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

FPL

January 18, 2012

L-2011-534
10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Re: St. Lucie Plant Unit 2
Docket No. 50-389
Renewed Facility Operating License No. NPF-16

Response to NRC Reactor System Branch and Nuclear Performance Branch Request for Additional Information Regarding Extended Power Uprate License Amendment Request

References:

(1) R. L. Anderson (FPL) to U.S. Nuclear Regulatory Commission (L-2011-021), "License Amendment Request for Extended Power Uprate," February 25, 2011, Accession No. ML110730116.

(2) Email from T. Orf (NRC) to C. Wasik (FPL), "St. Lucie 2 EPU – draft RAIs Reactor Systems Branch and Nuclear Performance Branch (SRXB and SNPB)," September 6, 2011.

(3) Email from L. Abbott (FPL) to T. Orf (NRC), "Re: St. Lucie 2 EPU – draft RAIs Reactor Systems Branch and Nuclear Performance Branch (SRXB and SNPB) – Question Numbering," September 28, 2011.

By letter L-2011-021 dated February 25, 2011 [Reference 1], Florida Power & Light Company (FPL) requested to amend Renewed Facility Operating License No. NPF-16 and revise the St. Lucie Unit 2 Technical Specifications (TS). The proposed amendment will increase the unit's licensed core thermal power level from 2700 megawatts thermal (MWt) to 3020 MWt and revise the Renewed Facility Operating License and TS to support operation at this increased core thermal power level. This represents an approximate increase of 11.85% and is therefore considered an extended power uprate (EPU).

A001
NRR

In an email dated September 6, 2011 from NRC (T. Orf) to FPL (C. Wasik) [Reference 2], the NRC staff requested additional information regarding FPL's license amendment request (LAR) to implement the EPU. FPL email dated September 28, 2011 from FPL (L. Abbott) to NRC (T. Orf) [Reference3], provided specific numbers (SXRB-01 through SRXB-102) for the questions included in the September 6, 2011 email. The attachment to this letter provides the FPL responses to RAI questions SRXB-32 through SRXB-39 related to Technical Specifications. The remaining responses are being provided in separate submittals.

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

This submittal does not alter the significant hazards consideration or environmental assessment previously submitted by FPL letter L-2011-021 [Reference 1].

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

Should you have any questions regarding this submittal, please contact Mr. Christopher Wasik, St. Lucie Extended Power Uprate LAR Project Manager, at 772-467-7138.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed on 18-January-2012

Very truly yours,

Richard L. Anderson
Site Vice President
St. Lucie Plant

Attachment

cc: Mr. William Passetti, Florida Department of Health

Response to Reactor Systems Branch and Nuclear Performance Branch Request for Additional Information

The following information is provided by Florida Power & Light (FPL) in response to the U.S. Nuclear Regulatory Commission's (NRC) Request for Additional Information (RAI). This information was requested to support the review of Extended Power Uprate (EPU) License Amendment Request (LAR) for St. Lucie Nuclear Plant Unit 2 that was submitted to the NRC by FPL via letter (L-2011-021), February 25, 2011, Accession No. ML110730116.

In an email dated September 6, 2011 from NRC (T. Orf) to FPL (C. Wasik), "St. Lucie 2 EPU – draft RAIs Reactor Systems Branch and Nuclear Performance Branch (SRXB and SNPB)," the NRC staff requested additional information regarding FPL's request to implement the EPU. FPL email dated September 28, 2011 from FPL (L. Abbott) to NRC (T. Orf), "Re: St. Lucie 2 EPU – draft RAIs Reactor Systems Branch and Nuclear Performance Branch (SRXB and SNPB) – Question Numbering," provided specific numbers (SXRB-01 through SRXB-102) for the questions included in the email. The responses to RAI questions SRXB-32 through SRXB-39 are provided below. The remaining responses are being provided in separate submittals.

II. TS Changes in the SRXB Areas (Attachments 1 and 3 to Licensing Report)

SRXB-32 (TS-1)

TS Table 2.2-1, Functional Unit 14 proposes the required setpoint of 35.0% of the narrow range SG level indication for the steam generator level – low trip. Page Attachment 1-7 briefly states that an increase of setpoint of 20.5% to 35% is determined to assure that sufficient operator action time is available to restore feedwater during a total loss of feedwater events.

Discuss the analysis that determines the required setpoint. The information should include a discussion of: (1) the method and computer used for the analysis to show they are acceptable; (2) all the cases analyzed to show that the scope of the analysis is complete; (3) the values of key parameters to show they are adequate; and (4) the result of analysis to show it meets appropriate acceptance criteria. Also, address how uncertainties of the water level are considered in determination of the proposed setpoint. Table 2.8.5.0-4 indicates that the TS trip point of the SG level – low is 20.5%. Clarify the difference of the setpoint of 20.5% and 35% listed in Table 2.8.5.0-4 and the proposed TS Table 2.2-1 for the SG level – low trip signal, respectively.

