FPL

March 29, 2016
L-2016-064
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 Request for Additional Information Regarding
License Amendment Request No. 237, Application to Revise
Technical Specification Figure 3.1-2, Boric Acid Tank Minimum Volume

References:

1. Florida Power & Light Company letter L-2015-065, "License Amendment Request No. 237, Application to Revise Technical Specification Figure 3.1-2, Boric Acid Tank Minimum Volume," April 16, 2015.
2. NRC Request for Additional Information regarding Turkey Point Units 3 and 4 LAR 237 (CACs MF6148 and MF6149), August 20, 2015.
3. NRC Request for Additional Information regarding Turkey Point Units 3 and 4 LAR 237 (CACs MF6148 and MF6149), August 21, 2015.
4. Florida Power & Light Company letter L-2015-293, "Response to Request for Additional Information Regarding License Amendment Request No. 237, Application to Revise Technical Specification Figure 3.1-2, Boric Acid Tank Minimum Volume," December 7, 2015.
5. NRC Request for Additional Information regarding Turkey Point Units 3 and 4 LAR 237 (CACs MF6148 and MF6149), March 01, 2016.

In Reference 1, Florida Power & Light Company (FPL) requested an amendment to Renewed Facility Operating Licenses DPR-31 and DPR-41 for Turkey Point Units 3 and 4, respectively. The proposed amendment would revise Technical Specification Figure 3.1-2, "Boric Acid Tank Minimum Volume," to reflect a correction to the instrument uncertainty calculation.

In References 2 and 3, the NRC requested additional information determined to be needed in order to complete their review of the amendment request. The additional information was provided by FPL letter dated December 7, 2015 (Reference 4). In Reference 5, the NRC requested additional information determined to be needed in order to complete their review of the amendment request. The enclosure to this letter contains the requested information.

The additional information provided does not impact the no significant hazards determination and environmental considerations previously submitted to the NRC by Reference 1.

There are no new commitments or changes to existing commitments made in this submittal.

A001
NRR

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

If you have any questions or require additional information, please contact Mr. Mitch Guth, Licensing Manager, at 305-246-6698.

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

Executed on March 29, 2016.

Sincerely,

Thomas Summers
Vice President
Turkey Point Nuclear Plant

Enclosure
Attachments

cc: USNRC Regional Administrator, Region II
USNRC Project Manager, Turkey Point Nuclear Plant
USNRC Senior Resident Inspector, Turkey Point Nuclear Plant
Florida Department of Health

Response to Request for Additional Information Regarding Turkey Point Units 3 and 4 License Amendment Request No. 237: Application to Revise Technical Specifications Figure 3.1-2, Boric Acid Tank Minimum Volume

Enclosure

EICB RAI-4

The December 7, 2015, FPL response to the staff's RAI dated October 15, 2015, was responsive, but the staff's development of a documented safety evaluation necessitates this request for more detailed information from the total loop uncertainty (TLU) calculation. The following TLU calculation information is requested:

a. **Describe the methodology used for the calculation, including whether FPL used Regulatory Guide (RG) 1.105 and ISA 67.04.01. If FPL is using a plant specific methodology, then describe whether the method is based on a combination of the random, the non-random, and the bias errors, and how the methodology meets the intent of RG 1.105.**

FPL Response

The methodology contained in FPL Nuclear Engineering Department Discipline Standard IC-3.17 was used to determine the Total Loop Uncertainty (TLU) of Calculation 25489-000-JLC-BG-00001. Standard IC-3.17 states that although FPL nuclear plants are not committed to Regulatory Guide 1.105, which endorses the use of ISA Standard 67.04, its methodology was written to meet the intent of Regulatory Guide 1.105.

The square root of the sum of the squares (SRSS) method from Standard IC-3.17 was used in Calculation 25489-000-JLC-BG-00001 to calculate the results of each of the required parameters. The equations utilized in Calculation 25489-000-JLC-BG-00001 as well as the required parameters are shown below.

