Florida Power & Light Company, 9760 S.W. 344 St. Homestead, FL 33035

OCT 14 2011

L-2011-444
10 CFR 50.90

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555-0001

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Response to NRC Reactor Systems Branch Request for Additional Information
Regarding Extended Power Uprate License Amendment Request No. 205

References:

(1) M. Kiley (FPL) to U.S. Nuclear Regulatory Commission (L-2010-113), "License Amendment Request for Extended Power Uprate (LAR 205)," Accession No. ML103560169, October 21, 2010.

(2) Email from J. Paige (NRC) to S. Hale (FPL), "Turkey Point EPU - Reactor Systems (SRXB) Requests for Additional Information - Round 1.3 (Part 3)," Accession No. ML11202A174, July 21, 2011.

(3) M. Kiley (FPL) to U.S. Nuclear Regulatory Commission (L-2011-233), "Response to NRC Request for Additional Information Regarding Extended Power Uprate License Amendment Request No. 205 and Reactor Systems Issues," Accession No. ML11221A227, August 5, 2011.

(4) Email from J. Paige (NRC) to S. Hale (FPL), "Turkey Point EPU - Reactor Systems (SRXB) Requests for Additional Information - Round 2.3 (Part 3)," Accession No. ML11263A204, September 20, 2011.

(5) M. Kiley (FPL) to U.S. Nuclear Regulatory Commission (L-2011-400), "Response to NRC Reactor Systems Branch (SRXB) Request for Additional Information Regarding Extended Power Uprate License Amendment Request No. 205," Accession No. ML11276A080, September 30, 2011.

(6) Email from J. Paige (NRC) to S. Hale (FPL), "Turkey Point EPU - Reactor Systems (SRXB) Requests for Additional Information - Round 3.3 (Part 3)," October 13, 2011.

By letter L-2010-113 dated October 21, 2010 [Reference 1], Florida Power and Light Company (FPL) requested to amend Renewed Facility Operating Licenses DPR-31 and DPR-41 and revise the Turkey Point Units 3 and 4 Technical Specifications (TS). The proposed amendment will increase each unit's licensed core power level from 2300 megawatts thermal (MWt) to 2644 MWt and revise the Renewed Facility Operating Licenses and TS to support operation at this increased core thermal power level. This represents an approximate increase of 15% and is therefore considered an extended power uprate (EPU).

By email dated July 21, 2011 [Reference 2], the Nuclear Regulatory Commission (NRC) Project Manager (PM) issued a Request for Additional Information (RAI) from the NRC Reactor Systems Branch (SRXB). The RAI consisted of thirty-nine questions pertaining to loss-of-coolant accident (LOCA) and non-LOCA analyses. On August 5, 2011, FPL provided its response to RAI questions SRXB-1.3.1-1.3.6 and SRXB-1.3.16-1.3.39 via FPL letter L-2011-233 [Reference 3].

By email from the NRC PM dated September 20, 2011 [Reference 4], FPL received two follow-up RAI questions requesting PTN to demonstrate acceptable plant response for two events that had not been previously analyzed. Inadvertent Opening of a Power-Operated Relief Valve (PORV)

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and Feedwater Line Break events. On September 30, 2011, FPL provided the analysis results for Inadvertent Opening of a PORV (RAI question SRXB-2.3.1, a follow-up to SRXB-1.3.29) via FPL letter L-2011-0400 [Reference 5].

After review of the information provided in Reference 5, the SRXB staff expressed a concern regarding the potential for pressurizer overfill resulting from an Inadvertent Opening of a PORV and requested additional information via email on October 13, 2011 [Reference 6]. The response to this RAI is provided in the Attachment to this letter.

This submittal does not alter the significant hazards consideration or environmental assessment previously submitted by FPL letter L-2010-113 [Reference 1].

This submittal contains no new commitments and no revisions to existing commitments.

In accordance with 10 CFR 50.91(b)(1), a copy of this letter is being forwarded to the State Designee of Florida.

Should you have any questions regarding this submittal, please contact Mr. Robert J. Tomonto, Licensing Manager, at (305) 246-7327.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on October 14, 2011.