Response

The EPU LAR proposed Technical Specifications (TS) changes include an increase in the reactor protection system (RPS) steam generator (SG) low level trip to 35.0% narrow range span (NRS) from the current value of 20.5% NRS. The use of the proposed 35.0% NRS TS setpoint arises from beyond design basis considerations associated with increasing the minimum SG heat sink capacity for a total loss of normal feedwater and auxiliary feedwater (AFW) scenario.

An uncertainty analysis confirmed the SG low level uncertainty of 5% span for the normal environment and 14% span for the accident environment, as shown in EPU LAR Attachment 5, Appendix E, over the entire range of indicated water levels for the EPU. Thus, the uncertainties remain unchanged for the proposed setpoint increase.

The proposed setpoint change has the potential to impact the non-loss of coolant accident (Non-LOCA) transient analyses performed in Chapters 10 and 15 of the Updated Final Safety Analysis Report (UFSAR), as discussed below.

The current TS setpoint of 20.5% NRS is listed in EPU LAR Attachment 5, Table 2.8.5.0-4. The Non-LOCA safety analyses that result in a decrease in SG level and thus, may consider a low SG level trip are:

- Feedwater malfunction event (EPU LAR Attachment 5, Section 2.8.5.1.1);
- Pre-trip and post-trip steamline break events (EPU LAR Attachment 5, Section 2.8.5.1.2);
- Loss of normal feedwater event (EPU LAR Attachment 5, Section 2.8.5.2.3);
- Feedline break event (EPU LAR Attachment 5, Section 2.8.5.2.4); and
- Asymmetric steam generator transient event (EPU LAR Attachment 5, Section 2.8.5.2.5).

The analysis value used in the above analyses, and the remainder of the Non-LOCA safety analyses described in EPU LAR Attachment 5, Section 2.8.5 and its corresponding subsections, is set to a significantly more conservative setpoint of 1.0% NRS as shown in the "Analysis Setpoint" column of Table 2.8.5.0-4. As such, none of the events above, or the remaining events in Section 2.8.5, credit a reactor trip on low SG level because the setpoint is set low enough such that another reactor trip will actuate first. Thus, the proposed setpoint change has no effect on the Non-LOCA accident analyses performed for the EPU.

The analyses of AFW system performance at EPU conditions as described in EPU LAR Attachment 5, Section 2.5.4.5 and the response to RAI SRXB-61 being provided in a separate submittal, consider reactor trips on low SG level (set to the minimum allowable values consistent with current TS Table 3.3-4, Item 7.c minus 5% NRS normal environment uncertainty for the loss of main feedwater event and minus 14% NRS harsh environment uncertainty for the feedline break event). These analyses will remain bounding with respect to the proposed increase to 35.0% NRS, as the lower trip setpoint will delay the reactor trip resulting in less SG mass at the time of the trip, thus placing greater strain on the AFW system to provide heat removal during the loss of feedwater and the feedline break scenarios. The proposed setpoint change thus has no adverse impact on the Section 2.5.4.5 related analyses performed for the EPU.

The purpose for the proposed increase in the SG low level setpoint is to improve plant safety beyond the level required by the design basis safety analyses. The increase in the SG low level setpoint has no impact on the uncertainty analysis and does not adversely impact any of the Non-LOCA analyses performed for the EPU.

SRXB-33 (TS-2)

TS 3.1.2.7.a and 3.1.2.7.b proposes for Modes 5 and 6 the required minimum water volume and boron concentration in BAMT, and the minimum borated water volume, boron concentration and temperature range for the refueling water tank (RWT), respectively.

Discuss the analysis used in determination of the above requirements for the BAMT and RWT, and address how uncertainties of the water volume, boron concentration and temperature are considered in determination of the proposed requirements. This RAI is applicable to the required boron concentration proposed in TS LCO 3.1.1.1, LCO 3.1.1.2, LCO 3.9.1, LCO 3.9.11 and LCO 3.10.1.

Response

The evaluation of boration capability to maintain shutdown margin for Mode 5 and Mode 6 cooldown is based on a cooldown scenario that meets the safe shutdown requirements of NRC Branch Technical Position (BTP) 5-4, and consists of two cases based on the borated water source. The first uses only the boric acid makeup (BAM) tank, and the second uses only the refueling water tank (RWT) for makeup due to coolant contraction. This provides defense in depth boration capability after the plant has been placed in Modes 5 and 6.

The starting boron concentration is assumed to be at the most limiting concentration for Mode 5 entry based on the Mode 1 through Mode 4 cooldown analysis results. The only means for boration is makeup for coolant contraction. Letdown was assumed to be isolated for the Mode 5 and Mode 6 analysis. This assumption is conservative because the boration capability is greatly enhanced if letdown is restored and a feed-and-bleed strategy is used.

