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SUBJECT: Forwards response to NRC 920629 RAI on proposed license amends,dtd 920421 & 0519 re 480 volt load centers degraded voltage protection scheme.

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

Gentlemen:

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Request for Additional Information (RAI) -
Proposed License Amendments: 480 Volt Load Centers
Degraded Voltage Protection Scheme

By letters L-92-097, dated April 21, 1992 and L-92-153, dated May 19, 1992, Florida Power and Light Company (FPL) submitted a request to amend the Turkey Point Technical Specifications. In a discussion between FPL and the staff on June 29, 1992, the NRC requested additional information to support the technical review of the proposed license amendments. The response to these NRC questions is enclosed.

Should there be any questions, please contact us.

Very truly yours,

TF Plunkett

T. F. Plunkett
Vice President
Turkey Point Nuclear

Enclosure

TFP/RJT/rt

cc: Stewart D. Ebneter, Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant
Mr. Jacob Daniel Nash, Florida Department of Health and Rehabilitative Services

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STATE OF FLORIDA)
) ss.
COUNTY OF DADE)

T. F. Plunkett being first duly sworn, deposes and says:

That he is Vice President, Turkey Point Nuclear Plant, of Florida Power and Light Company, the Licensee herein;

That he has executed the foregoing document; that the statements made in this document are true and correct to the best of his knowledge, information and belief, and that he is authorized to execute the document on behalf of said Licensee.

T F Plunkett
T. F. Plunkett

Subscribed and sworn to before me this
29 day of July, 1992.

Cheryl A Kelly

CHERYL A. KELLY
Name of Notary Public (Type or Print)

NOTARY PUBLIC, in and for the County of Dade, State of Florida

NOTARY PUBLIC STATE OF FLORIDA
MY COMMISSION EXP SEPT 27,1992
My Commission expires BONDED THRU GENERAL INS. UND.
Commission No. ____________

T. F. Plunkett is personally known to me.

[illegible]
[illegible]
[illegible]

FLORIDA POWER AND LIGHT COMPANY

TURKEY POINT UNITS 3 AND 4

RESPONSE TO NRC QUESTIONS

ON THE

PROPOSED LICENSE AMENDMENTS:
480 VOLT LOAD CENTERS UNDERVOLTAGE PROTECTION SCHEME

RESPONSE TO NRC QUESTIONS

In response to a discussion between Florida Power and Light Company (FPL) and the staff on June 29, 1992 the NRC requested additional information to support their technical review of the FPL licensing submittal on 480 Volt Load Center Degraded Voltage Protection (L-92-097, dated April 21, 1992 and L-92-153, dated May 19, 1992). Enclosed is a summary of the NRC requests for information and the responses to these requests.

1. Question: Calculation No. 21701-523-E-02, Assumption 3.2, states that credit is taken for the overcurrent protection on the motors where thermal damage curves could not be found. What is the basis for the validation of this assumption?

Response: Safe heating curves for small motors are generally not available. IEEE Standard 620-1987 (Reference 6) is the only industry standard on motor safe heating curves. This standard was prepared for squirrel cage motors over 500 hp. Although this standard can be applied to smaller motors, most of the industry does not provide such safe heating curves for smaller motors. The motors for standard application in this size follow standard design and overload settings are generally based on a percentage of the motor full-load current. The overload protection guidelines provided in ANSI/IEEE Standard C37.96-1988 (Reference 7) Sections 2.2.3 and 4.2.9 for sizing the motor overload protection device, are normally adequate to protect the motors in this range.

As stated above, safe motor heating curves are generally not available for small size motors. For a few special cases FPL has been able to obtain these curves for motors smaller than 500 hp (i.e., Containment Spray Pump: 250 hp, Emergency Containment Coolers: 30 hp and Emergency Containment Filters: 75 hp). These motor safe heating curves have been plotted on the Time/Current plots. As can be seen from all the curves (Attachment 1 to Calculation 21701-523-E-02, Revision 0 [Reference 3 of this submittal]), the motor currents at the degraded voltage relay settings are well under the overload protection or the safe motor heating curve for each motor. Use of the existing thermal overload protection for the motor based on ANSI/IEEE standards to demonstrate adequacy of degraded voltage protection is, therefore, acceptable.

2. Question: When the test switch is placed in the test mode, is there an audible alarm? The Engineering Package states that there is a visual alarm. Bypass switch does activate visual and audible alarm. In addition is the system placed in the bypass mode during testing?

Response: The use of terms annunciator and alarm in the design package is synonymous. Initiation of an annunciator in the control room generates an audible alarm (horn) and flashing annunciator window. Acknowledgment of the alarm turns off the audible alarm and the flashing window goes to a steady light. Off-normal positions of the Test or Bypass switch provide an alarm in the Control Room.

