



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

Report Nos.: 50-250/90-42 and 50-251/90-42

Licensee: Florida Power and Light Company  
P. O. Box 14000  
Juno Beach, FL 33408-0420

Docket Nos.: 50-250 and 50-251

License Nos.: DPR-31, DPR-41

Facility name: Turkey Point 3 and 4

Inspection Conducted: December 3-5, and 10-18, 1990, and January 7, 1991

Inspector: G. A. Hallstrom 1-17-91  
G. A. Hallstrom Date Signed

Approved by: F. Jape 1/22/91  
F. Jape, Chief Date Signed  
Test Programs Section  
Engineering Branch  
Division of Reactor Safety

SUMMARY

Scope:

This routine, announced inspection examined the programmatic controls and quality documentation associated with scheduled preoperational tests for the 4A & 4B Emergency Diesel Generators (EDG's) and observed tests conducted for the 4B EDG through completion of diagnostics, support systems checks, and the initial 24 hour endurance run. Observation of welding activities for various safety related supports was also completed.

Results:

Timely and competent actions were generally observed for most activities inspected, particularly those taken by startup personnel (see details in paragraph 2.b.(2) regarding loss of an AC supply circuit). Construction backfit welding activities were also satisfactory with exception of The NCV listed below. The timely and effective licensee response to the NCV also demonstrated good management commitment and involvement. However, some potential for loss of control of construction activities was identified by the loss of the AC supply circuit. This potential was noted in the exit interview along with a caution that conformance to procedures be maintained. Vice



President Plunkett mentioned FP&L's intent to require specific conformance to procedures during outage activities.

One NCV was identified: Loss of Control of Quality Documentation on Safety Related Welds - paragraph 3.c.

One inspector followup item was identified: Potential Early Failure of EDG Pilot Exciter Regulator Components - paragraph 2.b.(1).

Two unresolved items were identified: Potential for Inadequate Control of Construction Loads Causing Loss of AC Supply Circuit During Initial EDG 4B 24 Hour Endurance Run - paragraph 2.b.(2), and Potential Inadequate M-K Relay Design for EDG Solenoid Valves - paragraph 2.b.(3).

The EDG 4B 35 consecutive start sequence testing was not observed during this inspection due to problems associated with the above items which delayed the start of this testing until after the inspection time frame. A followup telephone call from licensee personnel on January 7, 1991, provided additional details but not sufficient information to resolve the URIs listed above.

## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

- \*T. Abbatiello, QA Supervisor - PMON
- \*J. Arias, Jr., Technical Assistant to Vice President
- !\*P. Banaszak, Lead Electrical/I&C System Engineer
- \*J. Broadwater, Startup EDG Preoperational Testing Manager
- \*W. Brown, Site Construction Project Manager
- !\*W. Busca, Electrical Staff Engineer
- J. Estop, Maintenance Electrical Supervisor, Second Shift
- \*T. Finn, Assistant Operations Superintendent
- D. Fletcher, Site Welding Engineer, Second Shift
- !R. Grass, Nuclear Engineer, Corporate
- \*P. Hansen, Lead Mechanical Engineer, Corporate
- B. Hamilton, Construction Electrical Superintendent, Second Shift
- J. Hughes, Site Welding Engineering Supervisor, Second Shift
- \*L. Huenniger, Startup Superintendent
- !R. Hornak, EDG Startup Test Director
- \*D. Jenkins, Lead Electrical Engineer, Corporate
- L. Kennedy, Lead Electrical Engineer, EDGs, Corporate
- \*J. Knorr, Regulatory Compliance Supervisor
- !\*R. Kundalkar, Electrical Enhancement Project-Engineer
- !J. Marchese, Project Construction Supervisor
- J. Martellaro, EDG Startup Test Engineer
- G. Morrow, EDG Startup Test Director
- J. Muskopf, EDG Startup Test Engineer
- G. Ondriska, EDG Startup Joint Tests Chairman
- \*L. Pearce, Plant Manager
- \*T. Plunkett, Vice President
- J. Pocus, EDG Startup Electrical Test Engineer
- !\*D. Powell, Site Licensing Superintendent
- !G. Rodgers, Site Welding Supervisor
- \*R. Rose, Design Control Supervisor
- !\*D. Sisk, Compliance Engineer
- G. Shrader, Quality Engineering Supervisor
- W. Williams, Parts Procurement Manager
- G. Winters, EDG Systems Engineer
- D. Weeks, Site Mechanical Engineer
- \*A. Zielonka, Technical Department Supervisor

Other licensee employees contacted during this inspection included engineers, technicians, operators and office personnel.