The BAM tank volume in Technical Specification (TS) 3.1.2.7.a and RWT volume in TS 3.1.2.7.b include margin to account for the unusable tank inventory, the inventory associated with level measurement uncertainty, the inventory associated with auxiliary spray, and the minimum vortex prevention level. The required net positive suction head (NPSH) allowance of the pumps delivering the BAM tank volume (the charging pumps) is acceptable at EPU conditions. In addition, the NPSH allowance for the BAM pumps remains unchanged since the 0% BAM tank level was not changed for EPU. In addition, a 100 ppm boron concentration uncertainty is applied to the nominal concentration of both the BAM tank and RWT.

The direction of conservatism in the temperature for the BAM tank and RWT is based on decreasing the solution density, which decreases the mass of boron delivered to the reactor coolant system (RCS) per unit volume. The RWT and BAM tank temperature is thus based on the maximum tank temperature, applicable to Mode 5 and Mode 6, plus a temperature uncertainty of 4°F. It should also be noted the minimum temperature of the RWT is well above the solubility limit for the required RWT boron concentration of 1900 ppm.

The boron concentration of the RCS is calculated as a function of time. The xenon transient is no longer a major influence at the time of Mode 5 entry, resulting in little change in the required boron concentration to maintain shutdown margin. As the xenon transient is the primary time dependent component of the reactivity, the cooldown rate is not strongly tied to the shutdown reactivity margin for Modes 5 and 6. The pressure reduction rate is limited such that sub-cooled conditions were maintained in the RCS. Limiting results from the analyzed configurations, with boron sourced from either the BAM tank or RWT, ensure the system delivery boron concentration exceeds the anticipated EPU shutdown margin concentration requirements. This requirement is verified for each core reload as part of the cycle specific reload analysis.

The following addresses TS 3.1.2.7.a:

Table SRXB-33-1 below summarizes the BAM tank volume, temperature and boron TS requirements and the boric acid delivery analysis values.

Table SRXB-33-1
Mode 5 and 6 BAMT TS and
Boric Acid Delivery Analysis Values

Parameter	TS Value	Analysis Value
Volume	3550 gal	1432 gal
Concentration	5420 ppm	5320 ppm
Temperature	N/A	104°F

The required BAM tank volume calculated for the Mode 5 and Mode 6 cooldown, that ensured adequate margin between the system boron delivery and the shutdown margin boron requirement under EPU conditions, was well below the volume specified in the current TS 3.1.2.7.a. The current TS required BAM tank volume for Mode 5 and Mode 6 is retained at EPU conditions

The following addresses TS 3.1.2.7.b:

Table SRXB-33-2 below summarizes the RWT volume, boron and temperature TS requirements and the boric acid delivery analysis values.

Table SRXB-33-2
Mode 5 and 6 RWT TS and
Boric Acid Delivery Analysis Values

Parameter	TS Value	Analysis Value
Volume	125000 gal	1443 gal
Concentration	1900 ppm	1800 ppm
Minimum Temperature	40 °F	N/A*
Maximum Temperature	120°F	124°F
* Minimum temperature not used as maximum temperature was limiting for boric acid delivery analysis.		

The required RWT volume calculated for the Mode 5 and Mode 6 cooldown, that ensured adequate margin between the system boron delivery and the shutdown margin boron requirement under EPU conditions, was well below the volume specified in the current TS 3.1.2.7.b. The current TS required RWT volume for Mode 5 and Mode 6 is retained at EPU conditions.

The following addresses LCO 3.1.1.1:

TS LCO 3.1.1.1 provides direction for emergency boration at a boration rate of greater than or equal to 40 gpm in the event that shutdown margin is not maintained as specified in the Core Operating Limits Report (COLR). The proposed change to the boron concentration of the boration source from "greater than or equal to 1720 ppm" to "greater than or equal to 1900 ppm" is a conforming change to the proposed RWT boron concentration change specified in TS LCOs 3.1.2.8.d and 3.5.4. The boron concentration of 1900 ppm is determined to be adequate to maintain the reactor sufficiently subcritical at EPU conditions to preclude inadvertent criticality in the shutdown condition, after accounting for a 100 ppm boron concentration uncertainty.

The following addresses LCO 3.1.1.2:

TS LCO 3.1.1.2 provides direction for emergency boration at a boration rate of greater than or equal to 40 gpm in the event that shutdown margin is not maintained as specified in the COLR. The proposed change to the boron concentration of the boration source from "greater than or equal to 1720 ppm" to "greater than or equal to 1900 ppm" is a conforming change to the proposed RWT boron concentration change specified in TS LCO 3.1.2.7.b. The boron concentration of 1900 ppm is determined to be adequate to maintain the reactor sufficiently subcritical at EPU conditions to preclude inadvertent criticality in the shutdown condition, after accounting for a 100 ppm boron concentration uncertainty.

The following addresses LCO 3.9.1:

TS LCO 3.9.1 provides direction for emergency boration at a boration rate of greater than or equal to 40 gpm in the event the boron concentration is not maintained as specified in the COLR. The proposed change to the boron concentration of the boration source from "greater than or equal to 1720 ppm" to "greater than or equal to 1900 ppm" is a conforming change to the proposed RWT boron concentration change specified in TS LCO 3.1.2.7.b. The boron concentration of 1900 ppm is determined to be adequate to maintain the reactor sufficiently subcritical at EPU conditions to preclude inadvertent criticality in the shutdown condition, after accounting for a 100 ppm boron concentration uncertainty.