Total Loop Uncertainty (TLU)

$$\pm TLU = \pm\sqrt{PC^2 + PU^2 + DU_1^2 + DU_2^2 + \ldots + DU_n^2} \pm B \qquad (1)$$

Where:

PC = Process Allowance

PU = Primary Element Uncertainties

DU_n = n number of Device Uncertainties

B = Appropriate Biases

Process Allowance (PC)

$$PC = \pm\sqrt{PC_1^2 + PC_2^2 + \ldots + PC_n^2} \qquad (2)$$

Where:

PC_n = n number of Process Considerations

Primary Element Uncertainties (PU)

$$PU = \pm\sqrt{PU_1^2 + PU_2^2 + \ldots + PU_n^2} \qquad (3)$$

Where:

PU_n = n number of Primary Element Uncertainties

Device Uncertainties (DU)

$$\pm DU = \pm\sqrt{A^2 + D^2 + TE^2 + RE^2 + S^2 + HU^2 + RES^2 + ST^2 + SPE^2 + PS^2 + M^2} \pm B \qquad (4)$$

Where:

A = Reference Accuracy

D = Drift

TE = Temperature Effects

RE = Radiation Effects

S = Seismic Effects

HU = Humidity Effects

RES = Readability/Resolution

ST = Setting Tolerance

SPE = Static Pressure Effects

PS = Power Supply Effects

M = Measurement & Test Equipment (M&TE)

All of the terms in Equations (1) to (4) above that are within the square root are considered random and independent to each other. The Bias (B) term is non-random and, therefore added algebraically to the SRSS value.

EICB RAI-4b.

Describe the changes in assumptions since the last revision of the calculation.

FPL Response

The assumptions for Revision 0 of Calculation 25489-000-JLC-BG-00001 have been included as Attachment 1 of this letter. The assumptions for Revision 1 have been included as Attachment 2 of this letter. In general, the changes from Revision 0 to Revision 1 are not significant and only involved providing additional details/clarification to the wording of the assumptions, adding figures to illustrate previous discussions and making slight changes/corrections to calculated values previously provided.

EICB RAI-4c.

Describe the type(s) of errors considered, and how the errors are combined. In particular, describe all the process errors and how they are calculated and combined. Include construction errors, specific gravity errors (item B(PC1) of equation 21 of the calculation discussed during the draft RAI clarification teleconference held on January 28, 2016), and any other errors.

FPL Response

Calculation 25489-000-JLC-BG-00001 considers the errors/uncertainties associated with the level transmitter and the level indicator to calculate the total loop uncertainty.

Level Transmitter

For the level transmitter, the table below itemizes all of the applicable uncertainties. These uncertainties are considered random, independent errors, unless otherwise noted.

Parameter	Value (%CS)	Source/Note
A	N/A	1 & Basis 4.1.11
D	± 0.64	2
TE	± 0.65	3
RE	N/A	Assumption 4.2.5
S	N/A	4
HU	N/A	5
RES	N/A	6
ST	± 0.50	1 & Basis 4.1.11
SPE	N/A	7
PS	± 0.03	Basis 4.1.7
M	± 0.18	8

The notes and calculations for each of the applicable parameters in the table above are provided below. Additionally, Attachment 2 includes the assumptions referenced in the table.

Note:

1. The Reference Accuracy (A) is specified by Rosemount as ± 0.25% of Calibrated Span (CS), which includes the combined effects of Linearity, Hysteresis and Repeatability (Reference 2.13). Accuracy (A) is not included because Setting Tolerance (ST) is included (Basis 4.1.11 & Reference 2.34).

