



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

Report Nos.: 50-250/91-03 and 50-251/91-03

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: January 14-18 and February 5-7, 1991

Inspector: *M. D. Hunt* 3-5-91  
 M. D. Hunt Date Signed

Approved by: *M. B. Shymlock* 3-5-91  
 M. B. Shymlock Chief Date Signed  
 Plant Systems Section  
 Engineering Branch  
 Division of Reactor Safety

SUMMARY

Scope:

This special, announced inspection was conducted to review the current status of the licensee's Emergency Power System Enhancement, observe cable pulling operations and review of various open items identified during previous inspections.

Results:

No major weakness were identified during this inspection, with the exception of the following Noncited Violation, 50-250, 251/91-03-01, Inadequate Procedures for Megger Testing. (See paragraph 2.c)

The licensee's power cable installation program was identified as a strength in that care was taken to insure that the cables are protected during pulling operations and any indication of damage was immediately evaluated before pulling operations proceeded.



## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

- P. M. Banaszak, Electrical Engineer
- \*W. Bladow, Quality Assurance (QA) Manager
- \*R. J. Daly, Outage Manager
- \*S. T. Hale, Site Engineering Manager
- \*M. P. Huba, Engineering
- \*D. Jenkins, Engineering, Electrical Juno Plant Nuclear (JPN)
- \*R. Kundalkar, Electrical Enhancement Project Engineer
- \*J. F. O'Brien, Quality Control (QC) Superintendent
- \*L. Pearce, Plant Manager
- \*T. Plunkett, Site Vice President
- \*D. R. Powell, Licensing Superintendent
- \*A. Zielonka, Technical Department Supervisor

Other licensee employees contacted during this inspection included craftsmen, engineers, technicians, and administrative personnel.

#### NRC Resident Inspectors

- \*G. A. Schnebli

\*Attended exit interview

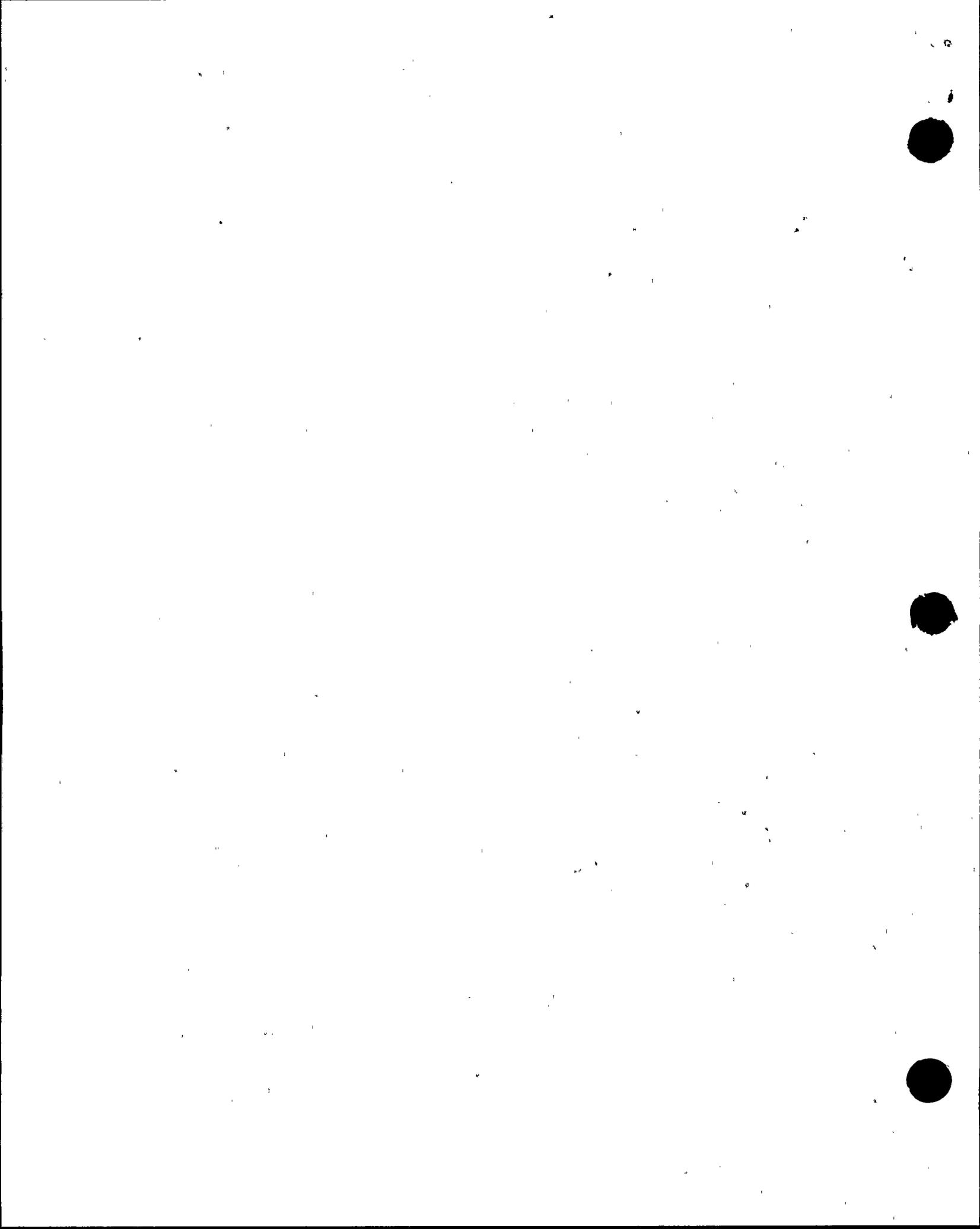
### 2. Emergency Power Systems Enhancement Status Review