The following addresses LCO 3.9.11:

TS LCO 3.9.11 specifies the spent fuel pool (SFP) required water level and boron concentration. The SFP minimum boron concentration is revised to reflect the proposed RWT minimum boron concentration of 1900 ppm, specified for TS LCOs 3.1.2.7.b, 3.1.2.8.d, and 3.5.4, which is consistent with the current TS Bases. This minimum boron concentration assures an additional subcritical margin, after accounting for a 100 ppm boron concentration uncertainty, to the value of K_{eff} calculated in the SFP EPU criticality analysis satisfying the requirements of proposed TS 5.6.1. This increase in boron from 1720 ppm to 1900 ppm also supports the TS bases conclusion that a SFP inadvertent boron dilution event is not a credible event. The minimum water level is unchanged for EPU and is consistent with the assumptions of water level used for the removal of iodine in the EPU fuel handling accident analysis.

The following addresses LCO 3.10.1:

TS LCO 3.10.1 provides direction for emergency boration at a boration rate of greater than or equal to 40 gpm in the event the reactivity requirements of LCO 3.10.1 are not met. The proposed change to the boron concentration of the boration source from "greater than or equal to 1720 ppm" to "greater than or equal to 1900 ppm" is a conforming change to the proposed RWT boron concentration change specified in TS LCOs 3.1.2.8.d and 3.5.4. The boron concentration of 1900 ppm is determined to be adequate to maintain the shutdown margin at EPU conditions within the limits of TS 3.1.1.1.

SRXB-34 (TS-3)

TS Figure 3.1-1 shows for Modes 1 through 4 the required minimum boric acid makeup tank (BAMT) volume as a function of boron concentration in BAMT.

Discuss the analysis that determines the required BAMT volume, and explain how uncertainties of the boron concentration are adequately considered.

Response

The boration capability for Modes 1 through 4 is determined based on a cooldown scenario that meets the safe shutdown requirements of NRC Branch Technical Position (BTP 5-4). The boric acid delivery analysis assumes the plant is operating at 100% power with equilibrium xenon at the time of the reactor trip. Immediately following the reactor trip, the plant is shutdown and held at hot zero power (HZP) for a time period such that the xenon level has returned to equilibrium 100% power xenon level. At this time, offsite power and letdown are assumed to be lost. No operator action is assumed for 30 minutes, during which time the reactor coolant system (RCS) temperature rises. The thermal expansion due to a conservatively assumed temperature increase results in a rise in pressurizer level. Following the 30 minutes without operator action, plant operators initiate plant cooldown with makeup for liquid shrinkage sourced first from the boric acid makeup (BAM) tank and then the refueling water tank (RWT) once the BAM tank is exhausted. This provides boration to the RCS. The maximum boration capability requirement occurs at the end of cycle conditions.

The boric acid delivery analysis assumes the RCS is a closed system at a conservatively low initial boron concentration. The cooldown rate used for Mode 1 through Mode 4 conservatively includes a hold period to prevent reactor vessel upper head voiding. Also, the pressure reduction rate is limited such that sub-cooled conditions are maintained in the RCS.

The analysis yields a limiting boron concentration that can be achieved in the RCS with the BAM tank at the concentrations and volumes specified in Technical Specification (TS) Figure 3.1-1 and RWT at the concentration and volume within the limits specified in TS 3.1.2.8.d. The BAM tank volume in TS Figure 3.1-1 includes margin to account for the unusable tank inventory, the inventory associated with level measurement uncertainty, the inventory associated with auxiliary spray, and the minimum vortex prevention level. The required net positive suction head (NPSH) allowance of the pumps delivering the BAM tank volume (the charging pumps) is acceptable at EPU conditions. In addition, the NPSH allowance for the BAM pumps remains unchanged since the 0% BAM tank level was not changed for EPU. A 100 ppm boron concentration uncertainty is applied to the boron concentration of both the BAM tanks and RWT. The RWT volume requirement is significantly less than that required by TS LCO 3.5.4. For consistency, the larger volume from TS LCO 3.5.4 is also specified for LCO 3.1.2.8.d.

The direction of conservatism in the temperature and pressure for the BAM tank and RWT is based on decreasing the solution density, which decreases the mass of boron delivered to the RCS per unit volume. The RWT and BAM tank temperature is thus based on the maximum tank temperature, applicable to Mode 1 through Mode 4, plus a temperature uncertainty of 4°F. It should also be noted that the minimum temperature of the RWT is above the solubility limit for the maximum boron concentration of 2200 ppm.

Table SRXB-43-1 below summarizes BAM tank volume and boron TS requirements and the boron delivery analysis values. It should be noted three BAM tank configurations, based on minimum volume and boron concentration identified in TS Figure 3.1-1, were analyzed. A limiting composite of these results was used to establish the minimum boric acid delivery capability assured by maintaining the TS requirements.

