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SUBJECT: Forwards responses to NRC questions re 860402 application for amend to License DPR-67, revising Tech Spec limts on liner heat rate.

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SUBJECT: Forwards responses to NRC questions re 860402 application for amend to License DPR-67,revising Tech Spec limits on liner heat rate.

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BOX 14000, JUNO BEACH, FL 33408
FPL
FLORIDA POWER & LIGHT COMPANY

MAY 1 3 1986
L-86-200

Office of Nuclear Reactor Regulation
Attention: Mr. Ashok C. Thadani, Director
PWR Project Directorate #8
Division of PWR Licensing - B
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Thadani:

Re: St. Lucie Unit 1
Docket No. 50-335
Linear Heat Rate

By letter dated April 2, 1986 (L-86-144), Florida Power & Light Company (FPL) submitted a proposal to revise the Technical Specification limits on linear heat rate for St. Lucie Unit 1. In response to a request from your staff, we have prepared the attached information to supplement our April 2 submittal.

Very truly yours,

C. O. Woody

C. O. Woody
Group Vice President
Nuclear Energy

COW/MAS/gp

Attachment

cc: Dr. J. Nelson Grace, USNRC, Region II
Harold F. Reis, Esquire, Newman & Holtzinger

A001
1/1

RESPONSES TO THE NRC QUESTIONS

ON THE

ST. LUCIE UNIT 1 CYCLE 7, 11% SGTP

PROPOSED LINEAR HEAT RATE LICENSE AMENDMENT

Prepared by: ______________________ Date: 5-8-86

J. Arpa, Senior Engineer,
Thermal-Hydraulics & Safety

Reviewed and
Approved by: ______________________ Date: 5-9-86

S.K. Mathavan, Supervisor
Thermal-Hydraulics & Safety

Question #1: How does the primary coolant flow rate used in this analysis compare to that used in the previously approved LOCA/ECCS analysis? Discuss and justify any differences.

Answer The primary coolant flows used in the last three approved LOCA/ECCS analyses for St. Lucie Unit 1 are shown below:

a)	Cycle 6	370,000 gpm [1]
b)	Cycle 7 with 15% Steam Generator Tube Plugging (SGTP)	381,068 gpm [2]
c)	Cycle 7 with 11% SGTP	386,121 gpm [3]

The last two flow measurements at the plant were:

d)	Cycle 6	395,877 gpm [4]
e)	Cycle 7	401,564 gpm [5]

The flow in a) is the Technical Specification flow for St. Lucie Unit 1. The flows in b) and c) are best estimate flows. They were derived from the latest measured flow at the time [Item d)] with provisions for 15% and 11% steam generator tube plugging respectively.

Appendix K of 10 CFR 50 does not require that the LOCA/ECCS analysis be run with the Technical Specifications Value for the flow. Therefore the use of the best estimate flow for the present calculation is well justified. Exxon has previously used best estimate loop flow rates in LOCA/ECCS anlyses for other plants.

REFERENCES FOR THE ANSWER TO QUESTION #1

[1] "St. Lucie Unit 1 LOCA Analysis Using the EXEM/PWR ECCS Model", XN-NF-82-98, Exxon Nuclear Company, Richland, WA, December 1982.

[2] "St. Lucie Unit 1 Revised LOCA-ECCS Analysis with 15% Steam Generator Tube Plugging", XN-NF-85-117, Exxon Nuclear Company, Richland, WA, November 1985

[3] "St. Lucie Unit 1 LOCA/ECCS Analysis with 11% Steam Generator Tube Plugging", XN-NF-86-23, Exxon Nuclear Company, Richland, WA, February 1986

[4] St. Lucie Unit 1 RCS Flow Determination by Calorimetric Procedure of May 23, 1984.

[5] St. Lucie Unit 1 RCS Flow Determination by Calorimetric Procedure of January 2, 1986.

Question #2: The statement is made that the increased initial containment temperature (100°F compared to 90°F used previously) is more representative of the mean temperature observed from actual plant measurements. What time span does the mean temperature refer to and how much can it vary over this interval?

Answer: The containment temperature of 100°F used in the LOCA/ECCS analysis for St. Lucie 1 Cycle 7 was assumed from plant measurements (see attached table) covering the period from June 1984 to October 1985 (Cycle 6). It is believed that this temperature of 100°F is an adequate best estimate representation of the containment conditions.

