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FACIL:50-389 St. Lucie Plant, Unit 2, Florida Power & Light Co. 05000389

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SUBJECT: Forwards addl info requested re confirmatory piping analysis open items.

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	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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	LPDR 03	1	1	NRC PDR 02	1	1
	NSIC 05	1	1	NTIS	1	1

[illegible]

BOX [illegible]00, JUNO BEACH, FL 33408

FLORIDA POWER & LIGHT COMPANY

October 29, 1982
L-82-480

Office of Nuclear Reactor Regulations
Attention: Mr. Darrell G. Eisenhut, Director
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Eisenhut:

Re: St. Lucie Unit No. 2
Docket No. 50-389
Confirmatory Piping Analysis

Attached please find the additional information your staff requested to provide confirmation of the piping analysis open items.

If you have any questions regarding this submittal, please contact us accordingly.

Very truly yours,

Robert E. Uhrig

Robert E. Uhrig
Vice President
Advanced Systems and Technology

REU/RJS/JES/jea

Attachment

cc: J. P. O'Reilly, Region II
Harold R. Reis, Esquire

8001

ATTACHMENT

Confirmatory Piping Analysis Open Items

An investigation was performed for all Safety Class 2 & 3 Systems (irrespective of operating temperature) to demonstrate that the number of equivalent thermal cycles, as defined in ASME subsection NC 3611.2, was sufficiently low to confirm the conservatism of the existing stress analyses.

In accordance with the agreement reached at a meeting with the NRC and Florida Power & Light Company on October 14, 1982 an acceptance criteria of 1000 "Realistic" cycles was employed. In conducting this analysis, the following Safety Class 2 and 3 systems were reviewed:

Reactor Coolant	Component Cooling Water
Charging	Letdown
Safety Injection	Auxiliary Feedwater
Main Steam	Containment Spray
Main Feedwater	Intake Cooling Water

A sample calculation specifying methodology and a summary of results is provided on Table I.

Using realistic values of cycle frequencies, all systems were shown to exhibit approximately 700 equivalent cycles. Using all the thermal transients that appear in the Safety Class 1 specification (Refer to Tables II and III), which are conservative both in frequency and temperature variation, all systems were shown to have less than 1000 equivalent thermal cycles. Therefore, the above results confirm the conservatism of the existing stress analyses for Class 2 & 3 systems employing weldolets.

TABLE I

SAMPLE CALCULATION

Thermal Transient	Charging ΔTE	ΔTI	NI	N
5% Ramp Up	455	70	15000	2
5% Ramp Down	455	208	15000	299
10% Step Up	455	47	2000	0
10% Step Down	455	145	2000	7
Loss of RCP Flow	455	204	40	1
Reactor Trip	455	187	400	5
Loss of Load	455	204	40	1
Loss of Sec ss	455	330	5	1
Normal Var.	455	6	10^6	1
Hydro	455	335	10	2
Leak Test	455	335	200	43
Loss of Chrgr	455	335	20	6
Loss of Letdown	455	400	50	26
Regen H-X Iso	455	349	120	32
Max Purification	455	128	9000	16
Max Dilution	455	126	8000	14
Low VCT	455	45	2000	0
Norm Start	455	455	500	500
Aux FW Inj	–	–	–	–
Totals				955

1. Charging T max = 520°F
2. Ambient Temp (Tamb) 65°F
3. ΔTE = T max − Tamb = 455°F
4. Number of cycles = NI
5. Temp change of transient = ΔTI
6. Equiv # of cycles at ΔTI

$$N = NI\,(\Delta TI/\Delta TE)^5$$

TABLE 3.9-2

TRANSIENTS USED IN DESIGN AND FATIGUE ANALYSIS 5

1. Normal Conditions

(a) 500 heatup and cooldown cycles during the design life of the components with heating and cooling at a rate of 100 F/hr between 70 F and 532 F (653 F for the pressurizer). The heatup and cooldown rate of the system is administratively limited to 75 F/hr to assure that these limits will not be exceeded. This is based on a normal plant cycle of one heatup and cooldown per month rounded to the next highest hundred.

