FPL

L-2012-318
10 CFR 50.90

AUG 10 2012

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

Re: Turkey Point Unit 4
Docket No. 50-251
Supplemental Response to NRC Request for Additional Information Regarding Extended Power Uprate Amendment 245 and License Condition 3.K.1 on Spent Fuel Pool Cooling System Supplemental Heat Exchanger Structural Design

References:

(1) J. Paige (NRC) to M. Nazar (FPL), "Turkey Point Units 3 and 4 – "Issuance of Amendments Regarding Extended Power Uprate (TAC Nos. ME4907 and ME4908)," Accession No. ML11293A365, June 15, 2012.

(2) M. Kiley (FPL) to U.S. Nuclear Regulatory Commission (L-2012-143), "Supplemental Response to NRC Request for Additional Information Regarding Extended Power Uprate License Amendment Request No. 205 and Spent Fuel Pool Cooling System Structural Design (Unit 3)," June 19, 2012.

(3) M. Kiley (FPL) to U.S. Nuclear Regulatory Commission (L-2012-179), "Response to NRC Request for Additional Information Regarding Extended Power Uprate and Unit 3 License Condition 3.J.1 on Spent Fuel Pool Cooling System Heat Exchanger Design," Accession No. ML12199A010, July 13, 2012.

License conditions 3.J.1 for Unit 3 and 3.K.1 for Unit 4 for Renewed Facility Operating Licenses DPR-31 and DPR-41, respectively, were issued as part of EPU Amendment Nos. 249 and 245 on June 15, 2012 [Reference 1] and state:

> **"Prior to completion of the Cycle 26 [27] refueling outage for Unit 3 [4], the licensee shall provide confirmation to the NRC staff that the design and structural integrity evaluations associated with the modifications related to the spent fuel pool supplemental heat exchangers are complete, and that the results demonstrate compliance with appropriate UFSAR and code requirements. As part of the confirmation, the licensee shall provide a summary of the structural qualification results of the piping, pipe supports, supplemental heat exchanger supports, and the inter-tie connection with the existing heat exchanger for the appropriate load combinations along with the margins."**

The structural design information required to satisfy license condition 3.J.1 for Unit 3 was submitted to the NRC via letters L-2012-143 and L-2012-179 on June 19 and July 13, 2012 [Reference 2 and 3]. For Unit 4, the design and structural integrity evaluations associated with the modifications related to the spent fuel pool supplemental heat exchanger have been completed, and the results demonstrate compliance with appropriate UFSAR and code requirements. In accordance with license condition 3.K.1 of DPR-41, a summary of the structural qualification results of the piping, the pipe supports, major valves, supplemental heat exchanger nozzles and supports, and the inter-tie connection with the existing spent fuel pool cooling heat exchanger for the appropriate load combinations along with the design margins is provided in the Attachment to this letter.

Florida Power & Light Company
9760 SW 344 St., Florida City, FL 33035

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.

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 August 10, 2012.

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
Ms. Cindy Becker, Florida Department of Health

ATTACHMENT

Turkey Point Unit 4

SUPPLEMENTAL RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING EXTENDED POWER UPRATE AMENDMENT 245 AND LICENSE CONDITION 3.K.1 ON SPENT FUEL POOL COOLING SYSTEM SUPPLEMENTAL HEAT EXCHANGER STRUCTURAL DESIGN

Response to Request for Additional Information

The following information is provided by Florida Power & Light Company (FPL) to satisfy Unit 4 license condition 3.K.1 that was made in response to a U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI). This information is required for the implementation of Extended Power Uprate (EPU) Amendment 245 for Turkey Point Nuclear Plant (PTN) Unit 4 that was issued on June 15, 2012 [Reference 1].

