April 20, 2001

Mr. T. F. Plunkett
President - Nuclear Division
Florida Power and Light Company
P.O. Box 14000
Juno Beach, Florida 33408-0420

SUBJECT: ST. LUCIE PLANT, UNIT NO. 1 - ISSUANCE OF AMENDMENT REGARDING REVISION TO LICENSING BASIS ANALYSIS OF A MAIN STEAM LINE BREAK (TAC NO. MA9304)

Dear Mr. Plunkett:

The Commission has issued the enclosed Amendment No. 175 to Facility Operating License No. DPR-67 for the St. Lucie Plant, Unit No. 1. This amendment consists of a change to the licensing bases to incorporate a revised analysis of the Main Steam Line Break inside containment into the Unit 1 Updated Final Safety Analysis Report in response to your application dated December 4, 2000, as supplemented February 9, 2001.

A copy of the Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

/RA/

Brendan T. Moroney, Project Manager, Section II
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-335

Enclosures:
1. Amendment No.175 to DPR-67
2. Safety Evaluation

cc w/encls: See next page

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NUCLEAR REGULATORY COMMISSION

April 27, 2001

Mr. T. F. Plunkett
President - Nuclear Division
Florida Power and Light Company
P.O. Box 14000
Juno Beach, Florida 33408-0420

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Sincerely,

Brendan T. Moroney, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-335

Enclosures:
1. Amendment No. 175 to DPR-67
2. Safety Evaluation

cc w/encls: See next page

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FLORIDA POWER & LIGHT COMPANY

DOCKET NO. 50-335

ST. LUCIE PLANT UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 175
License No. DPR-67

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Florida Power & Light Company (the licensee), dated December 4, 2000, as supplemented February 9, 2001, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, changes to the St. Lucie Unit 1 Updated Final Safety Analysis Report (UFSAR) to reflect a revised analysis of the Main Steam Line Break inside containment, as set forth in the application for amendment dated December 4, 2000, as supplemented February 9, 2001, are authorized. The licensee shall submit the revised description authorized by this amendment with the next update of the UFSAR, in accordance with 10 CFR 50.71(e).

3. This license amendment is effective as of its date of issuance and shall be implemented as specified in 2 above.

FOR THE NUCLEAR REGULATORY COMMISSION

Richard P. Correia, Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Date of Issuance: April 20, 2001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 175 TO FACILITY OPERATING LICENSE NO. DPR-67

FLORIDA POWER AND LIGHT COMPANY

ST. LUCIE PLANT, UNIT NO. 1

DOCKET NO. 50-335

1.0 INTRODUCTION

By application dated December 4, 2000, as supplemented February 9, 2001, Florida Power and Light Company (FPL, the licensee) requested an amendment to Facility Operating License DPR-67 for the St. Lucie Plant, Unit 1 (SL1). The proposed amendment would change the licensing bases for Unit 1 by revising the Unit 1 Updated Final Safety Analysis Report (UFSAR) analysis of a main steam line break (MSLB) inside containment to correct nonconservative assumptions used in the original analysis, and to reflect a new analysis treatment of a hypothesized single failure of a Main Feedwater Isolation Valve (MFIV).

The licensee's supplementary submittal dated February 9, 2001, did not affect the original proposed no significant hazards determination, or expand the scope of the request as noticed in the *Federal Register* on February 7, 2001 (66 FR 9383).

2.0 BACKGROUND

On December 23, 1998, FPL notified the Nuclear Regulatory Commission (NRC) that draft results of a re-analysis of the SL1 MSLB indicated there were nonconservative assumptions in the original analysis, which could result in the peak containment pressure following this accident exceeding the containment design pressure. This notification was followed by a written report, LER 50-335/1998-009-00 dated January 20, 1999.

The licensee reported that the most significant nonconservative input assumptions to the MSLB analysis concerned feedwater flow, feedwater isolation and initial containment pressure. Due to the feedwater pumps being farther out on the pump curve following a main steam line rupture, the actual flow to the faulted steam generator could be higher than the feedwater flow assumed in the original analysis. The closing characteristic of the MFIV was modeled in the original analysis as a ramp closure from 0 to 60 seconds. Since these are gate valves, the actual closure of the MFIV is more consistent with a step closure at 60 seconds. The initial

containment pressure was assumed to be 0 psig when, in fact, it could remain in compliance with Technical Specification 3.6.1.4, "Internal Pressure" at a value as high as 2.4 psig. The licensee evaluated this situation in accordance with Generic Letter (GL) 91-18 and determined it was a degraded, but operable, condition regarding the postulated peak pressure during an MSLB inside containment. After considering several options, the licensee decided to resolve the MSLB analysis issues by limiting the feedwater flow into a faulted steam generator with the use of rapid feedwater isolation. When the MSLB analysis of record uses conservative inputs and rapid feedwater isolation, the results are bounded by the design containment pressure.

