



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

Report No.: 50-302/88-19

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

Docket No.: 50-302/88-19

License No.: DPR-72

Facility Name: Crystal River 3

Inspection Conducted: June 27 - July 1, 1988

Inspector: M. D. Hunt M. D. Hunt 7/28/88  
 M. D. Hunt Date Signed

Team Members  
 P. J. Fillion  
 M. N. Miller

Approved by: T. E. Conlon T. E. Conlon 7/28/88  
 T. E. Conlon, Chief Date Signed  
 Plant Systems Section  
 Engineering Branch  
 Division of Reactor Safety

SUMMARY

Scope: This routine, announced inspection was in the areas of the licensee's conformance to Regulatory Guide (RG) 1.97.

Results: In the areas inspected, violations or deviations were not identified.

In general the licensee has performed the installation and modifications of instrumentation needed to comply with RG 1.97. There were exceptions noted in the Safety Evaluation Report (SER) issued June 16, 1987, as well as items identified during this inspection which are discussed in this report

The licensee had recognized the need for updating drawings after completion of modifications (as built) and developing instrumentation loop drawings but had placed no priority to the effort. During the inspectors' review of RG 1.97, discussions were held regarding the updating and development of drawings. The licensee was responsive to the inspector's concerns regarding the need to commit more engineering effort to this task and committed to expand this effort.

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## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

- C. Doyel, Manager, Nuclear Mechanical/Structural Engineering
- E. E. Freats, Supervisor, Nuclear Licensing
- \*E. M. Good, Senior Nuclear Licensing Engineer
- \*R. Iwachow, Senior Nuclear I&C Engineer
- \*W. N. Johnson, Nuclear Modification Specialist
- \*P. F. McKee, Director, Plant Operations
- \*V. R. Roppel, Manager, Maintenance and Outage
- \*W. L. Rassfeld, Manager, Nuclear Compliance
- S. H. Slearns, Lead I&C Engineer
- \*D. Shook, Manager, Nuclear Electrical/I&C Engineering
- J. E. Uhrink, Nuclear Engineer/I&C Engineering
- E. Welch, Manager, Nuclear Electrical/I&C Engineering Services
- \*R. C. Widell, Director, Nuclear Operations Site Support
- \*M. Williams, Nuclear Regulatory Specialist
- K. Wilson, Manager, Nuclear Licensing

Other licensee employees contacted during this inspection included craftsmen, engineers, operators, mechanics, security force members, technicians, and administrative personnel.

#### NRC Resident Inspector

\*J. E. Tedrow

\*Attended exit interview

Acronyms and initialisms used throughout this report are listed in the last paragraph.

2. The purpose of this inspection was to verify that the licensee has an instrumentation system for assessing variables and systems during and following an accident, as discussed in Regulatory Guide (RG) 1.97. Under accident conditions it is necessary that the operating personnel have (1) information that permits the operator to take preplanned actions to accomplish a safe plant shutdown; (2) determine whether the reactor trip, Engineered Safety-Feature Systems (ESFS), and manually initiated safety and other systems important to safety are performing their intended functions; and, (3) provide information to operators that will enable them to determine the potential for a breach of the radiation release barriers or if a breach has already occurred. It is essential that indications be provided to the operator if the barriers are being challenged that will allow the release of radioactive materials. For this reason multiple instruments with overlapping ranges may be necessary. The required instrumentation must be capable of surviving the accident environment for the length of time its operability is required. It is desirable components continue to function following seismic events.

As a result, three types of variables have been specified that serve as guides in defining criteria and the selection of accident-monitoring instrumentation. The types are: Type A - Those variables that provided information needed to permit the control room operating personnel to take specified manual actions for which no automatic control is provided and that are required for safety systems to accomplish their functions for design basis accident events. Type B - Those variables that provide information to indicate whether plant safety functions are being accomplished. Type C - Those variables that provide information to indicate the potential of barriers being breached or the actual breach of barriers out fission product release. Type D - Those variables that provide information to indicate operation of individual safety systems and other systems important to safety. Type E - Those variables to be monitored in determining the magnitude of the release of radioactive materials and for continuously assessing such release.