Very truly yours,

Michael Kiley
Site Vice President
Turkey Point Nuclear Plant

Attachment

cc: USNRC Regional Administrator, Region II
USNRC Project Manager, Turkey Point Nuclear Plant
USNRC Resident Inspector, Turkey Point Nuclear Plant
Mr. W. A. Passetti, Florida Department of Health

Turkey Point Units 3 and 4

RESPONSE TO NRC REACTOR SYSTEMS BRANCH REQUEST FOR ADDITIONAL INFORMATION REGARDING EXTENDED POWER UPRATE LICENSE AMENDMENT REQUEST NO. 205

**ATTACHMENT**

Response to Request for Additional Information

The following information is provided by Florida Power and Light Company (FPL) in response to the U. S. Nuclear Regulatory Commission's (NRC) Request for Additional Information (RAI). This information was requested to support License Amendment Request (LAR) 205, Extended Power Uprate (EPU), for Turkey Point Nuclear Plant (PTN) Units 3 and 4 that was submitted to the NRC by FPL via letter (L-2010-113) dated October 21, 2010 [Reference 1].

By email dated July 21, 2011 [Reference 2], the Nuclear Regulatory Commission (NRC) Project Manager (PM) issued a Request for Additional Information (RAI) from the NRC Reactor Systems Branch (SRXB). The RAI consisted of thirty-nine questions pertaining to loss-of-coolant accident (LOCA) and non-LOCA analyses. On August 5, 2011, FPL provided its response to RAI questions SRXB-1.3.1-1.3.6 and SRXB-1.3.16-1.3.39 via FPL letter L-2011-233 [Reference 3].

By email from the NRC PM dated September 20, 2011 [Reference 4], FPL received two follow-up RAI questions requiring additional analyses to be performed for two events that had not been previously analyzed for Turkey Point: Inadvertent Opening of a Power-Operated Relief Valve (PORV) and Feedwater Line Break events. On September 30, 2011, FPL provided the analysis results for Inadvertent Opening of a PORV (RAI question SRXB-2.3.1, a follow-up to SRXB-1.3.29) via FPL letter L-2011-0400 [Reference 5].

After review of the information provided in Reference 5, the SRXB staff expressed a concern regarding the potential for pressurizer overfill resulting from an Inadvertent Opening of a PORV and requested additional information via email on October 11, 2011 [Reference 6]. The response to this RAI is presented below.

**SRXB-3.3.1** **RAI SRXB-2.3.1 (ADAMS Accession No. ML11263A204) requested validation of the departure from nucleate boiling (DNB)-protective OTΔT trip setpoint by means of a demonstration depressurization safety analysis. By letter dated September 30, 2011 (ADAMS Accession No. ML11276A080), the licensee provided the requested information, which was based on the conservative DNB analysis of an inadvertent safety valve opening. This is conservative because a safety valve has a higher relief capacity than the power operated relief valve (PORV). Figure SRXB-2.3.1-5 plotted the pressurizer level associated with this transient. The plot indicated a very sharp pressurizer insurge that, if extrapolated, would reveal the pressurizer filling rather quickly.**

**The inadvertent PORV opening is an anticipated operational occurrence (AOO), and the information plotted in Figure SRXB-2.3.1-5 brings forth the concern that an inadvertent PORV opening could result in a pressurizer overfill condition. Such a condition could lead to an inability to isolate the PORV, resulting in a condition similar to a small break LOCA. This would not be an acceptable end result for an inadvertent opening of a PORV.**

**For additional information on anticipated transients that could develop into more serious events, refer to Regulatory Issue Summary 2005-29. In the present case, however, the operator action is not to shut off the ECCS, but rather to block the PORV.**

**Supplement the response to SRXB-2.3.1 to demonstrate that the pressurizer does not overfill. To address this concern, the staff recommends supplementing a thermal-hydraulic analysis of the reactor coolant system response to an**