A Main Steam Isolation Signal (MSIS) is provided to mitigate the effect of an MSLB accident at SL1. The signals from four pressure sensors for each steam generator are combined in a two-out-of-four logic to generate the MSIS on low steam generator pressure. An MSIS on either safeguards channel will close the Main Steam Isolation Valve (MSIV) and MSIV bypass valve, the MFIV, and the Main Feedwater (MFW) pump discharge valve on that channel and send a signal through an isolation relay to close the MSIV, the MSIV bypass valve, the MFIV, and the MFW pump discharge valve of the other channel. In the existing design, the MFIV and MFW pump discharge valves are motor-operated valves. However, the current motor operators for the MFIVs and MFW pump discharge valves lack the design margin necessary to ensure rapid valve closure. The licensee plans to implement a plant modification during the spring 2001 SL1-17 refueling outage to ensure that one MFW valve per train can close within the time constraints supported by the new MSLB analysis. The motor operators on the MFIVs will be replaced with pneumatic actuators. High-pressure nitrogen will be supplied to the MFIV actuators by the actuation of redundant electrically operated solenoid valves and pneumatically operated pilot valves.

In addition, the licensee proposes to change the MSLB feedwater addition single failure analysis of the safety-related MFIVs by crediting a backup trip of the nonsafety-grade MFW and condensate pumps. The licensee has designed modifications to provide a backup trip of the nonsafety-grade MFW and condensate pumps from the safety-grade MSIS. The design adds MSIS trips to the MFW pump and condensate pump breaker control circuits. This nonsafety-grade backup trips both MFW and condensate pumps on MSIS signals and provides increased assurance that rapid feedwater isolation will occur when an MSIS signal is generated. The design ensures that failure of one channel does not prevent a pump trip by the redundant channel. The MFW pump trip modification was implemented during the 1999 Unit 1 SL1-16 refueling outage, but this feature is not currently credited in the MSLB analysis. The condensate pump trip will be implemented during the SL1-17 refueling outage.

3.0 EVALUATION

3.1 Analysis

This amendment changes the licensing bases for the MSLB analysis to correct nonconservative inputs used in the previous analysis and to credit a trip of the nonsafety-grade MFW and condensate pumps as a backup method to terminate feedwater addition should an MFIV fail to close. This differs from the current licensing basis analysis that credits the closure of redundant safety-related valves for MFW termination single failure consideration.

The licensee stated that the computer codes previously used were re-run with the more conservative input. These codes are SGN-III for the mass and energy release to the containment and CONTEMPT for the containment analyses. This is acceptable to the staff since CONTEMPT is a conservative code widely used by the industry and SGN-III is an NRC-approved computer code for predicting the mass and energy released into the containment and serves as input to CONTEMPT. A matrix of single failures and power levels was analyzed to determine the most conservative containment pressure and temperature. These values are provided in the proposed revision to UFSAR Table 6.2-4C, "Results of Main Steam Line Breaks Inside Containment." The peak containment pressure results from a double-ended guillotine MSLB at the steam generator outlet nozzle from 102% power with failure of one containment spray pump. The predicted maximum containment pressure is 42.76 psig. The containment design pressure is 44 psig. The sequence of events for this case is given in the proposed revision to UFSAR Table 6.2-4D. The list of single failures considered and the power levels considered is given on pages 5 and 6 of 14 of the licensee's December 4, 2000, letter. The staff considers the licensee's analyses to be acceptable since the single failures and power levels are comprehensive enough to include the worst (most conservative) case. The failure of an MFIV to close was not the most limiting single failure since credit was taken for the MFW pump and condensate pump trips.

The licensee performed an evaluation of the change in risk due to changes in the way feedwater isolation is implemented. This evaluation addressed the change in reliability of feedwater termination via closure of redundant FWIVs (current design) versus feedwater termination achieved by closure of the MFIVs in conjunction with the trip of the condensate pump breakers and closure of the MFW pump discharge valves. Tripping of the condensate pump breakers is successful in terminating feedwater flow, because without adequate suction pressure, the MFW pumps are not capable of delivering flow. Additionally, closure of the MFW discharge valves is required to remove from consideration the flashing of the water volume contained in the piping upstream of these valves. The licensee's analysis shows that the failure probability for the proposed design is about the same as that of the existing design; consequently, the difference between the two designs in terms of plant risk is very small, as defined in Regulatory Guide 1.174. The staff accepts this result based on its review of the licensee's analysis. Therefore, the change to the licensing basis is not risk significant when compared to the existing design.

