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SUBJECT: Forwards addl info re 881024 application for amend to increase max allowable RTD response time,per 890208 request.

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

Gentlemen:

Re: St. Lucie Unit 2
Docket No. 50-389
Proposed License Amendment
Increased Maximum Allowable RTD Delay Time (TAC No. 69863)

Per letter L-88-463 dated October 24, 1988, Florida Power & Light Company (FPL) submitted a request to amend Facility Operating License NPF-16. The proposed amendment to the St. Lucie Unit 2 Technical Specifications would relax the maximum allowable primary loop resistance temperature detector (RTD) delay time. In conducting a review of the subject proposed license amendment, the NRC Staff determined a need for additional information per letter dated February 8, 1989.

By letter L-89-87, dated March 9, 1989, FPL provided a schedule for responding to this request for additional information by June 1, 1989. The purpose of this letter is to provide the additional information.

Should you have any questions, please let us know.

Very truly yours,

For C. O. Woody
Acting Senior Vice President - Nuclear

COW/MSD/cm

Attachment

cc: Stewart D. Ebneter, Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, St. Lucie Plant

A001

Request for Additional Information Related to Proposed Amendment for Increased Maximum Allowable RTD Response Time

Question 1:

Discuss the reasons for the request, specifically, problems encountered, benefits to be incurred, etc.

Response:

The intent of the proposed license amendment is to provide a RTD response time which will afford a reasonable assurance of the operability of the RTDs. Difficulties have been experienced with ensuring that any RTD after being replaced or repaired will meet the specified response time requirement when tested. This lack of assurance is a function of the installation tolerances required between the RTD and its thermowell, the obstructed access to the thermowells themselves, and the inability to accurately test response time until the unit is being returned to power.

Difficulties with RTD installation and removal were first experienced in early 1982 during the construction and startup of Unit 2. The temperature elements, manufactured by Rouge and deForest (RdF), did not easily slide into the installed thermowells, and, once situated, were not easily removed without damaging the element. Several failed RTD assemblies were returned to Combustion Engineering in an attempt to determine the cause of binding. Several contributing factors were identified, including bent and/or scratched thermowells, and galling between the RTD and the thermowell. The faulty thermowells were then replaced, and the RTD assemblies were modified to allow for a thin silver plating on the last 1.5" of the element in an attempt to reduce sticking and decrease response time.

The physical location of the Unit 2 thermowells has been a factor in the difficulties associated with meeting specified response time requirements, as reactor coolant system support structures interfere with access to thermowell/detector assemblies during element maintenance, installation and removal. In some cases, the RTD must be disassembled and inserted into the thermowell one piece at a time and reassembled during installation to ensure that the element is not damaged. To gain the fastest possible RTD response time, a close tolerance between the RTD and its associated thermowell is necessary. For those thermowells which are difficult to reach, this requirement for close tolerance increases the potential for the galling of the interior surfaces of the thermowells. This type of damage is known to have a negative effect on RTD response time capabilities.

The complications associated with installation of the RTDs are compounded by the fact that the elements cannot be tested until the reactor coolant system average temperature is greater than 515°F, with two reactor coolant pumps operating in the loop where the RTD under test is located. Should any detector not be properly installed in its thermowell, or should the thermowell have experienced some damage during RTD maintenance or replacement, the problem cannot be identified until the unit is being returned to power. An additional factor for consideration is the fact that some maintenance activities associated with RTDs must be performed when RCS inventory is at or below mid-nozzle (e.g., replacement of a thermowell).

Increasing the response time for the RTDs is deemed a means by which the optimum potential for operability in accordance with Technical Specification requirements may be ensured. Fast response Weed Corporation temperature detectors have been installed as a part of this effort, to ensure that the best possible time response would be attainable from the RTDs regardless of the difficulties encountered during element replacement. However, plant experience has shown that even the fast response RTDs may not be capable of meeting the existing requirement due to difficulties encountered during installation. The additional margin gained by the increase in Technical Specification response time will ensure that replacement of detectors every eighteen months in locations where accessibility is limited will not be required.

