B4-L	0.00E+00	2.15E-02	2.15E-02	0.00E+00	1.25E-02	2.14E-02	0.00E+00	2.15E-02	2.15E-02	0.00E+00
B4-R	0.00E+00	5.38E-05	5.38E-05	0.00E+00	3.14E-05	5.37E-05	0.00E+00	5.38E-05	5.38E-05	0.00E+00
B5-L	2.26E-07	4.19E-05	4.19E-05	2.26E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.19E-05	0.00E+00
B5-R	5.66E-10	1.05E-07	1.05E-07	5.66E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-07	0.00E+00
B6-L	2.57E-07	8.42E-06	8.42E-06	2.57E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.42E-06	0.00E+00
B6-R	6.45E-10	2.11E-08	2.11E-08	6.45E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.11E-08	0.00E+00
BYP-SGTR1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BYP-SGTR2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BYP-ISLOCA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C1-L	1.08E-01	9.57E-02	9.57E-02	0.00E+00	7.34E-02	9.27E-02	0.00E+00	9.57E-02	9.57E-02	0.00E+00
C1-R	2.71E-04	2.40E-04	2.40E-04	0.00E+00	1.84E-04	2.32E-04	0.00E+00	2.40E-04	2.40E-04	0.00E+00
C2-L	1.23E-01	1.92E-02	1.92E-02	2.38E-01	1.03E-01	1.86E-02	2.31E-01	1.92E-02	1.92E-02	2.38E-01
C2-R	3.08E-04	4.82E-05	4.82E-05	5.96E-04	2.58E-04	4.67E-05	5.79E-04	4.82E-05	4.82E-05	5.96E-04
C3-L	1.20E-01	1.07E-01	1.07E-01	0.00E+00	7.56E-02	1.07E-01	0.00E+00	1.07E-01	1.07E-01	0.00E+00
C3-R	3.01E-04	2.68E-04	2.68E-04	0.00E+00	1.89E-04	2.68E-04	0.00E+00	2.68E-04	2.68E-04	0.00E+00
C4-L	1.37E-01	2.15E-02	2.15E-02	2.57E-01	1.06E-01	2.15E-02	2.57E-01	2.15E-02	2.15E-02	2.57E-01
C4-R	3.42E-04	5.38E-05	5.38E-05	6.43E-04	2.66E-04	5.38E-05	6.43E-04	5.38E-05	5.38E-05	6.43E-04

TABLE E.1-1 (continued)
CONTAINMENT EVENT TREE ENDSTATE RELEASE FRACTIONS
(CONDITIONAL PROBABILITY) PART 3 (continued)

CET ES	Plant Damage States									
	IVD	IVE	IVF	IVH	VA	VB	VD	VE	VF	VH
C5-L	4.50E-05	4.11E-05	4.11E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.11E-05	0.00E+00
C5-R	1.13E-07	1.03E-07	1.03E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-07	0.00E+00
C6-L	5.12E-05	8.25E-06	8.25E-06	9.62E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.25E-06	0.00E+00
C6-R	1.28E-07	2.07E-08	2.07E-08	2.41E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.07E-08	0.00E+00
D1-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D1-R	3.30E-07	5.98E-05	5.98E-05	3.30E-07	3.50E-05	5.98E-05	4.00E-07	5.98E-05	5.98E-05	4.00E-07
D2-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D2-R	4.72E-07	2.19E-05	2.19E-05	4.72E-07	1.28E-05	2.19E-05	4.02E-07	2.19E-05	2.19E-05	4.02E-07
D3-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D3-R	2.29E-09	1.61E-08	1.61E-08	2.29E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E-08	0.00E+00
D4-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D4-R	3.28E-09	5.89E-09	5.89E-09	3.28E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.89E-09	0.00E+00
E1-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E1-R	4.45E-04	3.64E-04	3.64E-04	2.22E-04	2.91E-04	3.64E-04	2.22E-04	3.64E-04	3.64E-04	2.22E-04
E2-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E2-R	0.00E+00	0.00E+00	0.00E+00	2.23E-04	1.07E-04	0.00E+00	2.23E-04	0.00E+00	0.00E+00	2.23E-04
E3-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E3-R	3.09E-04	3.09E-04	3.09E-04	1.54E-04	2.26E-04	3.09E-04	1.54E-04	3.09E-04	3.09E-04	1.54E-04
E4-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E4-R	0.00E+00	0.00E+00	0.00E+00	1.55E-04	8.28E-05	0.00E+00	1.55E-04	0.00E+00	0.00E+00	1.55E-04
E5-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E5-R	3.09E-06	9.80E-08	9.80E-08	1.54E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.80E-08	0.00E+00
E6-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E6-R	0.00E+00	0.00E+00	0.00E+00	1.55E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE E.1-1 (continued)
CONTAINMENT EVENT TREE ENDSTATE RELEASE FRACTIONS
(CONDITIONAL PROBABILITY) PART 3 (continued)

CET ES	Plant Damage States									
	IVD	IVE	IVF	IVH	VA	VB	VD	VE	VF	VH
NCF	1.37E-01	6.83E-02	6.83E-02	1.31E-01	8.45E-02	7.20E-02	1.37E-01	6.84E-02	6.83E-02	1.31E-01
NCFA	3.35E-01	3.35E-01	3.35E-01	3.18E-01	3.53E-01	3.53E-01	3.35E-01	3.35E-01	3.35E-01	3.18E-01
NCFB	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.85E-04	3.16E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NEG	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

TABLE E.1-1 (continued)
CONTAINMENT EVENT TREE ENDSTATE RELEASE FRACTIONS (CONDITIONAL PROBABILITY) PART 4

CET ES	Plant Damage States								
	VIA	VIB	VID	VIE	VIF	VIH	SGTR1	SGTR2	ISLOCA
A1	1.54E-02	1.54E-02	1.69E-02	3.01E-02	3.01E-02	2.47E-02	0.00E+00	0.00E+00	0.00E+00
A2	3.10E-03	3.10E-03	1.93E-02	6.05E-03	6.05E-03	2.82E-02	0.00E+00	0.00E+00	0.00E+00
B1	9.11E-02	1.56E-01	8.67E-04	1.56E-01	1.56E-01	8.67E-04	0.00E+00	0.00E+00	0.00E+00
B2-L	1.83E-02	3.12E-02	9.85E-04	3.12E-02	3.12E-02	9.85E-04	0.00E+00	0.00E+00	0.00E+00
B2-R	4.58E-05	7.82E-05	2.47E-06	7.83E-05	7.83E-05	2.47E-06	0.00E+00	0.00E+00	0.00E+00
B3-L	6.24E-02	1.07E-01	0.00E+00	1.07E-01	1.07E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B3-R	1.56E-04	2.67E-04	0.00E+00	2.68E-04	2.68E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B4-L	1.25E-02	2.14E-02	0.00E+00	2.15E-02	2.15E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B4-R	3.14E-05	5.37E-05	0.00E+00	5.38E-05	5.38E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B5-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B5-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B6-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B6-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BYP-SGTR1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00
BYP-SGTR2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
BYP-ISLOCA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E+00
C1-L	7.34E-02	9.27E-02	0.00E+00	9.57E-02	9.57E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C1-R	1.84E-04	2.32E-04	0.00E+00	2.40E-04	2.40E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C2-L	1.03E-01	1.86E-02	2.31E-01	1.92E-02	1.92E-02	2.38E-01	0.00E+00	0.00E+00	0.00E+00
C2-R	2.58E-04	4.67E-05	5.79E-04	4.82E-05	4.82E-05	5.96E-04	0.00E+00	0.00E+00	0.00E+00
C3-L	7.56E-02	1.07E-01	0.00E+00	1.07E-01	1.07E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C3-R	1.89E-04	2.68E-04	0.00E+00	2.68E-04	2.68E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C4-L	1.06E-01	2.15E-02	2.57E-01	2.15E-02	2.15E-02	2.57E-01	0.00E+00	0.00E+00	0.00E+00
C4-R	2.66E-04	5.38E-05	6.43E-04	5.38E-05	5.38E-05	6.43E-04	0.00E+00	0.00E+00	0.00E+00

TABLE E.1-1 (continued)
CONTAINMENT EVENT TREE ENDSTATE RELEASE FRACTIONS (CONDITIONAL PROBABILITY) PART 4 (continued)

CET ES	Plant Damage States								
	VIA	VIB	VID	VIE	VIF	VIH	SGTR1	SGTR2	ISLOCA
C5-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C5-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C6-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C6-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D1-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D1-R	3.50E-05	5.98E-05	3.30E-07	5.98E-05	5.98E-05	3.30E-07	0.00E+00	0.00E+00	0.00E+00
D2-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D2-R	1.28E-05	2.19E-05	4.72E-07	2.19E-05	2.19E-05	4.72E-07	0.00E+00	0.00E+00	0.00E+00
D3-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D3-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D4-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D4-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E1-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E1-R	2.91E-04	3.64E-04	2.22E-04	3.64E-04	3.64E-04	2.22E-04	0.00E+00	0.00E+00	0.00E+00
E2-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E2-R	1.07E-04	0.00E+00	2.23E-04	0.00E+00	0.00E+00	2.23E-04	0.00E+00	0.00E+00	0.00E+00
E3-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E3-R	2.26E-04	3.09E-04	1.54E-04	3.09E-04	3.09E-04	1.54E-04	0.00E+00	0.00E+00	0.00E+00
E4-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E4-R	8.28E-05	0.00E+00	1.55E-04	0.00E+00	0.00E+00	1.55E-04	0.00E+00	0.00E+00	0.00E+00
E5-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E5-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E6-L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E6-R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE E.1-1 (continued)
CONTAINMENT EVENT TREE ENDSTATE RELEASE FRACTIONS (CONDITIONAL PROBABILITY) PART 4 (continued)

CET ES	Plant Damage States								
	VIA	VIB	VID	VIE	VIF	VIH	SGTR1	SGTR2	ISLOCA
NCF	8.45E-02	7.20E-02	1.37E-01	6.84E-02	6.84E-02	1.31E-01	0.00E+00	0.00E+00	0.00E+00
NCFA	3.53E-01	3.53E-01	3.35E-01	3.35E-01	3.35E-01	3.18E-01	0.00E+00	0.00E+00	0.00E+00
NCFB	1.85E-04	3.16E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NEG	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

E.1.4 REFERENCES

E.1-1 D.A. Sager (FPL) to Document Control Desk (NRC), "St. Lucie Units 1 & 2 Summary Report of Individual Plant Examination for Severe Accident Vulnerabilities – Generic Letter 88-20." (L-93-301) December 9, 1993.

E.1-2 CEOG Report CE NPSD-755. "Reactor Coolant Pump Seal Failure Probability Given Loss of Seal Cooling." Rev. 01. May 1988.

E.1-3 CEOG Technical Paper, "Evaluation of the Initiating Event Frequency for the Loss of Coolant Accident," CE Task 941. January 1997.

E.1-4 CEOG Technical Paper, "Evaluation of the Initiating Event Frequency for Main Steam Line Breaks," CE Task 941. January 1997.

E.1-5 Letter from D.A. Sager (FPL) to Document Control Desk (NRC), "Individual Plant Examination of External Events Submittal." (L-94-318, with Enclosure) December 15, 1994.

E.2 MELCOR ACCIDENT CONSEQUENCE CODE SYSTEM MODELING

E.2.1 INTRODUCTION

The following sections describe the assumptions made and the results of modeling performed to assess potential modifications to reduce the consequences of severe accidents [U.S. Nuclear Regulatory Commission (NRC) Class 9] at St. Lucie Units 1 & 2.

The Level 3 analysis was performed using the Melcor Accident Consequence Code System (MACCS) 2 code (Ref. E.2-1; Ref. E.2-2; Ref. E.2-3). MACCS2 simulates the impact of severe accidents at nuclear power plants on the surrounding environment. The principal phenomena considered in MACCS2 are atmospheric transport, mitigative actions based on dose projections, dose accumulation by a number of pathways including food and water ingestion, early and latent health effects, and economic costs. Input for the Level 3 analysis includes the reactor core radionuclide inventory, source terms from the Individual Plant Examination (IPE) [as applied to the probabilistic safety assessment (PSA) model], site meteorological data, projected population distribution (within a 50-mile radius) for the year 2025, emergency response evacuation modeling, and economic data. These inputs are described in the following section.

E.2.2 INPUT DATA

The input data required by MACCS2 are outlined below.

E.2.2.1 CORE INVENTORY

The MACCS2 code provides a default pressurized-water reactor (PWR) core inventory for a 3,412 megawatt (thermal) [MW(t)] output. The St. Lucie Units 1 & 2 licenses limit thermal power to 2,700 MW(t). Therefore, FPL used a power scaling factor of 0.791 (2,700/3,412) to adjust the default core inventory for the actual St. Lucie Units 1 & 2 power levels.

E.2.2.2 SOURCE TERMS

Table E.2-1 provides the source term release fractions for the MACCS2 element groups for 48 different release modes defined for St. Lucie Units 1 & 2. Forty-five release modes were identified in Table 4.0-7, “Fission Product Releases Associated with St. Lucie Release Modes,” of the St. Lucie Units 1 & 2 IPE submittal document (Ref. E.2-4). Three additional containment bypass release modes have been added to complete the release set. These are two steam generator tube rupture (SGTR) cases and one interfacing system loss-of-coolant accident (ISLOCA) case based on Tables F-28, F-29, and F-30 of the St. Lucie Units 1 & 2 IPE submittal for scenarios SGTR01, SGTR02, and VSEQC0, respectively. These three represent the late SGTR, early SGTR, and ISLOCA release modes, respectively. For all modes the ruthenium (Ru), lanthanum (La), cerium (Ce), and barium (Ba) fractions are set to zero as no values are given in Table 4.7-4 of the St. Lucie Units 1 & 2 IPE submittal. Also, for consistency with the other releases, the quoted bypass releases for La have been omitted. The release modes listed in Table E.2-1 are further designated by the characterization of the time of release and size of containment failure. Late leaks and ruptures are both considered here as "Late," whereas the early ones are divided into "Leak" and "Rupture" subclasses. The early failures are expected to have consequences

TABLE E.2-1
RELEASE FRACTION BY NUCLIDE GROUP

Release Mode[a]	Xenon/ Krypton	Iodine	Cesium	Tellurium	Strontium
A1	8.00E-01	2.98E-05	3.10E-05	6.70E-06	0.00E+00
A2	8.00E-01	9.04E-02	9.41E-02	2.03E-02	0.00E+00
B1	8.00E-01	5.07E-02	4.11E-04	6.70E-06	0.00E+00
B2-L	8.00E-01	1.47E-01	9.78E-02	2.03E-02	0.00E+00
B2-R	8.00E-01	1.40E-01	9.78E-02	5.08E-02	0.00E+00
B3-L	8.00E-01	5.07E-02	4.11E-04	6.70E-06	0.00E+00
B3-R	8.00E-01	5.07E-02	4.11E-04	1.68E-05	0.00E+00
B4-L	8.00E-01	1.47E-01	9.78E-02	2.03E-02	0.00E+00
B4-R	8.00E-01	1.47E-01	9.78E-02	5.08E-02	0.00E+00
B5-L	8.00E-01	5.37E-02	5.47E-03	3.39E-06	1.78E-09
B5-R	8.00E-01	5.37E-02	5.47E-03	8.47E-06	8.89E-09
B6-L	8.00E-01	1.38E-01	8.24E-02	1.03E-02	5.39E-06
B6-R	8.00E-01	1.38E-01	2.78E-02	2.57E-02	2.69E-05
C1-L	8.00E-01	5.07E-02	4.13E-04	3.23E-04	2.64E-05
C1-R	8.00E-01	5.07E-02	4.13E-04	8.07E-04	1.32E-04
C2-L	8.00E-01	1.47E-01	9.80E-02	3.83E-02	6.60E-04
C2-R	8.00E-01	1.47E-01	9.80E-02	9.57E-02	3.30E-03
C3-L	8.00E-01	5.07E-02	4.13E-04	3.23E-04	2.64E-05
C3-R	8.00E-01	5.07E-02	4.13E-04	8.07E-04	1.32E-04
C4-L	8.00E-01	1.47E-01	9.80E-02	3.83E-02	6.60E-04
C4-R	8.00E-01	1.47E-01	9.80E-02	9.57E-02	3.30E-03
C5-L	8.00E-01	5.37E-02	5.48E-03	3.19E-04	2.64E-05
C5-R	8.00E-01	5.37E-02	5.48E-03	7.98E-04	1.32E-04
C6-L	8.00E-01	1.38E-01	8.25E-02	2.82E-02	6.65E-04
C6-R	8.00E-01	1.38E-01	8.25E-02	7.05E-02	3.33E-03
D1-L	1.00E+00	7.48E-02	2.55E-02	5.42E-03	0.00E+00
D1-R	1.00E+00	7.48E-02	2.55E-02	1.35E-02	0.00E+00
D2-L	1.00E+00	3.11E-01	2.62E-01	5.42E-02	0.00E+00
D2-R	1.00E+00	3.11E-01	2.62E-01	1.35E-01	0.00E+00
D3-L	1.00E+00	1.89E-01	7.94E-02	1.11E-01	1.85E-02
D3-R	1.00E+00	1.89E-01	7.94E-02	2.77E-01	9.25E-02
D4-L	1.00E+00	5.71E-01	3.90E-01	1.66E-01	1.85E-02
D4-R	1.00E+00	5.71E-01	3.90E-01	4.16E-01	9.26E-02

TABLE E.2-1 (continued)
RELEASE FRACTION BY NUCLIDE GROUP

Release Mode[a]	Xenon/ Krypton	Iodine	Cesium	Tellurium	Strontium
E1-L	1.00E+00	7.48E-02	2.55E-02	7.53E-03	2.31E-04
E1-R	1.00E+00	7.48E-02	2.55E-02	1.88E-02	1.16E-03
E2-L	1.00E+00	3.12E-01	2.64E-01	1.18E-01	7.00E-03
E2-R	1.00E+00	3.12E-01	2.64E-01	2.95E-01	3.50E-02
E3-L	1.00E+00	7.48E-02	2.55E-02	7.53E-03	2.31E-04
E3-R	1.00E+00	7.48E-02	2.55E-02	1.88E-02	1.16E-03
E4-L	1.00E+00	3.12E-01	2.64E-01	1.18E-01	7.00E-03
E4-R	1.00E+00	3.12E-01	2.64E-01	2.95E-01	3.50E-02
E5-L	1.00E+00	1.89E-01	7.94E-02	1.12E-01	1.86E-02
E5-R	1.00E+00	1.89E-01	7.94E-02	2.79E-01	9.30E-02
E6-L	1.00E+00	5.72E-01	3.90E-01	1.94E-01	2.17E-02
E6-R	1.00E+00	5.72E-01	3.90E-01	4.85E-01	1.08E-01
SGTR1	7.64E-01	2.03E-02	2.03E-02	0	1.08E-05
SGTR2	9.19E-01	5.56E-02	5.56E-02	0	2.53E-05
V	9.96E-01	8.69E-01	8.69E-01	3.79E-01	2.06E-02

NOTES:

[a] Release Mode notations:

A, B, C designate late releases.

D, E designate early releases.

-L designates a containment leak.

-R designates a containment rupture.

SGTR1 designates the late SGTR bypass release mode.

SGTR2 designates the early SGTR bypass release mode.

V designates the ISLOCA (Event V) bypass release mode.

significantly dependent on the time of release, with much less dependency on the duration of the release once started. For example, the Release Modes D1-L and D1-R are assigned the same timing data set, while maintaining their separate identities with regard to release fractions.

Other terms associated with the release are provided in Table E.2-2. They are assigned to each source term according to the "type." Each release plume is assumed to have only one segment. The early rupture and bypass releases are essentially puff releases, and the early leak and late failures are more continuous. The energy of releases is assigned by analogy with similar releases in the NUREG-1150 submittal for Surry Unit 1 (Ref. E.2-5).

E.2.2.3 METEOROLOGICAL DATA

St. Lucie Units 1 & 2 hourly meteorological data for calendar years 1998 and 1999 were placed in MACCS2 format. Where data blocks were missing in the source files, supplementary information was derived from meteorological data obtained from the National Climatic Data Center of the National Oceanographic and Atmospheric Administration (NOAA) for Vero Beach Airport, latitude 27° 37', longitude -80° 25'. In these cases, atmospheric stability classes were estimated based on the hour, the elevation of the sun, the wind speed, and the reported cloud cover.

E.2.2.4 POPULATION DISTRIBUTION

St. Lucie Units 1 & 2 is a coastal plant (barrier island) with an eastern boundary of the Atlantic Ocean and a western boundary of the Indian River Lagoon. The nearest population centers (greater than 25,000) are Fort Pierce (5-10 miles) and Port St. Lucie (3-13 miles). The projected year 2025 permanent population distribution is approximately 500 people within 2 miles of the plant, 30,000 within 5 miles, and 218,000 people between 5 and 10 miles from the plant.