License conditions 3.J.1 for Unit 3 and 3.K.1 for Unit 4 for Renewed Facility Operating Licenses DPR-31 and DPR-41, respectively, are part of EPU Amendments 249 and 245 that were issued on June 15, 2012 [Reference 1] and state:

> **"Prior to completion of the Cycle 26 [27] refueling outage for Unit 3 [4], the licensee shall provide confirmation to the NRC staff that the design and structural integrity evaluations associated with the modifications related to the spent fuel pool supplemental heat exchangers are complete, and that the results demonstrate compliance with appropriate UFSAR and code requirements. As part of the confirmation, the licensee shall provide a summary of the structural qualification results of the piping, pipe supports, supplemental heat exchanger supports, and the inter-tie connection with the existing heat exchanger for the appropriate load combinations along with the margins."**

The structural design information required to satisfy license condition 3.J.1 for Unit 3 was submitted to the NRC via letters L-2012-143 and L-2012-179 on June 19 and July 13, 2012 [Reference 2 and 3].

The tables presented on the following pages provide the confirmation required above and summarize the structural qualification results of the piping, the pipe supports, major valves, supplemental heat exchanger nozzles and supports, and the inter-tie connection with the existing spent fuel pool cooling heat exchanger for the appropriate load combinations along with the design margins.

License Condition 3.K.1 Resolution:

Design analyses are complete for Unit 4 and all items comply with applicable UFSAR and code requirements. As part of the analytical efforts for Unit 4, a comprehensive reanalysis, of the applicable portions of the SFP and CCW systems, has been performed. Due to the extent of the piping that is being added, or modified, as a result of the addition (inter-tie) of the supplemental heat exchanger, the entirety of the main process piping, as well as the associated supports, have been fully re-analyzed to verify compliance with appropriate UFSAR and code requirements.

In a number of locations the pipe lines pass through various building walls from areas such as the Spent Fuel Pool to other areas such as the room containing both the existing, and the new supplemental Spent Fuel Pool Cooling Heat exchangers and to locations associated with the connections to the CCW Supply and Return headers. In essentially all situations the wall penetrations containing the subject piping are being grouted. As such, grouted wall penetrations provide certain support, or restraint, of the pipe; and the appropriate effects have been included in the modeling for pipe stress considerations.

The grouted penetrations are considered a structural feature, rather than a support; and no hanger drawing is generated for the penetration. In all cases, the appropriate loading from the piping (at the penetration) has been considered in structural evaluations of the applicable walls to verify that the applicable walls remain in compliance with appropriate UFSAR and code requirements.

Piping

The design analysis qualification evaluations of the piping, applicable to the spent fuel pool supplemental heat exchangers, are complete for PTN Unit 4. These analyses demonstrate that the piping as modified, and reconfigured, to add the new spent fuel pool supplemental heat exchanger, are in compliance with the appropriate UFSAR and code requirements.

With respect to piping codes, the construction code for piping at PTN was ASA B31.1-1955 edition as modified by the UFSAR. The UFSAR addresses load combinations and allowable stresses associated with low probability events not explicitly covered by ASA B31.1-1955 edition.

In practice, the 1973 edition of B31.1 has been used for piping analysis because that edition prescribes, in equation form, the calculation of stresses resulting from occasional loads, such as seismic events or water/steam hammer loading. PTN Design Standards acknowledge that ASA B31.1–1955 edition was the construction code of record for piping, and also provide the basis for using the methodology of B31.1-1973 edition, through Winter 1976 Addenda Code, for piping qualification at PTN. As such, the PTN Design Standards provide the justification/reconciliation for use of the later B31.1-1973 edition through Winter 1976 Addenda.

Note 1: Stress combinations are based on PTN piping requirements. The individual loadings for these stress loading combinations are as follows:

E = Thermal expansion including anchor displacement effects
P = Pressure
G= Gravity
OBE = Operational Basis Earthquake
SSE = Safe Shutdown Earthquake

Note 2: Design margin is defined as the ratio of EPU calculated stress divided by the allowable stress. It should be noted that stress levels resulting in design margins less than or equal to 1.0 are acceptable in accordance with B31.1 piping codes as modified by the UFSAR for low probability events. The allowable stress levels are well within ultimate stress limits.

