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L-2010-205
10 CFR 50.54(f)

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
11555 Rockville Pike
Rockville, Maryland 20852

RE: Florida Power & Light Company
Turkey Point Unit 4
Docket Nos. 50-251

Subject: Turkey Point Unit 4 Responses to the NRC's Request for Additional Information (RAI) Dated February 18, 2010 Regarding Generic Letter (GL) 2004-02, "Potential Impact Of Debris Blockage On Emergency Recirculation During Design Basis Accidents At Pressurized-Water Reactors" (TAC NO. 4726)

References:

(1) Letter L-2008-160 from W. Jefferson, Jr., (FPL) to U. S. Nuclear Regulatory Commission "Updated Supplemental Response to NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors," dated August 11, 2008 (ML082380244).

(2) NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors," dated September 13, 2004 (ML042360586).

(3) Letter from B. L. Mozafari (U. S. Nuclear Regulatory Commission) to J. A. Stall (FPL), "Turkey Point Nuclear Plant, Unit 4 –Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors," Request for Additional Information (TAC NO. 4726) dated December 19, 2008 (ML083440078).

(4) Letter L-2009-062 from W. Jefferson, Jr., (FPL) to U. S. Nuclear Regulatory Commission, "Response to NRC Request for Additional Information Regarding the Responses to Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors," (TAC NO. 4726), dated March 19, 2009 (ML090930452).

(5) Letter from J. C. Paige (U. S. Nuclear Regulatory Commission) to M. Nazar (FPL), Turkey Point Nuclear Generating Unit No. 4 – Request for Additional Information Regarding GL 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors," TAC NO. MC4726, dated February 18, 2010 (ML100351213).

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By letter dated August 11, 2008 (Reference 1), Florida Power and Light Company (FPL) submitted the final Turkey Point Unit 4 supplemental submittal for Generic Letter (GL) 2004-02 (Reference 2). Plant specific strainer testing and analysis confirmed that the new strainers are of sufficient size to demonstrate acceptable ECCS pump NPSH margin when fully loaded with debris and when evaluated for potential chemical impacts.

In a subsequent letter dated December 19, 2008 (Reference 3), the NRC staff stated that they needed additional information in order to conclude that there is reasonable assurance that GL 2004-02 has been satisfactorily addressed for Turkey Point Unit 4. By letter dated March 19, 2009 (Reference 4), FPL provided responses to the NRC's request for additional information (RAI).

Subsequently, on August 6, 2009 and September 2, 2009, teleconferences were held between FPL and the NRC to discuss the RAI responses for Turkey Point Unit 4. As a result of these teleconferences, the NRC recommended that additional supplemental information be provided to support the Turkey Point Unit 4 RAI responses. The additional supplemental information that was requested by the NRC was provided in draft form in December 2009, and discussed with the NRC staff in a public teleconference on February 3, 2010. By letter dated February 18, 2010 (Reference 5), the NRC staff indicated that additional information was needed in order for the staff to complete its review.

Attachment 1 provides the additional information that was requested by the NRC.

This information is being provided in accordance with 10 CFR 50.54(f).

Please contact Robert J. Tomonto, at (305) 246-7327, if you have any questions regarding this information.

Executed on September 17, 2010.

Sincerely yours,

Michael W. Kiley
Site Vice President
Turkey Point Nuclear Plant

Attachment: (1)

cc: NRC Regional Administrator, Region II
USNRC Project Manager, Turkey Point Nuclear Plant
Senior Resident Inspector, USNRC, Turkey Point Nuclear Plant

ATTACHMENT 1

TURKEY POINT UNIT 4 RESPONSES TO THE NRC'S REQUEST FOR ADDITIONAL INFORMATION (RAI) DATED FEBRUARY 18, 2010 REGARDING GENERIC LETTER (GL) 2004-02, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY RECIRCULATION DURING DESIGN BASIS ACCIDENTS AT PRESSURIZED-WATER REACTORS," (TAC NO. MC4726)

Turkey Point Unit 4 RAI - 1

The licensee indicated that "The method of qualification of the structural adequacy of Debris Interceptors (DIs) for the deadweight, seismic, and hydrodynamic load case is outlined....." Are the deadweight, seismic, and hydrodynamic loads combined to formulate the bounding load combination for the DIs? If this is not the bounding load combination, the licensee should indicate what the bounding load combination is for this structure.