The computer program SECPOP90 (Ref. E.2-6) was used to process block-level 1990 census data to prepare population estimates for the region surrounding the plant. County-specific years 1990 and 2015 population projections (Ref. E.2-7) were extrapolated to year 2025 using the ratio of the Bureau of the Census 2025 and 2015 Florida population projections (Ref. E.2-8) to form a county-specific set of population multiplier factors for the period 1990 to 2025. Year 2025 population projections were used for the MACCS2 analyses as these are the endmost data produced by the Bureau of the Census and because 2025 is about the midterm year of the proposed license extension period.

E.2.2.5 EVACUATION DATA

The model prepared for the St. Lucie Emergency Plan has been described by plant staff as very complex and extraction of MACCS2-type data from the Plan would be difficult. The emergency evacuation model has been modeled as a single evacuation zone extending out 10 miles from the plant. The evacuation speed and evacuation start time delay with no sheltering, 1.8 meters per second (m/s) and 7,200 seconds (s), respectively, are judgmentally chosen by examination of Surry Power Station emergency plan results. The Surry site is on a river with the bulk of the population located on the other side of the river

TABLE E.2-2
OTHER RELEASE MODE TERMS

MACCS2 Variable	EARLY RUPTURE	EARLY LEAK	BYPASS-V	BYPASS-SGTR2 EARLY	BYPASS-SGTR1 LATE	LATE
(Data Source[1])	NUREG-1150	NUREG-1150	Table F-11 & NUREG-1150	Table F-29 & NUREG-1150	Table F-28 & NUREG-1150	NUREG-1150
OALARM (s)	11,088	11,088	31,100	7,200	36,000	17,640
NUMREL	1	1	1	1	1	1
MAXRIS	1	1	1	1	1	1
REFTIM (s)	0	0.5	0.	0.5	0.	0.5
PLHEAT (w)	2.1E+6	1.8E+6	1.0E+6	1.5E+6	1.0E+6	9.2E+5
PLHITE (m)	30	30	0	30	30	30
PLDUR (s)	1,600	86,400	3,600	7,200	7,200	54,000
PDELAY (s)	17,640	17,640	34,700	9,500	40,000	86,400

NOTES:

[1] Values are from Tables 4.6-8A and 4.6-25, as appropriate, from NUREG-1150 (Ref. E.2-5).

The Bypass values are judgmentally extracted from the Modular Accident Analysis Program run data reported in the IPE submittal (Ref. E.2-4).

mostly in one quadrant and mostly beyond 5 miles. Other data such as sheltering factors are Surry values as recommended by the NRC (Ref. E.2-9). Complete evacuation is assumed as a base case.

Evacuation-related economic costs are the recommended values as given for the NUREG-1150 study (Ref. E.2-6). These data were updated using a recent Consumers Price Index (CPI) of 174.0 (M10/2000) from the Bureau of Labor (Ref. E.2-10). The referenced study uses a 1986 CPI of 113, referred to 100 in 1982. Therefore, the referenced study unit costs have been multiplied by a factor of 1.54 (174/113). The average non-farm property value and the average value of farm wealth were calculated as the population-weighted average for the largest counties within 50 miles of the plant.

E.2.2.6 LAND FRACTIONS

SECPOP90 calculates the land fraction for each rosette section, as explained in the manual for the code (Ref. E.2-6). The code contains a county-level database with the land fractions for each county obtained from the 1990 census data files. The calculated values are used directly in these analyses. Due to the way in which SECPOP90 allocates population from the census blocks, certain of the radial blocks near the plant are shown as all water. These segments have zero population so that the effect on the results is not significant.

E.2.2.7 WATERSHED INDEX

The sections were assigned to one of three watersheds. Each section that is over the ocean was assigned to a watershed that has zero contribution to the food chain in terms of uptake of deposited radionuclides. Those over Lake Okeechobee were assigned to a lake watershed, and the remainder to a river watershed.

E.2.2.8 CROP SEASON AND SHARE

Agricultural data including crop seasons were taken from data available in the 1997 Census of Agriculture (Ref. E.2-11) and were used to produce the land fraction used for each crop. It was not possible to enter values for some crops that are planted in the fall and harvested in the spring. The major crops are sugar cane for sugar, vegetables, and orchard fruits.

E.2.2.9 REGIONAL ECONOMIC DATA

The SECPOP90 code database includes county economic factors derived from the 1990 census and various other government sources dated 1992 to 1994. For the preparation of data for this St. Lucie Units 1 & 2 model the county data file was updated to circa 1999 for the nine Florida counties within 50 miles of the plant. By this means the site files prepared for St. Lucie contained updated values for each economic region and, hence, for each sector.

Agricultural data were taken from data available in the 1997 Census of Agriculture (Ref. E.2-11). The value of the non-farm assets (VNFRM) was calculated using the method and data given in Appendix D of the SECPOP90 manual and data from Ref. E.2-12 through Ref. E.2-15.

Economic consequences were estimated by summing the following costs:

1. Costs of evacuation,
2. Costs for temporary relocation (food, lodging, lost income),
3. Costs of decontaminating land and buildings,
4. Lost return-on-investments from properties that are temporarily interdicted to allow contamination to be decreased by decay of nuclides,
5. Costs of repairing temporarily interdicted property,
6. Value of crops destroyed or not grown because they were contaminated by direct deposition or would be contaminated by root uptake, and
7. Value of farmland and of individual, public, and non-farm commercial property that is condemned.

Costs associated with damage to the reactor, the purchase of replacement power, medical care, life shortening, and litigation are not calculated by MACCS2.

E.2.3 RESULTS

Based on the preceding input data, MACCS2 was used to estimate the following:

- The downwind transport, dispersion, and deposition of the radioactive materials released to the atmosphere from the failed reactor containment.
- The short- and long-term radiation doses received by exposed populations via direct (cloudshine, plume inhalation, groundshine, and resuspension inhalation) and indirect (ingestion) pathways.
- The mitigation of those doses by protective actions (evacuation, sheltering, and post-accident relocation of people; disposal of milk, meat, and crops; and decontamination, temporary interdiction, or condemnation of land and buildings).
- The early fatalities and injuries expected to occur within 1 year of the accident (early health effects) and the delayed (latent) cancer fatalities and injuries expected to occur over the lifetimes of the exposed individuals.
- The offsite costs of short-term emergency response actions (evacuation, sheltering, and relocation), of crop and milk disposal, and of the decontamination, temporary interdiction, or condemnation of land and buildings.

The result of the Level 3 model is a matrix of offsite exposure and offsite property costs associated with a postulated severe accident in each containment event-tree endstate. This matrix is combined with the results of the Level 2 model to yield the probabilistic offsite dose and probabilistic offsite property losses resulting from the analyzed plant configuration. The base case offsite exposure for Unit 1 is 15.31 person-rem/year and 13.97 person-rem/year for Unit 2. Table E.2-3 provides the baseline exposure risk associated with each containment event-tree endstate. The offsite exposure risk for each endstate is calculated by multiplying the frequency of the release by the dose [Sieverts (Sv)] and then converting that value to person-rem by multiplying it by a factor of 100.

TABLE E.2-3
OFFSITE EXPOSURE RISK ASSOCIATED WITH EACH CONTAINMENT ENDSTATE

CET ES	Frequency Unit 1 Base Case	Sieverts Unit 1	person-rem Unit 1	Frequency Unit 2 Base Case	Sieverts Unit 2	person-rem Unit 2
A1	5.80E-07	8.28E+01	4.80E-03	4.48E-07	8.28E+01	3.71E-03
A2	2.08E-07	1.60E+04	3.33E-01	1.40E-07	1.60E+04	2.25E-01
B1	2.84E-06	1.49E+03	4.23E-01	2.15E-06	1.49E+03	3.20E-01
B2-L	5.71E-07	1.63E+04	9.31E-01	4.32E-07	1.63E+04	7.05E-01
B2-R	1.43E-09	1.66E+04	2.38E-03	1.08E-09	1.66E+04	1.80E-03
B3-L	1.94E-06	1.49E+03	2.89E-01	1.47E-06	1.49E+03	2.19E-01
B3-R	4.85E-09	1.49E+03	7.23E-04	3.68E-09	1.49E+03	5.49E-04
B4-L	3.89E-07	1.63E+04	6.34E-01	2.95E-07	1.63E+04	4.82E-01
B4-R	9.75E-10	1.66E+04	1.62E-03	7.40E-10	1.66E+04	1.23E-03
B5-L	5.98E-10	4.57E+03	2.73E-04	5.32E-10	4.57E+03	2.43E-04
B5-R	1.50E-12	4.57E+03	6.85E-07	1.33E-12	4.57E+03	6.09E-07
B6-L	1.21E-10	1.59E+04	1.92E-04	1.07E-10	1.59E+04	1.70E-04
B6-R	3.02E-13	1.11E+04	3.35E-07	2.68E-13	1.11E+04	2.98E-07
BYP-SGTR1	3.21E-07	4.85E+04	1.56E+00	3.73E-09	4.85E+04	1.81E-02
BYP-SGTR2	8.73E-07	5.83E+03	5.09E-01	2.53E-07	5.83E+03	1.47E-01
BYP-ISLOCA	2.90E-06	1.36E+04	3.94E+00	5.62E-06	1.36E+04	7.64E+00
C1-L	2.22E-06	1.50E+03	3.33E-01	1.71E-06	1.50E+03	2.56E-01
C1-R	5.55E-09	1.53E+03	8.50E-04	4.27E-09	1.53E+03	6.54E-04
C2-L	1.73E-06	1.65E+04	2.85E+00	1.06E-06	1.65E+04	1.75E+00
C2-R	4.33E-09	1.72E+04	7.45E-03	2.66E-09	1.72E+04	4.57E-03
C3-L	2.43E-06	1.50E+03	3.65E-01	1.86E-06	1.50E+03	2.79E-01
C3-R	6.10E-09	1.53E+03	9.33E-04	4.66E-09	1.53E+03	7.13E-04
C4-L	1.87E-06	1.65E+04	3.08E+00	1.14E-06	1.65E+04	1.88E+00
C4-R	4.67E-09	1.72E+04	8.03E-03	2.86E-09	1.72E+04	4.91E-03
C5-L	6.53E-10	4.59E+03	3.00E-04	5.73E-10	4.59E+03	2.63E-04
C5-R	1.64E-12	4.60E+03	7.53E-07	1.44E-12	4.60E+03	6.61E-07
C6-L	3.54E-10	1.61E+04	5.70E-04	2.38E-10	1.61E+04	3.84E-04
C6-R	8.87E-13	1.66E+04	1.47E-06	5.97E-13	1.66E+04	9.92E-07
D1-L	0.00E+00	1.05E+04	0.00E+00	0.00E+00	1.05E+04	0.00E+00
D1-R	1.09E-09	1.33E+04	1.45E-03	8.25E-10	1.33E+04	1.10E-03
D2-L	0.00E+00	2.25E+04	0.00E+00	0.00E+00	2.25E+04	0.00E+00
D2-R	4.00E-10	4.21E+04	1.68E-03	3.03E-10	4.21E+04	1.27E-03
D3-L	0.00E+00	1.84E+04	0.00E+00	0.00E+00	1.84E+04	0.00E+00
D3-R	8.52E-13	3.89E+04	3.31E-06	6.99E-13	3.89E+04	2.72E-06

TABLE E.2-3 (continued)
OFFSITE EXPOSURE RISK ASSOCIATED WITH EACH CONTAINMENT ENDSTATE

CET ES	Frequency Unit 1 Base Case	Sieverts Unit 1	person-rem Unit 1	Frequency Unit 2 Base Case	Sieverts Unit 2	person-rem Unit 2
D4-L	0.00E+00	2.88E+04	0.00E+00	0.00E+00	2.88E+04	0.00E+00
D4-R	3.13E-13	7.73E+04	2.42E-06	2.57E-13	7.73E+04	1.98E-06
E1-L	0.00E+00	1.05E+04	0.00E+00	0.00E+00	1.05E+04	0.00E+00
E1-R	8.83E-09	1.36E+04	1.20E-02	6.48E-09	1.36E+04	8.82E-03
E2-L	0.00E+00	2.33E+04	0.00E+00	0.00E+00	2.33E+04	0.00E+00
E2-R	1.19E-09	4.93E+04	5.86E-03	6.65E-10	4.93E+04	3.28E-03
E3-L	0.00E+00	1.05E+04	0.00E+00	0.00E+00	1.05E+04	0.00E+00
E3-R	7.15E-09	1.36E+04	9.72E-03	5.28E-09	1.36E+04	7.17E-03
E4-L	0.00E+00	2.33E+04	0.00E+00	0.00E+00	2.33E+04	0.00E+00
E4-R	8.26E-10	4.93E+04	4.07E-03	4.62E-10	4.93E+04	2.28E-03
E5-L	0.00E+00	1.84E+04	0.00E+00	0.00E+00	1.84E+04	0.00E+00
E5-R	6.65E-12	3.90E+04	2.60E-05	5.25E-12	3.90E+04	2.05E-05
E6-L	0.00E+00	2.90E+04	0.00E+00	0.00E+00	2.90E+04	0.00E+00
E6-R	5.24E-13	8.04E+04	4.21E-06	2.80E-13	8.04E+04	2.25E-06
NCF	2.21E-06			1.53E-06		
NCFA	8.79E-06			6.31E-06		
NCFB	3.43E-09			1.77E-09		
NEG	0.00E+00			0.00E+00		
Total	2.99E-05		15.31	2.45E-05		13.97

The base case offsite property risk is $42,542 per year for Unit 1 and $38,571 per year for Unit 2. Table E.2-4 provides the base case offsite property risk values associated with each containment event-tree endstate. The property risk for each endstate is calculated by multiplying the frequency by the offsite dollar factor.

The final result of a Level 3 evaluation of a severe accident mitigation alternative (SAMA) is a value of the cumulative dose expected to be received by offsite individuals and a value of the expected offsite property losses due to severe accidents given the plant configuration under evaluation.

E.2.4 SENSITIVITY ANALYSIS

Florida Power & Light Company (FPL) evaluated the sensitivity associated with five of the MACCS2 inputs. These include weather, percentage evacuation, evacuation speed, population, and source terms.

E.2.4.1 SENSITIVITY CASES

E.2.4.1.1 WEATHER

Two years of meteorological data were considered to determine whether the offsite risks are dependent on the yearly weather variations. Data for year 1999 were considered in the base case and were compared to year 1998 data. Both of these cases assumed 100 percent evacuation.

E.2.4.1.2 NON-EVACUATION

For this case, the percentage of evacuation was reduced to 95 percent evacuation of the population within a 10-mile radius of the plant versus the base case, which assumed 100 percent of the population within a 10-mile radius of the plant evacuates.

E.2.4.1.3 REDUCED EVACUATION SPEED

The evacuation speed was reduced to 0.3 m/s compared to the base case 0.45 m/s value.

E.2.4.1.4 POPULATION PROJECTION INCREASED BY 2.5 PERCENT

For this case, the population projections were uniformly increased by 2.5 percent. This factor is similar to the increased year 2000 population found in Census 2000, compared to the previous estimate for year 2000. This latter number was used in projecting the year 2025 data in the base MACCS2 St. Lucie Units 1 & 2 model.

E.2.4.1.5 POPULATION PROJECTION INCREASED BY 10 PERCENT

For this case, the population projections were uniformly increased by 10 percent to serve as a bounding projection for year 2025.

TABLE E.2-4
OFFSITE PROPERTY RISK ASSOCIATED WITH EACH CONTAINMENT ENDSTATE

CET ES	Frequency Unit 1 Base Case	Conversion Factor ($)	Unit 1 Economic Risk ($)	Frequency Unit 2 Base Case	Conversion Factor ($)	Unit 2 Economic Risk ($)
A1	5.80E-07	1.82E+07	11	4.48E-07	1.82E+07	8
A2	2.08E-07	5.34E+09	1,112	1.40E-07	5.34E+09	750
B1	2.84E-06	2.37E+08	672	2.15E-06	2.37E+08	510
B2-L	5.71E-07	5.46E+09	3,117	4.32E-07	5.46E+09	2,360
B2-R	1.43E-09	5.47E+09	8	1.08E-09	5.47E+09	6
B3-L	1.94E-06	2.37E+08	460	1.47E-06	2.37E+08	349
B3-R	4.85E-09	2.37E+08	1	3.68E-09	2.37E+08	1
B4-L	3.89E-07	5.46E+09	2,124	2.95E-07	5.46E+09	1,613
B4-R	9.75E-10	5.47E+09	5	7.40E-10	5.47E+09	4
B5-L	5.98E-10	8.09E+08	0	5.32E-10	8.09E+08	0
B5-R	1.50E-12	8.09E+08	0	1.33E-12	8.09E+08	0
B6-L	1.21E-10	4.85E+09	1	1.07E-10	4.85E+09	1
B6-R	3.02E-13	2.33E+09	0	2.68E-13	2.33E+09	0
BYP-SGTR1	3.21E-07	8.88E+08	2,846	3.73E-09	8.88E+08	33
BYP-SGTR2	8.73E-07	1.33E+09	1,161	2.53E-07	1.33E+09	336
BYP-ISLOCA	2.90E-06	3.49E+09	10,121	5.62E-06	3.49E+09	19,614
C1-L	2.22E-06	2.39E+08	530	1.71E-06	2.39E+08	408
C1-R	5.55E-09	2.41E+08	1	4.27E-09	2.41E+08	1
C2-L	1.73E-06	5.48E+09	9,473	1.06E-06	5.48E+09	5,817
C2-R	4.33E-09	5.49E+09	24	2.66E-09	5.49E+09	15
C3-L	2.43E-06	2.39E+08	581	1.86E-06	2.39E+08	444
C3-R	6.10E-09	2.41E+08	1	4.66E-09	2.41E+08	1
C4-L	1.87E-06	5.48E+09	10,221	1.14E-06	5.48E+09	6,253
C4-R	4.67E-09	5.49E+09	26	2.86E-09	5.49E+09	16
C5-L	6.53E-10	8.10E+08	1	5.73E-10	8.10E+08	0
C5-R	1.64E-12	8.10E+08	0	1.44E-12	8.10E+08	0
C6-L	3.54E-10	4.86E+09	2	2.38E-10	4.86E+09	1
C6-R	8.87E-13	4.90E+09	0	5.97E-13	4.90E+09	0
D1-L	0.00E+00	1.87E+09	0	0.00E+00	1.87E+09	0
D1-R	1.09E-09	1.64E+09	2	8.25E-10	1.64E+09	1
D2-L	0.00E+00	8.40E+09	0	0.00E+00	8.40E+09	0
D2-R	4.00E-10	5.77E+09	2	3.03E-10	5.77E+09	2
D3-L	0.00E+00	4.58E+09	0	0.00E+00	4.58E+09	0
D3-R	8.52E-13	3.80E+09	0	6.99E-13	3.80E+09	0

TABLE E.2-4 (continued)
OFFSITE PROPERTY RISK ASSOCIATED WITH EACH CONTAINMENT ENDSTATE

CET ES	Frequency Unit 1 Base Case	Conversion Factor ($)	Unit 1 Economic Risk ($)	Frequency Unit 2 Base Case	Conversion Factor ($)	Unit 2 Economic Risk ($)
D4-L	0.00E+00	9.67E+09	0	0.00E+00	9.67E+09	0
D4-R	3.13E-13	6.60E+09	0	2.57E-13	6.60E+09	0
E1-L	0.00E+00	1.87E+09	0	0.00E+00	1.87E+09	0
E1-R	8.83E-09	1.64E+09	14	6.48E-09	1.64E+09	11
E2-L	0.00E+00	8.43E+09	0	0.00E+00	8.43E+09	0
E2-R	1.19E-09	5.79E+09	7	6.65E-10	5.79E+09	4
E3-L	0.00E+00	1.87E+09	0	0.00E+00	1.87E+09	0
E3-R	7.15E-09	1.64E+09	12	5.28E-09	1.64E+09	9
E4-L	0.00E+00	8.43E+09	0	0.00E+00	8.43E+09	0
E4-R	8.26E-10	5.79E+09	5	4.62E-10	5.79E+09	3
E5-L	0.00E+00	4.58E+09	0	0.00E+00	4.58E+09	0
E5-R	6.65E-12	3.80E+09	0	5.25E-12	3.80E+09	0
E6-L	0.00E+00	9.68E+09	0	0.00E+00	9.68E+09	0
E6-R	5.24E-13	6.61E+09	0	2.80E-13	6.61E+09	0
NCF	2.21E-06			1.53E-06		
NCFA	8.79E-06			6.31E-06		
NCFB	3.43E-09			1.77E-09		
NEG	0.00E+00			0.00E+00		
Total	2.99E-05		42,542	2.45E-05		38,571

E.2.4.1.6 AUGMENTED SOURCE TERMS

The St. Lucie Units 1 & 2 IPE Level 2 release fractions were used for the base case reported in Ref. E.2-4. These release fractions were assigned to the xenon/krypton, iodine, cesium, tellurium, and strontium MACCS2 release groups for each release mode in the base case. Other release groups were set to zero.