Table SRXB-34-1
Mode 1 through 4 BAM Tank TS Figure 3.1-1 and
Boric Acid Delivery Analysis Values

BAM Tank Configuration	Volume		Concentration	
	TS Value	Analysis Value	TS Value	Analysis Value
1	8750 gal	7325 gal	5420 ppm	5320 ppm
2	8250 gal	6825 gal	5682 ppm	5582 ppm
3	7550 gal	6125 gal	6119 ppm	6019 ppm

The required BAM tank volumes and concentrations used in the Mode 1 through Mode 4 cooldown boric acid delivery analysis ensured adequate margin between the system boron delivery and the shutdown margin boron requirement at EPU conditions, predicated on a minimum RWT boron concentration of 1900 ppm as specified in TS LCO 3.1.2.8.d. The RCS boron concentrations determined by this analysis is verified for each core reload to meet the shutdown margin requirements, as part of cycle specific reload analysis.

<u>SRXB-35 (TS-4)</u>

TS LCO 3.1.2.8.4.d and TS LCO 3.5.4 propose for Modes 1 through 4 the required minimum water volume, boron concentration and temperature of the borated water in the refueling water tank (RWT).

Discuss the analysis that determines the required water volume, range of the boron concentration and temperature of the borated water in the RWT, and explain how uncertainties of the water volume, boron concentration and temperature are adequately considered. This RAI is also applicable to TS LCOs 3.5.1.b, 3.5.1.c and 3.5.1.d regarding the required range of water volume, boron concentration and nitrogen pressure in the safety injection tanks.

<u>Response</u>

The analysis supporting TS LCO 3.1.2.8.d for the refueling water tank (RWT) volume, boron concentration and temperature is addressed in the response to SRXB-34. The volume requirement determined for TS LCO 3.5.4 bounds that required for TS LCO 3.1.2.8.d and thus, has also been used to establish the volume requirement for TS LCO 3.1.2.8.d.

The limits established in TS LCO 3.5.4 for the RWT volume, boron concentration and temperature are supported by the assumptions used in the accident analysis performed as part of the emergency core cooling system (ECCS) performance analysis described in EPU LAR Attachment 5, Section 2.8.5.6.3.

This LCO ensures:

- The RWT contains sufficient supply of borated water to support ECCS during the injection phase of a loss of coolant accident (LOCA) (peak cladding temperature (PCT) analysis),
- Sufficient water volume is available in the containment to support continued operation of ECCS pumps during the recirculation mode of cooling,

- Long term cooling is maintained (boron precipitation analysis), and
- The reactor remains subcritical following a LOCA (post-LOCA criticality analysis).

The minimum available RWT water volume for the injection phase of a LOCA is obtained from the volume in TS LCO 3.5.4, after accounting for the measurement uncertainty, unusable volume, and vortexing volume requirements. This minimum volume is determined to be sufficient to provide water inventory to the containment for the operation of ECCS pumps during the recirculation mode of cooling.

The maximum RWT boron concentration of 2200 ppm is supported by the boron precipitation analysis. The boron precipitation analysis has conservatively used a boron concentration of 2600 ppm, which accounts for a 100 ppm boron concentration uncertainty and an additional margin of 300 ppm. Using a maximum boron concentration conservatively maximizes the accumulation of boric acid in the core. Minimum RWT temperature (maximum density), after accounting for a 4°F uncertainty, is used in this analysis to maximize the mass inventory of the borated water and hence maximize the boron concentration in the core. It should also be noted that the minimum temperature of the RWT is above the solubility limit for the maximum boron concentration of 2200 ppm.

The minimum RWT boron concentration of 1900 ppm is supported by the post-LOCA criticality analysis. The post-LOCA criticality analysis has used a boron concentration of 1800 ppm, which accounts for a 100 ppm boron concentration uncertainty. Using a minimum boron concentration minimizes the boron concentration in the sump, which is conservative for this analysis. Maximum RWT temperature (minimum density), after accounting for a 4°F uncertainty, is used in this analysis to minimize the mass inventory of the borated water and hence minimize the boron concentration in the containment sump. The sump boron concentration gets diluted during the recirculation phase of cooling due to the increasing boron concentration in the core. A fuel specific analysis was performed to ensure that a limiting core will remain subcritical at the time of switchover to simultaneous hot/cold leg injection using the results of the sump dilution analysis. The core subcriticality is verified every cycle as part of the reload analysis.

The following addresses TS LCOs 3.5.1.b through 3.5.1.d:

The limits on safety injection tank (SIT) volume, boron concentration and nitrogen overpressure ensure that the assumptions used in the LOCA analyses are met. Table SRXB-35-1 summarizes SIT volume, boron concentration and nitrogen overpressure TS requirements and the applicable small break LOCA (SBLOCA) and large break LOCA (LBLOCA) analysis values.