The design and qualification criteria are separated into three separate categories that provide a graded approach to requirements depending on the importance to safety of the measurement of a specific variable. Category 1 provides the most stringent requirements and intended for key variables. Category 2 provides less stringent requirements and generally applies to instrumentation designated for indicating system operating status. Category 3 is intended to provide requirements that will ensure that high-quality off-the-shelf instrumentation is obtained and applies to backup and diagnostic instrumentation. A key variable is that single variable (or minimum number of variables) that most directly indicates the accomplishment of a safety function (Types B and C), or the operation of a safety system (Type D), or radioactive material release (Type E). Type A variables are plant specific and depend on the operations that the designer chooses for planned manual actions. Inspection of Categories 1 and 2 equipment was performed as described below.

a. Category 1 Instrumentation

The instrumentation listed in the category 1 Table, of this section, was examined to verify that the design and qualification criteria of RG 1.97 had been satisfied. The instrumentation was inspected by reviewing drawings, procedures, data sheets, other documentation, and performing walkdowns for visual observation of the installed equipment. The following areas were inspected:

- (1) Equipment Qualification - The EQ Master Equipment List and the Q-List were reviewed for confirmation that the licensee had addressed environmental qualification requirements for class 1E equipment.
- (2) Redundancy - Walkdowns were performed to verify by visual observation the the specified instruments were installed and separation requirements were met. In addition Loop drawings were reviewed, to verify redundancy and channel separation.

- (3) Power Sources - Loop drawings were reviewed to verify the instrumentation is energized from a safety-related power source.
- (4) Display and Recording - Walkdowns were performed to verify by visual observation that the specified display and recording instruments were installed. Loop drawings were reviewed to verify there was at least one recorder in a redundant channel and two indicators, one per division (channel) for each measured variable.
- (5) Range - Walkdowns were performed to verify the actual range of the indicator/recorders was as specified in RG 1.97 or the SER. Review of calibration procedures verified sensitivity and overlapping requirements of RG 1.97 for instruments measuring the same variable.
- (6) Interfaces - The loop drawings and Q-List were reviewed to verify that safety-related isolation devices were used when required to isolate the circuits from non safety systems.
- (7) Direct Measurement - Loop drawings were reviewed to verify that the parameters are directly measured by the sensors.
- (8) Service, Testing, and Calibration - The maintenance program for performing calibrations and surveillances was reviewed and discussed with the licensee. Calibration and surveillance procedures and the latest data sheets for each instrument were reviewed to verify the instruments have a valid calibration. In several instances, the post modification testing was used to verify calibration.

CATEGORY 1 TABLE

| <u>Variable</u>                                    | <u>Instrument No.<br/>(Channel)</u>  | <u>Instrument<br/>Loop Drawings</u> |
|--|--|-------------------------------------|
| 1. RCS<br>Pressure                                 | RC-158 PT (A)<br>RC-159 PT (B)<br>RC-158 PIR<br>RC-158 PI2 (A)<br>RC-159 PI2 (B) | 205-047<br>Sheet RC-02              |
| 2. Reactor Vessel (This system is not in service.) | of RV Level in Section 2.c   | See discussion                      |
| 3. Borated water<br>Storage Tank                   | DH-007-LT 1 (A)<br>DH-007-LIR (A)<br>DH-037-LT (B)<br>DH-037-LT (B)              | 205-021<br>Sheet DH-03              |