### Other Organizations

- H. Bourque, Ebasco Engineering Services (EES), Site Project Engineer
- P. Dillon, EES, Lead Startup/Operations Interface Engineer
- !\*R. Gonzalez, EES, I&C Engineering Supervisor
- !J. Giovas, Bechtel Power Corporation (BPC), Construction Supervisor
- F. Huber, EES, EDG Startup Support Engineer
- S. Overland, EES, EDG Startup Support Engineer

### NRC Resident Inspectors

- !\*R. Butcher, Senior Resident Inspector
- !\*G. Schnebli, Resident Inspector
- !\*L. Trocine, Resident Inspector

### NRC Office of Nuclear Reactor Regulation Personnel

- G. Edison, Licensee Project Manager (outgoing)
- R. Auluck, Licensee Project Manager (incoming)

- \*Attended exit interview on December 18, 1990.
- !Participated in January 7, 1991, telephone communication.

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

## 2. Preoperational Testing of 4A & 4B EDGs

One objective of the TPN Electrical Enhancement Program was improved capability, reliability and Unit specificity of EDGs. Activities scheduled to meet this objective include installation of two new upgraded Unit 4 EDGs (GM EMD 20-645F4B versus the present GM EMD 20-645E4), attendant support facilities, and necessary modifications to the idle start circuits of present EDGs. The present EDGs will be dedicated to Unit 3.

### a. Programmatic Controls (70300 & 70400)

The inspector examined programmatic procedures and associated documentation as listed below to ensure that controls over EDG preoperational testing had been developed in accordance with licensee commitments and regulatory requirements.

-October 19, 1988, letter (File L-88-454) from Mr. W. F. Conway to NRR transmitting details on Emergency Power System Enhancement Project (EPSEP).

-August 10, 1989, letter from Mr. G. Edison, NRR, to Mr. C. O. Woody transmitting the SER for the TPN EPSEP.



- TPN Units 3 & 4 EPSEP Design Report, Supplement No. 0, Revision 1, dated May 18, 1990, (File JPN-PTN-SENJ-90-043, Rev. 0).
- TPN Units 3 & 4 EPSEP Testing Report, Revision 1, dated May, 1990, (File JPN-PTN-SENJ-90-058, Rev. 0).
- PC/M No. 87-263, New EDGs Installation, Rev. 11, dated October 24, 1990.
- Preoperational Procedure 0804.037, dated November 27, 1990, EDG 4A System Preoperational Test Phase I
- Preoperational Procedure 0804.098, dated November 27, 1990, EDG 4B System Preoperational Test Phase I

During the above examination the inspector noted that preoperational tests of the idle start modifications to existing Unit 3 EDGs were removed from the EPSEP by Revision 1, of the EPSEP testing report. The inspector requested details regarding the RG 1.108 type preoperational testing planned for unit 3 EDGs and specifics of NRR concurrence with the planned tests. Licensee personnel responded that idle start modification testing specifics had not been discussed with NRR since FP&L considered these changes to be 10 CFR 50.59 type modifications; i.e., not requiring RG 1.108 type certification testing. Specific details were that RG 1.108 tests for unit 3 diesels would be limited to 23 consecutive starts since:

- RG 1.108 provides guidelines for pre-service and inservice testing of EDGs. There are no specific guidelines for post modification testing.
- RG 1.108 specifies that 23 consecutive starts be performed without failure for the pre-service test if the plant has 4 EDGs of the same design.
- The primary component being replaced by the idle start modifications is the governor. The governors of all 4 EDGs will be of the same design.
- The 23 consecutive starts provides a conservative level of testing consistent with the guidelines of RG 1.108 for extent of the modifications being performed.

The inspector provided the above details to NRR personnel during the inspection. NRR personnel indicated that they would request additional details from the licensee concerning this matter. The inspector was unable to review specifics regarding post modification tests for the idle start modification, since the necessary PC/M was not issued. NRC review of this PC/M will be completed in subsequent inspections.

The inspector also noted that for the new unit 4 diesels RG 1.108 requirements to demonstrate load sequencing capability immediately after completing the 24-hour endurance run would not be demonstrated

after the initially scheduled 24 hour run. Licensee personnel agreed and informed the inspector that this test must be repeated later in the program to satisfy RG 1.108 requirements. The additional challenge to the EDG (2 hours at 110% load) was considered an acceptable tradeoff for an early demonstration of endurance capability.