Note 3: The allowable stress values for the various "stress combination" equations shown are as follows:

Upset: $P + G + OBE \leq 1.2$ Sh, where Sh is the basic material allowable stress
Faulted: $P + G + SSE \leq 1.0$ Sy, where Sy is the yield stress
$E \leq$ Sa, where Sa is the nominal allowable thermal range stress

In some cases, as provided for in, and permitted by, the piping code, {e.g., Section 102.3.2, D of B31.1 – 1973 edition through Winter 1976 Addenda}, an alternative load combination can be used for evaluation when there is an exceedance of Sa using the above equation. The code requires that sustained stresses $(P + G) \leq$ Sh and allows comparison of these stresses combined with thermal range stresses to their combined allowables, i.e., $(P + G + E) \leq$ Sh + Sa.

The following table (Table 1) provides a summary of the governing stress results from the pipe stress analyses for the main process piping of both the Component Cooling Water (CCW) and Spent Fuel Pool Cooling (SFP) lines.

Table 1
Turkey Point Unit 4 Spent Fuel Pool Cooling Pipe Stress Summary

Piping Analysis Description	Stress Combination	EPU Stress (psi)	Allowable Stress (psi)	Design Margin (Note 1)
CCW Piping From Supply Header to Supplemental HX 4E208B (also to 4E208A), **(CCW-11)**	P+G+OBE	4,135	14,400	0.29
	P+G+SSE	10,189	28,560	0.36
	E	6,383	18,000	0.36
	P+G+E	7,564	30,000	0.25
CCW Piping Return Header From Supplemental HX 4E208B (also from 4E208A), **(CCW-12)**	P+G+OBE	10,426	14,400	0.72
	P+G+SSE	18,214	28,440	0.64
	E	21,231	18,000	1.18*
	P+G+E	22,150	30,000	0.74
SFP Cooling System Discharge Piping from SFP Pump 4P212A, 4P212B, and Emergency SFP Pump Discharge to SFP HX 4E208A and 4E208B **(SFP-11)**	P+G+OBE	6,752	18,490	0.37
	P+G+SSE	14,318	24,653	0.58
	E	31,385	27,227	1.15*
	P+G+E	34,341	42,635	0.81
SFP Cooling System Piping from SFP HX 4E208A and 4E208B Outlet Nozzles to Spent Fuel Pool **(SFP-12)**	P+G+OBE	11,062	18,490	0.60
	P+G+SSE	20,975	24,653	0.85
	E	26,608	27,227	0.98
	P+G+E	28,150	42,635	0.66
SFP Cooling System Suction Piping from Spent Fuel Pool to SFP Pump 4P212A, 4P212B, and Emergency SFP Cooling Pump **(SFP-13)**	P+G+OBE	4,874	18,490	0.26
	P+G+SSE	7,714	24,653	0.31
	E	33,301	27,227	1.22*
	P+G+E	34,712	42,635	0.81

Note 1: Design margin is defined as the ratio of EPU stress divided by the allowable stress.

* As permitted by ASME Code, exceedance of thermal expansion range allowable stress is evaluated by a comparison to an allowable limit for sustained stresses (P+G) combined with thermal range stresses.

Piping Supports

The pipe supports for Unit 4 have been designed per AISC rules as modified by the UFSAR for allowable stresses associated with low probability events. The following methodologies were applied to the ensuing analyses:

1. The applicable elastic stress equations and allowable stress limits of AISC Eighth Edition are utilized.
2. The supports are considered subjected to normal, upset and faulted loads.
3. The primary support loads consider deadweight, thermal, and seismic loads and are derived from the applicable pipe stress evaluations for CCW and SFP piping. The support load combinations address the following combinations:
    a. Normal: E + D
    b. Upset: E + D + OBE
    c. Faulted: E + D + SSE

    where:

    E = Thermal
    D = Deadweight
    OBE = Design Earthquake (Operating Basis Earthquake)
    SSE = Maximum Potential Earthquake (Safe Shutdown Earthquake)
4. Supports are compared to corresponding stress limits of AISC, as described below:
    a. Normal: $S_a = 1.0 * S$, where S = allowable stress from AISC
    b. Upset: $S_a = 1.33 * S$
    c. Faulted: $S_a = Y$, where Y = allowable Yield Stress per PTN UFSAR

    Typically, initial qualification efforts consisted of comparing Faulted loadings to Normal allowables without consideration of permissible increases in allowables as indicated above. By meeting the Normal allowables, with Faulted loadings, the underlying evaluations are implicitly addressed and acceptable. Also, the general practice for designing new supports, by FPL standards, is to design the support for a Normal load increased by 25% above the calculated load, or the Upset or the Faulted load increased by 10% above the calculated load. This practice was also often utilized in evaluation of existing supports providing additional conservatism.