3.2 FWIV Modification

The licensee's submittal dated December 4, 2000, indicated that the design modification to address the potential MSLB will include one pneumatic-powered MFIV and one motor-operated MFW pump discharge valve in each feedwater line.

The licensee proposes to change the design of the two motor-operated MFIVs with pneumatic-operated MFIVs. The MFIVs will each have an accumulator supplied with nitrogen. The accumulators will be safety-related with double check valves to isolate them from the nonsafety-related nitrogen supply system. Thus, the motive power for the proposed MFIVs is essentially a passive pre-charged system. Nitrogen from the passive accumulator to close each MFIV will be admitted to the operator by either of two redundant solenoid valves, one powered from the safety-related "A" dc bus and the other from safety-related "B" dc bus. MSIS signals from either "A" or "B" safeguards train will actuate both sets of solenoid valves on each

MFIV, thus closing both MFIVs. The pneumatic-operated MFIVs will "fail as is" on loss of nitrogen pressure or "fail open" on loss of both redundant trains of dc power. The design of the MFW pump discharge valves is not changed with this amendment.

The licensee states that the safety-related design criteria for the modification to install pneumatic actuators on the MFIVs will include seismic, Class 1E electrical, diesel/battery loading, American Society of Mechanical Engineers Code requirements, high energy line break requirements, environmental qualification, and Appendix R fire control requirements. The licensee plans to implement the plant modification during the Unit 1 refueling outage in April 2001.

In a response dated February 9, 2001, to an NRC staff request for additional information, the licensee stated that the required closing thrust for the original motor-operated MFIVs was determined using the Electric Power Research Institute (EPRI) Motor-Operated Valve Performance Prediction Program. The licensee is procuring the replacement pneumatic actuators for these valves with a closure time specification of 10 to 15 seconds, and thrust requirements greater than the EPRI prediction. The licensee stated that the design specification requires that the maximum closing time for these valves be accomplished for a flow rate greater than the postulated accident conditions. The licensee also established a minimum closing time that will ensure that valve damage does not occur and that unacceptable hydraulic loads are not generated.

The licensee also stated that the MFW pump discharge valves will remain the safety-related redundant backup to the MFIVs for postulated breaks in the nonseismically qualified portions of the main-steam system. The most limiting scenario requires the MFW pump discharge valves to be capable of closing to prevent steam generator overfill in the event that the MFIVs fail to close. For an MSLB outside containment (downstream of the MSIV in the nonsafety piping), the MFW pump discharge valves must be capable of isolating feedwater flow against MFW pump discharge pressure. The licensee stated that its differential pressure calculations will be based on this limiting scenario, and that actuator setpoints will be revised and adjusted accordingly. The licensee will retain the MFW pump discharge valves in its programs established in response to GL 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," and GL 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves."

The replacement of the MFIV actuators will limit feedwater addition to the faulted steam generator so that the containment design pressure will not be exceeded. This modification, as described above, will meet all applicable criteria for being considered safety grade.

3.3 Backup Pump Trip

The licensee proposes to change the MSLB single-failure analysis of the safety-related MFIVs by crediting a backup trip of the nonsafety-grade MFW and condensate pumps from the safety-grade MSIS signal. The modifications to the MFW and condensate pump trips will not be safety grade except for the MSIS signal to the breakers.

The licensee has proposed to implement the backup trip of the nonsafety-related condensate pumps by adding safety-related MSIS trip signals to the breaker trip circuits. This allows both

condensate pumps to trip on MSIS signals. Control power for tripping the condensate pump breakers is from safety-related "A" dc bus for the "A" condensate pump breaker and from safety-related "B" dc bus for the "B" condensate pump breaker. Although the new trip circuit design is safety related, the actual pump breakers and control circuits to close the breakers are not safety related. These breakers are similar in design to the safety-related breakers used throughout the plant. The modification to the condensate pump breakers will be implemented during the SL1-17 refueling outage.