The inspector further noted PC/M No. 87-263 requirements that the EDG must be considered TS inoperable (by definition) if the DODT high level alarm is actuated. Licensee personnel responded that this was an M-K requirement due to the vendor's concern that fuel could seep into the cylinder (through potentially open injectors) during engine-off conditions and then cause piston damage during a subsequent start. Therefore PC/M No. 87-263 also required that operability be re-established by draining the DODT to clear the alarm and rotating the engine with the barring device to assure removal of any excess fuel which might have accumulated. After review of the injector design drawings, the inspector noted that fuel seepage via gravity head through the 1300 pound injector check valve was unlikely. However, due to the present PC/M requirements a valid high DODT alarm annunciation during the testing would constitute lack of EDG operability by definition and must constitute an automatic test failure.

b. Observation of EDG 4B Preoperational Tests (61701)

The inspector observed over 50% of EDG 4B preoperational test activities including completion of diagnostic tests (procedure 0804.098 steps 9.1.1.1 through 9.1.475), air compressor system checks (steps 9.2.1 through 9.2.34), radiator fan control checks (step 9.3.1 through 9.3.37.30), fuel oil system checks (steps 9.4.1.1 through 9.4.34), EDG space heater checks (steps 9.5.1.1 through 9.5.8), lube oil system checks (steps 9.6.1.1 through 9.6.74), EDG control demonstration (steps 9.7.1 through 9.7.48), and 24 hour endurance run (steps 9.8.1.1 through 9.8.22). Portions of Sections 9.7 and 9.8 were performed out of sequence or repeated entirely due to problems reported below.

Problems associated with the above tests and resultant NRC followup items were as follows:

(1) Early Failure of EDG Pilot Exciter Regulator Components

Early failures of the EDG 4A & 4B pilot exciter regulators were identified. The pilot exciter regulators provide EDG black start capability as well as an alternate source of DC control power. These failures had not been identified during earlier tests since the EDGs will self-excite due to residual magnetism within the 15 second TS limit. However this time is longer than the vendor guaranteed 10 seconds and residual magnetism (and therefore black start capability) could be substantially lost





during a long term overhaul teardown. The normal surveillance tests as presently written will not identify this particular failure since a chart recorder is required to observe the excitation response and a test for loss of alternate DC control power is not a normal surveillance test. The test for loss of alternate DC control power was scheduled during preop testing only (step 9.7.32 of procedure 0804.098).

An earlier recognized design discrepancy with the field flash alarm circuit (CRN No. A508 issued December 12, 1990) was in process of correction and contributed to the lack of pilot exciter failure identification before conducting step 9.7.32. CRM A508 identified that the field flash alarm would annunciate on field flash failure and then reset even with the failure condition present. Completion of step 9.7.32 caused an unanticipated EDG challenge since loss of DC control power caused attendant loss of electrical governor and most EDG instruments. The EDG immediately accelerated to its mechanical governor limit of 910 RPM but did not accelerate sharply enough to cause an overspeed trip (i.e.; an automatic test failure). A similar failure of the EDG 4A pilot exciter was discovered during the subsequent attempt to use the 4A exciter circuit board as a replacement part. Both EDGs had been operated for less than 70 hours when the failures were discovered. The licensee is conducting a root cause analysis on these failures and the failed circuit boards have been returned to M-K for further analysis. There is some possibility that the failures occurred through licensee tests (meggering) which were completed after receiving the EDGs on site. The licensee's examination of this matter is not yet complete. The inspector informed licensee personnel that this matter would be identified as Inspector Followup Item 50-250,251/90-42-01, Potential Early Failure of EDG Pilot Exciter Regulator Components.

(2) Loss of AC Supply Circuit During Initial EDG 4B 24 Hour Endurance Run

An unanticipated loss of AC supply voltage to the EDG building (supplied via MCC 4K, LC 3F, and 4160 bus 3C) was experienced on December 15, 1990, after completion of approximately 12 hours of the 24 hour endurance run. Loss of all building lighting as well as EDG cooling capability occurred through loss of AC supply to cooling fan motors. The fans will be a normal EDG load when construction modifications are complete but were temporarily supplied as a building load through MCC 4K. The resultant forced shutdown (from 100% load to dead stop) provided a further challenge to the EDG since the normal 20 minute cooldown period at idle speed was bypassed and the testing time at 110% load was required to be repeated. However, timely and



competent actions by startup personnel (removal of 4A EDG battery loads) prevented probable damage to turbocharger bearings which would have occurred on forced shutdown due to loss of the 4B DC powered oil soakback pump (from accelerated battery drainage with both EDGs on the temporary batteries).

The 24 hour endurance run was subsequently repeated successfully (steps 9.8.10 through 9.8.19 of procedure 0804.098).