2. Rosemount specifies the drift (D), or stability as ± 0.25% of upper range limit for six months (Reference 2.13), and it is calibrated at a frequency of 48 weeks (Basis 4.1.8). The transmitter drift will be based on a span of 136.8 inch WC (Basis 4.1.6). Hence,

$$D = \pm \frac{150inWC}{136.8inWC} \times \frac{0.25\%}{26wks} \times 48wks \times 1.25 = \pm 0.64\%CS \qquad (5)$$

3. Rosemount has specified the Temperature Effects (TE) as ± (0.75% upper range limit + 0.5% span) per 100°F ambient temperature change (Reference 2.13). Based on a span of 136.8 inch WC (Basis 4.1.6) and the maximum temperature change 49°F (Basis 4.1.3).

$$TE = \pm \frac{(0.75\% \times 150"WC) + (0.5\% \times 136.8"WC)}{136.8"WC} \times \frac{49°F}{100°F} = \pm 0.65\%CS \qquad (6)$$

8. The transmitter calibration will include a measurement with Fluke Model 45 DMM and Ametek, Heise or equivalent pressure gauge (References 2.10 & 2.15). The range of the DMM is 0-30VDC, and 4-20 mA transmitter output is measured across the Hagan I/V module to give a 1-5V signal (References 2.10 & 2.15). Note that the Hagan I/V modules have no effect on the level accuracy even though current passes through it. It is for alarm signals (i.e., Hagan comparators). The accuracy of the DMM for voltage is ± 0.025% of input plus 2 digits (Reference 2.16) and the DMM input is limited to 5V in this application. Converting these values to %CS gives:

$$DMM = \pm 0.025\% \times \frac{5V}{(5-1)V} + 2digits = \pm 0.04\%CS + 2digits \quad (7)$$

where 2 digits are equated to 2 x 1mV (Reference 2.16). Thus, the total accuracy is:

$$DMM = \pm 0.04\%CS + \frac{0.002V \times 100\%}{(5-1)V}CS = \pm 0.09\%CS \quad (8)$$

The test gauge is accurate to ± 0.1% of full scale reading throughout the entire dial range plus Sensitivity (0.01% of full scale) (Reference 2.27). Thus, the reference accuracy of the gauge is:

$$A_{Gauge} = \pm 0.1\% \quad (9)$$

The test gauge has a scale range of 0-200 inch WC (Reference 2.10). Converting it to %CS gives:

$$GAUGE = \pm 0.1\% \times \frac{200''WC}{136.8''WC} = \pm 0.15\%CS \quad (10)$$

Hagan 3110554 I/V Converter is treated as part of the M&TE and per Assumption 4.2.6, the device uncertainty is: $DU_{IV} = \pm 0.01\%CS$ and per (8) and (10) above, M&TE (M) is:

$$M = \pm\sqrt{0.09^2 + 0.15^2 + 0.01^2} = \pm 0.18\%CS \quad (11)$$

According to Equation (4) in Section 3.0, the Device Uncertainty (DU_{LT}) associated with the Rosemount Transmitter is as follows:

$$DU_{LT} = \pm\sqrt{0.64^2 + 0.65^2 + 0.5^2 + 0.03^2 + 0.18^2} = \pm 1.06\%CS \quad (12)$$

Level Indicator

For the level indicator, the table below itemizes all of the applicable uncertainties. These uncertainties are considered random, independent errors, unless otherwise noted.

Parameter	Value (%CS)	Source/Note
A	N/A	Assumption 4.2.8 & Basis 4.1.11
D	N/A	Assumption 4.2.7
TE	N/A	Assumption 4.2.7
RE	N/A	Assumption 4.2.9
S	N/A	1
HU	N/A	2
RES	±1.16	3
ST	±1.50	Basis 4.1.11
SPE	N/A	4
PS	N/A	5
M	N/A	6

The notes and calculations for each of the applicable parameters in the table above are provided below. Additionally, Attachment 2 includes the assumptions referenced in the table.