The following table (Table 2) provides a summary of results from the applicable pipe support analyses for the main process piping of both the Component Cooling Water (CCW) and Spent Fuel Pool Cooling (SFP) lines.

Table 2
Turkey Point Unit 4 SFP Cooling Piping Supports

Piping System	Stress Problem No.	Pipe Support No.	Support Calc No.	Governing Loading Condition	Margin Factor (Note 1)	Design Margin (Note 2)
Component Cooling Water						
	CCW-00011					
		SR-702	CCW-00107	Faulted	1.12	0.89
		4-ACH-202	CCW-00105	Faulted	1.79	0.56
		4-ACH-203	CCW-00106	Faulted	1.22	0.82
		4-ACH-225	CCW-00100	Faulted	4.73	0.21
		4-ACH-257	CCW-00101	Normal	1.32	0.76
		4-ACH-258	CCW-00102	Faulted	1.17	0.85
		4-ACH-259	CCW-00103	Normal	3.2	0.31
		4-ACH-260	CCW-00104	Faulted	1.2	0.83
	CCW-00012					
		4-ACH-198	CCW-00110	Faulted	1.25	0.80
		4-ACH-199	CCW-00111	Faulted	1.40	0.71
		4-ACH-200	CCW-00112	Faulted	2.82	0.35
		4-ACH-216	CCW-00117	Faulted	1.07	0.93
		4-ACH-217	CCW-00118	Faulted	1.88	0.53
		4-ACH-218	CCW-00119	Faulted	1.19	0.84
		4-ACH-261	CCW-00114	Faulted	1.22	0.82
		4-ACH-263	CCW-00115	Faulted	1.12	0.89
		SR-687	CCW-00121	Faulted	1.16	0.86

Table 2 (continued)
Turkey Point Unit 4 SFP Cooling Piping Supports

Piping System	Stress Problem No.	Pipe Support No.	Support Calc No.	Governing Loading Condition	Margin Factor (Note 1)	Design Margin (Note 2)
Spent Fuel Pool Cooling						
	SFP-00011					
		H-695-01	SFP-00121	Faulted	1.05	0.95
		H-695-02	SFP-00122	Normal	1.18	0.85
		H-695-04	SFP-00124	Faulted	1.66	0.60
		H-695-07	SFP-00127	Faulted	1.13	0.89
		H-695-08	SFP-00151	Normal	1.92	0.52
		H-695-09	SFP-00152	Normal	5.88	0.17
	SFP-00012					
		H-117-01	SFP-00143	Normal	1.15	0.87
		H-117-02	SFP-00144	Faulted	1.90	0.53
		H-117-03	SFP-00145	Faulted	1.27	0.79
		H-117-04	SFP-00146	Faulted	2.09	0.48
		H-117-05	SFP-00147	Normal	2.00	0.50
		H-696-01	SFP-00128	Faulted	1.60	0.63
		H-696-02	SFP-00129	Normal	1.04	0.96
		H-696-03	SFP-00130	Normal	1.77	0.56
		H-696-04	SFP-00131	Normal	2.20	0.45
		H-696-05	SFP-00132	Faulted	1.05	0.95
		H-696-08	SFP-00134	Normal	4.39	0.23
		H-696-09	SFP-00135	Faulted	1.13	0.88
		H-696-10	SFP-00135	Faulted	1.13	0.88
		H-696-11	SFP-00135	Faulted	1.13	0.88
		H-696-12	SFP-00135	Faulted	1.13	0.88
		H-696-13	SFP-00135	Faulted	1.13	0.88
		H-696-14	SFP-00142	Normal	1.59	0.63
		H-696-15	SFP-00135	Faulted	1.13	0.88
	SFP-00013					
		H-119-01	SFP-00120	Faulted	2.03	0.49
		H-119-02	SFP-00119	Faulted	1.03	0.97
		H-694-03	SFP-00112	Normal	1.84	0.54
		H-694-09	SFP-00116	Faulted	1.15	0.87
		H-694-10	SFP-00117	Faulted	1.08	0.93
		H-694-11	SFP-00118	Normal	23.1	0.04