The licensee previously implemented a modification during the SL1-16 refueling outage, which trips the nonsafety-related MFW pumps by a signal from the safety-related MSIS. The design added MSIS trips to the MFW pump breaker control circuits. This nonsafety-grade backup trips both MFW pumps on MSIS signals. This diverse trip signal provides assurance that rapid feedwater isolation will occur when an MSIS signal is generated. The design of the new engineered safety feature actuation signal (ESFAS) trip circuits is such that failure of one channel does not prevent a pump trip by the redundant channel. The design includes the installation of two isolation/trip relays in an enclosure to maintain electrical separation between the safety-related MSIS trip circuitry and the nonsafety-related pump breaker control circuitry. The enclosure is seismically mounted. The isolation MSIS signals are generated using fused SA and SB 125 Vdc power. Cable and conduit installation complies with safety-related electrical-separation requirements. This includes separation of the SA and SB cables from the ESFAS cabinets to the new enclosure, a barrier to maintain separation in the enclosure where spatial separation is not available, and fuses to protect the cables and the 125 Vdc power supplies. The isolation relays are Class 1E devices. Since each relay trips all running pumps, a failure of one relay would not prevent an MSIS trip of the 1A and 1B MFW pump circuit breakers. A circuit failure (open) would result in a failure of that protection channel to trip the MFW pumps. This failure, however, would not prevent tripping of the pumps from the control room or automatic tripping of the pumps by the redundant protection channel. The design of safety-related portion of the nonsafety-grade backup MFW pump MSIS trip meets all applicable design requirements for the safety-related MSIS system. The redundancy of the MSIS trip circuit provides reasonable assurance that the trip of the nonsafety-related MFW pumps is a reliable backup to the postulated failure of the MFIVs to close.

To ensure that the trip of the nonsafety-related MFW and condensate pumps remains highly reliable, the licensee states that procedures will be revised and developed to periodically test the trip function of the MFW and condensate pumps on receipt of an MSIS. In addition, the licensee states that the MFW and condensate pump breakers will be included in the SL1 maintenance rule monitoring program to ensure the continued reliability of the breakers.

NUREG-0800, Revision 2, "Standard Review Plan," allows crediting the use of a nonsafety-grade system as a backup to mitigate the effects of the failure of an active safety-related component. Section 6.2.1.4, "Mass and Energy Release Analysis for Postulated Secondary System Pipe Ruptures," states that:

> A single active failure in the steam or feedwater line isolation provisions or feedwater pumps, such that the containment peak pressure and temperature are maximized, should be assumed to occur in steam and feedwater line break analyses. For the assumed failure of a safety grade steam or feedwater isolation

> valve, operation of nonsafety grade equipment may be relied upon as a backup to the safety grade equipment.

Section 15.1.5 "Steam System Piping Failures Inside and Outside of Containment (PWR)," states that:

> For postulated instantaneous pipe failures in seismically qualified portions of the main steam line (inside containment and upstream of the MSIVs), only safety grade equipment should be assumed operative. If, in addition, a single malfunction or failure of an active component is postulated, credit may be taken for use of a backup nonsafety grade component to mitigate the consequences of the break.

Thus, the use of nonsafety-grade equipment as a backup for mitigation of a steam line break inside containment is permitted. The staff finds the licensee's proposed use of this nonsafety-grade equipment to be acceptable since it is only used as a backup, the licensee is taking steps to ensure its reliability, and the proposals made by the licensee are consistent with those used at other nuclear power plants for the same purpose.

3.4 Summary

The staff has evaluated the licensee's submittal and concluded the following:

The changes to the SL1 licensing basis to revise the MSLB inside containment analysis to correct nonconservative assumptions in the original analysis are acceptable.

This amendment changes the licensing bases for the MSLB analysis to credit a trip of the nonsafety-grade MFW and condensate pumps as a backup method to terminate feedwater addition should an MFIV fail to close. This differs from the current licensing basis analysis that credits the closure of redundant safety-related valves for MFW termination single failure consideration. The change is consistent with the guidance provided in the Standard Review Plan Sections 6.2.1.4 and 15.1, which allows the use of a nonsafety backup in response to a failure of safety-related components for mitigating the effect of the energy release due to ruptured secondary piping inside containment, and is, therefore, acceptable.

The reliability analysis of the proposed design changes indicates that the change in plant risk due to the new design is not significant and is, therefore, acceptable.

The licensee's completed and planned actions to address the capability of the power-operated valves are acceptable.

4.0 STATE CONSULTATION

Based upon a letter dated March 8, 1991, from Mary E. Clark of the State of Florida, Department of Health and Rehabilitative Services, to Deborah A. Miller, Licensing Assistant, NRC, the State of Florida does not desire notification of issuance of license amendments.

5.0 ENVIRONMENTAL CONSIDERATION

This amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazard consideration and there has been no public comment on such finding (66 FR 9383). Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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Date: April 20, 2001