The bypass switch and the test switch can operate independent of each other. The purpose of the bypass switch is to bypass the trip circuit associated with any one of the two degraded voltage channels and place the circuit in trip mode. Therefore, when a channel is bypassed, the trip logic is changed from two-out-of-two to one-out-of-one.

The test switch is used to test the operability of the relays periodically, in accordance with the surveillance requirements of the Technical Specifications. The off-normal position of the test switch is also annunciated in the control room.

Load Centers 3A and 3C are part of the Train A power system. Load Centers 3B and 3D are part of the Train B power system. Emergency Load Sequencer 3A receives degraded voltage signal inputs from Load Centers 3A and 3C. During the surveillance testing of the degraded voltage relays, the trip signal from that load center is blocked for the duration of the test. Should a degraded voltage condition occur at the load center, during the surveillance testing of one load center relay, the degraded voltage will be sensed at the other load center of the same power train (3C during the testing of 3A and 3A during the testing of 3C respectively) and the trip signal will initiate the sequencer action. Hence, the capability of the automatic safety function is maintained during the testing of the relays at any load center.

3. **Question:** **How did FPL account for the time dependent inaccuracies for the IAV 55C and the ABB 27N relays in Calculation 21701-523-E-01?**

Response: 1.0 General

The Asea Brown Boveri (ABB) undervoltage relays are provided to actuate within the Technical Specifications trip setpoints. These setpoints are listed in Table 3.3.3, Item 7.c, of Turkey Point Technical Specifications (Reference 11). Based on a Potential Transformer ratio of 4:1, the corresponding setpoints at 120 Volts base are as given below:

Load Center	Technical Specification Trip Setpoints (Volts)	
	minimum	maximum
3A	104.75	107.25
3B	105.50	108.00
3C	108.00	110.50
3D	107.50	110.00

The ABB 27N relay dropout range has been provided within the above Technical Specification values. The relay dropout ranges, per Calculation 21701-523-E-01 (Reference 2), are as shown below:

Load Center	Relay Dropout Range (Volts)	
	minimum	maximum
3A	105.477	106.523
3B	106.224	107.276
3C	108.314	109.386
3D	108.216	109.284

The 27N relays are used to satisfy the Technical Specification trip setpoints.

Section 5.0 (Page 23) of Calculation 21701-523-E-01 Rev. 0 (Reference 2) provides the tap settings for the IAV relays. The tap settings are in the range of 98.00 to 100.50 Volts. For the voltages above the operating point of the IAV relays, the ABB 27N relays provide the degraded voltage protection.

From the above discussion it is evident that in the proposed design the 27N relays are used to satisfy the Technical Specification trip setpoint whereas IAV relays provide protection for more severe voltage transients.

2.0 Consideration of Inaccuracies

Calculation 21701-523-E-01 (Reference 2) accounted for known inaccuracies in determining the settings of both types of relays. These inaccuracies include relay repeatability, Measuring and Test Equipment accuracy and tolerance and Potential Transformer inaccuracies. It did not address time dependent inaccuracy specifically.

The NRC questioned if FPL had accounted for time dependent inaccuracies for the relays. There is no industry standard which provides guidance in defining and/or measuring time dependent inaccuracies for protective relays that can be applied uniformly for these devices. However, ANSI/ISA Standard S51.1 -1979, Process Instrumentation Technology, defines "Drift" as "An undesired change in output over a period of time, which change is unrelated to the input, environment or load."

In order to resolve the NRC's question, a representative from ABB was contacted to obtain the drift for the 27N relays. ABB advised that no data was available for drift of the 27N relays. Similarly, a representative from General Electric Company (GE) was contacted to obtain the drift for the IAV relays. GE also advised that no data was available for drift for the IAV relays.

2.1 Drift for 27N Relays

FPL was advised that Northern States Power Company at Monticello Nuclear Generating Plant is testing ABB 27N relays to obtain data on the repeatability and drift of the relay setpoint. At FPL's request, Northern States Power Company sent the available data on these relays. This data was collected from April 4, 1991, to May 28, 1992, for six relays. FPL understands that the testing of the relays and the collection of the data is continuing. The settings were checked every two or three months using recently calibrated instruments. A review of the data shows a maximum change in the relay setpoints (in either direction) of 0.09 volts and a range of values between 0.05 and 0.09 volts.

The test data indicate that the relay setting changed in both positive and negative directions. It also shows that the maximum change in the setpoint did not occur at the end of the data collection period. As the change in the setting did not increase or decrease with time or occur in one direction only, the setting change can be primarily attributed to relay repeatability with insignificant or minor contribution due to drift.