**inadvertent PORV (or, if additional conservatism is sought, a safety valve) opening with maximum safety injection with the following information. Identify the control-grade mitigating systems, structures, or components (SSCs), if any, that would terminate this event, and indicate their actuation signals and time of actuation. Also identify the time of operator notification of the inadvertent PORV opening, and the actual signals that would notify the operator. Finally, discuss what operator actions would terminate this event, and discuss how long the operator would take to perform these actions. The thermal-hydraulic analysis should be of an unmitigated event, and it should run long enough to indicate the time from event initiation to pressurizer overfill.**

The FPL response to RAI SRXB-2.3.1 [Reference 5] provided the analysis of the Inadvertent Opening of a PORV event with respect to DNB for inclusion in the PTN licensing basis for EPU. As is typical for this safety analysis, only the short term phase of the transient (i.e., up to the point of reactor trip and just beyond) was analyzed to demonstrate that the DNB ratio (DNBR) limit would not be violated. The long term effects of the event, including the potential for pressurizer overfill and water relief through the PORV, are not typically analyzed because the transient is mitigated by operator actions (e.g., Off-normal and Emergency Operating Procedures (EOPs)) that were implemented in response to the NUREG-0737 action plan. This NUREG outlined specific actions required by licensees as a result of the Three Mile Island accident.

To demonstrate that the Inadvertent Opening of a PORV event can be terminated before the pressurizer becomes water-solid, a pressurizer overfill analysis has been performed using the RETRAN digital computer code. The code simulates neutron kinetics, reactor coolant system (RCS), pressurizer, pressurizer relief and safety valves, pressurizer spray, steam generator, and steam generator safety valves to compute pertinent plant variables including temperatures, pressures, and power level. Analysis results show that under EPU conditions, sufficient time is available to terminate the event given the Control Room indications and procedural enhancements that were implemented for NUREG-0737.

The standard safety analysis evaluating DNBR for the Inadvertent Opening of a PORV event has been issued [Reference 5] for inclusion in the PTN licensing basis for EPU. However, FPL does not intend to incorporate the pressurizer overfill analysis into the EPU licensing basis since the NUREG-0737 commitments, which remain part of the PTN licensing basis, are shown below to remain adequate, under EPU conditions, for terminating the event before water relief occurs.

The pressurizer overfill analysis was performed at conditions corresponding to the EPU Nuclear Steam Supply System (NSSS) power level of 2652 MWt, with a pressurizer PORV modeled to open at transient initiation. Uncertainties on the initial conditions were modeled in the direction of conservatism that is more limiting for pressurizer filling concerns. Control systems are not modeled in the safety analyses unless their actuation makes the results of the event more adverse. As such, sensitivity analyses were performed with and without automatic rod control and with and without pressurizer heaters. The pressurizer spray was modeled since its operation is worse for overfill concerns. The reactor protection system functioned to

trip the reactor. The reactor was tripped on either the Overtemperature ΔT or Low Pressurizer Pressure. No single active failure would prevent the reactor protection system from providing a reactor trip.

Table SRXB-3.3.1-1 provides a summary of initial conditions and key assumptions modeled in the analysis. Based upon the results of the sensitivity analyses, the minimum time to filling corresponded to low $T_{avg}$ minus uncertainties, maximum Steam Generator Tube Plugging (SGTP), maximum feedwater temperature, no pressurizer heaters, manual rod control, maximum fuel heat transfer coefficients, and maximum reactivity feedback; the maximum low pressurizer pressure SI setpoint was modeled with maximum SI flow.

**Table SRXB-3.3.1-1: Initial Conditions and Key Assumptions**

| Parameter | Value | Bias |
|---|---|---|
| NSSS Power Level | 100.3% | High |
| Total RCS Flow Rate | 260,7000 gpm | Thermal Design Flow (TDF) |
| RCS Average Temperature | 564°F | Low |
| Pressurizer Pressure | 2197 psia | Low |
| Pressurizer Level | 53.4% span (low $T_{avg}$) | High |
| Steam Generator Level | 50% NRS | Nominal |
| SGTP | 10% | Maximum |
| Feedwater Temperature | 440°F | Maximum |
| Fuel Heat Transfer Coefficient | Maximum | --- |
| Reactivity Feedback | Maximum | --- |
| Pressurizer Heaters | Off | --- |
| Pressurizer Spray | On | --- |
| Rod Control System | Manual | --- |
| SI Flow Profile | 4 high-head SI pumps | Maximum |
| Total Auxiliary Feedwater Flow Rate | 373 gpm | Minimum |
| Auxiliary Feedwater Temperature | 100°F | Maximum |
| SI Low Pressurizer Pressure Setpoint | 1875 psia | Maximum |

