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

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Report Nos.: 50-250/92-30 and 50-251/92-30

Licensee: Florida Power and Light Company
9250 West Flagler Street
Miami, FL 33102

Docket Nos.: 50-250 and 50-251 License Nos.: DPR-31 and DPR-41

Facility Name: Turkey Point 3 and 4

Inspection Conducted: November 16-20, 1992

Inspector: Merle N Miller 12/3/92
M. N. Miller Date Signed

Approved by: M B Shymlock 12-3-92
M. B. Shymlock, Chief Date Signed
Plant Systems Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine, announced inspection was conducted in the areas of the Unit 3 electrical systems to ensure that damage caused by Hurricane Andrew was identified and corrected. The electrical systems were examined to ensure that there were no safety issues and the electrical systems were ready for operation prior to the restart of Unit 3. In addition, the modification to the Unit 3 sequencers was reviewed.

Results:

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

The licensee did an excellent job of identifying and correcting the damage to the electrical systems. No safety issues for Unit 3 restart were identified. The electrical systems are ready for operation and restart of Unit 3. The Unit 3 sequencers were modified and satisfactorily tested.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

P. Banaszak, Electrical Systems Engineering Supervisor
C. Bible, Electrical Supervisor, Production Engineering
*D. Jerngan, Technical Support Manager
*J. Knorr, Regulation and Compliance Specialist
*R. Kundalkar, Engineering Manager
*T. Plunkett, Site Vice President
*L. Pearce, Plant General Manager
M. Pearce, Electrical Maintenance Superintendent
*D. Powell, Services Manager
*R. Earl, Quality Assurance Supervisor
*M. Wayland, Maintenance Manager
*E. Weinkam, Licensing Manager

NRC Personnel

*R. Butcher, Senior Resident Inspector
*L. King, Region II
*L. Mellon, Region II
*M. Thomas, Region II
*C. Smith, Region II

*Attended exit interview

2. Inspection Followup (92701)

a. Unit 3 Sequencers Modifications

Background. On December 12, 1991, Sequencer 4A had a failure that resulted in the sequencer aborting the AUTO TEST mode of operation. The AUTO TEST mode of operation consisted of a software routine that was designed to automatically control the continuous self testing of the input cards in the programmable controller. (The sequencer is basically a programmable controller that has been programmed to perform the "load shedding" and "load sequencing" functions for an emergency diesel generator). Programmable controllers have input cards (modules) that receive input signals and output cards (modules) that control outputs. The output cards can have either solid state relays or electro mechanical relays with contacts. The AUTO TEST mode of self testing was accomplished by sending output signals from the programmable controllers output test cards (module) back into the input cards. These 125 VDC signals were sent through the electro mechanical relay contacts on the output cards. Because of the capacitance in the input signal cables, a large momentary inrush charging current passed through the relay contacts. A few microseconds of this inrush current appeared to exceed the contacts current rating. Excessive current can damage the contacts causing them to become pitted or in some cases be welded together. The

automatic self testing of the input/output cards was performed at three minutes intervals. Due to the excessive momentary current and the large number of times the relay was cycled, a 4A Sequencer relay contact eventually failed. After the root cause investigation, the licensee's engineering personnel determined that resistors were needed to limit the inrush current to within the contacts rating. The NRC inspector that initially reviewed this problem determined that the three minute self testing interval for the relays was excessive (3/minute =20/hour = 480/day = 14,400/month = 172,800/year).

The inspector reviewed modification PC/M NO. 92-033, Revision 0, dated July 10, 1992, Emergency Bus Load Sequencer for Unit 3 to verify that the changes to both the hardware and software were satisfactorily implemented to correct the failed relay problem. In addition, other changes that were made to enhance the sequencer were reviewed to ensure that these changes did not affect the sequencers intended function. The inspector reviewed and examined the following modification changes:

a. Installation of eight 1000 ohm current limiting resistors each in series with a relay contact(s) on the output card (module).

b. Change AUTO TEST software routine to test inputs once per hour instead of once every three minutes.

c. Change of software routine and the addition of internal wiring jumpers to require a two out of two logic for the inputs for the 4.16 kV undervoltage (degraded) and a two out of two logic for the 480 V Load Centers undervoltage (instantaneous) signals.