The inspector reviewed with licensee representatives the status of the various phases of cable installation, equipment installation and testing.

#### a. Cable Installation Review (55063)

The inspector reviewed the licensee's cable pull testing calculation PTN-OFJE-90-0007 which established the limits for pulling tensions using a LUFF-EAZ "Mares Tail" to pull lead sheathed 5 KV, Class 1E cables when it is necessary to pull cable in the middle of the cable run. This operation involves wrapping the mares tail around the outside of the individual conductor or around the group of conductors if the pull is made up of more than one cable. The sizes and tensions are listed in the table below:

<u>Number of Conductors</u>	<u>Wire Size</u>	<u>Maximum Allowable Pulling Tension in LBS.</u>
1	1250 KCM	3000
3	1250 KCM	4000
3	750 KCM	3000
3	4/0 AWG	3000



There are also certain conditions which must be met in order to assure that the cable is not damaged during the pull. There are cautions given to insure that the mares tail is installed properly so that the tensions are not concentrated in localized areas of the cable.

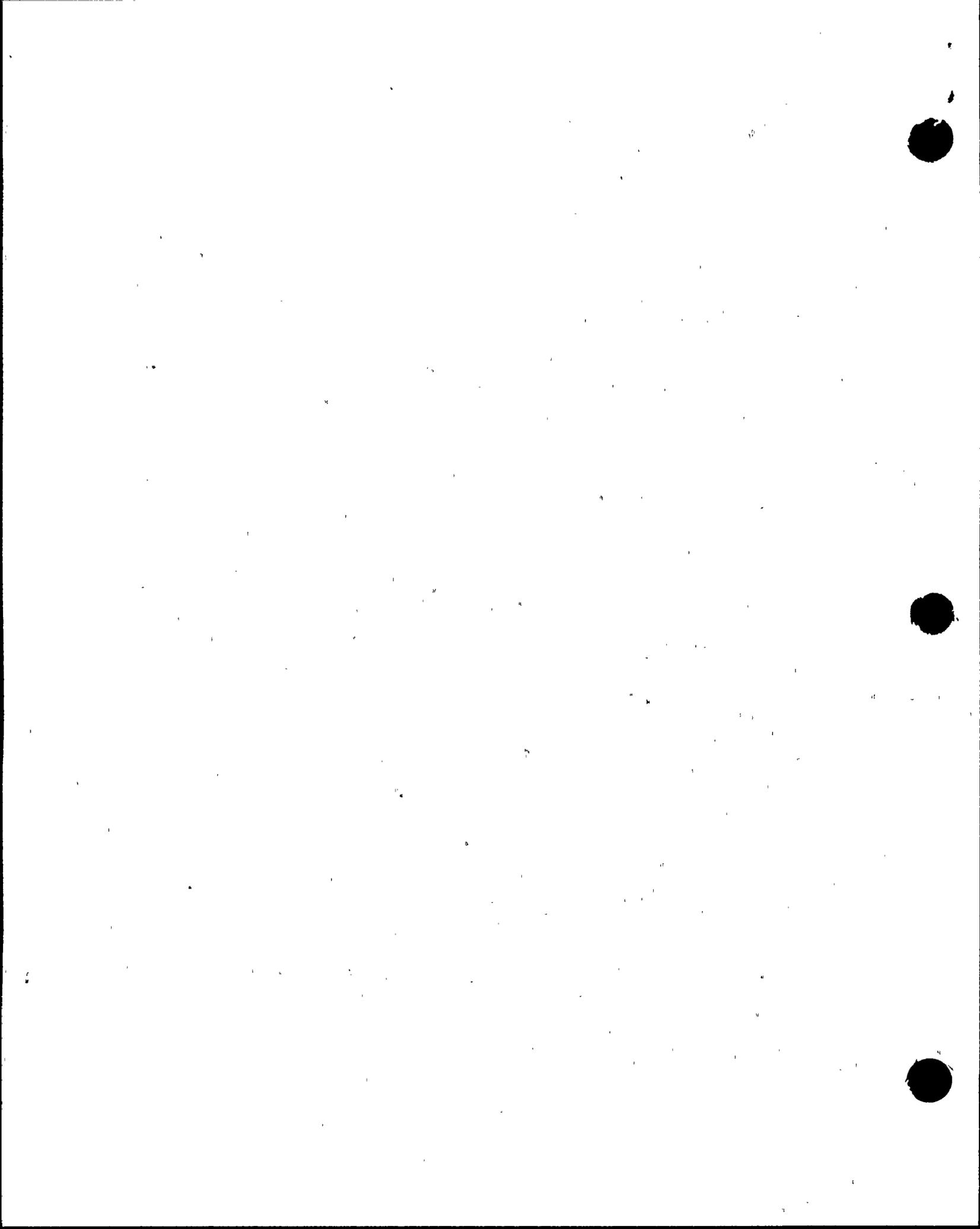
The inspector observed portions of the pulling process for cable Number 4AD06B which consisted of 3 1/C 750 KCM cables that were to be pulled into a conduit bank that runs between several manholes. Due to the configuration of the manholes and conduits it was necessary to pull portions of the cable into the conduits and then pull cables out onto a protected area and then reenter the conduits leaving that manhole by pulling from the next manhole. Due to the length of the cable run it required pulling portions of the cable using a mares tail.