Question 2:

What is the value for RTD response time assumed in the original accident analysis? What is it now? Please provide reasons for any difference.

Response:

The value for RTD response time assumed in the original accident analysis was eight seconds. The current accident analysis incorporates a sixteen second RTD response time. This value is consistent with the proposed Technical Specification amendment requesting RTD response time increases from 8 to 16 seconds.

Question 3:

Discuss the reasons why the 8 second RTD delay time was chosen in the first place. Provide a breakdown for the assigned values for the RTD sensor, the electronic delay and the lag time. What are these based on?

Response:

Technical Specifications had been issued, increasing RTD response time from the original 5 seconds to 8 seconds. The reason for this increase was to allow for the reevaluation of response time as measured by the loop current step response (LCSR) test method. The original evaluation of the RTD response time had been performed by the plunge test method. In an effort to ensure that differences between the two St. Lucie units be kept to a minimum, good engineering judgement dictated the setting of the Unit 2 RTD response time requirements to be the same as those on Unit 1.

The response of the RTD, or the time constant, is now measured for both St. Lucie units via the LCSR test method. In an LCSR test, RTD temperature is increased a few degrees above ambient temperature by resistance heating within the sensor. After steady state is reached, the resistance heating is stopped, and sensor output is monitored as it cools. The output indicates the response of the sensor to changes in internal heating, but the required information is the response of the sensor to changes in the temperature of the fluid outside the sensor assembly. For both St. Lucie units, response time for each sensor is calculated from the measured LCSR data using a computerized program. The time calculated by the program corresponds to the value used for RTD response time; no further analysis or breakdown of data has been performed to date to determine electronic delay or lag time.

Question 4:

How much change in the overall response time do you expect per year after initial installation of the RTDs? What is this based on?

Response:

No increase in RTD response time due to temperature element degradation is expected after initial installation. Purchase specifications for the Weed Corporation Model N9004D resistance temperature detectors which are currently installed on Unit 2 required that RTD drift be limited to not greater than 0.1°F per year and that repeatability would remain within 0.05% of the temperature being measured.

Question 5:

Discuss the reasons why doubling of the 8 second RTD response time is necessary, as opposed to some shorter time.

Response:

The sixteen second response time was chosen from the current accident analysis for St. Lucie Unit 2 through engineering judgement. Difficulties have been experienced with ensuring that any RTD, after being replaced or repaired, will meet the specified

response time requirement when tested. As stated in the response to Question 1, this lack of assurance is a function of the installation tolerances required between the RTD and its thermowell, the obstructed access to the thermowells themselves, and the inability to accurately test response time until the unit is being returned to power. It is the intent of the proposed license amendment to permit a temperature element response time which will provide a reasonable assurance of the operability of the RTDs at the time of installation. Regardless of the fact that the new Weed transmitters are capable of responding to temperature changes far more quickly that the RdF elements, the difficulties inherent with maintenance and replacement still remain. Therefore, FPL believes that the sixteen second response time is appropriate.

Question 6:

What is the average occupational dose delivered during RTD replacement?

Response:

The following table shows the actual measured doses for RTD replacement work for Unit 2:

*1984	0.150 Man-rem
1987	29.240 Man-rem
1989	33.035 Man-rem

* Data not complete in 1984 due to differences in recordkeeping practices. Only shows Instrument and Control personnel data; does not include doses to support personnel as does 1987 and 1989 data.

Question 7:

Your submittal states that the previous surveillances of the RTD response times were "close" to the 8.0 second maximum allowable value. Provide specific numbers as well as trending of the response times. The specific numbers should include a breakdown for the RTD sensor, electronic delay and lag.