Note 1: Margin factor is defined as the ratio of the Code allowable stress, or allowable load, divided by the EPU calculated stress, or load as applicable.

Note 2: Design margin is defined as the ratio of EPU calculated stress, or load, divided by the allowable stress, or load.

Supplemental SFP Heat Exchanger Support Platform

The Unit 4 supplemental SFP Heat Exchanger is supported by a new steel platform that is being installed inside the existing SFP Heat Exchanger Room. The platform is designed as a Class I structure. The platform will be attached to the existing concrete walls and floor slab of the room using post-installed expansion anchors. As this is a new structure, it is being designed with a later Edition of the AISC and ACI codes. The steel members of the platform have been designed in accordance with the AISC Ninth Edition, Allowable Stress Design (ASD) rules. The applicable concrete items such as walls and the floor slab have been designed and evaluated in accordance with applicable ACI 318-05 rules. Expansion anchors have been designed utilizing the standard methodology and criteria developed and used for Turkey Point.

The following methodologies were applied to the ensuing analyses:

1. The applicable elastic stress equations and allowable stress limits of AISC Ninth Edition utilizing ASD rules are utilized.
2. The Heat Exchanger platform (support structure) is considered subjected to normal and seismic loads.
3. The loading considered deadweight, thermal, applicable support loads, heat exchanger nozzle loads, and seismic loads.

   In accordance with the UFSAR, this Class I structure is designed to satisfy the applicable load cases as follows:

   $\Phi Y = 1.25D + 1.25E$ (for OBE)
   $\Phi Y = 1.0D + 1.0E'$ (for SSE)

   where:

   Y = required yield strength of the material.

   D = dead load of structure and equipment plus any other permanent loads contributing stress, such as soil or hydrostatic loads. In addition, a portion of "live load" is added when such load is expected to be present when the unit is operating. An allowance is also made for future permanent loads.

   E = design earthquake load.

   E' = maximum earthquake load.

   Φ = 0.90 for fabricated structural steel.

   Φ = 0.90 for reinforced concrete in flexure.

   Φ = 0.85 for tension, shear, bond, and anchorage in reinforced concrete.

The following table (Table 3) provides a summary of results from the platform analyses:

Table 3
Turkey Point Unit 4 Supplemental SFP Heat Exchanger Supports

Maximum member interaction = 0.70 (Enveloped OBE & SSE loads)
Maximum connection interaction = 0.86 (Enveloped OBE & SSE loads)
Maximum anchor bolt interaction = 0.91 (Enveloped OBE & SSE loads)

Supplemental SFP HX Nozzles and Valves

The main process lines servicing the new supplemental spent fuel pit heat exchanger (4E208B) for Turkey Point Unit 4 consist of the Spent Fuel Pool (SFP) Cooling System and the Component Cooling Water (CCW) System. Each system has a single inlet and a single outlet connection to the supplemental heat exchanger; therefore a total of four main process connections.

The SFP Cooling System removes the decay heat generated by the radioactive spent nuclear fuel assemblies that are stored in the SFP during normal plant operations and refueling operations. SFP cooling pumps take suction from the SFP, circulate the water through the tube side of the SFP heat exchanger and return the water back to the SFP. The shell side of the heat exchanger is cooled by the CCW System. The CCW System is a closed loop with fluid being continuously circulated through the system by the CCW pumps. The CCW System is the heat sink for safety-related components and for non-safety-related components that are in potentially radioactive systems.