Based on the results of the representative analysis cases considered, the minimum time to pressurizer filling is approximately 4 minutes. Table SRXB-3.3.1-2 provides the sequence of events for the limiting case (i.e., fastest to fill). The RCS pressure remains low such that the Pressurizer Safety valves (PSVs) are not challenged. Figures SRXB-3.3.1-1 through SRXB-3.3.1-4 provide the transient plots of key parameters. Note that the times presented include 100 seconds of steady state operation prior to the initiation of the transient. This steady state condition has been removed from the figures (i.e., the figures start at 100 seconds).

| Table SRXB-3.3.1-3: Sequence of Events | |
|---|---|
| **Event** | **Time (seconds)** |
| Transient Initiation (PORV spuriously opens) | 100.0 |
| Reactor Trip/SI Initiation (Low Pressurizer Pressure) | 151.1 |
| Turbine Trip | 151.1 |
| Feedwater Isolation | 179.0 |
| Auxiliary Feedwater Initiation | 269.1 |
| Pressurizer Fills | 360.5 |

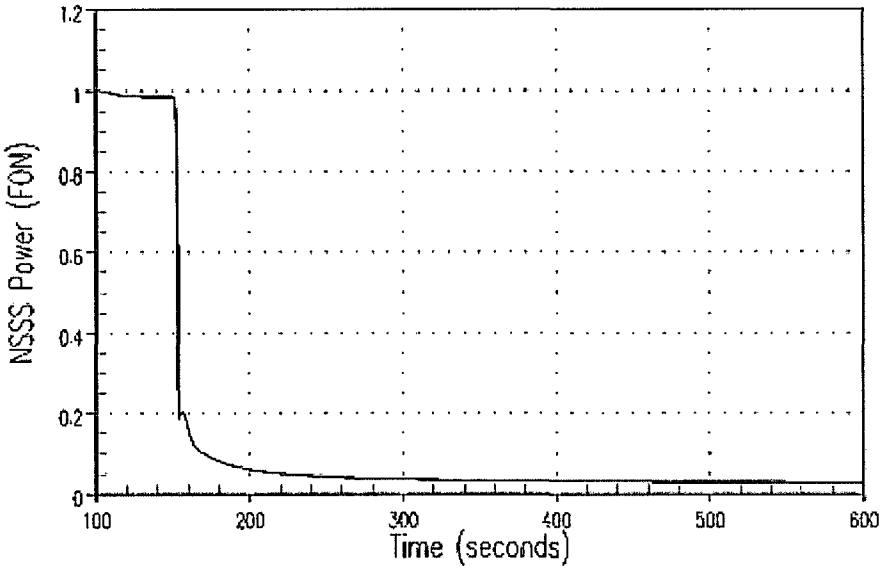


**Figure SRXB-3.3.1-1: NSSS Power vs. Time**

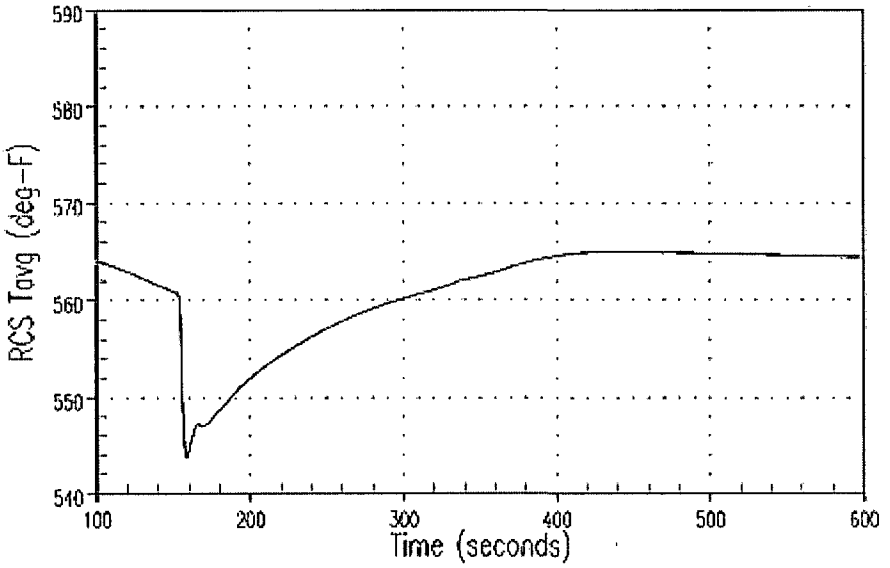


**Figure SRXB-3.3.1-2: RCS Tavg vs. Time**

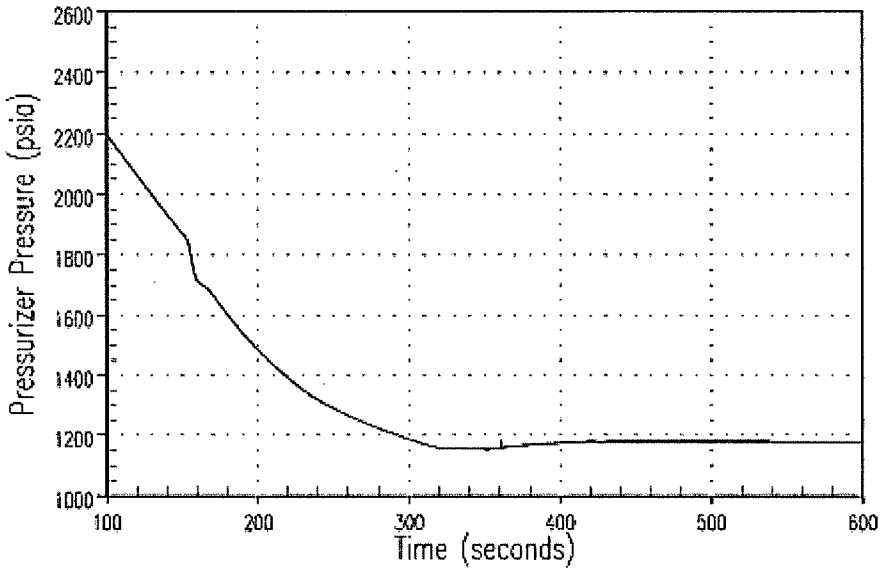


**Figure SRXB-3.3.1-3: Pressurizer Pressure vs. Time**

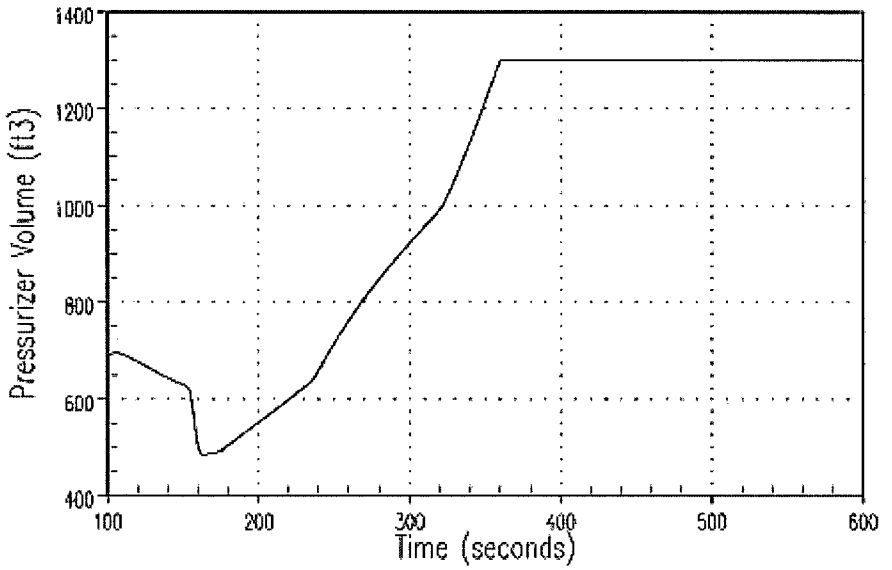


**Figure SRXB-3.3.1-4: Pressurizer Volume vs. Time**

Inadvertent opening of a PORV is not addressed in the current licensing basis for Turkey Point. However, the ability to quickly diagnose and respond to an inadvertent opening of a PORV event at Turkey Point was specifically addressed in response to NUREG 0737 action items including II.D.1, II.D.3, II.G.1, and II.K.3. Actions for Turkey Point included risk significance determinations for stuck open PORV events, hardware modifications for indication and mitigation of the event, PORV and Block Valve testing, and improved operator training. Additionally, actions as a result of GL 89-10 and GL 96-05 verify, through testing, the ability of the PORV block valves to close against the maximum differential pressure for this event.

