Florida Power
CORPORATION

July 18, 1990
3F0790-10

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
Emergency Diesel Generator Block Loading Voltage Dips

Dear Sir:

The attached Justification For Continued Operation (JCO) describes a problem with voltage dips discovered recently during diesel generator testing at Crystal River 3 (CR-3). The JCO also describes the corrective actions already taken and planned, and why continued operation is justified during the interim period. A meeting is scheduled for July 24, 1990 at which FPC plans to discuss the details of the test results and additional information on our corrective action plans.

Sincerely,

P. M. Beard, Sr.
Senior Vice President
Nuclear Operations

PMB:AEF:

Attachment

xc: Regional Administrator, Region II
Senior Resident Inspector

A001

Emergency Diesel Generator
Voltage Dips during concurrent ES/LOOP
Justification for Continued Operation

Florida Power Corporation (FPC) modified the block loading sequence of the emergency diesel generators during Refuel 7. As part of the post-modification test program FPC monitored voltages on the 4160, 480 VAC Engineered Safeguards (ES) Busses and selected 480/120 VAC loads during our integrated ES response test. This test, SP-417, Refueling Interval Integrated Plant Response to an Engineered Safeguards (ES) Actuation, simulates a full ES actuation followed by a loss of offsite power. The post-modification test, PT-340, EGDG-1A and EGDG-1B Block Loading Voltage Drop Validation, which measured the voltages was performed to confirm calculated values for 480 and 120 AC voltages.

PROBLEM DESCRIPTION

A review of the test results on Emergency Diesel Generator (EDG) "A" identified that the 4th load block exceeded the guidance in Regulatory Guide 1.9 that the voltage should not decrease to less than 75% of nominal (i.e. 25% drop from nominal). The fourth load block produced a voltage dip of 28%. Subsequent rereview of the test data also shows that the EDG-A Block 2 and EDG-B Block 1 voltage dips are also greater than 25%. The expected and measured voltage dips for each block are given in Attachment 1.

The test results also showed that the Block 3 to 4 load sequence interval was approximately 4 seconds which was inconsistent with the Technical Specification requirement. The Technical Specifications require testing to assure that the intervals are 5 +/- 10% (4.5 to 5.5) seconds. The test data also shows that the EDG "A" voltage between load blocks does not reach a steady state value prior to the addition of the next load block.

CAUSE

The equipment which could cause the problems encountered has been reviewed. This review focused on the block load timing relays and the EDG voltage regulator. Alarm records during the EDG-A test indicate that one of two relays necessary to start the motor driven emergency feedwater pump timed out early probably due to a contact that failed to reclose during other phases of the testing. (Efforts to duplicate the failure were not successful so no actual repairs were made.) The shorter than nominal interval decreased the time available for the EDG-A voltage regulator and governor to respond to the transient effects of the block loading. The response of the EDG voltage regulator and governor were also not fast enough to ramp the voltage back to nominal within 5 seconds. This prevented the voltage from recovering fully prior to another block being

loaded. In general, the EDG-B equipment responded better and satisfactorily except for the initial block which may be an artifact of the test equipment location rather than a voltage regulator or governor problem.

CORRECTIVE ACTION

The installed relays have a repeatability of +/- 10% which could result in shortened load sequence intervals. FPC will install higher accuracy relays which would improve on the accuracy and repeatability of the load intervals. FPC is continuing to evaluate the performance of the voltage regulator and governor to determine if the response characteristics are appropriate and how the response can be improved.

Replacement of the timers will be made in the 1991 mid-cycle outage if material delivery can support such a schedule. Adjustments to tune the voltage regulator and governor will be made during this outage. Appropriate testing will be performed dependent upon the modifications and adjustments which have been made. When sufficient assurance is obtained that the modifications or adjustments have corrected the problems, the applicable sections of PT-340 will be rerun. EP-417 must also be rerun in parallel with PT-340 to place the plant into the required configuration. The plant must be in Mode 3 for several days to set up and perform the testing. Thus, the schedule for these improvements is the mid-cycle outage planned for 1991.

FPC has modified the frequency of appropriate online surveillance procedures to exercise and check the accuracy of the timing relays on a quarterly basis.

SAFETY SIGNIFICANCE

The primary significance of the voltage dips exceeding the criteria of the Regulatory Guide is that actuated contactors may not pick up or if picked up, will drop out due to low voltage while the EDG block sequencing is occurring. Earlier FPC calculational efforts have identified worst case loads at each ES Motor Control Center (MCC) from a voltage drop perspective.

The overall worst case contactor is supplied from 480 V ES MCC 3A2. It operates motor operated valve MUV-40. The measured voltage at this MCC during the worst case of block 4 sequencing was approximately 339 VAC. The voltage at the contactor was calculated to be 68.7% at the 120 volt level. The worst case contactor supplied from 480 V ES MCC 3A1 operates motor operated valve DHV-34. The measured voltage at this MCC during the worst case of Block 4 sequencing was 339.1 VAC. The voltage at the contactor was calculated to be 69.2% at the 120 VAC level. The worst case contactor supplied from 480 V ES MCC 3A3 operates motor operated

valve MUV-73. The voltage at this contactor was measured to obtain the voltage at the 120 VAC level during the test. The actual voltage during the worst case block 4 dip was 86.25 V or 71.8% and the contactor remained energized.

The contactors are specified to hold in at voltages of 65% for 2 seconds. Because the extent of the dip did not produce voltages below 65% (at 120 VAC level) and the duration of the dip below 25% was less than 0.75 seconds, the contactors will not drop out. Because the worst case contactors do not drop out the plant operation is still within the applicable safety analysis and other requirements. FPC continues to be committed to expeditiously improve the transient voltage performance. Based on this analysis, however, the plant performance is currently acceptable.

Voltage dips of this magnitude were addressed in the original licensing of Crystal River 3 (CR-3). They were considered acceptable due to other plant characteristics. The original plant Safety Evaluation Report (SER) summarizes the issue as follows:

> The loading of the diesel generators is within the limits suggested by Regulatory Guide 1.9 except for the voltage dip during the first loading block which is approximately 28% of the nominal instead of 25% recommended by Regulatory Guide 1.9. To compensate for this voltage dip, the applicant has provided motor starters that will hold in during this somewhat lower voltage transient. We have concluded that this is acceptable."

The current condition is very similar to the original situation which was reviewed and approved against the same criteria that exist today.

ATTACHMENT 1

EMERGENCY DIESEL GENERATOR "A"

BLOCK	TESTED KW	START KVA	PROJECTED DIP (%)	MEASURED DIP (%)
1	902.4	5547	23.0	24.3%
2	607.7	4446	19.3	27.2%
3	488.3	3950	17.5	19.9%
4	664.5	3914	17.4	28.7%
5	194.5	1857	9.1	6.8%
6	259.7	2178	10.5	8.3%

EMERGENCY DIESEL GENERATOR "B"

BLOCK	TESTED KW	START KVA	PROJECTED DIP (%)	MEASURED DIP (%)
1	1000.1	6023	24.4	25.8%
2	599.2	4446	19.3	24.3%
3	468.7	3950	17.5	20.0%
4	273.5	1905	9.3	8.3%
5	197.1	1857	9.1	11.2%
6	275.1	2178	10.5	11.2%

NOTES:

(1) Projected dip is the calculated voltage change based on starting KVA of each block of loads.

(2) Measured dip is the difference between actual bus voltage during the recent PT-340 testing and a nominal 4160 V.