Turkey Point Unit 4 RAI – 1 Response

The Dead Load (dry), Seismic (SSE), and Live Load are combined to formulate the bounding load combination for the DIs and is the bounding load combination for the DI structural members, panels, brackets, bolts, anchors and other components pre-accident. Post-accident, Dead Load, Seismic, and Hydrodynamic loads (Pcr) are combined to formulate the bounding load combination for the DIs.

Turkey Point Unit 4 RAI - 2

The licensee described the hydrodynamic load as the "maximum differential pressure" across the DIs. It does not appear that the hydrodynamic loading effects of sloshing during a seismic event were incorporated into the licensee's structural analysis of the DI structures. The licensee should provide the basis for neglecting the effects of loading from sloshing during a seismic event. Additionally, justification should be provided for why this load would not be included in a bounding load combination.

Turkey Point Unit 4 RAI – 2 Response

The DIs are 33.50 inches tall and will be submerged as the minimum sump water level is 35.652 inches. In addition, the horizontal displacement of the structure at the elevation of the DIs during a SSE event is less than 0.2 inch. Therefore, inertial effects of water including sloshing are insignificant because the amplitude displacement is so small, and are not directly included in the load combinations. However, the maximum differential pressure load across the DIs (hydrodynamic load = Pcr) used in the analysis is conservatively taken as 500 lbs/panel, while the actual calculated load on the DI is 269 lbs/panel. This conservatism adequately envelops any affect of the loading from sloshing during a seismic event.

Turkey Point Unit 4 RAI - 3

The licensee incorporated the use of the momentum function, as it applies to open channel flow, to derive the hydraulic loading on the DIs. Based on the licensee's description of the flow through the DIs in their August 11, 2008, supplemental response, it is difficult to decipher whether a water height gradient exists across the DI boundary. Based on the licensee's use of the momentum function from Henderson's *Open Channel Flow*, the hydraulic load would be a zero value with no height differential. The licensee should provide a range of parameters that would be used to compute this hydraulic load (q, y_1, y_2), using the function outlined.

Turkey Point Unit 4 RAI – 3 Response

There is a slight water height gradient. The maximum hydraulic loads on the DIs were determined by computing the loads from Henderson's Open Channel Flow function using a range of upstream water levels, y_1 = (36.696 inches, 36.700 inches), downstream water levels, y_2 = (35.652 inches, 35.660 inches) and a discharge per unit width of the channel, $q = 0.3523\ ft^3/sec$.

Turkey Point Unit 4 RAI - 4

The licensee should provide a justification for not considering live loads induced by post-LOCA debris, which may impact the DIs.

Turkey Point Unit 4 RAI – 4 Response

The structural analysis of the DIs in service (flooded) assumes that no flow can pass through the debris interceptor's surface, and all flow must pass over the top of the DIs. This is conservative because it simulates complete blockage of the DIs with debris and maximizes the hydrodynamic load on the DIs. The analysis also conservatively uses water at 65 °F with a density of 62.4 lb/ft^3, while the actual temperature in the containment sump is higher than 65 °F during a LOCA. The analysis assumes that the DIs can be accurately modeled using submerged broad-crested weirs where the nominal sump water levels are 36.00 inches with a maximum total flow rate of 7062 gpm. In addition, a conservative hydrodynamic load (Pcr) of 500 lbs per DI panel is applied in the horizontal direction (normal to panel) only. The actual calculated hydraulic load on each DI panel using the maximum flow rate is 269 lbs. With these conservative assumptions, the difference between the horizontal load used in the analysis (500 lbs per DI panel) and the calculated horizontal load (269 lbs per DI panel) adequately accounts for the live load induced by the post LOCA debris which may impact the DIs. Therefore no additional live load for post LOCA debris is considered necessary.

Turkey Point Unit 4 RAI - 5

RAI-11s requested the licensee to provide the results of their structural analysis. No results were provided. The licensee should provide a tabulated data set showing, at a minimum, the maximum and allowable stresses for all of the DIs components structurally analyzed, including structural members, panels, brackets, bolts, anchors, and all other components. Applicable design margins or interaction ratios based on the aforementioned code allowable values should also be included to provide staff with reasonable assurance of the structural integrity of the DIs.