Note:

1. There is no seismic effect since design bases do not require this equipment following a seismic event.
2. Humidity Effects (HU) are not being considered since Westinghouse VX252 Indicator is located in the control room where the environment is maintained at the personnel comfort level (Reference 2.28).
3. The Westinghouse Indicator has a linear range of 0 - 8620 gallons with 1000 gallon major divisions and minor divisions of 200 gallons (Reference 2.12). The readability/resolution (RES) is half of the division (i.e., 100 gallons) (Reference 2.9).

$$RES = \pm \frac{100gal}{8620gal} \times 100\% = \pm 1.16\%CS \quad (16)$$

According to Equation (4) in Section 3.0, the Device Uncertainty (DU_{Li}) associated with Westinghouse VX252 Instrument uncertainty is as follows:

$$DU_{Li} = \pm\sqrt{1.16^2 + 1.5^2} = \pm 1.90\%CS \quad (17)$$

Process Allowance (PC)

The process allowances associated with the subject calculation are shown below. In addition, the Boric Acid Density (PC_1) shown below is discussed further in the response to NRC EICB RAI-4e.

a) Boric Acid Density (PC_1)

As per Bases 4.1.4 & 4.1.9 above, process density variance due to boric acid solution weight percentage and temperature variation (i.e., SG) is treated as a bias.

b) Tank Construction Tolerance (PC_2)

The PC_2 is established whereas tank construction tolerances are considered to be biased such that the tanks are treated as actually being 0.03% smaller than nominal (and holding less boric acid solution) (Reference 2.17).

$$PC_2 = \pm 0.03\%CS \quad (19)$$

c) Bubbler Construction Tolerance (PC_3)

A standard 0.5" bubbler opening elevation tolerance is included as an algebraically added conservative bias that considers the bubblers to actually be inserted 0.5" further down into the tanks than nominal (causing a greater pressure reading that indicates a higher useable boric acid solution level/volume in the tanks than actual). For a high level alert/alarm that warns of approaching overflow, the conservative bias is that the bubbler opening is 0.5" higher up than shown in Figure 4.1 (Assumption 4.2.16).

$$PC_3 = \pm 0.5\text{"} \times (100\%CS / 132.25\text{"}WC) = \pm 0.38\%CS \qquad (20)$$

EICB RAI-4d.

Provide the calculated error for each loop device (e.g., level transmitter, rack error, and indicator).

FPL Response

The calculated error for the level transmitter and the level indicator has been provided as part of the response for NRC EICB RAI-4c. There are no rack errors associated with Calculation 25489-000-JLC-BG-00001.

EICB RAI-4e.

Provide the TLU calculation (i.e., equations 20 to 26 of the calculation discussed during the draft RAI clarification teleconference held on January 28, 2016). What is the calculated TLU value?

FPL Response

Equation 20 has been provided as part of the response to NRC EICB RAI-4c. Equations 21 through 25 are provided below.

Therefore, BASTs indication TLU_{IND} is as follows:

$$TLU_{IND} = \pm (DU_{LT}^2 + DU_{LI}^2)^{1/2} + B(PC_2) + B(PC_3) - B(PC_1)$$

Per Equations *(12)*, *(17)* & *(20)* above,

$$TLU_{IND} = \pm (1.06^2 + 1.90^2)^{1/2} + B(PC_2) + B(PC_3) - B(PC_1)$$
$$= \pm 2.18\%CS + B(PC_2) + B(PC_3) - B(PC_1) \qquad (21)$$

The three BASTs are piped together to form, in essence, one large tank. In order to determine the required Technical Specification (TS) level, the indicated levels of the BASTs are summed. Therefore, the total indicator uncertainty is as follows:

$$TLU_{IND} = \pm 2.18\%CS + B(PC_2 + PC_3) - B(PC_1) = \pm 2.18\%CS \pm (0.03 + 0.38)\%CS - B(PC_1) \quad (22)$$

This error equates to 3.43 inches of tank level (i.e., 2.59% x 132.25"). This level is in the cylindrical portion of the tank, therefore, converting to gallons (Reference 2.18).