For this case, estimates for the ruthenium, lanthanum, cerium, and barium MACCS2 release groups were prepared and added to the release fractions RELFR in ATMOS.

NUREG-1465 (Ref. E.2-16) presents postulated representative severe accident fission product source terms released into the Containment. The summed (gap, in-vessel, and ex-vessel) releases for PWRs are:

Fission Product	Postulated Source Term
Barium (Ba)	(same as Strontium)
Noble metals (Ru)	0.005
Cerium group (Ce)	0.0055
Lanthanides (La)	0.0052

The barium release group was set equal to the St. Lucie-reported strontium release fraction for each of the 48 different release modes.

For the early release and bypass release modes (Dxx, Exx, V, and SGTRn) the Ru, Ce, and La release fractions were set equal to the NUREG-1465 values above. This assumes no containment release mitigation.

For the late release modes (Axx, Bxx, and Cxx) the Ru, Ce, and La release fractions were set equal to one tenth of the NUREG-1465 in-containment release values. This represents an estimate of a factor of 10 in the late containment release mitigation.

E.2.4.2 SENSITIVITY RESULTS

Table E.2-5 shows the results of the weather and non-evacuation cases described in Section E.2.4.1. The offsite risks are not significantly dependent on the yearly weather variations, as judged from the 1998 and 1999 weather data. Also, making the assumption that 5 percent of the population was not evacuated did not result in a significant difference when compared with the similar weather case with 100 percent evacuation.

TABLE E.2-5
WEATHER AND NON-EVACUATION SENSITIVITY RESULTS

Risk	1998 Weather	1999 Weather	5% Non-evac, 1999 Weather
Dose, Sv /yr	0.315	0.343	0.347
Economic costs, $/yr	108,880	110,990	110,390

The sensitivity results for the remaining cases are shown in Table E.2-6 in terms of total average annual risk for the base case and three sensitivity cases. The base case is the "99 Weather" case.

TABLE E.2-6
EVACUATION SPEED, POPULATION, AND FISSION PRODUCT SENSITIVITY ANALYSIS RESULTS

RISK	Base Case	0.03 m/s evac spd	+2.5 % pop	+10% pop	+FissProd
Dose, Sv/yr	0.343	0.351	0.355	0.380	0.397
Economic costs, $/yr	110,990	110,990	113,430	121,230	125,680

E.2.5 REFERENCES

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E.2-2 Oak Ridge National Laboratory. RSICC Computer Code Collection MACCS2 V.1.12. CCC-652 Code Package. Oak Ridge, Tennessee. 1997.

E.2-3 H-N Jow, et al. *MELCOR Accident Consequence Code System (MACCS) Model Description*. NUREG/CR-4691 (SAND86-1562). Vol. 2. Sandia National Laboratories. Albuquerque, New Mexico. February 1990.

E.2-4 D.A. Sager (FPL) to Document Control Desk (NRC), "St. Lucie Units 1 & 2 Summary Report of Individual Plant Examination for Severe Accident Vulnerabilities – Generic Letter 88-20." (L-93-301) December 9, 1993.

E.2-5 R. J. Breeding, et al. *Evaluation of Severe Accident Risks: Surry Unit 1*. NUREG/CR-4551 (SAND86-1309). Vol. 3, Rev. 1, Part 1. Sandia National Laboratories. Albuquerque, New Mexico. October 1990.

E.2-6 S. L. Humphreys, et al. *SECPOP90: Sector Population, Land Fraction, and Economic Estimation Program*. NUREG/CR-6525 (SAND93-4032). Sandia National Laboratories. Albuquerque, New Mexico. September 1997.
and
Bureau of the Census. *Census of Population and Housing, 1990: Public Law (P. L.) 94-171, Data Technical Documentation*. CD – ROM set. 1991.

E.2-7 S. K. Smith and J. Nagle, "Population Projections by Age, Sex and Race for Florida and its Counties, 1999-2015." Bulletin 127. Bureau of Economic and Business Research, University of Florida. Tallahassee, Florida. June 2000.

E.2-8 Paul Campbell, "Population Projections: States, 1995-2025." P25-1131. Bureau of the Census, U. S. Department of Commerce. May 1997.

E.2-9 J. L. Sprung, et al. *Evaluation of Severe Accident Risks: Quantification of Major Input Parameters MACCS Input*. NUREG/CR-4551, (SAND86-1309). Vol. 2, Rev. 1, Part 7. Sandia National Laboratories. Albuquerque, New Mexico. December 1990.

E.2-10 U.S. Bureau of Labor, "Consumers Price Index-All Urban Consumers." SERIES ID CUUR0000SA0. December 6, 2000.

E.2-11 U.S. Department of Agriculture, "1997 Census of Agriculture." AC97-A-51. National Agricultural Statistics Service/Florida Agricultural Statistics Service. Washington, D.C. March 1999.

E.2-12 U.S. Department of Commerce. *Statistical Abstract of the United States 1999*. CD-COMP-ABSTR99. March 2000.

a) Table No. 774, “Net Stock of Fixed Reproducible Tangible Wealth: 1980 to 1997.”

b) Table No.1114, ”Farm Assets, Debt, and Income, by State:1996 and 1997.”

c) Table No.1103, “Farms —Number, Acreage, and Value, by Type of Organization.”

d) Table No. 395, “Land Cover/Use, by State.”

e) Table No. 1224, “Net Stock of Residential Capital:1985 to 1997.”

f) Table No. 2, “Population:1960 to 1998.”

E.2-13 U.S. Department of Commerce. “Fixed Assets and Consumer Durable Goods for 1925–99,” *Survey of Current Business*. p.19. Table 1, “Current-Cost Net Stock of Fixed Assets and Consumer Durable Goods, 1925–99.” Bureau of Economic Analysis. Washington, D.C. September 2000.

E.2-14 Bureau of Economic Analysis Regional Accounts Data Web Site, “State Personal Income.” http://www.bea.doc.gov/bea/regional/sqpi/. Accessed August 8, 2000.

E.2-15 Bureau of the Census, “1999 year population US.” http://www.census.gov/population/www/estimates/national.html. Accessed December 20, 2000.

E.2-16 U.S. Nuclear Regulatory Commission. *Accident Source Terms for Light-Water Nuclear Power Plants*. NUREG-1465. Office of Nuclear Regulatory Research. Washington, D.C. February 1995.

E. 3 IDENTIFICATION AND SCREENING OF CANDIDATE SAMAs

This section describes the generation of the initial list of potential severe accident mitigation alternatives (SAMAs) for St. Lucie Units 1 & 2, the screening methods, and the screening results.

E.3.1 SAMA LIST COMPILATION

Florida Power & Light Company (FPL) has generated a list of candidate SAMAs by reviewing industry documents and considering plant-specific enhancements not addressed in published industry documents. Industry documents FPL reviewed include the following:

- St. Lucie Units 1 & 2 Individual Plant Examination (IPE) submittal (Ref. E.3-1)
- The Watts Bar Nuclear Plant Unit 1 IPE submittal (Ref. E.3-2)
- The Limerick Severe Accident Mitigation Design Alternatives (SAMDAs) cost estimate report (Ref. E.3-3)
- NUREG-1437 description of Limerick SAMDAs (Ref. E.3-4)
- NUREG-1437 description of Comanche Peak SAMDAs (Ref. E.3-5)
- Watts Bar SAMDA submittal (Ref. E.3-6)
- Tennessee Valley Authority (TVA) response to the U.S. Nuclear Regulatory Commission's (NRC's) request for additional information (RAI) on the Watts Bar SAMDA submittal (Ref. E.3-7)
- Westinghouse AP600 SAMDA (Ref. E.3-8)
- Safety Assessment Consulting presentation by Wolfgang Werner at the NUREG-1560 conference (Ref. E.3-9)
- NRC IPE Workshop – NUREG-1560 NRC Presentation (Ref. E.3-10)
- NUREG-0498, Supplement 1, Section 7 (Ref. E.3-11)
- NUREG/CR-5567, [Pressurized-water reactor] *PWR Dry Containment Issue Characterization* (Ref. E.3-12)
- NUREG-1560, Volume 2, NRC Perspectives on the IPE Program (Ref. E.3-13)
- NUREG/CR-5630, *PWR Dry Containment Parametric Studies* (Ref. E.3-14)
- NUREG/CR-5575, *Quantitative Analysis of Potential Performance Improvements for the Dry PWR Containment* (Ref. E.3-15)
- Combustion Engineering, Inc. (CE), System 80+ Submittal (Ref. E.3-16)
- NUREG-1462, NRC Review of ABB CE System 80+ Submittal (Ref. E.3-17)
- An International Conference on Nuclear Engineering paper by C. W. Forsberg, et al., on a core-melt source reduction system (Ref. E.3-18)
- The Oconee SAMA analysis (Ref. E.3-19)
- The Turkey Point Units 3 & 4 SAMA analysis (Ref. E.3-20)
- The Calvert Cliffs Nuclear Power Plant Units 1 & 2 SAMA analysis (Ref. E.3-21)

In addition, the top 100 cutsets of the Level 1 probabilistic safety assessment (PSA) update were examined to identify the important contributors to plant risk (both plant equipment and operator actions) and to ensure that the important contributors were addressed by one or more SAMA.

Although the Units are a CE design, each of the above documents has been reviewed for potential SAMAs even if it is not necessarily applicable to a CE plant. Those items found not applicable were subsequently screened from this list. The containment performance improvement programs for boiling water reactors and ice condenser plants were not reviewed (and the NUREG-1560 portion of the containment performance improvements for these improvement programs was not reviewed). FPL assumes that any issues from these documents have been included in the large, dry containment performance improvement program (NUREG/CR-5567). Conceptual enhancements for which no specific details are available (e.g., "improve diesel reliability" or "improve procedures for loss of support systems") were not included unless they were considered to be vulnerabilities in the plant's IPE.

FPL was able to eliminate most of the SAMAs identified in the Oconee SAMA analysis because they were already identified from the review of the industry documents listed above, the intent had already been met, or they are covered by the St. Lucie Units 1 & 2 Severe Accident Management Guidelines program. However, four items were added to the SAMA list as a result of this review.

E.3.2 QUALITATIVE SCREENING OF SAMAS

The initial list of potential SAMAs is presented in Table E.3-1. Table E.3-1 also presents a qualitative screening of the initial list. Items have been eliminated from further evaluation based on one of the following criteria:

- The SAMA is not applicable at St. Lucie Units 1 & 2, either because the enhancement is only for boiling water reactors or the Westinghouse AP600 design or PWR ice condenser containments, or because it is a plant-specific enhancement that does not apply (Screening Criterion "A"); or
- The SAMA is already implemented at St. Lucie Units 1 & 2 or the plant design meets the intent of the SAMA, as determined by plant staff review of each SAMA (Screening Criterion "B").

Based on preliminary screening, 29 improvements were eliminated as not applicable to St. Lucie Units 1 & 2 and 90 were already implemented or the intent was already met. This left 50 improvements subject to the final screening and evaluation process. The final screening and cost-benefit evaluation are presented in Section 4.15.

TABLE E.3-1
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
Improvements Related to RCP Seal LOCAs (loss of CCW or SW)					
1	Cap downstream piping of normally closed CCW drain and vent valves.	Reduces the frequency of loss of CCW initiating event, a large portion of which was derived from catastrophic failure of one of the many single isolation valves.	(13)	B	Vents and drains are ¾ inch or 1 inch, giving time to locate leaks should they occur. P&IDs indicate many are capped. Many inaccessible ones (e.g., containment fan coolers) are locked closed. Larger connections indicate blind flanges.
2	Enhance loss of CCW (or loss of SW) procedure to facilitate stopping RCPs.	Reduces potential for RCP seal damage due to pump bearing failure.	(2), (10), (13)	B	Site procedure [1(2)-EOP-02] is specific about stopping RCPs on loss of CCW, which is the only cooling at St. Lucie Units 1 & 2. This is emphasized in training.
3	Enhance loss of CCW procedure to present desirability of cooling down RCS prior to seal LOCA.	Potential reduction in the probability of RCP seal failure.	(2)	B	Site procedure [1(2)-EOP-02] is specific about stopping RCPs (and isolating controlled bleedoff) on loss of CCW. If done within the one hour allowable per CE (procedure requires 30 minutes), the probability of a seal LOCA is greatly reduced. This is emphasized in training.
4	Provide additional training on the loss of CCW.	Potential improvement in success rate of operator actions after a loss of CCW.	(2)	B	Procedures and training already cover loss of CCW, especially for RCP seal LOCAs.

NOTES:

a. Source identifiers correlate to entries on the reference list (see Section E.3.4): for example, (13) identifies Ref. E.3-13, i.e., NUREG-1560.

b. Screening criteria:

A = Not Applicable

B = Intent Met or Implemented

N = Not Initially Screened. Considered in cost-benefit evaluation.

c. Acronyms and symbols are defined in Section E.5.

TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
5	Provide hardware connections to allow another ERCW (SW) to cool charging pump seals.	Reduce effect of loss of CCW by providing a means to maintain the charging pump seal injection after a loss of CCW. Note, at Watts Bar, this capability was already in place for one charging pump at one unit, and the potential enhancement identified was to make it possible for all the charging pumps.	(2), (6), (11), (13)	B	Current seals are not designed for seal injection. Moreover, St. Lucie Units 1 & 2 seals do not require seal injection to maintain integrity after a loss of cooling water, assuming the operators stop the RCPs and isolate controlled bleedoff flow. If operators do not secure the RCPs, they would be unlikely to then initiate seal injection. Therefore, expanding the ability to support seal injection would have no impact on St. Lucie CDF.
6	On loss of ERCW, proceduralize shedding CCW loads to extend the CCW heatup time.	Increase time before the loss of CCW (and RCP seal failure) in the loss of ERCW sequences.	(2)	B	Procedure [1(2)-EOP-02] is specific about stopping RCPs (and isolating controlled bleedoff) on loss of CCW. If done within the one hour allowable per CE (procedure requires 30 minutes), the probability of a seal LOCA is greatly reduced. This is emphasized in training.

NOTES:

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
7	Increase charging pump lube oil capacity.	Would lengthen time before charging pump failure due to lube oil overheating in loss of CCW sequences.	(2)	B	Current seals are not designed for seal injection. Costs to modify seals, spares, revise procedures, and retrain operators would be high. This would be necessary before the charging pumps could even be used. St. Lucie Units 1 & 2 seals do not require seal injection to maintain integrity after a loss of cooling (assuming the operators stop the RCPs and isolate controlled bleedoff flow). Current seals are not designed for injection. Due to shaft cracking, seal injection would NOT be continuously operated at St. Lucie Units 1 & 2 and would have to be initiated on loss of CCW. (At one time procedures said, "secure RCPs and initiate seal injection.") If operators do not secure the RCPs, they are unlikely to then initiate seal injection. Therefore, expanding the ability to support seal injection would have no impact on St. Lucie Units 1 & 2 CDF and no benefits would arise from doing so.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
8	Eliminate RCP thermal barrier dependence on CCW, such that loss of CCW does not result directly in core damage.	Would prevent loss of RCP seal integrity after a loss of CCW. Watts Bar IPE said TVA could do this with ERCW connection to charging pump seals.	(2), (13)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
9	Provide additional SW pump.	Providing another pump would decrease CDF due to a loss of SW.	(5)	B	St. Lucie Units 1 & 2 have two trains of ICW with a third pump, which can be aligned to either train. One pump is capable of supplying accident/shutdown loads for a Unit.
10	Create an independent RCP seal injection system, with dedicated diesel.	Would add redundancy to RCP seal cooling alternatives, reducing CDF from loss of CCW or SW, or from SBO.	(6), (11), (13)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
11	Create an independent RCP seal injection system, without dedicated diesel.	Would add redundancy to RCP seal cooling alternatives, reducing CDF from loss of CCW or SW, or from SBO.	(11)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
12	Use existing hydro test pump for RCP seal injection.	Independent seal injection source, without cost of a new system.	(7)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
13	Replace ECCS pump motors with air-cooled motors.	Remove dependency on CCW.	(10), (13)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
14	Install improved RCP seals.	RCP seal O-rings constructed of improved materials would reduce chances of an RCP seal LOCA.	(11), (13)	B	All of the St. Lucie Units 1 & 2 RCPs have been upgraded with the new N-9000 seal packages.
15	Add a third CCW pump.	Reduce chance of loss of CCW leading to an RCP seal LOCA.	(13)	B	St. Lucie Units 1 & 2 have two trains of CCW with a third pump, which can be aligned to either train. One pump is capable of supplying accident/shutdown loads for a Unit.
16	Prevent charging pump flow diversion from the relief valves.	If relief valve opening causes a flow diversion large enough to prevent RCP seal injection, then modification can reduce frequency of loss of RCP seal cooling.	(13)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
17	Change procedures to isolate RCP seal letdown flow on loss of CCW, and provide guidance on loss of injection during a seal LOCA.	Reduce CDF from loss of seal cooling.	(13)	B	Procedure [1(2)-EOP-02] is specific about stopping RCPs (and isolating controlled bleedoff) on loss of CCW. If done within the one hour allowable per CE (procedure requires 30 minutes), the probability of a seal LOCA is greatly reduced. This is emphasized in training.

NOTES:

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
18	Create procedures to stagger HPSI pump use after a loss of SW.	Allow high-pressure injection to be extended after a loss of SW.	(13)	B	HPSI does not need CCW for injection. Loss of ICW/CCW with a LOCA would lead to many other problems, which would not be solved by gaining some time for HPSI injection.
19	Use fire water pumps as a backup for seal injection and high-pressure makeup.	Reduce RCP seal LOCA frequency and SBO CDF.	(13)	A	Fire water pumps cannot be used as backup for seal injection and high-pressure makeup since the fire water is at considerably lower pressure. St. Lucie Units 1 & 2 have two electric fire pumps with discharge pressures of 200 psi or less.
20	Provide procedural guidance for use of cross-tied CCW or SW pumps.	Can reduce the frequency of the loss of either of these.	(13)	B	St. Lucie Units 1 & 2 have a total of 2 CCW and 2 ICW trains, each with three pumps. One pump is an installed spare. The spare is used for either of the trains and is aligned electrically as well as mechanically per procedures and operator training.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
21	Create procedure and operator training enhancements in support-system failure sequences, with emphasis on anticipating problems and coping.	Potential improvement in success rate of operator actions after support-system failures.	(2), (13)	B	Support-system initiators dominated by loss of CCW, ICW, and DC bus. Reasonable procedures and training exist for these.
22	Improve ability to cool RHR heat exchangers.	Reduced chance of loss of DHR by 1) performing procedure and hardware modification to allow manual alignment of Fire Protection System to the CCW system, or 2) installing a CCW header cross-tie.	(12), (13)	B	Cost of procedure revision and training is a factor of 2 higher than the estimated $16K benefit for eliminating ALL SDC failures (most of which are NOT CCW related). St. Lucie Units 1 & 2 CCW system is cross-connected, implementing part of the intent. CCW is well addressed in procedures and training.
Improvements Related to HVAC					
23	Stage backup fans in switchgear rooms.	Provides alternate ventilation in the event of a loss of switchgear ventilation.	(13)	B	Unit 1 has redundant 100% capacity (HVS-5A and -5B) cooling supply fans. Unit 2 has redundant 100% capacity (HVS-5A and -5B) cooling supply fans and redundant 100% exhaust fans (HVE-11 and -12). Both Units have redundant turbine building switchgear fans.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
24	Provide redundant train of ventilation to 480V board room.	Would improve reliability of 480V HVAC. At Watts Bar, only one train of HVAC cools the 480V board room that contains the unit vital inverters, and recovery actions are heavily relied on. Watts Bar IPE said their corrective action program is dealing with this.	(2), (13)	B	Unit 1 has redundant 100% capacity (HVS-5A and -5B) cooling supply fans. Unit 2 has redundant 100% capacity (HVS-5A and -5B) cooling supply fans and redundant 100% exhaust fans (HVE-11 and -12).
25	Create procedures for temporary HVAC.	Provides for improved credit to be taken for loss of HVAC sequences.	(11), (13)	B	Temporary ventilation is included in appropriate external event (fire) procedures. Use of temporary ventilation is also included in ventilation off-normal procedures [1(2)-ONP-25.02].
26	Add a switchgear room high temperature alarm.	Improve diagnosis of a loss of switchgear HVAC.	(13)	B	St. Lucie Units 1 & 2 do not have cooling other than fans (i.e., no air conditioning units) for switchgear rooms. There are alarms for loss of flow, which meet the intent of this SAMA.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
Improvements Related to Ex-vessel Accident Mitigation/Containment Phenomena					
27	Create ability to switch fan power supply to DC in SBO.	Allow continued operation in SBO (was created for a BWR RCIC room, Fitzpatrick; possible for turbine AFW if it has its own fan).	(13)	A	St. Lucie Units 1 & 2 AFW pump cooling is not required due to pump design and outdoor location of pumps and motors.
28	Delay containment spray actuation after large LOCA.	When ice remains in the ice condenser at such plants, containment sprays have little impact on containment performance, yet rapidly drain down the RWT. This improvement would lengthen time of RWT availability.	(2), (6)	A	St. Lucie Units 1 & 2 do not have an ice condenser.
29	Install containment spray throttle valves.	Can extend the time over which water remains in the RWT when full containment spray flow is not needed.	(11), (12), (13)	B	St. Lucie Units 1 & 2 Containment Spray Systems have valves that can be used for throttling if desired.
30	Install an independent method of suppression pool cooling.	Would decrease frequency of loss of containment heat removal.	(3), (4)	A	Not applicable to PWRs. St. Lucie Units 1 & 2 have 2 trains of spray plus containment coolers, thus yielding 3 trains of post-accident containment cooling with additional capability using LPSI pumps for spray.

TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
31	Develop an enhanced drywell spray system.	Would provide a redundant source of water to the Containment to control containment pressure when used in conjunction with containment heat removal.	(3), (4), (16), (17)	B	This is a BWR item since there is no drywell for PWRs. However, if we were to consider this as another containment cooling system, FPL assumes that 1 (of 2) spray pump or the 4 containment coolers at St. Lucie Units 1 & 2 are all individually adequate for containment cooling. This gives St. Lucie Units 1 & 2 three systems even though all 4 coolers are required as are trains of power for support. LPSI can be used in place of spray pumps.
32	Provide a dedicated existing drywell spray system.	Identical to the previous concept, except that one of the existing spray loops would be used instead of developing a new spray system.	(3), (4) [similar PWR contain-ment spray option in (5), (6), (11)]	B	This is a BWR item since there is no drywell for PWRs. But if we were to consider this as another containment cooling system, FPL assumes that 1 (of 2) spray pump or the 4 containment coolers at St. Lucie Units 1 & 2 are all (each) adequate for containment cooling. This gives St. Lucie Units 1 & 2 three systems for containment cooling. Also, LPSI can be used in place of spray pumps.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
33	Install a containment vent large enough to remove ATWS decay heat.	Assuming injection is available, would provide alternative decay heat removal in an ATWS.	(3), (4)	B	The St. Lucie Units 1 & 2 design accommodates containment purge, which would provide an unfiltered vent that is probably large enough to do this. Impact on the environment would be similar to containment failure. Intent met since an unfiltered system is available.
34	Install a filtered containment vent to remove decay heat.	Assuming injection is available (non-ATWS sequences), would provide alternate decay heat removal with the released fission products being scrubbed.	(3), (4) [similar options in (5), (6), (8), (11), (12), (16), (17)]	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
35	Install an unfiltered, hardened containment vent.	Provides an alternate decay heat removal method (non-ATWS), which is not filtered.	(3), (4), (9), (14)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
36	Create/enhance hydrogen igniters with independent power supply.	Use a new, independent power supply, a non-safety grade portable generator, existing station batteries, or existing AC/DC independent power supplies such as the security system diesel. Would reduce hydrogen detonation at lower cost.	(3), (5), (6), (7), (9), (12), (13), (14), (15), (16), (17)	A	St. Lucie Units 1 & 2 have hydrogen recombiners requiring only electric power for operation. Neither hydrogen concentration buildup nor pockets were found to be a problem in the St. Lucie IPE, Section 4.4.3.
37	Create a passive hydrogen ignition system.	Reduce hydrogen detonation potential without requiring electric power.	(7), (11), (16), (17)	A	St. Lucie Units 1 & 2 have hydrogen recombiners requiring only electric power for operation. Neither hydrogen concentration buildup nor pockets were found to be a problem in the St. Lucie IPE, Section 4.4.3.
38	Create a giant concrete crucible with heat removal potential under the basemat to contain molten debris.	A molten core escaping from the vessel would be contained within the crucible. The water-cooling mechanism would cool the molten core, preventing a melt-through.	(3), (4), (16), (17)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
39	Create a water-cooled rubble bed on the pedestal.	This rubble bed would contain a molten core dropping onto the pedestal, and would allow the debris to be cooled.	(3), (4), (8), (16), (17)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
40	Provide modification for flooding of the drywell head.	Would help mitigate accidents that result in leakage through the drywell head seal.	(4), (9)	A	Item applicable to BWRs; therefore, not applicable to St. Lucie Units 1 & 2.
41	Enhance Fire Protection System and/or Standby Gas Treatment System hardware and procedures.	Improve fission product scrubbing in severe accidents.	(4)	A	Item applicable to BWRs; similar SAMA for PWRs presented by Item 47.
42	Enhance air return fans (ice condenser containment).	Provide an independent power supply for the air return fans, reducing containment failure in SBO sequences.	(6), (11)	A	Applicable to ice condenser plants only.
43	Create a reactor cavity flooding system.	Would enhance debris coolability, reduce core concrete interaction, and provide fission product scrubbing.	(5), (6), (9), (11), (12), (13), (15), (16), (17)	B	Intent of SAMA is to flood area around reactor vessel to prevent vessel breach and late containment failure. Wet cavity design at St. Lucie Units 1 & 2 will fill to over half of vessel height during severe accident to provide similar protection.

NOTES:

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
43.1	Create other options for reactor cavity flooding (Part a).	Use water from dead-ended volumes, the condensed blowdown of the RCS, or secondary system by drilling pathways in the reactor vessel support structure to allow drainage from the steam generator compartments, refueling canal, sumps, etc., to the reactor cavity. Also (for ice condensers), allow drainage of water from melted ice into the reactor cavity.	(7), (9), (13)	B	Intent of SAMA is to flood area around reactor vessel to prevent vessel breach and late containment failure. Wet cavity design at St. Lucie Units 1 & 2 will fill to over half of vessel height during severe accident to provide similar protection.
43.2	Create other options for reactor cavity flooding (Part b).	Flood cavity via systems such as diesel-driven fire pumps.	(7), (9), (13)	B	Intent of SAMA is to flood area around reactor vessel to prevent vessel breach and late containment failure. Wet cavity design at St. Lucie Units 1 & 2 will fill to over half of vessel height during severe accident to provide similar protection.

NOTES:

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
44	Provide a core debris control system.	Intended for ice condenser plants: Would prevent the direct core debris attack on the primary containment steel shell by erecting a barrier between the seal table and the containment shell.	(6), (11)	A	Applicable to ice condenser plants only.
45	Create a core melt source reduction system (COMSORS).	Place enough glass underneath the reactor vessel such that a molten core falling on the glass would melt and combine with the material. Subsequent spreading and heat removal from the vitrified compound would be facilitated, and concrete attack would not occur (such benefits are theorized in the reference).	(18)	B	Intent of SAMA is to flood area around reactor vessel to prevent vessel breach and late containment failure. Wet cavity design at St. Lucie Units 1 & 2 will fill to over half of vessel height during severe accident to provide similar protection.
46	Provide containment inerting capability.	Would prevent combustion of hydrogen and carbon monoxide gases.	(6), (9), (11), (14)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
47	Use fire water spray pump for containment spray.	Redundant containment spray method without high cost.	(7), (9), (10), (12)	B	For St. Lucie Units 1 & 2, one (of 2) spray pump or the group of 4 containment coolers is adequate for containment cooling. This gives St. Lucie Units 1 & 2 three systems for containment cooling. Also, LPSI can be used in place of spray pumps.
48	Install a passive Containment Spray System.	Containment spray benefits at a very high reliability, and without support systems.	(8)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
49	Provide secondary containment filtered ventilation.	For plants with a secondary containment, would filter fission products released from the primary containment.	(8)	B	St. Lucie Units 1 & 2 already have safety-grade secondary containment filtered ventilation systems.
50	Increase containment design pressure.	Reduce chance of containment overpressure.	(8)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
51	Increase the depth of the concrete basemat, or use an alternative concrete material to ensure melt-through does not occur.	Prevent basemat melt-through.	(16), (17)	A	Applicable to new design, not to existing Containments.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
52	Provide a reactor vessel exterior cooling system.	Potential to cool a molten core before it causes vessel failure, if the lower head can be submerged in water.	(16), (17)	B	Wet cavity design meets intent. This SAMA is based on a theoretical response, and there is no evidence that cooling the molten core in-vessel would actually prevent vessel failure. CCNPP cost estimate is $4.7M.
53	Create another building, maintained at a vacuum, to be connected to the containment.	In an accident, connecting the new building to the containment would depressurize the containment and reduce any fission product release.	(17)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
54	Add ribbing to the containment shell.	Would reduce the chance of buckling of the containment under reverse-pressure loading.	(17)	B	St. Lucie Units 1 & 2 vacuum relief systems to reduce the chance of buckling under reverse pressure. For an existing plant, design and installation of this SAMA is not considered feasible since it requires an extensive reconstruction of the containment.
Improvements Related to AC/DC Reliability/Availability					
55	Train operations crew for response to inadvertent actuation signals.	Improves chances of a successful response to the loss of two 120V AC buses, which causes inadvertent signals.	(13)	B	St. Lucie Units 1 & 2 operators are trained for these types of scenarios.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
56	Proceduralize alignment of spare diesel generator to shutdown board after LOP and failure of the non-emergency (i.e., normal) diesel generator.	Reduced SBO frequency.	(2)	B	St. Lucie Units 1 & 2 have no "spare" diesel. The plant does have the ability to cross-tie electrical power between Units such that 1 EDG can supply both Units for at least shutdown loads. This is proceduralized and operator training is performed.
57	Provide an additional diesel generator.	Would increase onsite emergency AC power reliability and availability (decrease SBO). The ANO-1 IPE reported that Entergy committed to install an AC power source capable of supplying the LOOP loads of any one of the four safety buses. This source would be available within 10 minutes after determination of SBO conditions.	(5), (6), (10), (13) (16), (17)	B	St. Lucie Units 1 & 2 have cross-tie capability to opposite Unit EDGs (and opposite Unit startup transformers), and these are included in procedures.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
58	Provide additional DC battery capability.	Would ensure longer battery capability during an SBO, reducing the frequency of long-term SBO sequences.	(5), (6), (13), (16), (17)	B	Battery depletion is a 4- to 8-hour event at St. Lucie Units 1 & 2. Each St. Lucie Unit has an installed battery that can be tied to the 'AB' bus to feed the "tied" vital battery. The 'AB' bus can be connected to only one battery at a time by physical interlocks and procedures. Offsite power recovery, use of cross-tie between Units, and realignment of the 'AB' DC bus can mitigate the effects of loss of the bus. Also, the non-safety class battery could be aligned to further support DC power needs in the event of loss of chargers for various reasons.
59	Use fuel cells instead of lead-acid batteries.	Extend DC power availability in an SBO.	(16), (17)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
60	Create procedure to cross-tie HPCS diesel.	(BWR 5/6)	(10)	A	Item applicable to BWRs. St. Lucie Units 1 & 2 do not have HPCS diesels.
61	Improve bus cross-tie ability.	Improved AC power reliability.	(10), (13)	B	Each Unit has two offsite power (startup) transformers. These can be cross-tied to the other Unit. Also, the SBO cross-tie can tie the vital buses together.

NOTES:

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
62	Provide alternate battery charging capability.	Improved DC power reliability. Either cross-tie AC buses, or provide a portable diesel-driven battery charger.	(10), (11), (12), (13)	B	Both Units have 2 battery chargers for each of the 2 vital batteries. The non-vital battery charger can be tied through the 'AB' bus to either of the vital batteries on both Units. An AC cross-tie is also available.
63	Increase/improve DC bus load shedding.	Improved battery life in SBO.	(10), (11), (12), (13)	B	DC bus load shedding is already included in St. Lucie Units 1 & 2 EOPs. Battery depletion is a 4- to 8-hour event at St. Lucie. Offsite power recovery, use of cross-tie between Units, and realignment of the 'AB' DC bus can mitigate the effects of loss of the bus. Also, the non-safety class battery could be aligned to further support DC power needs in the event of loss of chargers for various reasons.
64	Replace batteries.	Improved reliability.	(10)	B	St. Lucie Units 1 & 2 have already replaced batteries with current technology batteries. Further replacements are scheduled.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
65	Create AC power cross-tie capability across units at a multi-unit site.	Improved AC power reliability.	(11), (12), (13)	B	Each Unit has two offsite power (startup) transformers. These can be cross-tied to the other Unit. Also, the SBO cross-tie can tie the vital buses together. This provides "double" cross-tie capability.
66	Create a cross-unit tie for diesel fuel oil.	For multi-unit sites, adds diesel fuel oil redundancy.	(13)	B	St. Lucie Units 1 & 2 have the ability to cross-connect diesel fuel oil between Units.
67	Develop procedures to repair or changeout failed 4kV breakers.	Offers a recovery path from a failure of breakers that transfer 4.16kV non-emergency buses from unit station service transformers to system station service transformers, leading to loss of emergency AC power (i.e., in conjunction with failures of the diesel generators).	(13)	B	Given the time constraints, repair/ changeout would not be practical. When maintenance personnel are available after the ERFs are manned this is already a repair option available to response teams. It has been rehearsed during emergency drills usually by transferring a breaker from another location.
68	Emphasize steps in recovery of offsite power after an SBO.	Reduced HEP during offsite power recovery.	(13)	B	St. Lucie Units 1 & 2 training adequately reduces human error during SBO recovery. This is also an FPL system function, demonstrated in response to Hurricane Andrew and improved since then.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
69	Develop a severe weather conditions procedure.	For plants that do not already have one, reduces the likelihood of external events CDF.	(13)	B	St. Lucie Units 1 & 2 have severe weather procedures.
70	Provide procedures for replenishing diesel fuel oil.	Allow long-term diesel operation.	(13)	B	St. Lucie maintains a one-week supply of EDG fuel oil and procedures provide for replenishing diesel fuel oil and contracts with suppliers are in place.
71	Install gas turbine generators.	Improve onsite AC power reliability.	(13)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
72	Install tornado protection on gas turbine generator.	If the Unit has a gas turbine, the tornado-induced SBO frequency would be reduced.	(16), (17)	A	Not applicable since there is no gas turbine at St. Lucie Units 1 & 2 (EDGs are tornado protected).
73	Create a river water backup for diesel cooling.	Provides redundant source of diesel cooling.	(13)	B	St. Lucie Units 1 & 2 diesels are air cooled.
74	Use fire water as a backup for diesel cooling.	Redundancy in diesel support systems.	(13)	B	St. Lucie Units 1 & 2 diesels are air cooled.
75	Provide a connection to alternate offsite power source.	Increase offsite power redundancy.	(13)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
76	Implement underground offsite power lines.	Could improve offsite power reliability, particularly during severe weather.	(13)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
77	Replace anchor bolts on diesel generator oil cooler.	Millstone found a high seismic SBO risk due to failure of the diesel oil cooler anchor bolts. For plants with a similar problem, this would reduce seismic risk.	(13)	A	Unit 1 EDG unit was "shake-tested" satisfactorily and the Unit 2 EDG is essentially identical. Moreover, seismic risk is extremely low in Florida and bolts are very plant specific.
Improvements in Identifying/Coping with Containment Bypass					
78	Proceduralize use of pressurizer vent valves during SGTR sequences.	CCNPP procedures direct the use of pressurizer sprays to reduce RCS pressure after an SGTR. Use of the vent valves provides a backup method.	(13)	B	If SGTR is not controlled by EOP-4, EOP-15 will be entered. EOP-15 uses once-through cooling (PORVs to vent) to control RCS pressure and core heat removal if necessary.
79	Install a redundant spray system to depressurize the primary system during an SGTR.	Enhanced depresssurization ability during an SGTR.	(16), (17)	B	St. Lucie Units 1 & 2 have spray and alternate spray systems. If EOP-4 does not control plant, EOP-15 will be entered. EOP-15 causes once-through cooling (PORVs to vent) to control RCS pressure and heat removal, if necessary.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
80	Improve SGTR coping abilities.	Improved instrumentation to detect SGTR, or additional systems to scrub fission product releases.	(7), (9), (10), (13), (14), (16), (17)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
81	Add other SGTR coping features.	A highly reliable (closed loop) steam generator shell-side heat removal system that relies on natural circulation and stored water sources, A system that returns the discharge from the steam generator relief valve back to the primary containment, An increased pressure capability on the steam generator shell side with corresponding increases in the safety valve setpoints.	(7), (8), (17)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
82	Increase secondary-side pressure capacity such that an SGTR would not cause the relief valves to lift.	SGTR sequences would not have a direct release pathway.	(8), (17)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
83	Replace SGs with new design.	Lower the frequency of SGTR.	(13)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
84	Direct steam generator flooding after an SGTR, prior to core damage.	Would provide for improved scrubbing of SGTR releases.	(14), (15)	B	Procedures call for cooling isolated SG by feeding, but do not specify flooding SG. Procedures already call for isolating affected SG. If operators fail to cool and isolate the SG, then it is not prudent to assume they would flood the SG. Cooling and isolation will prevent releases.
85	Establish a maintenance practice that inspects 100% of the tubes in an SG.	Reduce chances of SGTR.	(16), (17)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
86	Revise EOPs to direct that a faulted steam generator be isolated.	For those plants where EOPs don't already direct this, SG isolation would reduce the consequences of SGTR.	(13)	B	St. Lucie Units 1 & 2 procedures direct isolation of faulted SG.
87	Locate RHR inside of containment.	Would prevent ISLOCA occurrences via the RHR pathway.	(8)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
88	Install self-actuating containment isolation valves.	For plants that don't have this, the valves would reduce the frequency of isolation failure.	(8)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
89	Install additional instrumentation for ISLOCA sequences.	Pressure or leak monitoring instruments installed between the first two pressure isolation valves on low-pressure injection lines, RHR suction lines, and high-pressure injection lines would decrease ISLOCA frequency.	(5), (6), (11), (13)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
90	Increase frequency of valve leak testing.	Decrease ISLOCA frequency.	(12)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
91	Improve operator training on ISLOCA coping.	Decrease ISLOCA effects.	(12), (13)	B	Procedures already direct determination of break location and operators are well-trained on existing procedures.
92	Install relief valves in the Component Cooling Water System.	Would relieve pressure buildup from an RCP thermal barrier tube rupture, preventing an ISLOCA.	(13)	B	St. Lucie Units 1 & 2 CCW piping at the RCPs is rated at RCS pressure and has isolation valves that close automatically on high temperature (as from RCS coolant leaking into CCW).
93	Provide leak testing of valves in ISLOCA paths.	At Kewaunee, four MOVs isolating RHR from the RCS were not leak tested. Will help reduce ISLOCA frequency.	(13)	B	St. Lucie Units 1 & 2 currently perform leak testing of valves in ISLOCA flow paths. This can only be done at cold shutdown.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
94	Revise EOPs to improve ISLOCA identification.	Salem had a scenario in which an RHR ISLOCA could direct initial leakage back to the PRT, giving indication that the LOCA was inside containment. Procedure enhancement would ensure LOCA outside containment would be observed.	(13)	B	St. Lucie Units 1 & 2 LOCA EOPs direct comparison of RWT and sump levels to determine if leakage outside containment may exist.
95	Ensure all ISLOCA releases are scrubbed.	Would scrub ISLOCA releases. One suggestion was to plug drains in the break area so the break point would cover with water.	(14), (15)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
96	Add a redundant and diverse limit switch to each containment isolation valve.	Enhanced isolation valve position indication, which would reduce frequency of containment isolation failures and ISLOCAs.	(16), (17)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
Improvements in Reducing Internal Flooding Frequency					
97	Modify swing direction of doors separating Turbine Building basement from areas containing safeguards equipment.	For a plant where internal flooding from Turbine Building to safeguards areas is a concern, this modification can prevent flood propagation.	(13)	A	This SAMA is for a plant where Turbine Building flooding could reach/affect safeguards equipment. The St. Lucie Units 1 & 2 open Turbine Building design and the elevation of surrounding ground area make flooding of RAB or AFW areas from the Turbine Building not credible.
98	Improve inspection of rubber expansion joints on main condenser.	For a plant where internal flooding due to failure of a circulating water expansion joint is a concern, this can help reduce the frequency.	(13)	A	This SAMA is for a plant where Turbine Building flooding could reach/affect safeguards equipment. The St. Lucie Units 1 & 2 open Turbine Building design and the elevation of surrounding ground area make flooding of RAB or AFW areas from the Turbine Building not credible.
99	Install internal flood prevention and mitigation enhancements.	Use of submersible MOV operators. Back-flow prevention in drain lines.	(13)	B	Per the IPE internal flooding analysis, this has been done in selected areas as needed. For instance, submersible operators for the CCW area and back-flow check valves for the ECCS pump rooms have already been installed.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
100	Replicate internal flooding improvements used at Ft. Calhoun.	Prevention or mitigation of: A rupture in the RCP seal cooler of the CCW System, An ISLOCA in a shutdown cooling line, An AFW flood involving the need to possibly remove a watertight door. For a plant where any of these apply, would reduce flooding risk.	(13)	A	Specifically applicable to Ft. Calhoun. These items were not identified in the flooding analysis performed on St. Lucie Units 1 & 2.
Improvements Related to Feedwater/Feed & Bleed Reliability/Availability					
101	Install digital feedwater upgrade.	Reduces chance of loss of MFW following a plant trip.	(13)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
102	Perform surveillances on manual valves used for backup AFW pump suction.	Improves success probability for providing alternate water supply to AFW pumps.	(13)	B	Check valve from Unit 2 to Unit 1 CST is tested (1-OSP-12.01) and this also cycles the manual valves. Normal fill from the TWST is used routinely to adjust CST level.
103	Install manual isolation valves around AFW turbine-driven steam admission valves.	Reduces the dual turbine-driven pump maintenance unavailability.	(13)	B	At St. Lucie Units 1 & 2 the steam valves from each SG to the AFW pump on each Unit have manual inlet and outlet isolation valves.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
104	Install accumulators for turbine-driven AFW pump flow control valves.	Provides control air accumulators for the turbine-driven AFW flow control valves, the motor-driven AFW pressure control valves, and the SG PORVs. This would eliminate the need for local manual action to align nitrogen bottles for control air during an LOP.	(11)	B	St. Lucie Units 1 & 2 valves are MOVs and can be operated manually by a handwheel. IA has no impact on St. Lucie Units 1 & 2 AFW System.
105	Install a new CST (AFWST).	Either replace old tank with a larger one or install a backup tank.	(13), (16), (17)	B	St. Lucie Unit 2 CST is sized to supplement the smaller Unit 1 CST. The TWST can be used to fill either CST. Also, procedures are in place to fill Unit 1 CST from Unit 2 or to use the DWST to fill either CST.
106	Provide for cooling of steam-driven AFW pump in an SBO.	a) Use fire water to cool pump, or b) make the pump self-cooled. Would improve success chances in an SBO.	(13)	A	St. Lucie Units 1 & 2 AFW pumps do not require cooling due to pump design and outdoor location of pumps and motors; therefore, intent met.
107	Proceduralize local manual operation of AFW when control power is lost.	Lengthen AFW availability during SBO. Also provides a success path should AFW control power be lost during non-SBO sequences.	(13)	B	St. Lucie Units 1 & 2 EOPs provide for local manual operation of AFW valves and the steam-driven AFW pump.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
108	Provide portable generators to be hooked into the turbine-driven AFW after battery depletion.	Extend AFW availability in an SBO (assuming the turbine-driven AFW requires DC power).	(16), (17)	B	If power is lost, a cross-tie is available, 2 chargers per battery. St. Lucie Units 1 & 2 EOPs provide for local manual operation of AFW valves and the steam-driven AFW pump.
109	Add a motor train of AFW to the steam trains.	For PWRs that do not have any motor trains of AFW, this can increase reliability during non-SBO sequences.	(13)	B	St. Lucie Units 1 & 2 have both motor- and steam-driven 100% capacity AFW trains.
110	Create ability for emergency connections of existing or alternate water sources to feedwater/condensate.	Would be a backup water supply for the feedwater/condensate systems.	(12)	B	Use of TWST for CST fill is proceduralized.
111	Use fire water as a backup for steam generator inventory.	Would create a backup to the Main and Auxiliary Feedwater Systems for steam generator water supply.	(13)	B	St. Lucie Units 1 & 2 procedures first direct use of AFW, MFW, filling of CST (including Unit 1 fill from larger Unit 2 CST), or condensate (not fire pump). In order to be able to use fire water, the cost will be prohibitive due to the low pressure of the pump and other significant modifications needed.