| <u>Variable</u><br>(cont'd) | <u>Instrument No.</u><br>(Channel)   | <u>Instrument</u><br><u>Loop Drawings</u>   |
|-----------------------------|--|---|
| 4. Steam Geierator<br>Level | SP-017-LT (A)<br>SP-017-LIR<br>SP-018-LI1<br>SP-018-LT (A)<br>SP-025-LT (A)<br>SP-025-LIR<br>SP-026-LT (B)<br>SP-026-LI1<br>SP-021-LT(A)<br>SP-021-LIR & LI<br>SP-022-LT (B)<br>SP-022-LI1 | 205-074<br>Sheet SP-01<br>thru SP-04        |
| 5. Steam Generator          | SP-029-LT (A)<br>SP-029-LIR and LI<br>SP-030-LT(B)<br>SP-030-LIR and LI  |   |
| Steam Generator<br>Pressure | MS-106 PT (A)<br>MS-107 PT (B)<br>MS-110 PT (A)<br>MS-111 (B)<br>MS-106-PIR<br>MS-106-PI<br>MS-107-PIR<br>MS-007-PI<br>MS-110-PIR<br>MS-110-PI<br>MS-111-PIR<br>MS-111-PI                  | A & D 205-029<br>Sheet MS-01<br>Sheet MS-02 |
| Pressurizer<br>Level        | RC-001-LT 1 (A)<br>RC-001-LI 3 (B)<br>RC-001-LIR 1<br>RC-001-LIR 3<br>RC-001-LI 1<br>RC-001-LT 3   | 205-047<br>Sheet RC-01                      |
| Aux FW Flow                 | EF-23-FT (A)<br>EF-23-FI<br>EF-25-FT (A)<br>EF-25-FI<br>EF-24-FT (B)<br>EF-24-FT<br>EF-26-FT (B)<br>EF-26-FI   | 205-026<br>Sheet EF-01 & 02                 |

| <u>Variable</u><br>(cont'd)                                    | <u>Instrument No.</u><br>(Channel)   | <u>Instrument</u><br><u>Loop Drawings</u> |
|--|--|---|
| 4. Steam Generator   | SP-017-LT (A)  | 205-074                                   |
| Condensate<br>Tank Level<br>(Emergency<br>Feedwater<br>Supply) | EF-098-LT (A)<br>EF-098-LI<br>EF-099-LT (B)<br>EF-099-LI   | 205-026<br>Sheet EF-05                    |
| Containment<br>Sump Level<br>(Flood Level)                     | WD-303B-LT (A)<br>WD-303-LR<br>WD-303B-LI<br>WD-304B-LT (B)<br>WD-304-LR<br>WD-304-LI  | 205-060<br>Sheet WD-03                    |
| RCS Hot Leg<br>Temperature                                     | RC-004A-TE-1 (A)<br>RC-005A-TE-2 (A)<br>RC-004A-TIR1<br>RC-005A-TI<br>RC-004B-TE4 (B)<br>RC-005B-TE4 (B)<br>RC-004B-RI 4-1                     | 205-047<br>Sheet RC-04- & 10              |
| Containment<br>Pressure  | BS-016-PT (A)<br>BS-016-PI<br>BS-017-PT (B)<br>BS-017-PI<br>BS-090-PT (A)<br>BS-090-FI<br>BS-090-PR<br>BS-091-PT (B)<br>BS-091-PI<br>BS-091-PR | 205-009<br>Sheet BS-01                    |

b. Category 2 Instrumentation

The instrumentation listed in the Category 2 Table, of this section, was examined to verify that the design and qualification criteria of RG 1.97 had been satisfied. The instrumentation was inspected by reviewing drawings, procedures, data sheets, other documentation, and performing walkdowns for visual observation of the installed equipment. The following areas were inspected:

- (1) Equipment Qualification - The EQ Master Equipment List and the Q-List were reviewed for confirmation that the licensee had addressed environmental qualification requirements for Class 1E equipment.