PSL1 CONTAINMENT TEMPERATURES
DURING CYCLE 6 OPERATION
JUNE, 1984 to APRIL, 1985

Date	Lowest Containment Temperature*	Time
06/03/84	103.0	0300
07/01/84	103.8	1200
08/01/84	103.3	1700
09/01/84	106.5	0100
10/01/84	104.8	0200
11/01/84	106.3	0400
12/01/84	99.5	1300
01/01/85	100.3	1500
02/01/85	93.3	0300
03/01/85	98.3	0700
04/01/85	100.3	0000
05/01/85	103.5	0900
06/01/85	106.0	1200
07/01/85	107.3	0100
08/01/85	107.0	1000
09/01/85	100.5	2300
10/01/85	103.0	0900
Average	102.7	

*Lowest of 24 daily readings

Question #3: The reduction in accumulator line resistance is based on plant test data taken prior to cycle 1. What type of errors are included in the reduced value used in this analysis?

Answer: According to CE, accumulator line resistances ranging from 5.29 to 5.94 were calculated for the four dischage lines. These values were later confirmed by pre-operational blowdown measurements. For conservativism the highest resistance of 5.94 was selected for the four lines in the CE LOCA analyses.

The change in accumulator line resistance for this submittal was made to be consistent with the value used by CE in their St. Lucie 1 LOCA licensing analyses (K-Factors of 5.94 with associated flow areas of 0.5592 ft^2). According to CE this value is QA verified. Since the safety injection tank piping has never been altered, the accumulator line resistance value of 5.94, as verified by testing, is valid.

Question #4: Provide additional justification for the change in the modeling of the operation of the secondary feedwater and steam valves which allows secondary steam flow and feedwater flow after the break initiation rather than instantaneous isolation of the secondary system.

Answer: For the LOCA scenario assumed in the analysis, the steam and feedwater flows are isolated through the following logic. Immediately after break opening, a high containment pressure signal is generated. This signal produces a reactor trip signal which in turn causes a turbine trip which isolates the steam flow. The Main Steam Isolation Valves (MSIVs) are not actuated by the high containment pressure signal at St. Lucie 1. The feedwater isolation valves close on the safety injection signal. Measured closure times for these valves are in the vicinity of 60. seconds. However, flow to the steam generators will decrease more rapidly due to loss of power to the feedwater pumps and subsequent pump coastdown. Loss of off-site power is assumed concurrent with the LOCA.

The information provided below is a detailed description of the various delays and assumptions used in the isolation of the steam and feedwater flows in the LOCA analysis (see attached diagrams).

a) Isolation of Steam Generator Flow (See attached diagram)

Δt_1 = 0.85 sec. From preliminary RELAP4 blowdown analyses it can be observed that the high containment pressure setpoint of 19.7 psia is attained at 0.92 sec. A value of 0.90 sec. has been chosen here. The Δt_1 used in the analysis has been calculated as:

$$\Delta t_1 = 0.90 - 0.05 = 0.85 \text{ sec.}$$

where 0.05 sec. is the time of break initiation in the blowdown analysis.

$\Delta t_2 = 0.25$ sec. This delay corresponds to the instrumentation response time between High Containment Pressure and Reactor Trip Signals and is based on observations of the Reactor Protective System Response Times Periodic Tests.

$\Delta t_3 = 0.20$ sec. This delay corresponds to the time between initiation of reactor trip signal and initiation of turbine trip signal and is based on observations of the plant's sequence of events recorder.

$\Delta t_4 = 0.40$ sec. This delay corresponds to the time between turbine trip signal and the signal to close the governor and throttle valves and is based on observations of the plant's sequence of events recorder (typical times range from 0.40 to 0.65 seconds).

$\Delta t_5 = 0.10$ sec. This is the delay between the signal and the time the governor and throttle valves start to close. This delay is based on information provided by the turbine manufacturer.