Anticipated Operational Occurrences (AOOs), as defined in Appendix A to 10 CFR Part 50, are those conditions of normal operation that are expected to occur one or more times during the life of the nuclear power unit (i.e., 40 years). The probability of an inadvertent opening of a PORV at Turkey Point is less than that for an AOO based on current industry performance with this event including Turkey Point (the event has not occurred at either unit at Turkey Point); therefore, Turkey Point's current licensing basis does not include the analysis of an inadvertent opening of a PORV as an AOO transient.

There are no automatic actions that isolate an inadvertent opening of a PORV at Turkey Point. Manual operator action is required in order to prevent pressurizer overfill. Operator response to an inadvertent opening of a PORV event is addressed in an off-normal operating procedure for pressurizer pressure control malfunctions. In the event of an inadvertent opening of a PORV, a number of annuciators and alarms would actuate immediately sending the operator to the off-normal operating procedure. These annuciators and alarms include (among others):

Window 4/1: "PORV/SAFETY VALVE OPEN"

Window 7/2: "PZR PORV HI TEMP"

Window 9/2: "PZR CONTROL HI/LO PRESS"

Each of these annunciators has prompt actions to close the PORV or block valve. Prompt operator actions are actions committed to memory and require SRO concurrence. Additionally, the first and second steps of the off-normal operating procedure direct the operator to close the PORV, as applicable, and