- (2) Power Sources - Loop drawings were reviewed to verify the instrumentation is energized from a high quality or a safety-related power source.
- (3) Display and Recording - Walkdowns were performed to verify by visual observation that the specified display and recording instruments were installed. Loop drawings were reviewed to verify there was a least one recorder, where required by RG 1.97, in a redundant channel and two indicators, one per division (channel) for each measure variable.
- (4) Range - Walkdowns were performed to verify the actual range of the indicators/recorders was as specified in RG 1.97 or the SER. Review of calibration procedures verified sensitivity and overlapping requirements of RG 1.97 for instruments measuring the same variable.
- (5) Interfaces - The loop drawings and Q-List were reviewed to verify that safety-related isolation devices are used when required to isolate the circuits from computer systems (Not safety-related).
- (6) Direct Measurement - Loop drawings were reviewed to verify that the parameters are directly measured by the sensors.
- (7) Service, Testing, and Calibration - The maintenance program for performing calibrations and surveillances was reviewed and discussed with the licensee. Calibration and surveillance procedures and the latest data sheets for each instrument were reviewed to verify the instruments have a valid calibration. In several instances, the post modification testing was used to verify calibration.

CATEGORY 2 TABLE

| <u>Variable</u>                                   | <u>Instrument (Channel)</u> | <u>Loop Drawing</u>    |
|---|-----------------------------|------------------------|
| Containment Sump<br>Water Level (Narrow<br>Range) | WD-301-LT (A)               | 205-060<br>Sheet WD-01 |
|   | WD-301-LI                   |                        |
|   | WD-301-LR                   |                        |
|   | WD-302-LT (B)               |                        |
|   | WD-302-LI                   |                        |
|   | 302-LR                      |                        |
| Containment Atmosphere                            | AH-536-TF                   | 205-005<br>Sheet AH-01 |
|   | AH-537-TE                   |                        |
|   | AH-538-TE                   |                        |
|   | AH-539-TE                   |                        |
|   | AH-536-TIR                  |                        |

| <u>Variable</u><br>(cont'd)                     | <u>Instrument (Channel)</u>  | <u>Loop Drawing</u>         |
|---|--|-----------------------------|
| Containment Spray<br>Flow                       | BS-001-DPT1 (A)<br>BS-001 FI1<br>BS-001 DPT2 (B)<br>BS-001 FI2   | 803 4036E                   |
| RHR System<br>Flow                              | DH-001-FT3 (A)<br>DH-001-FI3-1<br>DH-001-FT4 (B)<br>DH-001-FI4-4   | 205-021<br>Sheet DH-01-02   |
| Low Pressure<br>Injection Flow                  | Same as RHR Flow by valve positioning<br>DH-002-TE1 (A)  | 205-021                     |
| RHR Heat<br>Exchanger Outlet<br>Temperature     | DH-002-TI1 and TE2 (B)<br>DH-002-TI2   | Sheet DH-04                 |
| Accumulator Tank<br>Isolation Valve<br>Position | Indicating<br>Lights from<br>MOV position Limit Switches<br>CFV-5 & CFV-6  | 208-013<br>Sheet CF-01      |
| High Pressure<br>Injection Flow                 | MU-023-DPT8 A<br>MU-023-FI8-1<br>MU-023-DPT6 (B)<br>MU-023-FI6-1<br>MU-023-DPT7<br>MU-023-FI7-1<br>MU-023-DPT5<br>MU-023-FI5-1 | 205-041<br>Sheet MU-01 T004 |
| RCS Relief Valve<br>Monitoring                  | RC-160-ME 1 RE-160 MI1<br>RC-160-ME 2 RE-160-MI2<br>RC-160-ME 3 RE-160-MI3   | 205-047<br>Sheet RC-17      |

c. Discussion

The licensee, Florida Power Corporation (FPC), was requested by generic Letter 82-33 to provide a report to the NRC describing how the post-accident monitoring instrumentation meets the guidelines of Regulatory Guide (RG) 1.97 as applied to emergency response facilities. The licensee's response to RG 1.97 was provided by letters dated August 21, 1984, November 15, 1985, and March 27, 1986.

As the result of a detailed review and technical evaluation of the submittals, the NRC issued the Safety Evaluation Report (SER) by letter dated June 16, 1987. The evaluation identified an exception for the instrumentation for monitoring the status of the pressurizer heaters.