d. Wiring the 125 VDC power to the output test card through test relay contacts. This only allows power to be available when the sequencer is in a test mode of operation, MANUAL or AUTO TEST.

e. Change of a software routine and the addition of internal wiring to generate an alarm on failure "on" or "off" of output ADO-29, the Load Center 3H Transfer permissive.

f. Change of software routine and the internal wiring at Switchgear 3A to delay by more than ten cycles (166 milliseconds) the signal from the auxilliary transformer breaker "open" position to the sequencer. This was done to prevent sequencer action during a fast bus transfer from the auxilliary transformer to the start-up transformer. This function was previously performed by a timing relay.

g. Changes to internal wiring of the stripping and blocking relays to provide indication in the event of a relay failing "closed".

h. Changes to the software to eliminate the nuisance alarm from momentary undervoltage signals caused by starting of large loads such as motors.

i. Incorporation of additional software to provide diagnostic information messages for troubleshooting.

The inspector determined that items a. and b. were necessary to correct the failed relay problem and to prevent future occurances. Items c. through i. were considered enhancements. The inspector determined the licensee had satisfactorily modified and tested the two Unit 3 sequencers.

b. Unit 3 Electrical Restart Inspection

The purpose of this inspection was to verify that all the damage to the electrical systems caused by Hurricane Andrew was identified and appropriate corrective action was implemented by the licensee. In addition, the electrical systems were also examined to ensure they were ready for operation prior to the restart of Unit 3. To accomplish these purposes for the electrical systems; the inspector reviewed damage assessment lists, priority work lists, special hurricane damage inspection procedures, completed work orders for damaged equipment, and several of the licensee's Unit 3 Restart Readiness procedures (electrical portion). In addition, the inspector conducted detailed walkdown inspections throughout the plant to verify that all damage that needed repaired was corrected. The inspector also observed portions of the Safeguards surveillance test (Train A 4.16 kV switchgear).

The inspector reviewed the two special electrical test procedures, TP-880 and TP-881 developed by the licensee to provide instructions for assessing the hurricane damage and re-energizing the electrical systems. TP-880, Re-energization Of Motor Control Center Loads, dated August 31, 1992 was a detailed procedure for the inspection, cleaning, meggering, and re-energization of non-vital; lighting panels, electrical panels, motor control centers, buses, distribution centers, and load centers. TP-881, Re-energization Of The Vital 4160 and 480 VAC Loads After Hurricane Andrew, dated August 31, 1992 was a detailed procedure for assuring safe re-energization of vital (safety related) loads. TP-881 also required inspection, cleaning, meggering, and re-energization of the safety related electrical loads. Both procedures TP-880 and TP-881 contained attachments listing all the plant electrical panels, load centers, distribution centers, motor control centers (MCC), and switchgear. The licensee's electrical maintenance and engineering personnel conducted extensive walkdown inspections using procedures TP-880 and TP-881 to re-energize the electrical loads and identify damage that needed repair. The inspector reviewed these completed procedures, their associated completed work orders, and conducted walkdowns to verify that the licensee personnel did a very thorough job of identifying damaged equipment and re-energizing the loads.

The licensee's personnel developed damage lists and priority lists for all the damaged equipment. All safety related electrical equipment was on priority 1 lists. The priority 2 lists contained minor damage to non-safety related electrical equipment such as damaged cable tray covers.

These lists included the completion status with work order numbers and were classified as follows:

* Unit 3 Storm Punch List (developed before priority lists)
* Unit 3 Priority 1 Storm Punch List
* Unit 3 Priority 2 Storm Punch List
* Units 4 and 3/4 Priority 1 Storm Punch List
* Units 4 and 3/4 Priority 2 Storm Punch List

The inspector reviewed the above lists to identify the damaged electrical equipment, the work orders numbers, the work status (open, being worked, or completed), and if appropriate priorities were assigned. The inspector examined the completed work orders for all electrical equipment listed on the various storm punch's lists listed above. Sixty seven work orders and work tasks were reviewed and the work was examined during walkdowns by the inspector to verify the work was completed. The inspector determine that the licensee had properly identified and prioritized the damaged electrical equipment and corrected the damaged equipment as necessary. Not all the minor damage to non-safety related electrical equipment had been repaired.