(b) 15,000 power change cycles over the range of 15 percent to 100 percent of full load at 5 percent of full load per minute increasing and decreasing. This is based on a normal plant operation involving one cycle per day for 40 years rounded to the next highest 1000.

(c) 2,000 cycles of step power changes of 10 percent of full load, 1
increasing in the 15 percent to 100 percent of full load range and decreasing in the 100 percent to 25 percent of full load range. This is based on a normal plant operation involving one cycle per week for 50 weeks of the year.

(d) 1×10^6 cycles of normal variations of - 100 psi and - 6 F when at operating temperature and pressure. This was selected based on 1×10^6 cycles being equivalent to infinite cycles and thus the limiting stress is the endurance limit. - 100 psi is the maximum pressure fluctuation above the setpoint (2235 psig) before backup heaters come on or spray valves open. For conservatism, the temperature cycle developed for the pressurizer is used for all components.

2. Upset Conditions

(a) 40 cycles of complete loss of reactor coolant flow when at 100 percent power. This is based on one reactor trip per year for the life of the plant resulting from failure of electrical supply to the reactor coolant pumps.

(b) 400 reactor trips from full load. This is based on one reactor trip per month for the life of the plant and includes trips due to operator error and equipment failure.

(c) 40 cycles of turbine trip from 100 percent power with delayed reactor trip. This is based on one reactor trip per year for the life of the plant considering failure of the turbine trip/reactor trip circuit as credible.

[illegible]

TABLE 3.9-2 (Cont'd)

3. Emergency Conditions

5 cycles of complete loss of secondary pressure. This transient would follow a steam line break. A steam line break is not considered credible in forming the basis for design of the Reactor Coolant System. However, system components will not fail structurally in the unlikely event that it does happen.

4. Faulted Conditions

The loading combination resulting from the combined effects of the design basis earthquake and normal operation at full power are categorized as faulted condition.

The loading combinations resulting from the design basis earthquake, normal operation at full power and pipe rupture conditions are categorized as faulted condition. Design basis earthquake and pipe rupture loadings are combined by the SRSS method. 6

5. Test Conditions

10 cycles of system hydrostatic testing at 3110 psig and at a temperature not less than 60 F above the highest component reference temperature (RT_{NDT}) or 100 F above the highest component section (RT_{NDT}) value. This is based on one initial hydrostatic test plus a major repair every four years for 36 years which includes equipment failure and normal plant cycles.

200 cycles of leak testing at 2235 psig and at a temperature not less than 60 F above the highest component reference temperature (RT_{NDT}) or 100 F above the highest pipe section RT_{NDT}. This is based on normal plant operation involving five shutdowns for head removal or valve repair per year for 40 years.

TABLE 3.9-3A 1

A/E SUPPLIED QUALITY GROUP A TRANSIENTS

PLANT EVENT	LIFETIME OCCURRENCES	COMPONENT* CONDITION
Plant Cooldown	500	N
Plant Heatup	500	N
Power Operation	-	N
Loading/Unloading Ramp 5% per Min Step 10%	 15,000 2,000	N
Reactor Trip	400	U
Hydro Static Tests, (3125 psia)	10	T
Leak Test, (2250 psia)	200	T
Normal Pressure Variation ($\pm$ 100 psi, $\pm$ 7° F)	10^6	N
Loss of Primary Flow	40	U
Loss of Secondary Pressure	5	E
Loss of Turbine-Gen. Load	40	U
Purification, & Boron Dilution (CVCS)	11,000	N
Loss of Charging Flow (CVCS)	20	U
Loss of Letdown (CVCS)	50	U
Isolation Check Valve Leaks	40	U

1

* Definitions of the events Normal (N), Upset (U), Emergency (E), Faulted (F) and Test (T) are given in ASME III, Para. NB-3113.

TABLE 3.9-3A (Cont'd) 1

PLANT EVENT	LIFETIME OCCURRENCES	COMPONENT* CONDITION
LOCA (Safety Injection)	1	F
LOCA (Hot Leg Injection)	1	F

1

* Definitions of the events Normal (N), Upset (U), Emergency (E), Faulted (F) and Test (T) are given in ASME III, Para NB-3113.