Initial licensee examinations indicated that loss of MCC 4K could have indicated a loss of control of construction electrical loads since a Temporary System Alteration (TSA) Tag was not found on the faulted circuit breaker (CB 41508) as required by Administrative Procedure O-ADM-503, section 4.1. The fault appeared to have originated on a circuit (CB 41508) supplied by MCC 4G which was normally supplied by LC 4G and 4160 bus 4C. However, these loads were being temporarily supplied by 4160 bus 3C on December 15, 1990. Latest information from the licensee indicates that control of construction loads may not have been a factor in this failure. However, the licensee has not completed investigation of the matter. The inspector informed licensee personnel that this matter would be identified as Unresolved Item 50-250,251/90-42-02, Potential for Inadequate Control of Construction Loads Causing Loss of AC Supply Circuit During Initial EDG 4B 24 Hour Endurance Run.

(3) Inadequate M-K Relay Design for EDG Solenoid Valve

Failure of relay FOT controlling EDG fuel isolation solenoid valve SV-3434B occurred near the end of the EDG 4B 24 hour endurance run and provided additional complications as reported below. This unanticipated failure was identified after the high DODT level alarm annunciated soon after completing the 24 hour run. The alarm was found to be valid and the high day tank level had occurred when isolation valve SV-3434B remained open on relay FOT failure. As noted above, design documents (PC-M No. 87-263) state that this alarm is to be considered a TS operability failure as required by M-K. Therefore receiving the alarm during preop testing would constitute test failure. The more significant potential for relay failure with the valve closed (fuel starvation) would cause actual loss of operability even under emergency conditions. Examination of the relay after its failure identified overheating (contact points melted) as the failure mode. Subsequent examination of design documentation and field testing indicated that relay FOT was rated for a 125VDC application at around 2 amp max allowable but was subjected to an in-rush current of approximately 45 amp during change of state for SV-3434B. Licensee personnel indicated that M-K was solely responsible for the design error.



However, the licensee's initial review of the M-K relay design did not identify the discrepancy. Later communication on January 7, 1991, established that licensee review had identified two other cases of questionable design for EDG SV relays but that FP&L believes there is no generic concern. The licensee's examination of this matter is not yet complete. FP&L has requested that M-K review the analyses completed to date. The inspector informed licensee personnel that this matter would be identified as Unresolved Item 50-250,251/90-42-03, Potential Inadequate M-K Relay Design for EDG Solenoid Valves.

### 3. Construction Backfit Welding Activities (55050 and 55100)

During discussions with licensee personnel, the inspector was informed that most welding activities to be completed during the outage were associated with PC/Ms and would be completed as construction backfit welding activities.

#### a. Programmatic Controls

The inspector examined programmatic procedures and associated documentation as listed below to ensure that controls over construction backfit welding had been developed in accordance with licensee commitments and regulatory requirements.

- ASP-34, Preparation of Process Sheets and Installation Lists, Rev. 1, dated 11/30/89
- ASP-6, Control of Welding Special Processes, Rev. 7, dated 11/06/86
- M-3.45, General Welding Standard - Nuclear Piping and Components, Rev. 4, dated 2/25/89
- M-3.46, Weld Joint Details for Nuclear and Non-Nuclear Piping and Piping Components, Rev. 3, dated 4/28/87
- M-3.47, General Welding Standard - Non-Nuclear Piping and Components, Rev. 3, dated 2/25/89
- M-3.48, General Welding - Structural Steel, Rev. 4, dated 9/6/89
- M-3.51, Welding Requirements for Field Welds - Pipe and Structural, Rev. 2, dated 9/16/86
- WPS No. 5, Shielded Metal Arc Welding (P1 to P1), Rev 0, dated 8/18/83
- WPS No. 9, Shielded Metal Arc welding (P1 to P8), Rev 2, dated 12/22/89



- WPS No. 10, Shielded Metal Arc welding (P8 to P8), Rev 2, dated 9/12/85
- WPS No. 24, Gas Tungsten Arc & Shielded Metal Arc Welding (P1 to P1), Rev. 1, dated 8/18/83
- WPS No. 43, Gas Tungsten Arc Welding (open root) (P8 to P8), Rev. 5, dated 10/22/84
- WPS No. 68, Gas Tungsten Arc Welding (open root) (P1 to P8), Rev. 2, dated 8/18/83
- WPS No. 89, Gas Tungsten Arc Welding (open root) (P1 to P1), Rev. 0, dated 8/18/83
- WTS No. 2, Weld Repair Report Disposition, Rev. 2, dated 9/18/88
- WTS No. 3, Weld Material Control, Rev. 4, dated 3/18/88
- WTS No. 5, Welding Performance Qualification Requirements, Rev. 4, dated 12/8/89
- WTS No. 6, Welding Procedure Qualification Requirements, Rev. 2, dated 6/5/85
- WTS No. 10, Post Weld Heat Treatment, Rev. 0, dated 2/9/84  
Neither violations nor deviations were identified during the above review.