Turkey Point Unit 4 RAI – 5 Response

The structural analysis Summary of Results Tables for the DI calculations are presented below:

SUMMARY OF RESULTS OF THE DEBRIS INTERCEPTOR STRUCTURAL ANALYSIS

FOR THE DEBRIS INTERCEPTOR LOCATED AT THE FUEL TRANSFER CANAL, (AZ 99)

Component		Limiting Stress	Maximum	Allowable	Remark
Horizontal Grate Panel (3,4 and 5) Live Load		Strength Capacity	250 lbs	702 lbs	acceptable
Vertical Grate Panel for Pcr load		Strength Capacity	500 lbs	1287 lbs	acceptable
Bar Grate Horizontal Brace Bracket		Interaction Ratio	0.611	1.0	acceptable
3/8 Machine Bolt		Interaction Ratio	0.60	1.0	acceptable
Built-Up C-Channel		Bending Stress	9698 psi	20160 psi	acceptable
Angle 3x3x1/4		Bending stress	1432 psi	25200 psi	acceptable
3/8 Hilti Kwik Bolt, 1 5/8" embedment		Interaction Ratio	0.85	1.0	acceptable
W5X16		Axial + Bending	0.081	1.0	acceptable
Weld between W5X16 to Base Plate, ¼" Fillet		Interaction Ratio	0.17	1.0	acceptable
2 Bolt Base Plate Post 1-Item 31	5/8" dia, 3 ½" emb.	Interaction Ratio	0.889	1.0	acceptable
	¾" Plate	Bending Stress	10242 psi	25200 psi	acceptable
4Bolt Base Plate Post 2-Item 26	5/8" dia, 2 ¾" emb	Interaction Ratio	0.963	1.0	acceptable
	¾" Plate	Bending Stress	5385 psi	25200 psi	acceptable
4Bolt Base Plate Post 3-Item 17	5/8" dia, 2 ¾" emb	Interaction Ratio	0.621	1.0	acceptable
	¾" Plate	Bending Stress	4522 psi	25200 psi	acceptable
4Bolt Base Plate Post 4-Item 23	5/8" dia, 2 ¾" emb	Interaction Ratio	0.762	1.0	acceptable
	¾" Plate	Bending Stress	5016 psi	25200 psi	acceptable

SUMMARY OF RESULTS OF THE DEBRIS INTERCEPTOR STRUCTURAL ANALYSIS

FOR THE DEBRIS INTERCEPTORS LOCATED AT THE BIO-WALL

Component		Limiting Stress	Maximum	Allowable	Remarks
Hor. Grating Panel (Live Load)		Strength Capacity	250 lb	702 lb	acceptable
Vert. Grating 36" Panel (Pcr + SSE)		Strength Capacity	67.8 psf	468 psf	acceptable
Vert. Grating 54" Panel (Pcr + SSE)		Strength Capacity	47.0 psf	208 psf	acceptable
W5x16		Axial + Bending	3364 psi	20160 psi	acceptable
		Local Flange Stress	9789 psi	25200 psi	acceptable
¼" Fillet Weld between W5x16 and Baseplate	Weld	Shear Stress	8803 psi	27000 psi	acceptable
	Base Metal	Shear Stress	5731 psi	13440 psi	acceptable
Baseplate 1	5/8" ϕ, 2 ¾" embed	Interaction Ratio	0.584	1.0	acceptable
	¾" Plate	Bending Stress	6366 psi	25200 psi	acceptable
Baseplate 2	5/8" ϕ, 2 ¾" embed	Interaction Ratio	0.824	1.0	acceptable
	¾" Plate	Bending Stress	5471psi	31894 psi	acceptable
3/8" ϕ Hilti Kwik 3 Bolt, 1 5/8" embed		Interaction Ratio	0.32	1.0	acceptable
Angle 2x2x1/4		Bending Stress	23183 psi	25515 psi	acceptable
Angle 3x3x1/4		Bending Stress	3026 psi	21262 psi	acceptable
3/8" ϕ Machine Bolt		Interaction Ratio	0.04	1.0	acceptable
Bar Grate Horizontal Brace Bracket		Interaction Ratio	0.54	1.0	acceptable
Door Hinge		Lateral Load	1144 lb	7380 lb	acceptable
		Thrust Load	290 lb	1580 lb	acceptable
½" ϕ Hinge Bolt		Interaction Ratio	0.16	1.0	acceptable