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INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
112	Procure a portable diesel pump for isolation condenser makeup.	Would provide backup to the city water supply and diesel fire water pump in providing isolation condenser makeup.	(13)	A	Applicable to isolation condenser plants only.
113	Install an independent diesel for the Condensate Storage Tank makeup pumps.	Would allow continued inventory in CST during an SBO.	(13)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
114	Change failure position of condenser makeup valve.	If the condenser makeup valve fails open on loss of air or power, this can prevent CST flow diversion to the condenser. Allows greater inventory for the AFW pumps.	(13)	B	Non-safety related connections have standpipes to ensure required volume is maintained. Valves fail closed on loss of air or power.
115	Create passive secondary-side coolers.	Provide a passive heat removal loop with a condenser and heat sink. Would reduce CDF from the loss of feedwater.	(17)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
Improvements in Core Coding Systems					
116	Provide capability for diesel-driven, low-pressure vessel makeup.	Extra water source in sequences in which the reactor is depressurized and all other injection is unavailable (e.g., fire water).	(4), (5), (13)	A	Unborated water for SI implies applicability to BWRs, not PWRs.
117	Provide an additional HPSI pump with independent diesel.	Reduce frequency of core melt from small LOCA sequences and from SBO sequences.	(6), (16), (17)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
118	Install independent AC HPSI system.	Would allow makeup and feed-and-bleed capabilities during an SBO.	(11)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
119	Create the ability to manually align ECCS recirculation.	Provides a backup should automatic or remote operation fail.	(12)	B	Although St. Lucie Units 1 & 2 recirculation alignment is automatic, procedures require operator verification and manual operation of the MOVs to align if necessary. Depending on radiation levels, the containment sump valves could also be operated locally. RWT valves should not have a radiation level problem.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
120	Implement an RWT makeup procedure.	Decrease CDF from ISLOCA scenarios, some smaller break LOCA scenarios, and SGTR.	(12), (13)	B	LOCA EOPs 1[2]-EOP-03 direct RWT makeup as do the functional recovery EOPs, 1[2]-EOP-15. An SGTR, if not controlled, will also be mitigated by EOP-15.
121	Stop low-pressure injection pumps earlier in medium or large LOCAs.	Would give more time to perform recirculation swapover.	(13)	B	Recirculation swapover at St. Lucie Units 1 & 2 is automatic so extending time available (for operator action) is not beneficial. Also, 1[2]-EOP-03, “Loss of Coolant Accident,” provides for stopping LPSI pumps if appropriate RCS conditions are met, indicating that the LOCA is "controlled.”
122	Emphasize timely recirculation swapover in operator training.	Reduce HEP of recirculation failure.	(13)	B	At St. Lucie Units 1 & 2, swapover to recirculation is automatic. Procedures and training require verification of recirculation and taking action if it does not occur.
123	Upgrade CVCS to mitigate small-small LOCAs.	For a plant like the AP600 where CVCS can’t mitigate a small-small LOCA, an upgrade would decrease CDF from small-small LOCAs.	(8)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.

NOTES:

a. Source identifiers correlate to entries on the reference list (see Section E.3.4): for example, (13) identifies Ref. E.3-13, i.e., NUREG-1560.

b. Screening criteria:

A = Not Applicable

B = Intent Met or Implemented

N = Not Initially Screened. Considered in cost-benefit evaluation.

c. Acronyms and symbols are defined in Section E.5.

TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
124	Install an active HPSI system.	For a plant like the AP600, where an active high-pressure injection system does not exist, would add redundancy in high-pressure injection.	(8)	B	St. Lucie Units 1 & 2 have an active HPSI System.
125	Change “in-containment” RWT suction from 4 check valves to 2 check and 2 air-operated valves.	Remove common-mode failure of all four injection paths.	(8)	A	SAMA refers to AP600 design with RWT inside containment. At St. Lucie Units 1 & 2 RWTs are outside containment. Suction line to HPSI/LPSI pumps contains two locked open MOVs and a series of locked open manual valves at the pump and no check valves. Since valves are not required to change state, no CCF applied.
126	Replace two of the four SI pumps with diesel pumps.	Intended for System 80+, which has four trains of SI. This would reduce common-cause failure probability.	(16), (17)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
127	Align LPCI or core spray to CST on loss of suppression pool cooling.	Low-pressure ECCS can be maintained in loss of suppression pool cooling scenarios.	(10), (13)	A	Item applicable to BWRs. PWRs do not have suppression pool cooling.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
128	Raise HPCI/RCIC backpressure trip setpoints.	Ensures HPCI/RCIC availability when high suppression pool temperatures exist.	(13)	A	Primarily a BWR item. At St. Lucie Units 1 & 2, the AFW pump turbine discharges to the atmosphere and has no need for backpressure trips.
129	Improve the reliability of the ADS.	Reduce frequency of high-pressure core damage sequences.	(4)	A	This is a BWR Automatic Depressurization System enhancement, not applicable to St. Lucie Units 1 & 2.
130	Disallow automatic vessel depressurization in non-ATWS scenarios.	Improve operator control of plant.	(13)	A	This is a BWR item that is not applicable to St. Lucie Units 1 & 2.
131	Create automatic swapover to recirculation on RWT depletion.	Would remove human error contribution from recirculation failure.	(5), (6), (11)	B	St. Lucie Units 1 & 2 have automatic switchover to recirculation, and station procedures require operators to verify this and make it happen if it does not occur.
Improvements Related to Instrument Air/Gas					
132	Modify EOPs for ability to align diesel power to more air compressors.	For plants that do not have diesel power to all normal and backup air compressors, this change allows increased reliability of instrument air after an LOP.	(13)	B	Two of the 4 Instrument Air compressors per Unit can be aligned to the EDGs and have self-contained cooling. Other compressors require cooling water pumps that are not intended to be diesel backed. Also, diesel compressors for maintenance use are generally available on site.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
133	Replace old air compressors with more reliable ones.	Improve reliability and increase availability of instrument air compressors.	(13)	B	After a few years of operation, Unit 1 compressors were upgraded to match Unit 2's. Under the Maintenance Rule, extensive efforts have been spent on maintaining and improving IA compressor reliability.
Improvements in ATWS Coping					
134	Install nitrogen bottles as backup gas supply for SRVs.	Extend operation of safety relief valves during SBO and loss-of-air events (BWRs).	(13)	A	St. Lucie Units 1 & 2 PORVs are solenoid operated. Since they do not use air, nitrogen would not help. Also the SRVs are spring loaded and do not require any outside power or air, etc.
135	Install MG set trip breakers in Control Room.	Provides trip breakers for the motor generator sets in the Control Room. Currently, at Watts Bar, an ATWS would require an immediate action outside the Control Room to trip the MG sets. Would reduce ATWS CDF.	(11)	B	St. Lucie Units 1 & 2 have a backup automatic trip of the control rod drive MG sets that will deenergize the CEDMs and allow rods to drop (scram).

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
136	Add capability to remove power from the bus powering the control rods.	Decrease time to insert control rods if the reactor trip breakers fail (during a loss of feedwater ATWS, which has rapid pressure excursion).	(13)	B	St. Lucie Units 1 & 2 have the capability to trip the rod drive MG sets for backup scram using RCS pressure for initiating signal.
137	Create cross-connect ability for standby liquid control (SLC) trains.	Improved reliability for boron injection during ATWS.	(13)	B	St. Lucie Units 1 & 2 have redundant boric acid tanks, with redundant means/paths for supplying boric acid to charging pumps. Also, the RWT can readily be used to supply boric acid.
138	Create an alternate boron injection capability (backup to SLC).	Improved reliability for boron injection during ATWS.	(13)	B	St. Lucie Units 1 & 2 have redundant boric acid tanks, with redundant means/paths for supplying boric acid to charging pumps. Also, the RWT can readily be used to supply boric acid.
139	Remove or allow override of LPCI injection during ATWS.	On failure of HPCI and condensate, the Susquehanna Units direct reactor depressurization followed by 5 minutes of automatic LPCI. Would allow control of LPCI immediately.	(13)	A	This is applicable to BWRs and not applicable to St. Lucie Units 1 & 2.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
140	Install a system of relief valves that prevents any equipment damage from a pressure spike during an ATWS.	Would improve equipment availability after an ATWS.	(16), (17)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
141	Create a boron injection system to back up the mechanical control rods.	Provides a redundant means to shut down the reactor.	(16), (17)	B	St. Lucie Units 1 & 2 have capability for emergency boration.
142	Provide an additional I&C system such as AMSAC.	Improve I&C redundancy and reduce ATWS frequency.	(16), (17)	B	St. Lucie Units 1 & 2 already have the capability to remove power from control rods.
Other Improvements					
143	Provide capability for remote operation of secondary-side PORVs in SBO.	Manual operation of these valves is required in an SBO scenario. High area temperatures may be encountered in this case (no ventilation to main steam areas), and remote operation could improve success probability.	(2)	B	Valves can be operated manually. At St. Lucie Units 1 & 2, the main steam trestle area containing the secondary-side relief valves is outdoors, and with steel grating missile shields excessively high temperatures are implausible.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
144	Create/enhance Reactor Coolant System depressurization ability.	Either with a new depressurization system or with existing PORVs, head vents, and secondary-side valve, RCS depressurization would allow low-pressure ECCS injection. Even if core damage occurs, low RCS pressure alleviates some concerns about high-pressure melt ejection.	(5), (6), (9), (11), (12), (13), (14), (15), (16), (17)	B	St. Lucie Units 1 & 2 have spray and alternate spray. Also, if SGTR is not controlled by EOP-4, EOP-15 will be entered, which uses once-through cooling (PORVs to vent) to control RCS pressure and core heat removal, if necessary.
145	Make procedural changes only for the RCS depressurization option.	Reduce RCS pressure without the cost of a new system.	(7), (9), (13)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
146	Defeat 100% load rejection capability.	Eliminates the possibility of a stuck open PORV after an LOP, since PORV opening wouldn't be needed.	(13)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
147	Change CRD flow control valve failure position.	Change failure position to the 'fail-safest' position.	(13)	A	BWR item that is not applicable to St. Lucie Units 1 & 2.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
148	Install secondary-side guard pipes up to the MSIVs.	Would prevent secondary-side depressurization should a steam line break occur upstream of the MSIVs. Would also guard against or prevent consequential multiple SGTRs following a main steam line break event.	(16), (17)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
149	Provide digital large break LOCA protection.	Upgrade plant instrumentation and logic to improve the capability to identify symptoms/precursors of a large break LOCA (a leak before break).	(17)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
150	Increase seismic capacity of the plant to a HCLPF of twice the SSE.	Reduced seismic CDF.	(17)	A	Florida has extremely low seismic risk. The IPEEE found no significant vulnerabilities.
151	Provide self-cooled ECCS seals.	ECCS pump seals are CCW cooled.	(20)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
152	Separate non-vital buses from vital buses.	Some non-vital loads mixed with vital loads on load centers causing load shedding difficulties.	(20)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
153	Make CCW trains separate.	Current cross-tie capability creates a potential common-mode failure mechanism for both trains (and both stations).	(20)	B	A & B trains are normally isolated from each other with redundant isolation valves. The probability of this specific common-mode failure of both trains is insignificant.
154	Make ICW trains separate.	Current cross-tie capability creates a potential common-mode failure mechanism for both trains (and both stations).	(20)	B	A & B trains are normally isolated from each other with redundant isolation valves. The probability of this specific common-mode failure of both trains is insignificant.
155	Provide a centrifugal charging pump.	Currently charging pumps are positive displacement pumps.	(20)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
156	Provide a motor-operated AFW pump.	Currently AFW pumps are both turbine driven.	(20)	B	St. Lucie Units 1 & 2 have two motor-driven and one steam-driven (each 100% capacity) AFW pumps for each Unit.
157	Provide containment isolation design per GDC and SRP.	Enhance containment isolation capability.	(20)	B	Unit 2 has GDC and SRP containment isolation. Unit 1 essentially meets the GDC.
158	Improve RHR sump reliability.	Common-mode failure of RHR due to debris in sump.	(20)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
159	Provide AB vent/seal structure.	Enhance ventilation in the AB.	(20)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
160	Add charcoal filters on the AB exhaust.	Enhance fission product removal after an ISLOCA.	(20)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
161	Add penetration valve leakage control system.	Enhance capability to detect/control leakage from penetration valves.	(20)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
162	Enhance screen wash.	Potential for loss of ICW due to clogging of sea water screens.	(20)	B	St. Lucie Units 1 & 2 traveling screens and screen wash capability were improved in response to jellyfish problems in the early 1990s. Operators and maintenance have since repeatedly demonstrated the ability to keep screens clean enough to continue operation of main circulating water despite significant influxes of seaweed and other materials. Since ICW requires much less flow, the intent is met.
163	Enhance training for important operator actions.	Consider the operator actions in the top PSA cutsets for the Units.	(20)	B	Training is important but there is no clear way to translate improved training to improved performance by reducing HEPs. Since these are emphasized in operator and adequately addressed by PSA training, the intent is met.

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TABLE E.3-1 (continued)
INITIAL LIST OF CANDIDATE IMPROVEMENTS FOR THE ST LUCIE UNITS 1 & 2 SAMA ANALYSIS

SAMA Number	Potential Improvement	Discussion	Source[a]	Screening[b] Criterion	Disposition
164	Prevent tornado damage to RWT and penetration rooms.	Penetration rooms are tornado protected. Tornado category F2 and higher can generate heavy enough missiles that they could impact and damage the RWT.	(19)	B	Penetration rooms are tornado protected. For tornadoes, makeup water for safe shutdown is provided by the SITs located inside the tornado-protected containment.
165	Man SSF continuously to align Coolant Makeup System for RCP seal cooling.	A dedicated operator for seals or for the highest value operator action could be considered.	(19)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.
166	Protect against tornado that causes failure of power and upper surge tanks.	Consider protection for tanks or switchgear in Turbine Building. Surge tanks are suction for emergency feedwater pumps.	(19)	B	The CCW surge tank is tornado protected since it is in the RAB, adjacent to the Control Room. Unit 2 CST is fully protected; Unit 1 CST has partial protection and can be filled from Unit 2 CST. Although the turbine switchgear is not fully protected, the emergency power system is protected.
167	Replace reactor vessel with stronger vessel.	Reduce core damage contribution due to vessel failure.	(19)	N	Considered in cost-benefit evaluation. See Table 4.15-2 of the main report.

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b. Screening criteria:

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c. Acronyms and symbols are defined in Section E.5.

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E.4 PROBABILISTIC SAFETY ASSESSMENT (PSA) RUNS FOR SELECTED SAMA EVALUATION CASES

The severe accident mitigation alternative (SAMA) evaluation cases described in this document represent the plant risk given different plant configurations (as defined by the case). The case-specific plant configuration is defined as the plant in its baseline configuration [as modeled in the current probabilistic risk assessment (PRA)] with the model modified to represent the plant after the implementation of a particular SAMA. These model changes were performed in a manner expected to bound the change in risk that would actually be expected if the SAMA were implemented. This approach was taken because the actual designs for the SAMAs have not been developed.

For screening purposes, a single top event that included all plant damage states (PDSs) and containment bypass sequences (e.g., SGTR1, SGTR2, and ISLOCA), was developed from the Unit 1 and Unit 2 models. This gave a large but manageable number of cutsets and accounted for over 95 percent of the total baseline core damage frequency (CDF) calculated by using all sequences. This top model containing all PDS cutsets (for each Unit) could then be easily manipulated to give estimates of CDF reduction for a given circumstance. This technique was not used for estimation for such specific cases as steam generator tube ruptures (SGTRs) or interfacing system loss-of-coolant accidents (ISLOCAs). SGTRs and ISLOCAs and other cases were deemed important enough to warrant full risk-model cases.

The impacts of the improvement were estimated by modifying the system fault trees, the initiating events, the key PDS binning, or the containment release fractions. Once these changes were implemented, the process for calculating the containment release frequencies was identical to that used in calculating the baseline risk. The analysis of the Level 1 model resulted in the determination of PDS frequencies. These frequencies were combined with the conditional probabilities of each containment event-tree endstate, resulting in a frequency of release in each containment event-tree endstate. These containment event-tree endstate frequencies can be summed to yield CDF.

Since this is a screening evaluation, the exact modification option was not necessarily evaluated; the exact modifications are not defined by the plant design personnel and would only be defined in detail if the SAMAs were implemented. As a result, for some improvements multiple risk evaluations were done. This was, in general, a bounding-value quantification. The evaluations were based on very conservative approaches.

For many of the SAMAs, the CDF reduction was estimated from a baseline PDSTOP model. Although the baselines and cases were run with a large number of individual sequences, a PDS onetop run was also done for each. This file containing all PDS cutsets could then be used to estimate CDF reduction by setting the failure probability of the appropriate equipment to zero (as if the SAMA improvement were to make it perfectly reliable, which obviously is conservative). For St. Lucie Unit 1, the full baseline CDF from the sum of the sequences was 2.990E-05. The PDSTOP model CDF was 2.875E-05, which comprises over 96 percent of the entire CDF. For St. Lucie Unit 2, the full baseline CDF from the sum of the sequences was 2.445E-05. The PDSTOP model CDF was 2.425E-05, which comprises 99 percent of the entire CDF. Tables E.2-3 and E.2-4, presented in Section E.2 of this Appendix, show the full sum of the sequences and totals for each Unit. The reduced CDF was ratioed to the total benefit dollars available to give an estimate of the benefits of

the SAMA. To verify conservatism, results based on the CDF model estimate were compared to Cases 2, 3, and 4, which were calculated with the Level 2 and Level 3 matrix. In all three cases for both Units, the estimated benefits from the CDF model estimates were higher than the calculated case. For the purpose of estimating benefits, the CDF cutset method is conservative as it gives higher benefits than those based on more detailed Level 2 and Level 3 calculations. Results of this comparison are shown in Table E.4-1.