Table SRXB-35-1
Mode 1 through Mode 3 SIT Values

Parameter	TS Value	Analysis Value
Minimum Volume	1420 ft^3	1388 ft^3
Maximum Volume	1556 ft^3	1588 ft^3
Minimum Concentration	1900 ppm	1800 ppm
Maximum Concentration	2200 ppm	2600 ppm
Minimum N_2 Overpressure	500 psig	485 psig
Maximum N_2 Overpressure	650 psig	665 psig

The SIT inventory, boron concentration and nitrogen overpressure are shown to be adequate for both LBLOCA and SBLOCA, which produced acceptable results for EPU using conservative SIT parameters accounting for uncertainties. A 100 ppm boron concentration uncertainty, 15 psig nitrogen overpressure uncertainty, and 32 ft^3 volume uncertainty was applied. The SIT 15 psig nitrogen overpressure uncertainty and 32 ft^3 volume uncertainty conservatively bounds the total loop uncertainty in both cases.

The minimum volume requirement ensures that SITs can provide adequate inventory to reflood the core and downcomer following a LOCA. The maximum volume limit ensures adequate gas pressure is maintained for proper injection and ability to fully discharge.

The minimum and maximum gas pressures ensure that the discharge flow rates are consistent with those assumed in the safety analyses and that excessive amounts of gas will not be injected into the RCS after the SITs empty.

The minimum boron concentration ensures that the reactor will remain subcritical during the early stage of a LBLOCA. The maximum boron concentration limit is established so as to remain within the assumptions used in the boron precipitation analysis.

The SIT volume and nitrogen overpressure TS are unchanged and remain applicable for EPU conditions.

<u>SRXB-36 (TS-5)</u>

TS 3.2.5 is change to delete Table 3.2-2, which contains the limits for DNB-related parameters of (1) cold leg temperature, (2) pressurizer pressure, (3) axial shape index, and (4) RCS flow rate.

The NRC staff determines that deletion of the limits of the first three parameters is acceptable since those limits are currently allowed to be relocated to the COLR. However, the proposed deletion of the limit of RCS flow rate is inconsistent with the NRC staff's position, which states in an NRC letter for T. H. Essig of January 19, 1999 as follows:

> **"... a change in RCS flow is an indication of physical change to the plant which should be reviewed by the NRC staff. Because of this, the staff recommended that if RCS flow rate were to be relocated to the COLR, the minimum limit for RCS total flow based on a staff approved analysis (e. g., maximum tube plugging) should be retained in the TS to assure that a lower flow rate than reviewed by staff would not be used..."**

Although the NRC's position is documented in an SE approving TS changes for Westinghouse plants, it is generic in nature and applicable to PWRs including SL2. The licensee is requested to revise the proposed changes to TS Table 3.2-2 and related TS 3.2.5 and SR 4.2.5 to be consistent with the above NRC position. For example, with the proposed deletion of TS Table 3.2.2, the following sample LCO 3.2.5 is consistent with the NRC position and is acceptable.

> **"TS 3.2.5 RCS DNB parameters for cold leg temperature, pressurizer pressure, and axial shape index shall be within limits specified in COLR Table 3.2.2. The reactor coolant system total flow rate shall be greater than or equal to [the minimum required RCS flow]."**

The flow rate in the bracket is a value based on an NRC-approved analysis (considering a maximum tube plugging level) for SL2 in support of the EPU application.

Response

A revision to the EPU LAR proposed Technical Specifications was submitted by FPL letter L-2011-422, dated October 10, 2011, Accession No. ML11285A047.

SRXB-37 (TS-6)

Proposed footnote "*" in TS Table 2.2-1 states that "For minimum reactor coolant flow with four pumps operating, refer to COLR Table 3.2-2."

To be consistent with the NRC's position discussed in above request for additional information (TS-5), the required minimum reactor coolant flow should be retained in the TS. This note should refer the minimum reactor coolant flow to the appropriate TS that includes the required minimum reactor coolant, instead of "COLR Table 3.2-2."

Response

A revision to the EPU LAR proposed Technical Specifications was submitted by FPL letter L-2011-422, dated October 10, 2011, Accession No. ML11285A047.

SRXB-38 (TS-7)

TS 3.4.2.2 specifies the required lift settings of 2410.3 psig and 2560.3 psig for the pressurizer safety valves (PSV).

Identify the AOOs and accidents that are considered for determination of the upper or lower limit for the PSV lift settings, and discuss the relevant analyses supporting the proposed PSV lift settings. The information should include a discussion of how uncertainties of pressurizer pressure are considered in determining the range of the PSV lift setting, specific transients analyzed, and results of the analysis showing the compliance with adequate acceptable criteria.

Response

The design opening pressure of the pressurizer safety valves (PSVs) is 2500 psia. Current Technical Specification (TS) 3.4.2.2 specifies an operable range of 2435.3 psig (2450 psia) to 2535.3 psig (2550 psia). This corresponds to a +2%/-2% tolerance on the PSVs. The proposed TS 3.4.2.2 specifies an operable range of 2410.3 psig (2425 psia) to 2560.3 psig (2575 psia). This corresponds to a +3%/-3% tolerance on the PSVs. The EPU Non-LOCA safety analyses presented in EPU LAR Section 2.8.5 consider the more conservative +3%/-3% tolerance range outlined in the proposed TS. Table SRXB-38-1 below compares the TS range to that for the pre-EPU (current) UFSAR Chapter 15 safety analyses.