$$3 \times [\pi \times (6ft)^2 \times (3.43''/ 12'' \text{ per ft}) \times 7.48052 \text{ gal} / ft^3] = 725.5 \text{ gallons} \quad (23)$$

Thus,

$$TLU_{IND} = \pm 725.5 gallons - B(PC1) \qquad (24)$$

The BASTs transmitters are presently calibrated to a specific gravity of 1.030 (Reference 2.12). However, the process specific gravity may vary between 1.024 and 1.042 in support of EPU (Basis 4.1.4). As a result, the level transmitter is to be compensated for a specific gravity of 1.033 for EPU requirements. Applying the most limiting specific gravity (1.042) to the largest BASTs minimum volume of 20,500 gallons (Reference 2.1):

$$B(PC_1) = 20{,}500 \times ((1/1.042) - (1/1.033)) = -172 gallons \qquad (25)$$

The calculated TLU per Equation 26 is provided below.

Per *(24)* & *(25)*, this equates to a negative uncertainty of 725.5 + 172 = 897.5 gallons. Note the positive uncertainty is not considered here since it won't affect the minimum inventory requirements of BASTs (i.e., minimum level).

$$TLU_{IND} = -897.5 gallons \text{ or } -900 \text{ gallons to be conservative} \qquad (26)$$

EICB RAI-4f.

Provide an explanation of how the boric acid solution specific gravity is accounted for in the required and the available levels.

FPL Response

An excerpt from the subject calculation, which provides an explanation of the specific gravity range for the BASTs is shown below.

4.1.4 Assuming that the combination of pure boric acid with pure water only gives additional mass to, fully dissolves into and does not change the volume of liquid, the specific gravity (SG) of borated water in the BASTs at 55°F and 104°F with concentrations of 3.0 wt%, 3.5 wt% and 4.0 wt% boric acid is as follows (Reference 2.12, Attachment 1):

Water Temp. (°F)	Water Density (lbm/ft^3)	SG @3.0 wt%	SG @3.5 wt%	SG @4.0 wt%
55	62.3905	1.031	1.037	1.042*(1)
104	61.9424	1.024 (3)	1.029	1.035*(2)

*SG (1) & (2) based on pure water at 60°F and 1 atmosphere (Reference 2.32):

$$(1)\ \frac{100lbm}{96lbm} \times \frac{62.3905lbm/ft^3 @55°F}{62.371lbm/ft^3 @60°F} = 1.042$$

$$(2)\ \frac{100lbm}{96lbm} \times \frac{61.9424lbm/ft^3 @104°F}{62.371lbm/ft^3 @60°F} = 1.035$$

From the table above, the specific gravity midpoint between (1) and (3) is <u>1.033</u>, which is the value used (Basis 4.1.6) for setting the transmitter range. It should be noted this value is conservatively used rather than the smaller values of Reference 2.1, which uses an extrapolated curve fitting equation derived from empirical data (e.g., for 4.00 wt% at 120°F, the reference method SG is 1.004, whereas the SG using the method above is 1.031).

The specific gravity (concentration) of each BAST can be different, as discussed in the response to NRC EICB RAI-4g below. The tank concentrations are averaged (by Operations) and all three tanks are treated as one volume at a single concentration.

EICB RAI-4g.

Describe what measures are taken to assure consistency of specific gravity between the three Boric Acid Storage Tanks (BASTs).

FPL Response

Chemistry personnel sample the BASTs for boron concentration weekly, as required by plant procedures. The Boric Acid Batch Tank is sampled and results are confirmed as satisfactory prior to the transfer of boric acid solution to the BASTs.

The required BAST boron concentration limits are defined in Technical Specification (TS) 3.1.2.5 (Modes 1-4), TS 3.1.2.4 (Modes 5-6) and plant procedures. BAST boric acid concentration is administratively controlled between 3.25 wt% (5682 ppm) and 4.0 wt% (6993).