For the SFP inlet line to the new heat exchanger, an isolation valve is being provided in proximity to the heat exchanger, and an isolation valve is being added on the discharge line from pump 4P212A. For the SFP outlet line, only a flow adjustment valve is being provided on the return line to the SFP. For the CCW inlet line, a single isolation valve is being added. For the CCW outlet line, both an isolation valve and a flow adjustment valve are being added.

The attached Tables 4-7 provide the stress results for the heat exchanger nozzle loads and valve accelerations. The results are provided for each applicable piping stress analysis calculation, as each calculation contains both nozzle load tabulations and valve acceleration tabulations.

The nozzle load tabulations are enveloped loads considering combinations of load cases to conservatively bound nozzle loading conditions. As such, the nozzle loads contained within the attached tables are beyond the calculated loadings that would occur under any postulated scenario of simultaneous loading conditions. The loadings presented in the attached tables do include the loadings from the Maximum Hypothetical Earthquake (i.e., SSE equivalent loading). In all cases the calculated nozzle loads are low compared to the allowable nozzle loading derived from the Engineering Specification used for procurement of the supplemental spent fuel pit heat exchanger.

The valve acceleration tabulations are also enveloped loads considering combinations of load cases to conservatively bound nozzle loading conditions. As such, the valve accelerations contained within the attached tables are beyond the calculated loadings that would occur under any postulated loading condition. The loadings presented in the attached tables do include consideration of the effects from the Maximum Hypothetical Earthquake (i.e., SSE equivalent loading). In all cases the calculated valve accelerations are low compared to the allowable valve accelerations (derived as the acceleration levels utilized in the seismic qualification evaluations of the valves). The valve accelerations utilized for the valve evaluations were generally at least 3g's in each horizontal direction and 2 g's in the vertical direction.

Table 4
Piping Analysis: SFP-11

Description: Discharge Piping from SFP Pump 4P212A, 4P212B, & Emergency SFP Pump Discharge to SFP Heat Exchangers 4E208A & 4E208B

NOZZLE LOAD TABULATION – SUPPLEMENTAL SPENT FUEL PIT HEAT EXCHANGER

Equipment Nozzle	Fy (lb) (Axial)	Mx (ft-lb) (Circumferential Moment)	Mz (ft-lb) (Longitudinal Moment)
HEAT EXCHANGER 4E208B SFP INLET NOZZLE	874	3157	1903
Allowable Loads for 10" Nozzle	5395	8850	11506

Y = parallel to Heat Exchanger Nozzle and vertical; X = parallel to Heat Exchanger centerline (in plant East—West direction) and the other axis (Z) by right hand rule.

Valve Acceleration Tabulation

Valve Description	**Valve Tag No.**	**Valve Acceleration (g)**			**Allowable Valve Acceleration (g)**			**Design Margin**		
		X	Y	Z	X	Y	Z	X	Y	Z
SFP Pump 4P212B Discharge Isolation Valve	4-908E	0.232	0.387	0.537	3	2	3	0.08	0.19	0.18
SFP HX 4E208A SFP Inlet Isolation Valve	4-826	0.176	0.176	0.111	3	2	3	0.06	0.09	0.04
SFP HX 4E208B SFP Inlet Isolation Valve	4-919	0.642	0.122	0.214	3	2	3	0.21	0.06	0.07

X = plant East—West direction; Y = Vertical; Z = plant North—South direction
Design margin is defined as the ratio of calculated valve acceleration divided by the allowable valve acceleration.

Table 5
Piping Analysis: SFP-12

Description: Piping from SFP Heat Exchanger 4E208A and 4E208B Outlet Nozzles to Spent Fuel Pool

NOZZLE LOAD TABULATION – SUPPLEMENTAL SPENT FUEL PIT HEAT EXCHANGER

Equipment Nozzle	Fy (lb) (Axial)	Mx (ft-lb) (Circumferential Moment)	Mz (ft-lb) (Longitudinal Moment)
HEAT EXCHANGER 4E208B SFP OUTLET NOZZLE	1372	2227	8381
Allowable Loads for 10" Nozzle	5395	8850	11506

Y = parallel to Heat Exchanger Nozzle and vertical; X = parallel to Heat Exchanger centerline (in plant east—west direction) and the other axis (Z) by right hand rule.