Response:

A table showing the response time of the 16 RTDs relevant to the proposed license amendment is provided as Attachment One. As stated in the response to Question 3, the time calculated by the computerized program corresponds to the value used for the RTD response time; no further analysis or breakdown of data has been performed to date to determine electronic delay or lag time.

Question 8:

How often have St. Lucie RTDs been tested? How often have they been replaced?

Response:

Testing of RTD response time is performed in accordance with Unit 2 Surveillance Requirement 4.3.1.3; a specific breakdown of testing and replacement activities for each RTD is incorporated in the table provided in Attachment One.

Attachment One

ST. LUCIE UNIT 2 RTD RESPONSE TIME TESTING SUMMARY

RTD. Number	Startup	1984	1986	1987	1989	Comments
TE 1112CA	4.990			6.030	2.71	Original RdF RTD was replaced with fast-response Weed in 1989; 1987 test of Channel A sensors was in accordance with TS 4.3.1.3
TE 1112HA	5.670			6.570	2.97	Original RdF RTD was replaced with fast-response Weed in 1989; 1987 test of Channel A sensors was in accordance with TS 4.3.1.3
TE 112CB	5.190			2.280	3.23	Original RdF RTD was replaced with fast-response Weed in 1987; 1989 test of Channel B sensors was in accordance with TS4.3.1.3
TE 1112HB	5.870				2.92	Original RdF RTD was replaced with fast-response Weed in 1989
TE 1112CC	6.060	5.674			3.11	Original RdF RTD was replaced with fast-response Weed in 1989; 1984 test of Channel C sensors was in accordance with TS 4.3.1.3
TE 1112HC	6.840	6.119			4.65	Original RdF RTD was replaced with fast-response Weed in 1989; 1984 test of Channel C sensors was in accordance with TS 4.3.1.3
TE 1112CD	6.480		6.445	2.030		Original RdF RTD was replaced with fast-response Weed in 1987; 1986 test of Channel D sensors was in accordance with TS 4.3.1.3
TE1112HD	6.090		7.198		2.94	Original RdF RTD was replaced with fast-response Weed in 1989; 1986 test of Channel D sensors was in accordance with TS 4.3.1.3

RTD Number	Startup	1984	1986	1987	1989	Comments
TE 1122CA	6.090			8.090	9.70	This RTD was replaced with a fast-response Weed element in 1987; the RTD subsequently failed response time testing due to the difficulties encountered in installation. The RTD and the thermowell were replaced again in 1989 and failed response time testing once again. After the third change-out of the element and the thermowell, the as-left response time was 2.96 seconds.
TE 1122HA	5.190			3.311		Original RdF RTD was replaced with fast-response Weed in 1987.
TE 1122CB	5.700			2.630	3.45	Original RdF RTD was replaced with fast-response Weed in 1987; 1989 test of Channel B sensors was in accordance with TS 4.3.1.3
TE 1122HB	5.930	6.285		2.07.	3.29	Original RdF RTD was replaced with fast-response Weed in 1989; 1984 work involved the changeout of the RTD and the thermowell and subsequent retesting of the RTD. The 1989 test of Channel B sensors was in accordance with TS4.3.1.3
TE 1122CC	5.630	6.445		2.130		Original RdF RTD was replaced with fast-response Weed in 1987; 1984 test of Channel C sensors was in accordance with TS 4.3.1.3.
TE 1122HC	5.490	6.844		2.270	5.08	Original RdF RTD was replaced with fast-response Weed in 1987; 1984 test of Channel C sensors was in accordance with TS 4.3.1.3.
TE 1122CD	6.150		5.268	2.020		Original RdF RTD was replaced with fast-response Weed in 1987; 1986 test of Channel D sensors was in accordance with TS 4.3.1.3.
TE 1122HD	5.720		5.649	2.210	3.71	Original RdF RTD was replaced with fast-response Weed in 1987; 1986 test of Channel D sensors was in accordance with TS 4.3.1.3.