TABLE E.4-1
COMPARISON OF CUTSET ESTIMATE TO CALCULATED CASE BENEFITS

	Case 2 – Seal LOCA w/ Operator Failure	Case 3 – Small-Small LOCA	Case 4 – Seal LOCA w/o Operator Failure
Unit 1			
Case Benefits	$129,652	$225,316	$44,343
Cutset Benefits	$184,796	$329,923	$62,889
Unit 2			
Case Benefits	$145,657	$216,583	$50,090
Cutset Benefits	$224,062	$330,641	$76,340

E.4.1 SAMA EVALUATION CASE DESCRIPTIONS

Six SAMA evaluation cases are described in this section. Each evaluation case contains a description of the plant change that is represented by the case, and the specific SAMAs that are being evaluated by the case. Each case also includes a description of the changes that were made in the fault tree to represent the plant changes represented by the case. The PDS frequencies calculated as a result of the PSA model quantification for each considered SAMA evaluation case are presented in Table E.4-2. These PDS frequencies are used as input into the cost-benefit analysis.

E.4.1.1 CASE NO-ISLOCA

This case was used to determine the benefit to be obtained from improved ISLOCAs. For the purposes of the analysis, and for each Unit, a single bounding analysis was performed that assumed ISLOCA would be eliminated. This analysis case was used in the evaluation of SAMAs No. 89, 90, 95, 96, 159, and 160.

Evaluation method: The model was modified in order to evaluate the impact on the St. Lucie Units 1 & 2 risk profile if ISLOCA were eliminated. The PDSs that represent ISLOCA were set to zero to represent the impact of eliminating this event. The resulting frequency for each PDS is presented in Table E.4-2.

TABLE E.4-2
PDS RESULTS OBTAINED FROM ST. LUCIE UNITS 1 & 2
SAMA EVALUATION CASES

	UNIT 1							UNIT 2						
PDS	Baseline	NO-ISLOCA	NO-SGTR	Case 1	Case 2	Case 3	Case 4	Baseline	NO-ISLOCA	NO-SGTR	Case 1	Case 2	Case 3	Case 4
IA	5.25E-09	5.25E-09	5.25E-09	7.52E-08	5.25E-09	3.02E-09	5.25E-09	3.15E-09	3.15E-09	3.15E-09	7.01E-08	3.15E-09	1.82E-09	3.15E-09
IB	5.10E-06	5.10E-06	5.10E-06	5.13E-06	4.90E-06	1.12E-06	5.04E-06	4.02E-06	4.02E-06	4.02E-06	4.06E-06	3.84E-06	5.50E-07	3.97E-06
ID	1.13E-07	1.13E-07	1.13E-07	0.00E+00	1.07E-07	2.05E-08	1.11E-07	1.07E-07	1.07E-07	1.07E-07	0.00E+00	1.02E-07	1.69E-08	1.06E-07
IE	6.07E-09	6.07E-09	6.07E-09	1.80E-08	4.91E-09	3.72E-09	5.68E-09	3.91E-09	3.91E-09	3.91E-09	1.13E-08	2.53E-09	2.05E-09	3.52E-09
IF	1.10E-09	1.10E-09	1.10E-09	1.15E-09	1.10E-09	1.07E-09	1.10E-09	3.50E-10	3.50E-10	3.50E-10	3.50E-10	3.50E-10	3.50E-10	3.50E-10
IH	1.19E-08	1.19E-08	1.19E-08	0.00E+00	1.16E-08	9.52E-09	1.17E-08	7.35E-09	7.35E-09	7.35E-09	0.00E+00	7.04E-09	5.62E-09	7.04E-09
IIA	2.56E-07	2.56E-07	2.56E-07	2.56E-07	2.35E-07	3.43E-08	2.50E-07	2.08E-07	2.08E-07	2.08E-07	1.93E-07	1.99E-07	1.79E-08	2.06E-07
IIB	2.10E-07	2.10E-07	2.10E-07	2.10E-07	1.30E-07	8.66E-08	1.83E-07	2.83E-07	2.83E-07	2.83E-07	2.98E-07	2.82E-07	5.45E-09	2.83E-07
IID	2.79E-10	2.79E-10	2.79E-10	0.00E+00	2.79E-10	2.79E-10	2.79E-10	3.04E-11	3.04E-11	3.04E-11	0.00E+00	3.04E-11	3.04E-11	3.04E-11
IIE	6.32E-06	6.32E-06	6.32E-06	6.30E-06	2.58E-06	3.78E-06	5.03E-06	7.03E-06	7.03E-06	7.03E-06	7.02E-06	2.70E-06	4.39E-06	5.54E-06
IIF	1.27E-10	1.27E-10	1.27E-10	4.41E-11	1.27E-10	4.41E-11	1.27E-10	1.36E-08	1.36E-08	1.36E-08	1.36E-08	1.36E-08	4.79E-12	1.36E-08
IIH	6.51E-09	6.51E-09	6.51E-09	0.00E+00	4.49E-09	4.37E-09	5.93E-09	3.38E-09	3.38E-09	3.38E-09	0.00E+00	1.86E-09	1.94E-09	2.96E-09
IIIA	2.23E-08	2.23E-08	2.23E-08	5.80E-08	2.23E-08	2.23E-08	2.23E-08	1.26E-10	1.26E-10	1.26E-10	2.16E-08	1.26E-10	1.26E-10	1.26E-10
IIIB	5.57E-06	5.57E-06	5.57E-06	5.57E-06	5.57E-06	5.57E-06	5.57E-06	1.63E-06	1.63E-06	1.63E-06	1.63E-06	1.63E-06	1.63E-06	1.63E-06
IIID	5.61E-08	5.61E-08	5.61E-08	0.00E+00	5.61E-08	5.61E-08	5.61E-08	2.45E-08	2.45E-08	2.45E-08	0.00E+00	2.45E-08	2.45E-08	2.45E-08
IIIE	7.93E-07	7.93E-07	7.93E-07	5.83E-06	7.93E-07	7.92E-07	7.93E-07	1.63E-07	1.63E-07	1.63E-07	2.98E-06	1.63E-07	1.62E-07	1.63E-07
IIIF	3.59E-09	3.59E-09	3.59E-09	3.59E-09	3.59E-09	3.59E-09	3.59E-09	2.71E-10	2.71E-10	2.71E-10	3.29E-11	3.29E-11	3.29E-11	3.29E-11
IIIH	5.05E-06	5.05E-06	5.05E-06	0.00E+00	5.05E-06	5.05E-06	5.05E-06	2.82E-06	2.82E-06	2.82E-06	0.00E+00	2.82E-06	2.82E-06	2.82E-06
IVA	3.41E-08	3.41E-08	3.41E-08	4.21E-08	3.41E-08	3.41E-08	3.41E-08	8.00E-08	8.00E-08	8.00E-08	2.57E-08	8.00E-08	8.00E-08	8.00E-08
IVB	5.56E-07	5.56E-07	5.56E-07	5.62E-07	5.56E-07	5.55E-07	5.56E-07	1.00E-07	1.00E-07	1.00E-07	1.55E-07	1.00E-07	1.00E-07	1.00E-07
IVD	1.52E-08	1.52E-08	1.52E-08	0.00E+00	1.52E-08	1.52E-08	1.52E-08	2.02E-11	2.02E-11	2.02E-11	0.00E+00	2.02E-11	2.02E-11	2.02E-11
IVE	1.08E-07	1.08E-07	1.08E-07	2.38E-07	1.08E-07	1.08E-07	1.08E-07	9.04E-07	9.04E-07	9.04E-07	9.04E-07	9.04E-07	9.04E-07	9.04E-07
IVF	7.44E-10	7.44E-10	7.44E-10	8.09E-10	7.44E-10	7.44E-10	7.44E-10	4.41E-11	4.41E-11	4.41E-11	3.63E-15	3.63E-15	3.63E-15	3.63E-15
IVH	1.30E-07	1.30E-07	1.30E-07	0.00E+00	1.30E-07	1.30E-07	1.30E-07	1.97E-08	1.97E-08	1.97E-08	0.00E+00	1.45E-08	1.45E-08	1.45E-08

TABLE E.4-2
PDS RESULTS OBTAINED FROM ST. LUCIE UNITS 1 & 2
SAMA EVALUATION CASES

	UNIT 1							UNIT 2						
PDS	Baseline	NO-ISLOCA	NO-SGTR	Case 1	Case 2	Case 3	Case 4	Baseline	NO-ISLOCA	NO-SGTR	Case 1	Case 2	Case 3	Case 4
VA	6.41E-10	6.41E-10	6.41E-10	2.51E-09	6.41E-10	6.41E-10	6.41E-10	6.64E-10	6.64E-10	6.64E-10	2.26E-09	6.64E-10	6.64E-10	6.64E-10
VB	6.03E-07	6.03E-07	6.03E-07	6.04E-07	6.03E-07	6.03E-07	6.03E-07	6.18E-07	6.18E-07	6.18E-07	6.18E-07	6.18E-07	6.18E-07	6.18E-07
VD	3.16E-09	3.16E-09	3.16E-09	0.00E+00	3.16E-09	3.16E-09	3.16E-09	2.99E-09	2.99E-09	2.99E-09	0.00E+00	2.99E-09	2.99E-09	2.99E-09
VE	2.98E-10	2.98E-10	2.98E-10	3.09E-10	2.98E-10	2.98E-10	2.98E-10	4.15E-10	4.15E-10	4.15E-10	4.75E-10	4.15E-10	4.15E-10	4.15E-10
VF	1.54E-11	1.54E-11	1.54E-11	1.54E-11	1.54E-11	1.54E-11	1.54E-11	1.11E-11	1.11E-11	1.11E-11	1.11E-11	1.11E-11	1.11E-11	1.11E-11
VH	1.10E-11	1.10E-11	1.10E-11	0.00E+00	3.59E-11	3.59E-11	3.59E-11	6.00E-11	6.00E-11	6.00E-11	0.00E+00	6.00E-11	6.00E-11	6.00E-11
VIA	2.19E-08	2.19E-08	2.19E-08	2.31E-08	2.19E-08	2.19E-08	2.19E-08	4.26E-08	4.26E-08	4.26E-08	1.58E-08	4.26E-08	4.26E-08	4.26E-08
VIB	7.36E-07	7.36E-07	7.36E-07	7.36E-07	7.36E-07	7.36E-07	7.36E-07	4.14E-07	4.14E-07	4.14E-07	4.41E-07	4.14E-07	4.14E-07	4.14E-07
VID	3.03E-09	3.03E-09	3.03E-09	0.00E+00	3.03E-09	3.03E-09	3.03E-09	5.04E-10	5.04E-10	5.04E-10	0.00E+00	5.04E-10	5.04E-10	5.04E-10
VIE	6.68E-08	6.68E-08	6.68E-08	6.67E-08	6.68E-08	6.68E-08	6.68E-08	6.92E-08	6.92E-08	6.92E-08	6.91E-08	6.92E-08	6.92E-08	6.92E-08
VIF	1.40E-09	1.40E-09	1.40E-09	1.40E-09	1.40E-09	1.40E-09	1.40E-09	2.84E-10	2.84E-10	2.84E-10	2.84E-10	2.84E-10	2.84E-10	2.84E-10
VIH	6.99E-11	6.99E-11	6.99E-11	0.00E+00	6.99E-11	6.99E-11	6.99E-11	5.70E-11	5.70E-11	5.70E-11	0.00E+00	5.70E-11	5.70E-11	5.70E-11
SGTR1	3.21E-07	3.21E-07	0.00E+00	3.21E-07	3.21E-07	3.21E-07	3.21E-07	3.73E-09	3.73E-09	0.00E+00	3.73E-09	3.73E-09	3.73E-09	3.73E-09
SGTR2	8.73E-07	8.73E-07	0.00E+00	8.73E-07	8.73E-07	8.73E-07	8.73E-07	2.53E-07	2.53E-07	0.00E+00	2.53E-07	2.53E-07	2.53E-07	2.53E-07
ISLOCA	2.90E-06	0.00E+00	2.90E-06	2.90E-06	2.90E-06	2.90E-06	2.90E-06	5.62E-06	0.00E+00	5.62E-06	5.62E-06	5.62E-06	5.62E-06	5.62E-06
CDF	2.99E-05	2.70E-05	2.87E-05	2.98E-05	2.59E-05	2.29E-05	2.85E-05	2.44E-05	1.88E-05	2.42E-05	2.44E-05	1.99E-05	1.77E-05	2.29E-05

E.4.1.2 CASE NO-SGTR

This case was used to determine the benefit to be obtained from improved response to SGTRs. For the purposes of the analysis, and for each Unit, a single bounding analysis was performed that assumed SGTR would be eliminated. This analysis case was used in the evaluation of SAMAs No. 80-83, and 85.

Evaluation method: The model was modified in order to evaluate the impact on the St. Lucie Units 1 & 2 risk profile if SGTR events were eliminated. The PDSs that represents SGTR (i.e., SGTR1 and SGTR2) were set to zero. The resulting frequency for each PDS is presented in Table E.4-2.

E.4.1.3 CASE 1

This case was used to determine the benefit to be obtained from a redundant, highly reliable, independent Containment Spray System (CSS). For the purposes of the analysis, and for each Unit, a single bounding analysis was performed that assumed that the Containment Spray System would be perfectly reliable, thus eliminating those PDSs representing loss of sprays. This analysis case was used in the evaluation of SAMA No. 48.

Evaluation method: In order to evaluate the impact on the St. Lucie Units 1 & 2 risk profile if containment spray failures were eliminated, few logic changes were imposed. Instead of modifying the baseline results in the model in which safeguard bins that represent CSS failure (e.g., D, E, and H) are set to zero, the logic for CSS injection and recirculation was removed from the fault tree. To simulate the removal of CSS logic in each Unit's model, the following fault-tree logic was included in the corresponding master alignment flag:

Unit 1:

```
L1CSSINJ01      EQU .F
L1CSSREC04      EQU .F
L1CSSBOTH       EQU .F
```

Unit 2:

```
L2CSSINJ01      EQU .F
L2CSSREC04      EQU .F
L2CSSBOTH       EQU .F
```

The resulting frequency for each PDS is presented in Table E.4-2.

E.4.1.4 CASE 2

This case was used to determine the benefit to be obtained from elimination of reactor coolant pump (RCP) seal loss-of-coolant accident (LOCA) failure, including the operator action for securing the RCPs. For the purposes of the analysis, and for each Unit, a single bounding analysis was performed that assumed that RCP seal LOCA does not occur (and the operator does not fail to secure the RCPs). This analysis case was not used to evaluate SAMAs. See Case 4.

Evaluation method: In order to evaluate the impact on the St. Lucie Units 1 & 2 risk profile if RCP seal cooling does not fail, few logic changes were imposed on the SAMA baseline models. To simulate the elimination of seal LOCA logic from the respective fault trees, the following logic was introduced in the corresponding master alignment flags:

Unit 1:

SEALLOCA1 EQU .F

SEALLOCA EQU .F

RTOP1S1RCP EQU .F

Unit 2:

SEALLOCA1 EQU .F

SEALLOCA EQU .F

RTOP2S1RCP EQU .F

The resulting frequency for each PDS is presented in Table E.4-2.

E.4.1.5 CASE 3

This case was used to determine the benefit to be obtained from elimination of Small Small LOCAs. For the purposes of the analysis, and for each Unit, a single bounding analysis was performed that assumed that Small-Small LOCA does not occur. This analysis case was used in the evaluation of SAMA No. 123.

Evaluation method: In order to evaluate the impact on the St. Lucie Units 1 & 2 risk profile if Small-Small LOCA does not occur, few logic changes were imposed on the SAMA baseline models. To simulate the elimination of Small-Small LOCA logic from the respective fault trees, the following logic was introduced in the corresponding master alignment flags:

Unit 1:

%ZZS1U1 EQU .F

Unit 2:

%ZZS1U2 EQU .F

The resulting frequency for each PDS is presented in Table E.4-2.

E.4.1.6 CASE 4

This case was used to determine the benefit to be obtained from elimination of RCP seal LOCA failure. For the purposes of the analysis, and for each Unit, a single bounding analysis was performed that assumed that RCP seal LOCA does not occur. This analysis case was used in the evaluation of SAMAs No. 8, 10, 11, 12, and 16.

Evaluation method: In order to evaluate the impact on the St. Lucie Units 1 & 2 risk profile if RCP seal cooling does not fail, few logic changes were imposed on the SAMA baseline

models. To simulate the elimination of seal LOCA logic from the respective fault trees, the following logic was introduced in the corresponding master alignment flags:

Unit 1:

SEALLOCA1 EQU .F

SEALLOCA EQU .F

Unit 2:

SEALLOCA1 EQU .F

SEALLOCA EQU .F

The resulting frequency for each PDS is presented in Table E.4-2.

E.4.2 SAMA EVALUATION CASE AVERTED COSTS RESULTS

The modeling results of the six SAMA evaluation cases are provided in Tables E.4-3 and E.4-4, for Unit 1 and Unit 2, respectively. Each table presents the base case for comparison and the calculation for the averted costs (benefit). Also shown is the maximum attainable benefit (MAB) for eliminating all risk associated with the case-specific plant change (e.g., elimination of ISLOCA) represented by the bounding evaluation case. Although the total MAB for Unit 1 ($1,382,099) is higher than for Unit 2 ($1,202,105), some cases (and some CDF cutset estimates) are higher for Unit 2. The higher benefit of the two was used for screening and evaluation.

TABLE E.4-3
AVERTED COSTS (BENEFITS) FOR SAMA CASES – UNIT 1

Sama Evaluation Case							
	Base Case	**NoISLOCA**	**NoSGTR**	**Case1-CS**	**Case2-seal**	**Case3-SSL**	**Case4–Seal**
Offsite Annual Dose (rems)	15.3074	11.3634	13.2439	11.9466	14.3566	13.6433	14.9822
Offsite Annual Property Loss	$42,542	$32,421	$38,535	$30,771	$39,870	$37,834	$41,628
Reduction in CDF	100%	9.69%	3.99%	0.24%	13.52%	23.34%	4.62%
Averted Onsite Dose	$11,387	$1,104	$455	$27	$1,539	$2,658	$526
Averted Onsite Economic Cost	$583,332	$56,552	$23,273	$1,371	$78,887	$136,166	$26,979
Averted Offsite Population Dose	$329,505	$84,898	$44,419	$72,345	$20,468	$35,822	$7,001
Averted Offsite Economic Cost	$457,875	$108,931	$43,131	$126,695	$28,758	$50,670	$9,837
Total Benefit	$1,382,099	$251,485	$111,279	$200,437	$129,652	$225,316	$44,343

TABLE E.4-4
AVERTED COSTS (BENEFITS) FOR SAMA CASES – UNIT 2

	Base Case	**NoISLOCA**	**NoSGTR**	**Case1-CS**	**Case2-Seal**	**Case3-SSL**	**Case4–Seal**
Offsite Annual Dose (rems)	13.9718	6.3286	13.8063	12.0941	12.9021	12.3695	13.6026
Offsite Annual Property Loss	$38,571	$18,957	$38,201	$31,999	$35,564	$34,036	$37,531
Reduction in CDF	100%	22.98%	1.05%	0.21%	18.56%	27.41%	6.37%
Averted Onsite Dose	$9,309	$2,139	$97	$20	$1,729	$2,552	$593
Averted Onsite Economic Costs	$476,909	$109,594	$5,005	$984	$88,537	$130,736	$30,363
Averted Offsite Population Dose	$300,754	$164,526	$3,562	$40,419	$23,025	$34,490	$7,947
Averted Offsite Economic Cost	$415,133	$211,101	$3,976	$70,731	$32,366	$48,805	$11,188
Total Benefit	$1,202,105	$487,361	$12,640	$112,154	$145,657	$216,583	$50,090

E.5 ACRONYMS USED IN APPENDIX E

%	Percent
~	Approximately
<	Less than
>	Greater than
AB	Auxiliary Building
AC	Alternating Current
ADS	Automatic Depressurization System
ADV	Atmospheric Dump Valve
AFW	Auxiliary Feedwater
AFWST	Auxiliary Feedwater Storage Tank
AMSAC	ATWS Mitigating System Actuation Circuitry
ANO-1	Arkansas Nuclear One Unit 1
AOT	allowable outage time
AOV	Air-Operated Valve
ATWS	Anticipated Transient Without Scram
Ba	Barium
BGE	Baltimore Gas and Electric Company
BWR	Boiling Water Reactor
CCF	Common-Cause Failure
CCNPP	Calvert Cliffs Nuclear Power Plant
CCW	Component Cooling Water
CDF	Core Damage Frequency
Ce	Cerium
CE	Combustion Engineering, Inc.
CEDM	Control Element Drive Mechanism
CEOG	Combustion Engineering Owners Group
COMSORS	Core-Melt Source Reduction System
CPI	Consumers Price Index
CRD	Control Rod Drive
CSS	Containment Spray System
CST	Condensate Storage Tank