Table SRXB-38-1
Pressurizer Safety Valve Opening Pressure Comparison

	Negative Tolerance (Minimum)	**Positive Tolerance (Maximum)**
Opening Pressure - Analysis Value	2425 psia (2410.3 psig)	2575 psia (2560.3 psig)
Current TS 3.4.2.2	2435.3 psig (2450 psia)	2535.3 psig (2550 psia)
Proposed TS 3.4.2.2	2410.3 psig (2425 psia)	2560.3 psig (2575 psia)

The PSVs are mechanical, spring loaded valves. As such, they have no input from pressurizer pressure instrumentation. The PSVs are set to open at a nominal setpoint of 2500 psia and are assumed to open within the specified tolerance range. Uncertainties in pressurizer pressure covering the pressure instrumentation uncertainties are applied conservatively to the initial pressurizer pressure and to associated reactor trip or safety system actuation setpoints for a specific event. The tolerances discussed above provide the range of opening pressures of the valves. With the PSVs opening pressure within the tolerance band, the EPU safety analyses listed below remain applicable.

For the EPU Non-LOCA analyses presented in EPU LAR Section 2.8.5, the opening characteristics of the PSVs are chosen based on the specific criteria of interest for a given event. If a primary or secondary overpressurization case is constructed, the PSVs are set to the nominal setpoint +3% tolerance, as a higher setpoint will challenge overpressure criteria. If departure from nucleate boiling (DNB) is the specific concern for a given event or case, the nominal setpoint -3% tolerance is used as lower reactor coolant system (RCS) pressures present a greater challenge to DNB. If a given event or case does not result in RCS pressurization, the PSV setpoint of 2500 psia +3% tolerance is used and is acceptable as pressurizer pressure does not approach the minimum opening setpoint of the PSVs. A summary of the EPU Non-LOCA events, their acceptance criteria and results is shown in EPU LAR Attachment 5, Table 2.8.5.0-5. Table 2.8.5.0-5 documents that the Non-LOCA events meet their specific acceptance criteria. Thus, the +3%/-3% analysis value tolerance applied to the PSVs is considered acceptable for those events in which the PSVs actuate to meet the respective acceptance criteria. Table SRXB-38-2 below presents a list of the EPU Non-LOCA safety analyses and their use of PSVs.

Table SRXB-38-2
EPU Non-LOCA Safety Analyses
Pressurizer Safety Valve (PSV) Actuation Summary

Event	PSVs Actuate (Tolerance)
2.8.5.1 Increase in Heat Removal by the Secondary System	
Decrease in feedwater temperature	No
Increase in feedwater flow	No
Excessive increase in main steam flow	NA - Bounded by other events
Inadvertent opening of a steam generator relief or safety valve	NA - Bounded by other events
Pre-trip steam line break	No
Post-trip steam line break	No
2.8.5.2 Decrease in Heat Removal by the Secondary System	
Loss of condenser vacuum	Yes (+3% for pressurization, -3% for DNB
Loss of non-emergency AC to the station auxiliaries	NA - Bounded by other events
Loss of normal feedwater	NA - Bounded by other events
Feedwater system pipe rupture	Yes (+3% for pressurization, -3% for DNB)
Asymmetric steam generator transient	No
2.8.5.3 Decrease in RCS Flow Rate	
Partial / complete loss of forced reactor coolant flow	No
Reactor coolant pump sheared shaft or seized rotor	Yes (+3% for pressurization)
2.8.5.4 Reactivity and Power Distribution Anomalies	
Uncontrolled control element assembly (CEA) bank withdrawal from subcritical	NA – Safety valves not modeled
Uncontrolled CEA bank withdrawal at power	No
CEA misoperation (dropped rod)	No
Startup of an inactive loop at an incorrect temperature	NA – Event precluded by TS
CEA ejection	NA – Safety valves not modeled
2.8.5.5 Increase in Coolant Inventory	
Inadvertent emergency core cooling system (ECCS) operation at power	NA – Precluded by Safety Injection System Design
Chemical and volume control system (CVCS) malfunction	No
2.8.5.6 Decrease in Coolant Inventory	
Inadvertent RCS depressurization	No
Steam generator tube rupture	No

SRXB-39 (TS-8)

TS Table 3.7.2 specifies (1) the required lift settings of 955.3 psig and 1015.3 psig for main steam line safety valves (MSSVs) a through d, and (2) the required lift settings of 994.1 and 1046.1 psig for MSSVs e through h.

Identify the AOOs and accidents that are considered for determination of the upper or lower limit for the MSSV lift settings, and discuss the relevant supporting analysis. The information should include a discussion of how uncertainties of SG pressure are considered in determining the range of the MSSV lift settings, specific transients analyzed, and results of analysis showing the compliance with adequate acceptable criteria.