The maximum observed relay setpoint change was 0.09 Volts or 0.08% at 112 Volts, which includes drift and repeatability. This value is less than the repeatability value of 0.1% provided by the manufacturer. Since the actual test data collected over a period of 14 months indicate the maximum change in the setpoint to be only 0.08%, FPL's use of 0.1% for repeatability is acceptable to bound any drift inaccuracy for a period of 18 months for the ABB 27N relays.

2.2 Drift for GE IAV55C Relays

As discussed in Section 1.0 above, the IAV relay is used to provide protection for severe voltage transients. As shown in the time/voltage plots included with Calculation 21701-523-E-01 (Reference 2), there is sufficient margin between the IAV relay operating curves (including all known tolerances) and the worst case voltage transient, to preclude a spurious trip due to drift. Any unknown inaccuracies of even more than twice as large as the calculated known tolerance range of the relay (e.g. 2.285 Volts for Load Center 3B) can be accommodated within the existing margin. In addition, per Calculation 21701-523-E-02 (Reference 3), there is also sufficient margin between the degraded voltage setting and the motor overcurrent protection devices to account for any drift inaccuracies. Hence, any additional inaccuracy due to "drift" is inconsequential in this particular application.

3.0 Relay Settings to meet Technical Specification

The following table provides the Technical Specification (Reference 11) trip values, on a 120V base, and the calculated voltage range of the ABB 27N relay including known inaccuracies.

Load Center	Relay Dropout Range 27N Relay minimum	maximum	Technical Specification minimum	maximum
3A	105.477V	106.523V	104.75V	107.25V
3B	106.224V	107.276V	105.50V	108.00V
3C	108.314V	109.386V	108.00V	110.50V
3D	108.216V	109.284V	107.50V	110.00V

The above table shows that there is a margin of 0.314V, worst case, between the minimum Technical Specification trip setpoint and the minimum relay dropout range. Per calculation 21701-523-E-01 (Reference 2), the total worst case inaccuracy for the 27N relay, is for Load Center (LC) 3C, which is .536V. Therefore, additional relay inaccuracies can be accommodated within the available margin of 58% of the total relay setting tolerance, which includes other tolerances not considering time dependent inaccuracies. This margin is considered adequate to allow for small amount of relay drift, if any.

4.0 Conclusion

As stated in Section 2.1, based on the test data from Monticello the drift for 27N relay is enveloped by the known inaccuracy values of the relay; therefore, the drift contribution to the total inaccuracy of the relay is insignificant. Furthermore, per Section 3.0, there is sufficient margin between the relay setting and the allowable relay range per the Technical Specifications.

As stated in Section 2.2, the drift for the IAV relay is of no significance since there is sufficient margin between the relay setting and the voltage transient; and between the relay setting and the motor overcurrent protection devices.

Calculation 21701-523-E-01 (Reference 2) will be revised, by August 28, 1992, to address consideration of "drift", as discussed above.

4. Question: **FPL to identify how the M&TE requirements of the engineering package will be incorporated into plant procedures.**

Response: Sections 14.2.3 and 14.2.4 of Engineering Package 91-128 (Reference 1) require the use of specific instruments for setting and testing the relays that satisfy the M&TE accuracy requirements of the engineering package.

These sections specifically state that "only the M&TE specified in Reference 6.20 can be utilized." Reference 6.20 of the Engineering Package is the relay setting calculation 21701-523-E-01 (Reference 2). Per section 4.4 of this calculation, only the HP 34401A voltmeter and the Doble F-2200 timer, with the F-2010 attachment, can be used to set these relays. The accuracies of these instruments are given in Attachment 1 to the calculation.

In accordance with the Plant Change/ Modification (PC/M) mandatory requirements, as well as the plant administrative requirements, testing and calibration procedures will be developed which will incorporate the M&TE requirements specified in the engineering package (Sections 14.2.3 and 14.2.4). These procedures will be prepared prior to turnover of the design modifications.

5. Question: **Calculation 21701-523-E-02, Section 7, discusses the motor's temperature of 215°C which is stated to have thermal aging effect and not catastrophic failure. How does FPL address the thermal aging of these motors?**

Response: As discussed in Section 7 of Calculation 21701-523-E-02 (Reference 3), the time versus current plots of all individual motors are well below the motor thermal overload protection or the motor safe heating curves. Hence, the motors will not trip at the degraded voltages experienced at the load centers.