Valve Acceleration Tabulation

Valve Description	**Valve Tag No.**	**Valve Acceleration (g)**			**Allowable Valve Acceleration (g)**			**Design Margin**		
		X	Y	Z	X	Y	Z	X	Y	Z
SFP HX 4E208B SFP Outlet Isolation Valve	4-927A	0.216	0.141	0.161	3	3	3	0.07	0.05	0.05

X = plant East—West direction; Y = Vertical; Z = plant North—South direction
Design margin is defined as the ratio of calculated valve acceleration divided by the allowable valve acceleration.

Table 6
Piping Analysis: CCW-11

Description: CCW Piping from Supply Header to Supplemental Heat Exchanger 4E208B (also to 4E208A)

NOZZLE LOAD TABULATION – SUPPLEMENTAL SPENT FUEL PIT HEAT EXCHANGER

Equipment Nozzle	Fy (lb) (Axial)	Mx (ft-lb) (Circumferential Moment)	Mz (ft-lb) (Longitudinal Moment)
HEAT EXCHANGER 4E208B CCW INLET NOZZLE	938	2353	866
Allowable Loads for 10" Nozzle	5395	8850	11506

Y = parallel to Heat Exchanger Nozzle and vertical; X = parallel to Heat Exchanger centerline (in plant East—West direction) and the other axis (Z) by right hand rule.

Valve Acceleration Tabulation

Valve Description	Valve Tag No.	Valve Acceleration (g)			Allowable Valve Acceleration (g)			Design Margin		
		X	Y	Z	X	Y	Z	X	Y	Z
SFP HX 4E208B CCW Inlet Isolation Valve	4-779	0.148	0.104	0.615	3	2	3	0.05	0.05	0.21

X = plant East—West direction; Y = Vertical; Z = plant North—South direction

Design margin is defined as the ratio of calculated valve acceleration divided by the allowable valve acceleration.

Table 7
Piping Analysis: CCW-12

Description: CCW Piping Return Header from Supplemental Heat Exchanger 4E208B (also from 4E208A)

NOZZLE LOAD TABULATION – SUPPLEMENTAL SPENT FUEL PIT HEAT EXCHANGER

Equipment Nozzle	Fy (lb) (Axial)	Mx (ft-lb) (Circumferential Moment)	Mz (ft-lb) (Longitudinal Moment)
HEAT EXCHANGER 4E208B CCW OUTLET NOZZLE	964	1966	2257
Allowable Loads for 10" Nozzle	5395	8850	11506

Y = parallel to Heat Exchanger Nozzle and vertical; X = parallel to Heat Exchanger centerline (in plant East—West direction) and the other axis (Z) by right hand rule.

Valve Acceleration Tabulation

Valve Description	**Valve Tag No.**	**Valve Acceleration (g)**			**Allowable Valve Acceleration (g)**			**Design Margin**		
		X	Y	Z	X	Y	Z	X	Y	Z
SFP HX 4E208B CCW Outlet Throttle Valve	4-775B	0.186	0.098	0.354	3	3	3	0.06	0.03	0.12
SFP HX 4E208B CCW Outlet Isolation Valve	4-776B	0.145	0.102	0.347	3	2	3	0.05	0.05	0.12

X = plant East—West direction; Y = Vertical; Z = plant North—South direction

Design margin is defined as the ratio of calculated valve acceleration divided by the allowable valve acceleration.

Conclusion

In accordance with the requirements of license condition 3.K.1 for Unit 4, FPL has provided assurance that the design and structural integrity evaluations associated with the modifications related to the spent fuel pool supplemental heat exchangers are complete and that the results demonstrate compliance with the appropriate UFSAR and code requirements. A summary of the structural qualification results of the piping, the pipe supports, major valves, and supplemental heat exchanger nozzles and supports for appropriate load combinations along with the associated design margins has also been provided. Due to the extent of the piping that is being added or modified as a result of the addition (inter-tie) of the supplemental heat exchanger, the entire main process piping and associated supports has been re-analyzed to assure compliance with the appropriate UFSAR and code requirements.

References

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