Control Parameter	TS	Mode	TS Limit	Administrative Limit
Boron, ppm	3.1.2.5	1, 2, 3, 4	≥5245 to ≤6993	≥5682 to ≤6993
	3.1.2.4	5, 6	≥5245 to ≤6993	≥5682 to ≤6993

Analytical results falling outside of the specified limits are confirmed by grab sample and associated on-line monitor. Corrective actions are taken in accordance with plant procedures for restoring water quality to within the specified limits, as required.

Historically, boron concentration differences between BASTs have been observed, although the values have always been within the TS and administrative limits. Operations personnel average the boron concentration results of the three (A/B/C) BASTs and document the results in the Operations log. Additionally, plant procedures require verification that BAST level, boron concentration and temperature parameters are satisfactory.

EICB RAI-5

Because all three BASTs are interconnected creating a common tank, the staff requests information regarding the relative elevations of the BASTs.

a. Are the tanks at the same elevation?

FPL Response

All three BASTs are at the same elevation.

EICB RAI-5b.

Is the tank interconnection at a level that does not affect the accuracy of the level measurement system?

FPL Response

The BASTs are interconnected with 3 inch pipes at the bottom of each tank. The vortex height of each tank is 16 inches. The bubbler tube outlet for the level instrumentation is 4 inches below the top of the vortex level. Therefore, the useable range has been established from 4 inches above the outlet of the bubble tube to the top of the tank. As such, the BASTs interconnection does not affect the accuracy of the level measurement system. An excerpt from Calculation 25489-000-JLC-BG-00001 has been included below to further illustrate the vortex height and the useable range of the BASTs.

4.1.5 The full height of the BASTs is 148.25 inches, and subtracting the vortex height (16 inches) the useable height of the tank is 132.25 inches. The bubbler tube outlet for the level instrumentation is 4 inches below the vortex level (References 2.2, 2.17 & 2.18). Therefore, the useable range is from 4.0 inches above the outlet of the bubble tube to 136.25 inches above the outlet of the bubble tube (i.e., 4"-136.25").

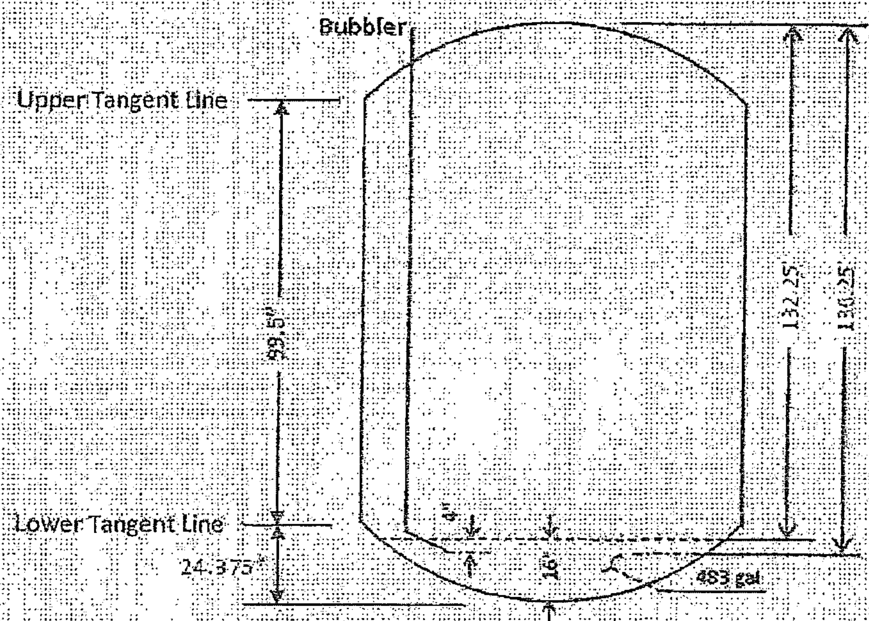

Figure 4.1: Elevation view of typical boric acid storage tank (not to scale—Reference 2.18)