$\Delta t_6 = 0.30$ sec. Taken as

$$\Delta t_6 = \Delta t_4 - \Delta t_5 = 0.40 - 0.10 = 0.30$$

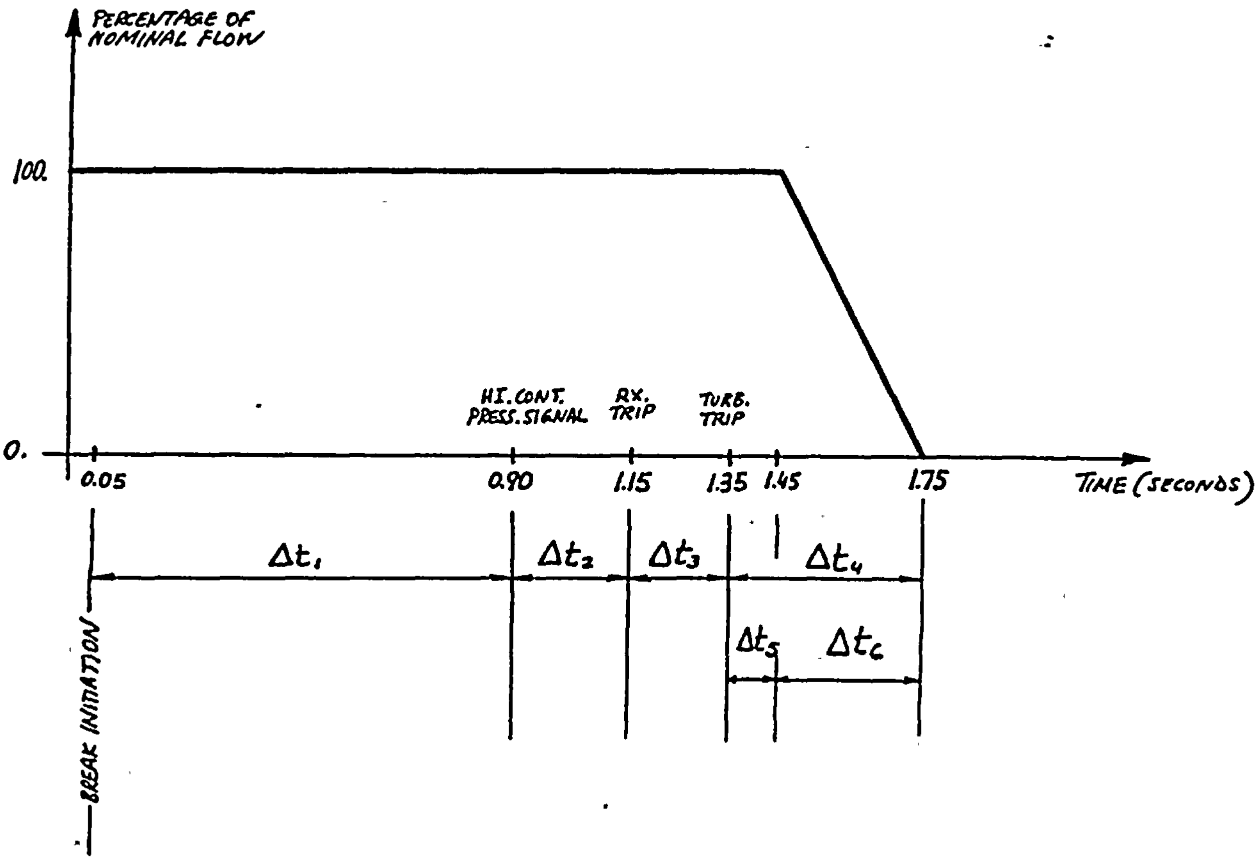
This delay corresponds to the time it takes for the governor and throttle valves to close. Flow through these valves during closure has been assumed to follow a linear ramp.

The above assumptions on the steam isolation conservatively represent the plant behavior in the case of a large break LOCA.

b) <u>Isolation of Feedwater Flow to the Steam Generators (See attached diagram).</u>

The feedwater isolation valves close on the safety injection signal. Measured closure times for these valves are in the vicinity of 60. seconds. However, flow to the steam generators will decrease more rapidly due to loss of power to the feedwater pumps and subsequent pump coastdown. Loss of off-site power is assumed concurrent with the LOCA. After discussions with plant staff it was concluded that the assumption used in the anaylsis of a linear coastdown of 2.0 seconds from the time of the break initiation would be reasonably conservative. Exxon estimates that this assumption on feedwater flow had little effect on the results of the transient.

a) Isolation of Steam Generator Flow



b) Isolation of Feedwater Flow to the Steam Generators