CVCS	Chemical Volume Control System
DC	Direct Current
DHR	Decay Heat Removal
DWST	Demineralized Water Storage Tank
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
EOP	Emergency Operating Procedure
ERCW	Emergency Raw Cooling Water
ERF	Emergency Response Facility
FPL	Florida Power & Light Company
FSAR	Final Safety Analysis Report
FW	Feedwater
GDC	General Design Criterion (Criteria)
HCLPF	High Confidence Low Probability of Failure
HELB	high-energy line break
HEP	Human Error Probability
HHSI	High-Head Safety Injection
HPCI	High-Pressure Coolant Injection
HPCS	High-Pressure Core Spray
HPSI	High-Pressure Safety Injection
HVAC	Heating, Ventilation, and Air Conditioning
I&C	Instrumentation and Controls
IA	Instrument Air
ICW	Intermediate Cooling Water
IEEE	Institute of Electrical and Electronic Engineers
IPE	Individual Plant Examination
IPEEE	Individual Plant Examination of External Events
ISLOCA	Interfacing System Loss-of-Coolant Accident
K	Thousand
kV	Kilovolt(s)
La	Lanthanum
LC	Load Center
LHSI	Low-Head Safety Injection

LOCA	Loss-of-Coolant Accident
LOOP	Loss of Offsite Power
LOP	Loss of Power
LPCI	Low-Pressure Coolant Injection
LPSI	Low-Pressure Safety Injection
m/s	Meters Per Second
MAB	Maximum Attainable Benefit
MACCS	Melcor Accident Consequence Code System
MFW	Main Feedwater
MG	Motor Generator
MLW	Mean Low Water
MOV	Motor-Operated Valve
mph	miles per hour
MSIV	Main Steam Isolation Valve
MTC	Moderator Temperature Coefficient
MW(t)	Megawatt (Thermal)
NOAA	National Oceanographic and Atmospheric Administration
NRC	U.S. Nuclear Regulatory Commission
ONP	Off-Normal Procedure
P&ID	Piping and Instrumentation Diagram
PDS	Plant Damage State
PMH	Probable Maximum Hurricane
pmp	Probable Maximum Precipitation
PMS	Probable Maximum Hurricane
PORV	Power-Operated Relief Valve
PRA	Probabilistic Risk Assessment
PRT	Pressure Relief Tank
PSA	Probabilistic Safety Assessment
psi	Pounds Per Square Inch
PWR	Pressurized-Water Reactor
RAB	Reactor Auxiliaries Building
RAI	Request for Additional Information
RCIC	Reactor Core Isolation Cooling

RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
rem	Roentgen Equivalent Man
RG	Regulatory Guide
RHR	Residual Heat Removal
RRAG	[FPL] Reliability and Risk Assessment Group
RRW	Risk Reduction Worth
Ru	Ruthenium
RWT	Refueling Water Tank
s	Second(s)
SAMA	Severe Accident Mitigation Alternative
SAMDA	Severe Accident Mitigation Design Alternative
SBO	Station Blackout
SDC	Shutdown Cooling
SG	Steam Generator
SGTR	Steam Generator Tube Rupture
SI	Safety Injection
SIT	Safety Injection Tank
SLC	Standby Liquid Control
SRP	Standard Review Plan
SRV	Safety Relief Valve
SSE	Safe Shutdown Earthquake
SSF	Safe Shutdown Facility
SSGFP	Standby Steam Generator Feed Pump
Sv	Sieverts
SW	Service Water
SWGR	Switchgear
TVA	Tennessee Valley Authority
TWST	Treated Water Storage Tank
UFSAR	Update Final Safety Analysis Report
USI	Unresolved Safety Issue
V	Volt(s)
VNFRM	Value of the Non-Farm Assets

WBN	Watts Bar Nuclear Plant
yr	Year

APPENDIX F. OTHER AGENCY CORRESPONDENCE

FPL = Florida Power & Light Company

SCH = State Clearing House

Florida Power & Light Company, 6501 South Ocean Drive, Jensen Beach, FL 34957

PSL-LR-01-0111

Ms. Cherie Trainor
State Clearing House
Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100

Subject: St. Lucie Nuclear Power Plant
License Renewal Project
Coastal Management Program Consistency Certification

Dear Ms. Trainor:

Florida Power & Light Company (FPL) is requesting concurrence with the enclosed Coastal Management Program Consistency Certification. This certification presents FPL's position that continued operation of St. Lucie Units 1 & 2 would be in compliance with the current Florida Coastal Management Program.

FPL is preparing an application to renew the U.S. Nuclear Regulatory Commission (NRC) Operating Licenses for St. Lucie Units 1 & 2 and has performed a review for consistency with the Florida Coastal Management Program. In conjunction with the application to NRC, FPL must submit a certification to the Federal licensing agency (NRC) and the State pursuant to the requirements of the Coastal Zone Management Act.

In accordance with NRC regulations for license renewal (10 CFR Part 54), FPL will include an Environmental Report with its license renewal application. This report will include a description of the proposed action and the affected environment, and an analysis of environmental consequences and mitigating actions. Also included in this report will be a complete list of licenses, permits, and other approvals from Federal, State, and local authorities for current St. Lucie Units 1 & 2 operations, as well as approvals and consultations that would be required for the approval of the license for the extended period of operation. A summary of this information is provided as part of the enclosed consistency certification.

The Environmental Report that FPL must submit as part of the St. Lucie Units 1 & 2 application will include a copy of this letter along with the Coastal Management Program Consistency Certification. When FPL submits its application to the NRC, you will also receive a copy of the Environmental Report.

After your review of the Environmental Report and Consistency Certification, I would appreciate a letter concurring with the attached Coastal Management Program Consistency Certification. A copy of your response will be made available to the NRC at the time of their site visit in connection with NRC's environmental review of the license renewal application.

If you have any questions or comments, please call T. V. Abbatiello at (561) 467-7316.

Sincerely,

Donald E. Jernigan
Vice President
St. Lucie Plant
EAT/TVA/sap

Enclosure: Coastal Management Program Consistency Certification

COASTAL MANAGEMENT PROGRAM CONSISTENCY CERTIFICATION

Florida has an approved coastal zone management program documented by the U.S. Nuclear Regulatory Commission (NRC) (Ref. 1). Florida Power & Light Company (FPL) has determined that the proposed St. Lucie Units 1 & 2 license renewal complies with the Florida-approved coastal management program and will be conducted in a manner consistent with such program.

Proposed Activity

FPL operates St. Lucie Units 1 & 2 pursuant to NRC Operating Licenses DPR-67 and NPF-16, respectively. The Unit 1 license will expire March 1, 2016, and the Unit 2 license will expire April 6, 2023. FPL is applying to NRC for renewal of both licenses, which would permit FPL to operate each unit for an additional 20 years (i.e., until March 1, 2036 and April 6, 2043). License renewal would give FPL the option of relying on St. Lucie Units 1 & 2 to meet Florida's future needs for electricity generation.

St. Lucie Units 1 & 2 are located on Hutchinson Island in St. Lucie County, Florida, approximately 7 miles southeast of Fort Pierce and 8 miles north of Stuart (Figure 1 and 2). West Palm Beach, the largest city within 50 miles, is approximately 48 miles to the south. The site is bordered on the east by the Atlantic Ocean and on the west by the Indian River Lagoon. Two public beaches, Blind Creek Pass Park and Walton Rocks Park, lie within the property boundary of St. Lucie Units 1 & 2. The stretch of the Lagoon adjacent to the site is designated as the Jensen Beach to Jupiter Inlet Aquatic Preserve. The Savannas State Preserve, a freshwater lagoon, is located on the mainland approximately 2 miles west of the site. The North Fork of the St. Lucie River Aquatic Preserve is located on the north fork of the St. Lucie River as it parallels the coast approximately 5 miles west of the site.

St. Lucie Units 1 & 2 are shown in Figure 3. Each unit is a pressurized light-water reactor with two steam generators that produce steam that turns turbines to generate electricity. Each unit is capable of an output of 2,700 MW(t), with a corresponding gross electrical output of approximately 890 MW(e). Onsite electrical power usage amounts to less than 100 MW(e), leaving each unit with a reliable net summer rating of 839 MW(e).

St. Lucie Units 1 & 2 utilize a once-through heat dissipation system that withdraws cooling water from and discharges to the Atlantic Ocean. FPL uses small amounts of chlorine in the cooling water systems that discharge to offsite surface waters. There are seven outfalls permitted under the site's Industrial Wastewater Facility Permit. Five of these are internal outfalls, discharging to either the Intake or Discharge Canals and thus ultimately to the Atlantic Ocean. The sixth is an internal outfall where nonindustrial related storm water is discharged to Mangrove Impoundment 8E, located between the Intake and Discharge Canals, east of State Highway A1A. The seventh outfall is the

main outfall and is associated with the Once-Through and Intake Cooling Water Systems discharging through the Discharge Canal to the Atlantic Ocean.

St. Lucie Units 1 & 2 use once-through cooling water from the Atlantic Ocean to remove waste heat from the electricity generation process in a two-loop, three-stage heat-transfer design. The primary and secondary loops are closed systems utilizing demineralized water that has been treated to control chemistry and corrosion. The final stage of the heat transfer system involves the Circulating Water System, which is unconfined. Ocean water is withdrawn through three offshore intake structures into the Intake Canal. This water is then pumped from the Intake Canal through the main condensers to the Discharge Canal. The heated water is discharged back to the Atlantic Ocean through offshore diffusers. The three cooling water intake structures are located approximately 1,200 feet offshore where the water is approximately 23 feet deep. They consist of a large concrete base with a vertical cylindrical opening in the center and a concrete velocity cap supported by columns extending approximately 6 feet from the base. Water is conveyed from the structures through separate buried pipes beneath the beach and dune system to the Intake Canal. FPL has installed and maintains three barriers in the channel of the Intake Canal to reduce potential for losses of marine life, particularly sea turtles, and to facilitate return of turtles to the ocean that have entered the intake canal. The Discharge Canal transports the heated cooling water to two discharge pipes at its eastern end. The pipes transport the water beneath the beach dune system back to the Atlantic Ocean. One pipe extends approximately 1,500 feet offshore and ends in a two-port "Y" diffuser. The other pipe extends approximately 3,400 feet offshore and ends in a multiport diffuser. 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. Temperature of the discharged cooling water is limited by the Industrial Wastewater Facility Permit for St. Lucie Units 1 & 2.

The Intake Cooling Water System for St. Lucie Units 1 & 2 is also a once-through cooling system. Up to 58,000 gallons per minute of ocean water are pumped from the Intake Canal through heat exchangers for non-contact cooling for a wide variety of plant equipment. Discharge is to the Discharge Canal and low-level chlorination is used to control biofouling of the system.

St. Lucie Units 1 & 2 use approximately 4 million gallons of water per month (0.13 million gallons per day) from the city of Fort Pierce's water supply system. This municipal water is the source of supply for the plant's process (primarily demineralizer water makeup), potable, sanitary, and fire protection water systems. St. Lucie Units 1 & 2 discharge treated waste process water into the Intake and Discharge Canals. These discharges are regulated under the plant's Industrial Wastewater Facility Permit. Sanitary wastewater is not disposed on site, but is piped to the County's South Hutchinson Island Water Reclamation Facility for treatment and disposal.

FPL employs a permanent workforce of approximately 791 employees and 138 contractors at St. Lucie Units 1 & 2. Approximately 46 percent of the employees live in

St. Lucie County, 37 percent live in Martin County, 8 percent live in Indian River County, and 6 percent live in Palm Beach County. The site workforce increases by as many as 575-870 workers for temporary (30 to 40 days) duty during refueling outages that occur about once a year. FPL does not anticipate the need for additional staff to support operations during extended operations.

In compliance with NRC regulations, FPL has analyzed the effects of plant aging and identified activities needed for St. Lucie Units 1 & 2 to operate for an additional 20 years. FPL conservatively assumes that renewal of the St. Lucie Units 1 & 2 operating licenses would require the addition of no more than 60 workers to perform the additional license renewal surveillance, monitoring, inspection, testing, trending, and reporting during the four 10-year in-service inspections. St. Lucie Units 1 & 2 license renewal would involve no major refurbishment activities.

St. Lucie transmission lines connect the plant through corridors to the state's electric grid at the Midway substation northwest of the plant (Figure 2). FPL maintains the Midway corridor using a combination of trimming, mowing, and herbicide application. Where required, FPL trims trees at the 14-foot level to maintain clearances. Typically, FPL only needs to do this at mid-span. In open, undeveloped areas, FPL mows approximately every five years. FPL uses spot and broadcast treatment with herbicides primarily to control tall exotic grasses and spot treatment for individual trees that may grow over 14 feet tall. These herbicides are applied under supervision by persons licensed by the State for herbicide application. These are the most common management practices for the Midway corridor.

St. Lucie Units 1 & 2 annually provide approximately 13.7 terawatt-hours of electricity to the grid that supplies electricity to all of FPL customers. In other words, the extended operation of St. Lucie Units 1 & 2 would meet the electrical needs of approximately one-half million households annually.

State Program

Florida's program is a networked coastal management program, which means that it is based on several different State and local authorities rather than a single law and set of regulations. The Program coordinates the actions of eight agencies and five water management districts under the authority of 23 statutes. The "Florida Coastal Program Guide" (Ref. 2) and its companion document, "The Florida Coastal Management Reference Book" (Ref. 3) document these authorities and how the State uses them to assure conformance with Coastal Zone Management Act (16 USC 1451 et seq.) requirements. Table 1 identifies the 23 chapters of the Florida Statutes included in the program as policies and notes the applicability of the key issues to the license renewal of St. Lucie Units 1 & 2. Tables 2 and 3 identify licenses, permits, consultations and other approvals necessary for St. Lucie Units 1 & 2 license renewal and continued operation, respectively.

FPL consulted with Federal, State, and local regulatory agencies listed below to inform them of St. Lucie Units 1 & 2 plans to seek license renewal. FPL described for the agencies its license renewal efforts and requested input from agency representatives regarding issues of concern.

Federal
U.S. Fish and Wildlife Service
National Marine Fisheries Service

Regional/Local
South Florida Water Management District

State of Florida
Department of Community Affairs
Department of Environmental Protection
Department of Health
Division of Historical Resources
Department of Transportation
Fish and Wildlife Conservation Commission
Florida Coastal Management Program
Florida Department of Agriculture and Conservation

Probable Effects

The NRC has prepared a generic environmental impact statement (GEIS) that analyzes the environmental impacts associated with the renewal of nuclear power plant operating licenses (Ref. 4 and 5). NRC has codified its findings by rulemaking (10 CFR Part 51, Subpart A, Appendix B, Table B-1). The codification identifies 92 potential environmental issues, 69 of which are generically identified as having small impacts and are called "Category 1" issues. Absent findings of new and significant information, NRC will rely on its codified findings, as amplified by supporting information in the GEIS, for its assessment of environmental impacts associated with license renewal. The codification and GEIS discuss the following types of Category 1 environmental issues:

- Surface water quality, hydrology, and use;
- Aquatic ecology;
- Groundwater use and quality;
- Terrestrial resources;
- Air quality;
- Land use;
- Human health;
- Socioeconomics;
- Uranium fuel cycle and waste management; and decommissioning.

For plants such as St. Lucie Units 1 & 2 that are located within the coastal zone, many of these issues involve potential impacts to the coastal zone. FPL has adopted by reference the GEIS analysis for all Category 1 issues.

The NRC review of environmental impacts arising out of license renewal identified 21 issues as "Category 2," for which license renewal applicants must submit additional, site-specific information.[1] There are 15 Category 2 issues that are applicable to St. Lucie Units 1 & 2.[2] The applicable issues and conclusions for these issues are as follows:

Aquatic ecology – FPL has conducted cooling water intake and discharge [Clean Water Act Section 316(a) and (b)] studies. It has been determined that the existing intake structures reflect the best technology available for minimizing entrainment and impingement impacts. Thermal plume studies indicated the thermal discharge from St. Lucie Units 1 & 2 complies with Florida Water Quality Standards without recourse to a Clean Water Act Section 316(a) variance. Consequently, the impacts of continued plant operation from entrainment, impingement, and heat shock would be small.

Terrestrial resources – FPL has no plans to perform major refurbishment activities; therefore, impacts due to refurbishment are not expected.

Threatened and endangered species – FPL has no plans to perform major refurbishment activities; therefore, impacts due to refurbishment are not expected and impacts to these species through license renewal would be small due to mitigative measures that are in place.

Air quality – FPL has no plans to perform major refurbishment activities; therefore, impacts due to refurbishment are not expected.

Human Health – St. Lucie Units 1 & 2 transmission lines meet the National Electric Safety Code recommendations for preventing electric shock from induced currents; therefore, the impact from electric shock would be small.

Socioeconomics – FPL has no plans for refurbishment activities; therefore, impacts to the local education system and transportation due to refurbishment are not expected. FPL's conservative bounding analysis of 60 additional license renewal personnel would not result in significant impacts to available housing or local water systems.

Offsite land use – FPL has no plans to perform major refurbishment activities; therefore, impacts due to refurbishment are not expected. The tax-related impacts of continued operations would be small.

[1] 10 CFR 51, Subpart A, Appendix B, Table B-1 also identifies 2 issues as "NA" for which NRC could not come to a conclusion regarding categorization. These issues, chronic effects of electromagnetic fields and environmental justice, do not affect the "coastal zone" as that phrase is defined by the Coastal Zone Management Act [16 USC 1453(1)]

[2] Some Category 2 issues are applicable to plants having features that are not present at St. Lucie Units 1 & 2 (e.g., cooling towers).

Historic and archeological resources – FPL has no plans to perform major refurbishment activities; therefore, impacts due to refurbishment are not expected, and continued operations would have no impacts.

Severe accident mitigation alternatives – FPL identified no cost beneficial modifications that would reduce the impacts of a severe accident.

Findings

1. NRC has determined that the significance of Category 1 issue impacts is small. A small significance level is defined by NRC as follows:

   > For the issue, environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purpose of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small as the term is used in this table. (10 CFR Part 51, Subpart A, Appendix B, Table B-1)

   FPL has adopted by reference the NRC findings for Category 1 issues.

2. For applicable Category 2 issues, FPL has determined that the environmental impacts are small, as that term is defined by the NRC. Impact to the coastal zone, therefore, would also be small.

3. To the best of its knowledge, FPL is in compliance with Florida licenses, permits, approvals, and other requirements as they apply to St. Lucie Units 1 & 2 impacts on the Florida coastal zone (see Table 1).

4. St. Lucie Units 1 & 2 license renewal and continued operation of St. Lucie Units 1 & 2 facilities, and their effects, are all consistent with the Florida Coastal Management Program.

State Notification

FPL hereby certifies that St. Lucie Units 1 & 2 license renewal is consistent with the Florida Coastal Management Program. The regulation [15 CFR 930.63(a)] provides the State has six months from the receipt of this letter and accompanying information in which to concur or object to the FPL certification. However, the regulation [15 CFR 930.63(b)] also provides that if Florida has not issued a decision within three months following commencement of State agency review, it shall notify the contacts listed below of the status of the matter and the basis for further delay. The State's concurrence, objections, or notification of review status should be sent to the following contacts:

Christopher I. Grimes, Branch Chief
License Renewal and Standardization Branch
Office of Nuclear Reactor Regulation
U.S Nuclear Regulatory Commission
One White Flint
11555 Rockville Pike
Rockville, Maryland 20555
(301) 415-1183

Donald E. Jernigan, Vice-President
St. Lucie Plant
Florida Power and Light Company
6351 S.Ocean Drive
Jensen Beach, FL 34957
(561) 467-7100

References

Ref. 1 U.S. Nuclear Regulatory Commission Office of Nuclear Reactor Regulation. "Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues." Revision 2, 1999.

Ref. 2 State of Florida, 1998 Coastal Program Guide, A Guide to the Federally Approved Florida Coastal Management Program. Department of Community Affairs. Revised November 1, 2000. Accessed June 2001. http://www.dca.state.fl.us/ffcm/fcmp/pubs/progguide98.htm.

Ref. 3 State of Florida, Florida Coastal Management Program 1998 Reference Book. Department of Community Affairs. http://www.dca.state.fl.us/ffcm/fcmp/pubs/refguide98/outline.htm. Accessed June 2001.

Ref. 4 U.S. Nuclear Regulatory Commission. Generic Environmental Impact Statement for License Renewal of Nuclear Plants. NUREG-1437. Washington, D.C., May 1996.

Ref. 5 U.S. Nuclear Regulatory Commission. Generic Environmental Impact Statement for License Renewal of Nuclear Plants. Section 6.3, "Transportation" and Table 9-1, "Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants." NUREG-1437, Vol. 1, Addendum 1. Washington, D.C., August 1999.