Response

The nominal opening setpoints of the main steam safety valves (MSSVs) are 1000 psia for the first bank of four valves and 1040 psia for the second bank of four valves on each of the steam lines. The proposed Technical Specifications (TS) Table 3.7-2 lists an opening range of 955.3 psig (970 psia) to 1015.3 psig (1030 psia) for the first bank of MSSVs and 994.1 psig (1008.8 psia) to 1046.1 psig (1060.8 psia) for the second bank of MSSVs. This operating band proposed in the TS corresponds to a +3%/-3% tolerance on the first bank of MSSVs and a +2%/-3% tolerance on the second bank. These tolerances are considered in the EPU safety analyses presented in EPU LAR Attachment 5, Section 2.8.5. For events in which primary or secondary overpressurization is a concern, the maximum opening setpoints (+3% for the first bank and +2% for the second bank) are used. The steam generator tube rupture (SGTR) event considers the minimum tolerances as a lower opening setpoint results in an earlier opening of the MSSVs thus, maximizing steam releases for radiological dose evaluations. If a given event or case does not result in main steam (MS) system pressurization, the MSSV setpoint of 1000 psia +3% tolerance on the first bank and 1040 psia +2% tolerance on the second bank are used and are acceptable as steam generator (SG) pressure does not approach the minimum opening setpoint of the MSSVs.

The MSSVs are mechanical, spring loaded valves. As such, they have no input from SG pressure instrumentation. The MSSVs are set to open at a nominal setpoint of 1000 psia for the first bank of MSSVs and 1040 psia for the second bank and are assumed to open within the specified tolerance range. Uncertainties in SG pressure covering the SG pressure instrumentation uncertainties are applied conservatively to associated reactor trip or safety system actuation setpoints. The tolerances, discussed above, provide the range of opening pressures of the valves. With the MSSVs opening pressure within the tolerance band, the EPU safety analyses listed below remain applicable.

The minimum opening setpoints shown in the proposed TS are consistent with those presented in the current TS. The maximum opening setpoints are increased from +1% to +3% tolerance for the first bank of MSSVs and from +1% to +2% tolerance for the second bank of MSSVs for the EPU. A summary of the EPU Non-LOCA events, with their acceptance criteria and results, is shown in EPU LAR Attachment 5, Table 2.8.5.0-5. Table 2.8.5.0-5 documents that the EPU Non-LOCA events meet their specific acceptance criteria. The SGTR dose analysis meets its respective acceptance criteria as documented in EPU LAR Attachment 5, Section 2.9.2, as modified by FPL letter L-2011-467, R. L. Anderson (FPL) to NRC Document Control Desk, Response to NRC Accident Dose Branch Request for Additional Information Regarding Extended Power Uprate License Amendment Request, November 14, 2011. Thus, the tolerances contained in the proposed TS Table 3.7-2 are acceptable for the EPU.

Table SRXB-39-1 below presents a list of the EPU Non-LOCA safety analyses and their use of the MSSVs.

Table SRXB-39-1
EPU Non-LOCA Safety Analyses
Main Steam Safety Valve (MSSV) Actuation Summary

Event	MSSV Actuate (Tolerance)
2.8.5.1 Increase in Heat Removal by the Secondary System	
Decrease in feedwater temperature	No
Increase in feedwater flow	No
Excessive increase in main steam flow	NA- Bounded by other events
Inadvertent opening of a SG relief or safety valve	NA- Bounded by other events
Pre-trip steam line break	No
Post-trip steam line break	No
2.8.5.2 Decrease in Heat Removal by the Secondary System	
Loss of condenser vacuum	Yes (+3%)
Loss of non-emergency AC to the station auxiliaries	NA- Bounded by other events
Loss of normal feedwater	NA- Bounded by other events
Feedwater system pipe rupture	Yes (+3%)
Asymmetric steam generator transient	Yes (+3%)
2.8.5.3 Decrease in RCS Flow Rate	
Partial / complete loss of forced reactor coolant flow	No
Reactor coolant pump sheared shaft or seized rotor	Yes (+3%)
2.8.5.4 Reactivity and Power Distribution Anomalies	
Uncontrolled control element assembly (CEA) bank withdrawal from subcritical	NA – Safety valves not modeled
Uncontrolled CEA bank withdrawal at power	Yes (+3%)
CEA misoperation (dropped rod)	No
Startup of an inactive loop at an incorrect temperature	NA – Event precluded by TS
CEA ejection	NA – Safety valves not modeled
2.8.5.5 Increase in Coolant Inventory	
Inadvertent emergency core cooling system (ECCS) operation at power	NA – Precluded by Safety Injection System Design
Chemical and volume control system (CVCS) malfunction	No
2.8.5.6 Decrease in Coolant Inventory	
Inadvertent reactor coolant system depressurization	No
Steam generator tube rupture	Yes* (-3%)

<u>Note</u>

* The SGTR event, unlike the others which have MSSV actuation, considers the minimum opening setpoint of nominal -3% tolerance as it maximizes the steam releases during the event.