The inspector walked down the Unit 3 "C" bus, the Unit 4 "C" bus and the five non-safety related auxilliary diesel generators (identified as "Black Start" or "cranking diesels) located on the fossil side of the site. During the hurricane, the doors to these diesels were blown open exposing their electrical control panels to the elements. There was minor water damage to the control panels that was repaired. These diesels have been restored to service. These diesels provide emergency power to the non-safety related 4.16 kV "C" buses. Normal power to the "C" buses comes from the "C" transformers connected to the switchyard. Both "C" buses were also examined. The "C" 4.16 kV switchgear houses (trailers) and the 480 V MCC buildings all sustained moderate to heavy damage. The buildings had their skin (siding and roof) partially blown away, the doors blown open, and the switchgear cubicles were wetted from the rain. After the storm several days were needed to restore the "C" buses back to services. One important area for the "C" buses was that they provide power to the two standby feedwater (FW) pumps. The standby FW pumps are the electrical backup pumps for the Auxiliary Feedwater System's three safety related turbine driven pumps. The 800 horsepower standby FW pumps are too large a load for the safety related 4.16 kV emergency diesel generators to supply power during emergency conditions. The 480 V "C" bus MCC provides power for the safety parameter display system (SPDS - non safety) in the control room. The inspector considered the condition where the "C" buses provide power to the two standby FW pumps and emergency power comes from the five "cranking" diesel

generators as a potential weakness during adverse conditions such as a severe storm, hurricane or tornado. The licensee stated that these items would be reviewed by engineering for consideration of potential corrective action if needed.

During the walkdown of the 125 VDC systems, the inspector observed that water had leaked into Battery Charger 4A2. The licensee stated that the leakage had caused the charger to short out. Charger 4A2 was repaired and returned to service immediately after this condition was discovered by the licensee. However, the inspector was concerned that no "drip shields" were installed above several of the new chargers. The licensee agreed to have drip shields installed over all of the chargers that do not already have drip shields. (Most of the chargers had drip shields)

The inspector conducted a detailed walkdown of the main switchyard and reviewed the licensee's "Storm Related Damage And Repairs To The Turkey Point Switchyard And Its Transmission Lines" report to ensure that all the necessary repairs were completed. The switchyard, the substation and the transmission lines were the first equipment the licensee's transmission group assessed for damage and repaired. During the walkdowns the inspector identified only a few minor items such as loose control cables in the cable trays and some damaged cable trays that had not been repaired. Overall the inspector considered the condition of the switchyard in very good condition and suitable for the restart of Unit 3.

During the Safeguards surveilance testing of the Unit 3 Train A Bus 3A switchgear, the inspector observed that the breaker 3AA22 caused a bus lockout condition. In preparation for the initiation of the Safeguards Loop test, Electrical Maintenance personnel cycled breaker 3AA22 closed (the breaker was racked in the test position). Immediately upon closing the breaker, the 3A 4.16 kV bus experienced a bus lockout (trip). Based on trouble shooting, the licensee determined the root cause of the trip was mechanical vibration of relay 174TDDO. Vibration caused the normally open contacts from relay 174TDDO to close. The momentary closing of these contacts provided a path to energize lockout relay 186/3A tripping the 3A bus. The mechanical vibration was induced when the "T-Bar" (piece of test equipment) connected to the breaker and the stationary contacts in the cubicle jarred the cubicle when the breaker was closed. The 174TDDO relay was located on the back panel of the cubicle. This panel was also where the stationary contacts are located (stationary contacts are the breaker position switch). The function of the "T-Bar" was to provide the mechanism to actuate the breaker plunger for the stationary contacts when the breaker was in the test position. The "T-Bar" is an adjustable push rod. In this case the "T-Bar" was not adjusted properly. It was approximately 0.25 inches to long. The "T-Bar" was adjusted to the correct length and the relay operated without tripping a bus lockout. However, the inspector considered that the 174TDDO relay was too sensitive to vibrations and potentially could cause another failure if jarred by means other than the "T-Bar". The licensee agreed to investigate this problem and consider replacing the relay with a less sensitive type.

Overall, the inspector determined that the licensee has identified and corrected all the necessary damage to the electrical systems caused by Hurricane Andrew for the restart of Unit 3.

7. Exit Interview

The inspection scope and results were summarized on November 20, 1992, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.