



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION II  
101 MARIETTA STREET, N.W.  
ATLANTA, GEORGIA 30323

Report No.: 50-302/88-05

Licensee: Florida Power Corporation  
3201 34th Street, South  
St. Petersburg, FL 33733

Docket No.: 50-302

License No.: DPR-72

Facility Name: Crystal River 3

Inspection Conducted: January 11-15, 1988

Inspectors:

Ralph H. Berghard  
R. Berghard

2/24/88  
Date Signed

Antoni J. Szczepaniec  
A. Szczepaniec

2/24/88  
Date Signed

Approved by:

Frank Jape  
F. Jape, Chief  
Test Programs Section  
Division of Reactor Safety

2/25/88  
Date Signed

SUMMARY

Scope: This routine, announced inspection was in the areas of verification of Confirmation of Action Letter (CAL) items identified in the CAL of November 17, 1987 and review of modifications.

Results: No violation or deviations were identified.

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## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

#### FPC Site Personnel

- \*F. R. Bailey, Superintendent, Projects
- \*D. H. Beach, Site Nuclear Engineering
- \*P. D. Breedlove, Supervisor, Records Management
- \*J. E. Colby, Manager, Mechanical Engineering Services
- \*J. Cooper, Jr., Superintendent, Nuclear Technical Support
- #D. Green, Nuclear Licensing Specialist
- \*P. G. Haines, Nuclear Licensing Specialist
- \*P. F. McKee, Director, Nuclear Plant Operations
- \*E. C. Simpson, Director, Nuclear Operations Site Support
- \*F. X. Sullivan, Supervisor, Site Nuclear Engineering
- \*E. Welch, Manager, Electrical Engineering Services
- \*M. S. Williams, Nuclear Compliance Specialist

#### FPC Corporate Personnel

- #R. M. Bright, Assistant to the Vice President, Nuclear Operations
- #R. E. Clauson, Instrument and Controls Engineer
- #M. Rahman, Senior Electrical Engineer
- #P. R. Tanguay, Manager, Nuclear Operations Engineering
- #R. C. Widell, Director, Nuclear Operations, Engineering, and Projects

Other licensee employees contacted included engineers, technicians, operators, mechanics, and office personnel.

#### Other Organization

R. Vaughn, Gilbert Commonwealth

#### NRC Resident Inspector

\*J. E. Tedrow

\*Attended exit interview at Crystal River on January 14, 1988

#Attended exit interview at Headquarters Engineering on January 15, 1988

### 2. Exit Interview

The inspection scope and findings were summarized on January 14, 1988, at Crystal River and on January 15, 1988 in St. Petersburg, Florida, with those persons indicated in paragraph 1 above. The inspector described the

areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee. The following new items were identified during this inspection:

- Unresolved Item Number (URI) 50-302/88-05-01, Low Developed Head from Building Spray Pump BSP-1A
- Inspector Followup Item (IFI) 50-302/88-05-02, Review Evaluation Performed for Low and High Flow Values for "Initial Flow" in PT-136

The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection.

### 3. Licensee Action on Previous Enforcement Matters

This subject was not addressed in the inspection.

### 4. Unresolved Items

Unresolved items are matters about which more information is required to determine whether they are acceptable or may involve violations or deviations. One unresolved item identified during this inspection is discussed in paragraph 5.b.

### 5. Details

This inspection was performed at the Crystal River facility and at the corporate engineering offices in St. Petersburg. The primary focus of the inspection was test procedure and results review of the kilowatt (KW) load testing and flow verification issues of the Confirmation of Action Letter (CAL) of November 17, 1987. In addition, a review was performed of modification's records for some changes in the plant made in response to these issues. Configuration control was discussed for items that could impact the load on the emergency busses. Two IFIs (50-302/85-32-02 and 50-302/85-32-03) were closed. One IFI and one UKI were opened. They are discussed below:

#### a. On Site Electrical Load Testing

In response to the CAL of November 17, 1987, the licensee performed KW load testing of major loads on the 'A' emergency bus. Motors with greater than a one hundred horsepower load during a Loss of Cooling Accident (LOCA) were selected for KW verification. While onsite, the inspectors reviewed the following PTs and the performance data:

PT-136, DC and SW System Flow Measurements and EGDG-1A KW Loading Due to ES Pumps, Revision 0, 12/10/87 with ITC PT136-1 dated 12/17/87

PT-312, RWP-2A and RWP-3A Power and Flow Measurements for EGDG-1A KW Loading Verification, Revision 0, 12/14/87 with ITC-PT-312-1 dated 12/28/87

PT-311, MUP-1A Power and Flow Measurements for EGDG-1A KW Loading Verification, Revision 0, 12/4/87

PT-308, DHP-1A and BSP-1A Power and Flow Measurements for EGDE-1A KW Loading Verification, Revision 0, 12/8/87 with ITC 87-12-26 dated 12/10/87

PT-310, EGDG-1A ES A Block Loading Voltage and Current Verification, Revision 0, 12/27/87

PT-309, EFP-1 Power and Flow Measurements for EGDG-1A KW Loading Verification, Revision 0, 12/15/87

SP-417, Refueling Interval Integrated Plant Response to Engineered Safeguards Actuation, Revision 23, 06/30/87, with ITC-88-1-26 dated 01/06/88, ITC 88-1-23 dated 01/05/88, ITC SP 417-10 dated 01/05/88, ITC SP 417-9 dated 01/03/88, and ITC 88-1-22 dated 01/04/88.

Some of the above procedures' final results had not been approved and accepted by the licensee at the time of the inspection. The test data were discussed with the responsible engineer. Upon completion of each test, the results had been forwarded to the corporate engineering offices in St. Petersburg for evaluation. Analysis was not performed on site. Data were taken for each motor and pump combination at several operational points. Data gathered were to be used to calculate a KW load on the emergency bus during accident conditions. Multiple tests were required for some loads to ensure enough data were available to determine, with reasonable assurance, that the KW data would cover the motor loads for the ES test condition (SP-417), and for the condition of a LOCA. Retest of PT-136 was performed due to realignment of the flow throttle valves in the SW system. The test method and data for each test were reviewed by the inspector onsite and discussed later with the engineers in St. Petersburg.

b. Onsite SW System Flow Measurements

PT-136 was used to obtain as-found flow rates for the emergency loads on the Service Water System. Throttle valves in the system were adjusted to insure adequate flow existed through the required components. Total system flow was reduced to lower the KW required for pumping the fluid. As-found data, taken prior to system adjustments, determined pump motor coolers and oil coolers to SWP-1A, SWP-1B, RWP-2B and EFP-1 had lower cooling water flow than the cooler design specification identified as rated flow. Other system flows typically exceeded their design values by a factor of two. The utility is evaluating the implications of both high and low flows

through the components. The staff said there have not been indications of higher than normal temperatures from those motors with low flow to their coolers. This review of the high and low flows will be tracked by IFI 88-05-02. In a review of the procedure with the test engineer, the inspector noted that final flow measurements were not available for all points. The system had been adjusted after the initial flow data (as-found condition) had been taken. Measurements were taken of the adjusted system. Then additional adjustments were made. These final adjustments would have resulted in some flows increasing and some decreasing. Those loads that would have had flows reduced were measured again and balanced to verify adequacy. Those flows that would have increased were not retested, due to time constraints.

Enclosure 2 of the test procedure has a column for the as-found flows labeled "Initial Flow." The column labeled "Retest Flow" is for the flows after balancing. These retest flows represent the flows at two different conditions, as discussed above. As the flows for components not retested after the final adjustment would be greater than those indicated in the retest column, the move is in the conservative direction. The test engineer told the inspector documentation describing this would be included in the final test package to insure the test chronology would be clear to a reviewer examining the documents at a later date.

In addition to the Service Water System (SW) flow being reduced, the Raw Water (RW) Pumps discharge valves were throttled to reduce RW system flow. Gilbert-Commonwealth provided engineering analysis of the heat removal effects of the reduced flows in SW and RW and determined the emergency heat loads could be removed at the new flows. In addition, a field problem report was written to evaluate the use of the butterfly valves for throttling the pumps flow. The cognizant supervisor indicated the butterfly valve would probably not be used long term in throttling service. The reduced flows resulted in KW reductions on the emergency busses.