b. Observation of Welding

The inspector observed completion of a portion of safety related welds by construction backfit personnel as listed below:

<u>Support/Drawing No.</u>	<u>Weld No.-Size-Type</u>	<u>Welder ID No.</u>
A508-28-42-264	Tube St. to Embed-1/8"-fillet	TEDC
A508-28-42-265	Tube St. to Embed-1/8"-fillet	TEDC
A508-28-42-266	Tube St. to Embed-1/8"-fillet	TEDC
A508-28-42-267	Tube St. to Embed-1/8"-fillet	TEDC
A623-03-30-687	Tube Steel to WF-1/8"-stitch	TEDC
A623-03-30-688	Tube Steel to WF-1/8"-stitch	TEDC
A623-03-18-685	Tube Steel to WF-1/8"-stitch	TEDC
A683-03-18-686	Tube Steel to WF-1/8"-stitch	TEDC
PTN-M-88-419-005F	FW-5 Socket Weld in 1/2" Sched. 80	TFIG
A511-18-18-589	Tube St. to Tube St.-3/16"-fillet	TECS/TECD
A511-18-18-590	Tube St. to Tube St.-3/16"-fillet	TECS/TECD
A504-03-18-006-6506	Tube St. to Base P1.-1/4"-fillet	TECZ/TEBN

Neither violations nor deviations were identified during the above observations.





c. Observation of Rod Issue Station Activities

The inspector observed construction backfit welding rod issue station activities on a random basis during the inspection time frame. Most rod issue station activities were in conformance to the procedures involved. However, the inspector observed safety related weld documentation packages CWO No. 101504, CWO No. 101505 (PC/M No. 87-261), and CWO No. A504 (PC/M 87-259) left unattended on the construction backfit rod issue station window ledge after end of second shift on December 12, 1990. The rod issue station was closed and locked. This was a lack of conformance to Administrative Site Procedure (ASP) 34, Rev 1, paragraph 5.2.4. Licensee corrective action response was timely (training of all qualified welders was completed on December 14, 1990 which re-emphasized the requirements) and effective (as evidenced by a random survey of conditions and welders by the inspector from December 14 - 18, 1990.) The licensee response also demonstrated good management commitment and involvement. The inspector informed licensee personnel that the violation would not be cited because the criteria specified in Section V.A. of the NRC Enforcement Policy were satisfied. The inspector further informed licensee personnel that this matter would be identified as NCV 50-250,251/90-42-04, Loss of Control of Quality Documentation on Safety Related Welds.

4. Exit Interview

The inspection scope and findings were summarized on December 18, 1990, and by telephone on January 7, 1991, 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. Proprietary information is not included in this report.

(Open) NCV 250,251/90-42-04, "Loss of Control of Quality Documentation on Safety Related Welds" - Paragraph 3.c.

(Open) Inspector Followup Item 50-250, 251/90-42-01, "Potential Early Failure of EDG Pilot Exciter Regulator Components" - Paragraph 2.b.(1).

(Open) Unresolved Item 50-250, 251/90-42-02, "Potential for Inadequate Control of Construction Loads Causing Loss of AC Supply Circuit During Initial EDG 4B 24 Hour Endurance Run" - Paragraph 2.b.(2).

(Open) Unresolved Item 50-250, 251/90-42-03, "Potential Inadequate M-K Relay Design for EDG Solenoid Valves" - Paragraph 2.b.(3).



## 4. Acronyms and Initialisms Used in This Report

ASP	Administrative Site Procedure
BPC	Bechtel Power Corporation
CFR	Code of Federal Regulations
CRN	Change Request Notice
CWO	Construction Work Order
EES	Ebasco Engineering Services
DODT	Diesel Operating Day Tank
EDG	Emergency Diesel Generator
EPSEP	Emergency Power System Enhancement Project
FP&L	Florida Power and Light Company
GM EMD	General Motors Electro-Motive Division
LC	Load Center
MCC	Motor Control Center
M-K	Morrison-Knudsen Company, Power Systems Division
NRR	NRC Office of Nuclear Reactor Regulation
PC/M	Plant Construction/Modification
RG	NRC Regulatory Guide
SER	NRC Safety Evaluation Report
TPN	Turkey Point Nuclear Plant
TS	Technical Specification
TSA	Temporary System Alteration
URI	Unresolved Item
WPS	Welding Procedure Specification
WTS	Welding Control Technique Sheet