FPC submittal a revised set of variable sheets by letter dated March 21, 1988, which stated

- (1) FPC will install environmentally qualified current measurement instrumentation to monitor the status of the pressurizer heaters during an emergency.
- (2) FPC will install valve position indication for the Main Steam Safety/Relief Valves and the Atmospheric Dump Valves.
- (3) FPC is still planning to complete the "on demand" displays for the Reactor Building High Range Radiation Monitors and the sump level variables into Recall by September 1988.

This will be accomplished by the end of Refuel VII scheduled for Fall 1989.

During the walkdowns and review of documents and drawings, the following three Inspector Followup Items (IFIs) were identified which will require further evaluation by the NRC to determine acceptability:

IFI 302/88-19-01, No Specific Identification for Instruments on the Control Boards. There is no special designation for the operator to easily discern which instruments are intended for RG 1.97 under accident conditions. This identification for type A, B, and C instruments designated as Categories 1 and 2 is characteristically identified by specially colored name plates. The licensee advised that the Emergency Operation Procedure (EOP) do not specify meters, indicators recorders ... etc by name plate. The EOP's are system and symptom oriented and the operator is required to know the control board location of the system of which the specific meter is a part. The inspector was advised that the control board labeling would be addressed in a control board labeling review.

IFI 302/88-19-02, Verify that Containment Atmospheric Temperature Recorder is Located Properly. The March 21, 1988, submittal regarding the containment atmospheric temperature states that this Category 2 variable is recorded in the control room. It was assumed by the reviewers that this statement mean the recorder is located on the front on the main control board. The recorder is located on the back of the control board. This location will be evaluated further.

IFI 302/88-19-03, Verify Adequacy of Emergency Power Source Indication. The licensee has installed indicating lights on the control board to indicate the status of standby power. There are RED and GREEN indication lights to indicate the failure to Inverter 3A, 3B, 3C, and 3D; 250 VDC battery 3A and 3B; 4160 Volt Bus 3A and 3B; 480 volt bus 3A and 3B; and Diesel Generator A and B. While a light may indicate that power is available or not available it in no way

indicates the quality of power. Since a relay is make or break type component, a determining voltage condition would not be observed until the voltage had reached the operation point of the relay or sensing device.

These items will be examined further by the staff to determine the acceptability of each application.

It should be noted that the licensee has installed level transmitters to measure the reactor vessel level. The taps are located between the reactor coolant hot and cold legs, and results in a measurement of flow when there is flow through the system. The NRC has not given the licensee the necessary criteria to place these level transmitters in service.

Within the area examined, no violation or deviations were identified.

### 3. Exit Interview

The inspection scope and results were summarized on July 1, 1988, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection items and concerns. Proprietary information is not contained in this report.

### 4. Acronyms and Initialisms

|              |   |                                   |
|--------------|---|-----------------------------------|
| AUX FW (AFW) | - | Auxiliary Feedwater (System)      |
| DPT          | - | Differential Pressure Transmitter |
| FI           | - | Flow Indicator                    |
| FT           | - | Flow Transmitter                  |
| LI           | - | Level Indicators                  |
| LIR          | - | Level Indicating Recorder         |
| LR           | - | Level Recorder                    |
| LT           | - | Level Transmitter                 |
| PI           | - | Pressure Indicator                |
| PIR          | - | Pressure Indicating Recorder      |
| PR           | - | Pressure Recorder                 |
| PT           | - | Pressure Transmitter              |
| RHR          | - | Residual Heat Removal (System)    |
| RC           | - | Reactor Coolant                   |
| RCS          | - | Reactor Coolant System            |
| RG           | - | Regulator Guide                   |
| SER          | - | Safety Evaluation Report          |
| TE           | - | Temperature Element               |
| TI           | - | Temperature Indicator             |
| TIR          | - | Temperature Indicating Recorder   |
| TI           | - | Temperature Transmitter           |