if that response is not obtained, to close the applicable block valve. These actions consist simply of operating valve switches, one for each valve, on the main control panels in the Control Room. Based on specific operator training for this event and simulator observations, the operator response to this event is expected to be accomplished well within the four minute time frame to pressurizer overfill discussed above.

Based on the above discussion, pressurizer overfill will not occur as a result of an inadvertent opening of a PORV event.

**References**

1. M. Kiley (FPL) to U.S. Nuclear Regulatory Commission (L-2010-113), "License Amendment Request for Extended Power Uprate (LAR 205)," Accession No. ML103560169, October 21, 2010.
2. Email from J. Paige (NRC) to S. Hale (FPL), "Turkey Point EPU - Reactor Systems (SRXB) Requests for Additional Information - Round 1.3 (Part 3)," Accession No. ML11202A174, July 21, 2011.
3. M. Kiley (FPL) to U.S. Nuclear Regulatory Commission (L-2011-233), "Response to NRC Request for Additional Information Regarding Extended Power Uprate License Amendment Request No. 205 and Reactor Systems Issues," Accession No. ML11221A227, August 5, 2011.
4. Email from J. Paige (NRC) to S. Hale (FPL), "Turkey Point EPU - Reactor Systems (SRXB) Requests for Additional Information - Round 2.3 (Part 3)," Accession No. ML11263A204, September 20, 2011.
5. M. Kiley (FPL) to U.S. Nuclear Regulatory Commission (L-2011-400), "Response to NRC Reactor Systems Branch (SRXB) Request for Additional Information Regarding Extended Power Uprate License Amendment Request No. 205," Accession No. ML11276A080, September 30, 2011.
6. Email from J. Paige (NRC) to S. Hale (FPL), "Turkey Point EPU - Reactor Systems (SRXB) Requests for Additional Information - Round 3.3 (Part 3)," October 13, 2011.