The discussion regarding the motor testing temperature at 215°C was included to point out the conservatism built into the specific motor safe heating curve. It is not the intent to run these motors at 215°C or to imply that 215°C is the operating temperature of the motor.

These motors have class H insulation for use in an ambient temperature environment of 50°C as shown on Attachment 3, Sheets 7 and 8 of the calculation. These motors are for Emergency Containment Cooler Fans and Emergency Containment Filters which are not required for normal plant operation. Hence, the motors remain at ambient temperature most of the time since they are not normally running. The allowable maximum insulation temperature for class H insulation is 180°C. Normal motor full load operating temperature is less than 180°C.

The above motors are qualified for 40 years life as documented in Environmental Qualification (EQ) Documentation Package 16.0 (Reference 10). Since these motors do not normally run, degraded voltages of short duration have no effect on their thermal aging.

6. Questions: **The results of Calculation 21701-523-E-02 state that the Containment Spray Pump overload condition will be notified to the operator via an alarm. How can you rely on a non-safety related alarm for motor protection?**

Response: The purpose of the calculation is to demonstrate that the Containment Spray Pump will not trip on overload during degraded bus voltage conditions. As demonstrated in Figure 9 of Attachment 1 of the calculation (the time versus current plot of the Containment Spray Pump motor), the motor current for the degraded voltage condition is well below the overcurrent protection provided for the motor. Hence, the motor will not trip due to the degraded voltage condition.

The safety function for the Containment Spray Pump is to provide spray inside containment to reduce containment pressure. During normal conditions this motor is not operating. The alarm is available, to the operator, to indicate a motor overload condition. The alarm does not perform a safety related function as safety related overcurrent protection is provided to automatically trip the breaker for excessively high currents.

7. Question: **FPL to provide a status of the overall coordination study for the plant and make a commitment in this regard if it does not exist.**

Response: As part of recent engineering activities, Calculation PTN-BFJE-91-019, Rev. 1 (Reference 8) and Calculation PTN-BFJE-92-023, Rev. 0 (Reference 9) have been prepared to document coordination of the protective devices for the AC Emergency Power System, for Turkey Point Units 3 and 4. These calculations are available for review.

The scope of these calculations include the overcurrent protective devices on all 4160 volt switchgear, 480 volt load centers and 480 volt motor control centers.

8. Question: **Engineering Package Section 2.3.16, states that the total mass of the equipment removed from the load centers is insignificant when compared to the overall mass of the load center and therefore, seismic qualification of the load center will not be degraded. What is the basis for this statement?**

Response: The total mass removed from the load center is 7.5 lbs. The minimum total mass of the load center is 4657 lbs. The mass removed from the load center is of the order of 0.16% which is insignificant when compared to the total mass of the load center. Therefore, the seismic response characteristics of the load center and seismic qualification of the load center is not affected by the removal of the electrical components.

REFERENCES

1. PC/M 91-128, Revision 0, "480V Undervoltage Protection Scheme Modification"

2. Bechtel Calculation 21701-523-E-01, Revision 0, "Unit 3 Load Center Undervoltage Relay Setpoints"

3. Bechtel Calculation 21701-523-E-02, Revision 0, "Verification of Degraded Voltage Relay Protection for Safety Related Equipment (Coordination between U/V and Overcurrent Protection)"

4. Letter, W. H. Bohlke (FPL) to USNRC Document Control Desk, "Turkey Point Units 3 and 4, Proposed License Amendments: 480V Load Centers Degraded Voltage Protection Scheme", L-92-097, dated April 21, 1992.

5. Letter, T. F. Plunkett (FPL) to USNRC Document Control Desk, "Turkey Point Units 3 and 4, Request for Additional Information (RAI) - Proposed License Amendments: 480 Volt Load Centers Degraded Voltage Protection Scheme", L-92-162, dated June 2, 1992.

6. IEEE Standard 620-1987, "IEEE Guide for Construction and Interpretation of Thermal Limit Curves for Squirrel-Cage Motors Over 500 hp"

7. ANSI/IEEE Standard C37.96-1988, "IEEE Guide for AC Motor Protection"

8. FPL Calculation PTN-BFJE-91-019, Rev. 1, "AC Emergency Power System Coordination Calculation"

9. FPL Calculation PTN-BFJE-92-023, Rev. 0, "Load Center Breaker and Ground Fault Relay Settings"

10. Turkey Point Units 3 & 4, Environmental Qualification Documentation Package, No. 16.0, Joy MFG. Co., Electrical Fans, Revision 3

11. Turkey Point Units 3 & 4, Technical Specifications, Amendment 151/146

12. FPL letter JPN-PTN-92-5721, "AC Emergency Power System Coordination", dated July 14, 1992.