Some large loads of SW are the Reactor Building Cooling Fans and Heat Exchangers. The inspector reviewed PM-139, HVAC Equipment Inspection and Service, Revision 5, 3/20/87, and Preventative Maintenance (PM) Control Sheet Number 162 to insure work was performed to maintain the airside of the coolers in a clean condition to provide good heat removal at the lower water flows. The PM was most recently completed October 13, 1987.

#### c. Configuration Control

Changes to the bus loads, such as additional loads being added, reconfiguration of swing loads or increase in required pump flows, would impact the load analysis for the bus. Controls must be in place to insure bus loads are not increased without prior engineering



evaluation. The staff indicated that the controls would be provided through procedure changes, administrative controls and through training. Licensing is to provide the inspector written confirmation of programs discussed during this inspection.

The inspector reviewed the following procedures to verify throttle valve controls in effect for the SW system and RW system:

OP-408, Nuclear Services Cooling System, Rev. 52, 10/29/87 and changes through IC-OP-408-17, dated 12/31/87

SP-381, Locked Valve List (Position Verification of Locked Valves), Rev. 40, 12/11/87 and changes through IC-SP-381-10, dated 12/31/87

These procedures had the repositioned valves' new throttle values indicated in them.

d. Modification Testing (72701)

A review was made of modification work packages for shedding of specified loads off the diesel generator in the event of a loss of offsite power coincident with an Emergency Safeguards (ES) actuation. Modification Approval Record (MAR) T87-10-03-10, EDG-3A Emergency Load Shedding - Heat Tracing, decreases the load upon the EDG-3A Emergency Diesel Generator by automatically shedding the heat tracing load when ES actuation coincident with a 480 volt undervoltage condition occurs. MAR T87-10-05-01, EDG-3A Load Shedding - Chargers, install control circuits to automatically shed battery chargers DPBC-1A, 1C, and 1E under the condition of a loss of offsite power coincident with ES actuation. Both modification packages were written and installed as temporary modifications, however, a permanent correction to the problem that forced these modifications is being developed.

MAR Functional Test Procedure for MAR T87-10-03-01, T.P.1, was written and performed to verify that this modification of the Emergency Diesel Generator load shedding system operates per design. The procedure verified that all wiring installation was correct as demonstrated by continuity verification and that the installed equipment operated properly by functional testing.

The procedure adequately stated the test objectives, test description and acceptance criteria, and also specified references and special test equipment. Limits and precautions and prerequisite conditions were also specified. Allowances were made to record completion of procedural steps including independent verification when deemed appropriate. Attachments were included to provide a test log, observations of functional test operational exceptions, operations notifications, electrical equipment alignment checklist, and an equipment alterations log.

The procedure was approved by Quality Assurance and it also contained a review checklist for regulatory and safety documents, and approval of walkdown and system acceptance requirements, all of which were completed satisfactorily.

MAR Functional Test Procedure for MAR T87-10-05-01, T.P. 1A, was written and performed to verify this modification of the Emergency Diesel Generator load shedding of Battery Chargers operates per design. The procedure verified the wiring installation was correct and demonstrated by continuity verification and that the installed equipment operated properly as demonstrated by functional testing.

The procedure adequately stated the test objectives, test descriptions and acceptance criteria and also specified references and special test equipment. Limits and precautions and prerequisite conditions were also specified. Allowances were made to record completion of procedural steps, including independent verification when deemed appropriate. Attachments were included to provide a test log, observations of fundamental test operational exceptions, operations notifications, electrical equipment alignment checklist and an equipment alterations log.

The procedure was approved by Quality Assurance and it also contained a review checklist for regulatory and safety documents and approval of walkdown and system acceptance requirements.

Both of the above test procedures were completed satisfactorily with no exceptions. In addition, following completion of these tests and turnover to operations, Surveillance Procedure SP 417, which tests emergency starting of the diesel generator, was performed and again verified proper operation of the modified components. Based upon the review of the modification packages and testing procedures, no violations or deviations were observed.

e. Engineering Review at Corporate Engineering Offices

The inspectors performed a review of the engineering process and calculations performed by the engineers at the St. Petersburg engineering offices.