TABLE 1
MATRIX OF FCMP ENABLING POLICIES AND LICENSE RENEWAL OF ST. LUCIE UNITS 1 & 2

Florida Statute	Key Issue	Applicability and Response
Chapter 161	Beach and Shore Preservation	Not applicable; proposed action does not involve coastal construction. If a need for beach modification were to arise as a result of erosion from an extreme storm event, FPL would consult with DEP and pursue the appropriate permit.
Chapter 163, Part III	County and Municipal Planning and Land Development Regulation	Not applicable; proposed action involves an existing facility and no alterations.
Chapter 186	State and Regional Planning	Not applicable; proposed action involves an existing facility and continued operations do not require changes to water use, land use or transportation.
Chapter 252	Emergency Management	FPL has an approved emergency plan that it implements in coordination with the Division of Emergency Management.
Chapter 253	State Lands	Not applicable; proposed action is not associated with state lands.
Chapters 253, 259, 260, and 375	Land Acquisition	Not applicable; proposed action is not associated with state lands.

TABLE 1 (continued)
MATRIX OF FCMP ENABLING POLICIES AND LICENSE RENEWAL OF ST. LUCIE UNITS 1 & 2

Florida Statute	Key Issue	Applicability and Response
Chapter 258	State Parks and Preserves	Not applicable to State Parks; proposed action will not impact the two parks (Blind Creek Pass and Walton Rocks) in the vicinity or impair the public's ability to enjoy these resources. There are no proposed changes to either permitted air emissions or liquid effluent discharges. The visual impact of the plant will not change, since there are no modifications associated with the proposed action. Not applicable to Aquatic Preserves; proposed action does not involve dredging, spoiling, filling, erection and repair of structures and facilities, excavation of minerals drilling of oil and gas, or aquaculture that could potentially impact the Jensen Beach to Jupiter Inlet Aquatic Preserve. Discharges are controlled by the Industrial Wastewater Facility Permit (see Table 2)
Chapter 267	Archives, History, and Records Management	FPL has corresponded with the State Historic Preservation Officer and received concurrence that the proposed action will not impact historic resources.
Chapter 288	Commercial Development and Capital Improvements	Continued operation of St. Lucie Units 1 & 2 supports and enhances economic development.
Chapters 334 and 339	Transportation Administration and Finance	Not applicable; proposed action does not involve the transportation system.
Chapter 370	Saltwater Fisheries	FPL has corresponded with the National Marine Fisheries Service and the Florida Fish and Wildlife Conservation Commission (FWCC). Proposed action does not involve construction or changes in operation; therefore, no additional impacts are anticipated.

TABLE 1 (continued)
MATRIX OF FCMP ENABLING POLICIES AND LICENSE RENEWAL OF ST. LUCIE UNITS 1 & 2

Florida Statute	Key Issue	Applicability and Response
Chapter 372	Wildlife	FPL has corresponded with the US Fish and Wildlife Service and FWCC. Proposed action does not involve construction or changes in operations; therefore, no additional impacts are anticipated.
Chapter 373	Water Resources	Industrial Wastewater Facility Permit controls impacts to surface waters of the state.
Chapter 376	Pollutant Discharge Prevention and Removal	Not applicable; proposed action does not involve transfer, storage, or transportation of gasoline, pesticides, ammonia, or chlorine. Liquid sodium hypochlorite is stored onsite in aboveground storage tanks for use in biofouling control of some cooling water systems. Management of these tanks is covered in the site's Spill Prevention Plan.
Chapter 377	Energy Resources	Not applicable; proposed action does not involve exploration, drilling, or production of oil, gas or other petroleum products.
Chapter 380	Land and Water Management	Not applicable; proposed action involves an existing facility that is not located in an Area of Critical Concern. A resource planning and management committee was established for Hutchinson Island who put in place a completed and approved resource management plan in the mid 1980s. The Florida legislature chose not to designate Hutchinson Island as an Area of Critical Concern.
Chapter 381.001, .0011, .0012, .006, .0061, .0065 -.0067	Public Health, General Provisions	Not applicable; FPL does not have onsite sewage treatment and disposal.

TABLE 1 (continued)
MATRIX OF FCMP ENABLING POLICIES AND LICENSE RENEWAL OF ST. LUCIE UNITS 1 & 2

Florida Statute	Key Issue	Applicability and Response
Chapter 388	Mosquito Control	Not applicable; proposed action does not involve arthropod control. FPL cooperates with St. Lucie County's mosquito control program in the Mangrove Impoundments in the vicinity of St. Lucie Units 1 & 2. The program involves withdrawals of small amounts of ocean water from the Intake Canal for annual seasonal flushing and renourishment of Mangrove Impoundment 8E and then pumping that water back to the Intake Canal. The county also controls water levels on the other Mangrove Impoundments surrounding St. Lucie Units 1 & 2. These impoundments are hydrologically connected by water control structures to the Indian River Lagoon. The proposed action would not involve changes to plant operations that would impact these mosquito control activities.
Chapter 403	Environmental Control	FPL has an air permit and an industrial wastewater facility permit (See Table 2).
Chapter 582	Soil and Water Conservation	Not applicable; proposed action does not involve activities associated with soil erosion.

DEP = Department of Environmental Protection
FPL = Florida Power & Light Company
FWCC = Fish and Wildlife Conservation Commission
NPDES = National Pollutant Discharge Elimination System
FCMP = Florida Coastal Program Guide

TABLE 2
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT ST. LUCIE UNITS 1 & 2 OPERATIONS

Agency	Authority	Requirement	Number	Expiration Date	Activity Covered
U.S. Nuclear Regulatory Commission	Atomic Energy Act [42 USC 2011, et seq.], 10 CFR 50.10	License to operate	DPR-67 (Unit 1) NPF-16 (Unit 2)	3/1/2016 (Unit 1) 4/6/2023 (Unit 2)	Operation of St. Lucie Units 1 & 2
U.S. Fish and Wildlife Service	Migratory Bird Treaty Act [16 USC 703 – 712]	Special Purpose Salvage	PRT-697722	12/31/2000 (In renewal process)	Carcass salvage and injured bird transport. This is an FPL system-wide permit that may be applied as necessary and appropriate at St. Lucie Units 1 & 2
U.S. Army Corps of Engineers	Rivers and Harbors Act (33 USC 403) Clean Water Act (33 USC 1344)	Dredge Permit	199301803	12/21/2003	Maintenance dredging of Intake Canal

TABLE 2 (continued)
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT ST. LUCIE UNITS 1 & 2 OPERATIONS

Agency	Authority	Requirement	Number	Expiration Date	Activity Covered
DEP	Florida Statutes § 403	Industrial Wastewater Facility Permit	FL0002208	1/9/2005	Wastewater treatment and effluent disposal. State implementation of National Pollutant Discharge Elimination System
DEP	Florida Statutes Chapter 376	Annual storage tank registration	Facility ID: 8630677 Placard No: 135878	6/30/2002	Operation of above-ground storage tanks. Five tanks for petroleum products (Tank Id Nos. 9, 10, 11, 12, and 13)
DEP Siting Coordination Office and Siting Board (Governor and Cabinet)	Florida Statutes § 403.501-518	Power Plant Siting Act Certification	Case No: PA74-02	Life of plant	Siting, construction, and operation of St. Lucie Unit 2 (The Power Plant Siting Act was not applicable to Unit 1)

TABLE 2 (continued)
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT ST. LUCIE UNITS 1 & 2 OPERATIONS

Agency	Authority	Requirement	Number	Expiration Date	Activity Covered
DEP	Florida Statutes Chapter 403	Air permit	1110071-003-AO	6/26/2005	Emissions from six emergency diesel generators, miscellaneous diesel-driven equipment, and facility-wide fugitive emission from storage tanks, roadways, and paint/sandblasting
Florida Fish and Wildlife Conservation Commission (FWCC)[a]	Florida Administrative Code Chapter 39	Special purpose permit	01S-018	1/26/2002	Collection and possession of marine organisms for experimental purposes

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TABLE 2 (continued)
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT ST. LUCIE UNITS 1 & 2 OPERATIONS

Agency	Authority	Requirement	Number	Expiration Date	Activity Covered
FWCC	Florida Administrative Code Chapter 39	Marine turtle permit	TP#026	1/31/2002	Conduct turtle watches and maintain and display preserved specimens
FWCC	Florida Administrative Code Chapter 39	Marine turtle permit	TP#125	1/31/2002	Conduct turtle activities including net capture, tagging, nesting surveys, hand-capture, nest relocation, rescue and release of hatchlings, stranding and salvage activities

TABLE 2 (continued)
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT ST. LUCIE UNITS 1 & 2 OPERATIONS

Agency	Authority	Requirement	Number	Expiration Date	Activity Covered
FWCC	Florida Administrative Code Chapter 39	Scientific Collecting permit	WS01374	6/25/2004	Carcass or wildlife salvaged and possessed for scientific or educational purposes. This is an FPL system-wide permit that may be applied as necessary and appropriate at St. Lucie Units 1 & 2
FWCC	Florida Administrative Code Chapter 39	Migratory Bird Nest permit	WN01373	6/25/2003	Authorization to destroy inactive nests of migratory birds other than ospreys (*Pandion haliaetus*) for routine facility maintenance. This is an FPL system-wide permit that may be applied as necessary and appropriate at St. Lucie Units 1 & 2

TABLE 2 (continued)
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT ST. LUCIE UNITS 1 & 2 OPERATIONS

Agency	Authority	Requirement	Number	Expiration Date	Activity Covered
South Florida Water Management District (SFWMD)	Florida Administrative Code 40E-20.042	General water use permit	56-01238-W	7/13/2002	Aquifer remediation of surficial aquifer
SFWMD	Florida Administrative Code Chapter 65-25	Stormwater discharge permit	56-00848-S	Perpetual	Stormwater discharge from overflow parking lot
SFWMD	Florida Administrative Code Chapter 62-25	Stormwater discharge permit	85-142	Perpetual	Stormwater discharge from the Simulator Building

CFR = Code of Federal Regulations
DEP = Florida Department of Environmental Protection
FFWCC = Florida Fish and Wildlife Conservation Commission
SFWMD = South Florida Water Management District
a. Effective July 1, 1999, the Florida Fish and Wildlife Conservation Commission replaced the Florida Game and Fresh Water Fish Commission.

TABLE 3
ENVIRONMENTAL AUTHORIZATIONS FOR ST. LUCIE UNITS 1 & 2 LICENSE RENEWAL[a]

Agency	Authority	Requirement	Remarks
U.S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011 et seq.)	License renewal	Environmental Report submitted in support of license renewal application.
FWS and NMFS	Endangered Species Act Section 7 (16 USC 1536)	Consultation	Requires Federal agency issuing a license to consult with FWS and NMFS.
Florida Department of Environmental Protection	Clean Water Act Section 401 (33 USC 1341) Florida Statures Chapter 62-4.160(13)(c)	Certification	St. Lucie Units 1 & 2 Industrial Wastewater Facility Permit constitutes State Certification.
Florida Division of Historic Resources	National Historic Preservation Act Section 106 (16 USC 470f)	Consultation	Requires Federal agency issuing a license to consider cultural impacts and consult with State Historic Preservation Officer (SHPO).
Florida Department of Community Affairs	Federal Coastal Zone Management Act (16 USC 1451 et seq.)	Certification	Requires an applicant to provide certification to the Federal agency issuing the license that license renewal would be consistent with the Federally approved state coastal zone management program. Based on its review of the proposed activity, the State must concur with or object to the applicant's certification.

FPL = Florida Power & Light Company
FWS = U.S. Fish and Wildlife Service
NMFS = National Marine Fisheries Service
a. No renewal-related requirements identified for local or other agencies.

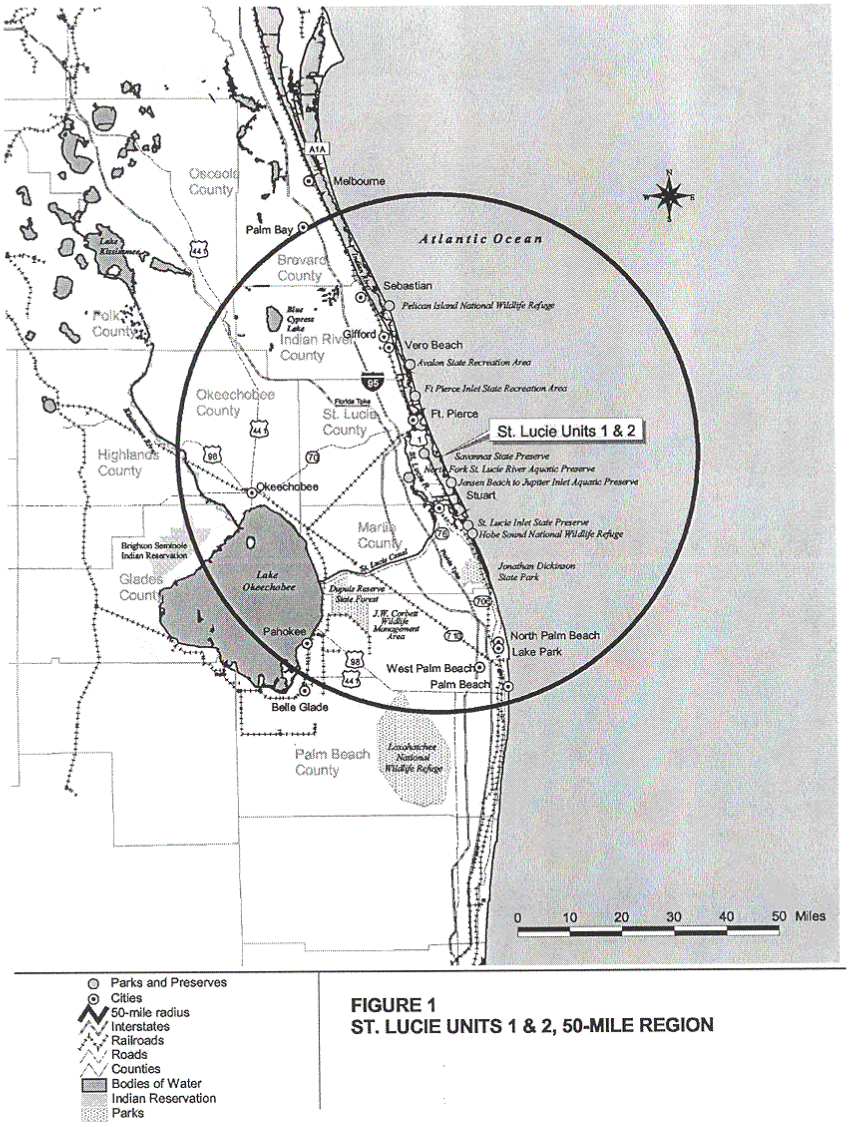

FIGURE 1
ST. LUCIE UNITS 1 & 2, 50-MILE REGION

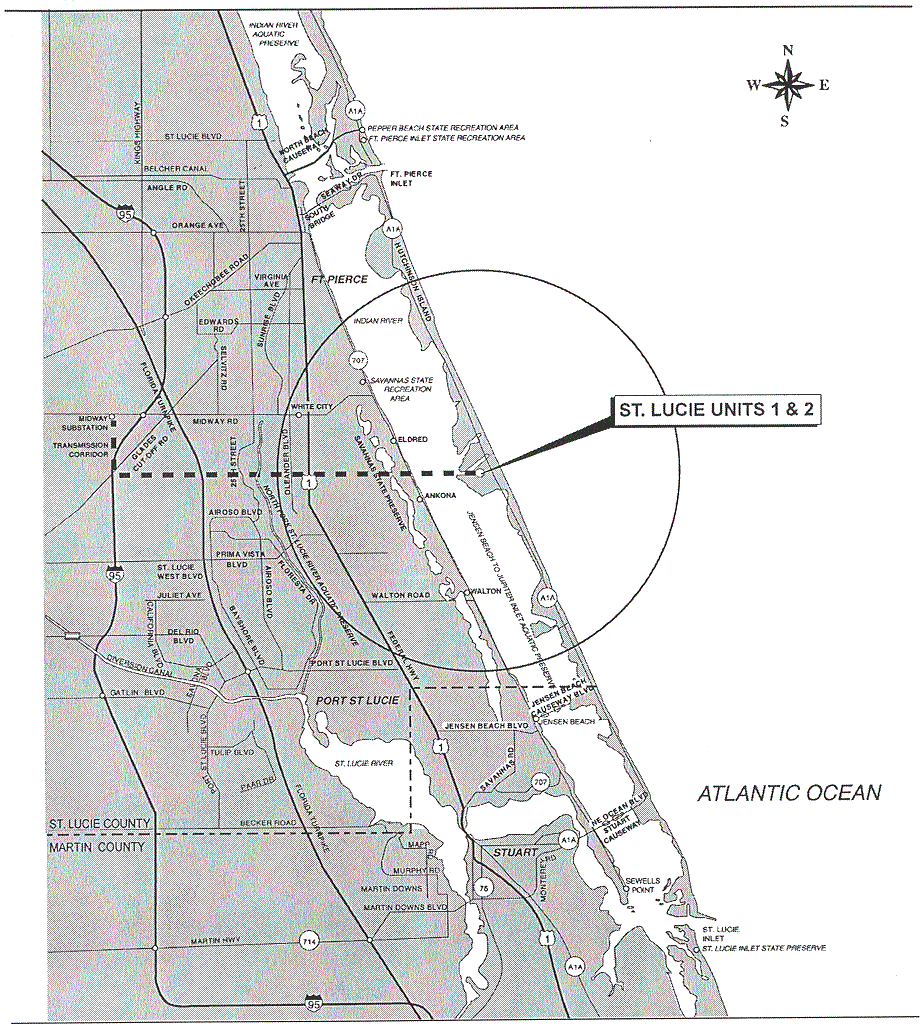

FIGURE 2
ST. LUCIE UNITS 1 & 2, 6-MILE REGION

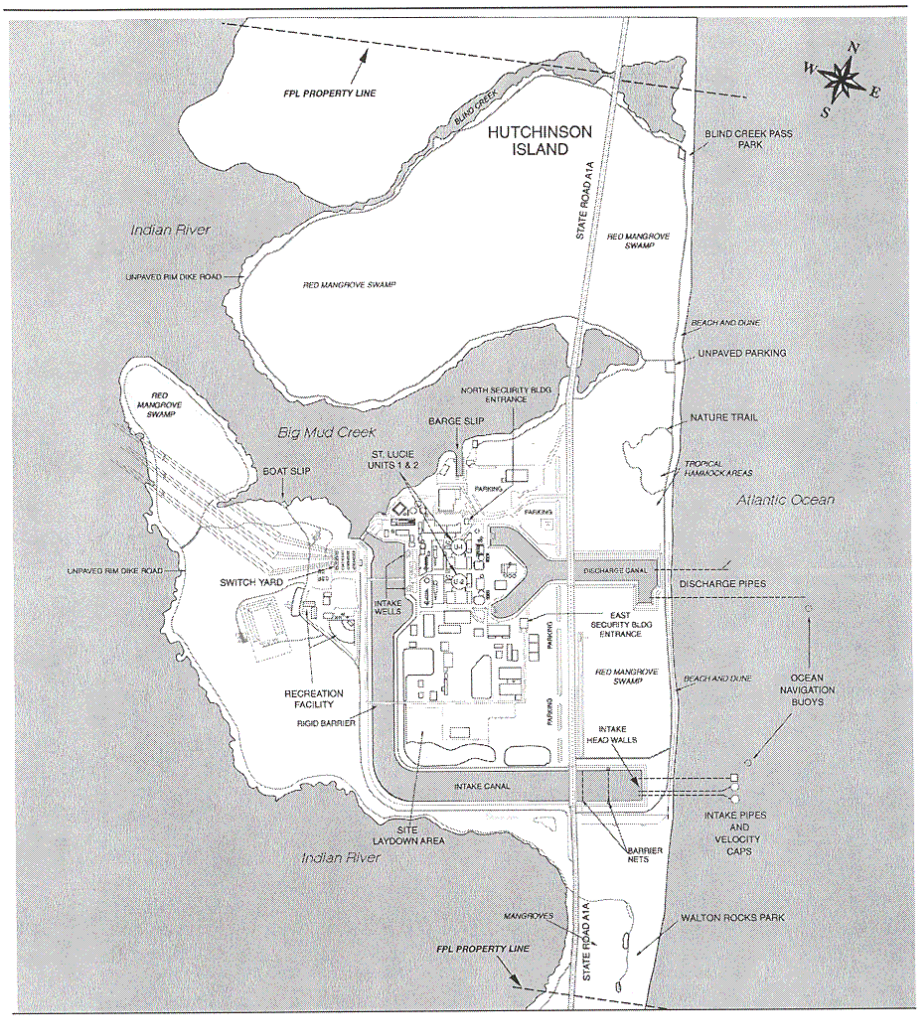

FIGURE 3
ST. LUCIE UNITS 1 & 2 SITE BOUNDARY