For the KW analysis the process of error correction of the flow and the KW data using the calibration data of the test equipment was reviewed. The method of using regression analysis to obtain values for data points that had to be interpolated or extrapolated was reviewed. The inspector's sensitivity analysis on the emergency feed pump data's regression analysis indicated pump curve data would be more dependable than the interpolated data. The utility revised its calculations to reflect this observation. The calculations reviewed followed good engineering practice with conservatism included in the analysis. Final calculations will be available in late February.

When plotting the head-flow curve for the Reactor Building Spray Pump, BSP-1A, the inspector noted a large discrepancy between the manufacturer's curve and the test data. Preliminary calculations performed during the inspection by the utility staff indicated the pump would be operable, based upon other pump head-flow data obtained the following week during a ASME Section XI test. There was also a large discrepancy between the test data performed several days apart. The final question of pump operability and an explanation for the discrepancy between the manufacturers curve and the test data will be tracked by URI 88-05-01.

The inspectors also discussed the results of the flow balance with representatives from both the licensee and Gilbert-Commonwealth. The concern about possible misuse of the "Retest Flow" values discussed earlier was expressed to the engineering staff. The inspectors reviewed the 10 CFR 50.59 analysis for the repositioning of the service water and raw water butterfly valves used to throttle flow. The analysis addressed only the issue of adequate flow provided to cool required loads.

It was determined that the flows provided as the design values in PT-136 for the components were based upon the purchase specifications, bill of material, or manufacturer's data sheets for each heat exchanger. The original minimum design design numbers were not used. An analysis is in progress using a node by node calculation method to model the SW system. This model will be confirmed using test data and will be used to verify operation at greater than 85°F raw water temperature. An assumption is being made that the heat exchanger's efficiency has not changed from the original analysis. The code will also use the original design fouling factors.

f. Open Items List (OIL)

The status of the following OIL items was reviewed as part of the inspection:

Inspector Followup Item (IFI) 50-302/85-32-02, Establish Technical or Statistical Bases for the Rejection of Data.

IFI 50-302/85-32-03, Application and Implementation of the Chi-Squared Test for Source Range Neutron Monitors.

IFI 50-302/87-38-02, Review of Licensee's Evaluation to Confirm that the Liner Weld Channels are Equivalent to the Containment Liner.



## (1) IFI 50-302/85-32-02

A review was performed of PT-100, Controlling Procedure for Precritical Testing, Revision 13, 12/22/87. Changes were made to Revision 8 to the procedure on 2/4/86 by a procedure change. These changes included statistical rejection criteria for values of Reactor Coolant (RC) temperature prior to calculation of average RC temperature. The changes are still incorporated in Revision 13 of the procedure, which was in use at the time of the inspection. Discussions with the Reactor engineer responsible for the incorporation of the change indicated the reactor engineering group is using statistical methods wherever a method for rejection of data is required. This item is closed.

## (2) IFI 50-302/85-32-03

A review was performed of PT-110, Controlling Procedure for Zero Power Testing, Revision 12, 12/22/87. Changes had been made to Revision 9 of the procedure by a procedure change signed 1/31/86. The procedure change incorporated a data test based upon Chauvenet's criterion for the count rate. In addition, a Chi-squared test was included to verify source range count rates represented a Poisson distribution about a point. The changes are still incorporated in Revision 12 of the procedure, which was in use at time of the inspection. This item is closed.

## (3) IFI 50-302/87-38-02

The licensee has completed a review of the construction and status of test channels used for the containment integrity testing. In a letter to the Nuclear Regulatory Commission dated December 22, 1987, the licensee stated that its review determined that containment integrity will be maintained during the Design Basis Loss of Coolant Accident with the channels in either the vented or inverted condition. Since the conclusion reached by the licensee does not completely address the area of concern stated in the open item, this item remains open pending submission of additional information by the licensee and further evaluation by NRC staff.