The QC inspector reviewed the entire pulling arrangement prior to the start of the pulling operation. This included verification of the calibration of the tensionmeter used to measure the pulling tension. The tension was monitored continuously during the pulling operation. At no time did the pull tension exceed the calculated (expected) values which were very conservative. All personnel involved in the pulling operation were knowledgeable and understood the requirements and precautions. In addition there was a commitment to High Potential (HiPot) testing of these cables after installation to assure that no damage was done to the cable insulating materials during the pulling operation.

During the inspection the licensee continued the pulling activities for the longest cable runs which are manpower intensive due to the configuration of the imbedded conduits and the limited lay down area at each of the pull points. The majority of the pulls are completed for power cables that will connect the 4B Emergency Diesel Generator (EDG) to the 4D switchgear. These were the longest cable pulls (approximately 1007 feet) and the largest size cables that will be pulled. There were two pulls which involved three single conductor 750 KCM cables each and three pulls of single conductor 1250 KCM cable. As discussed earlier the licensee's program appears to be fully adequate to accomplish the cable pull effort in a manner that will result in proper cable installation.

b. Equipment Installation (55053)

The Unit 4 EDGs and the mechanical support equipment have been installed. The interconnecting wiring needed to operate the diesel engines is permanently installed. The output power cables from the EDG to the safety busses are being installed. The permanent control cables will be installed to permit EDG testing to start in April.



The licensee had committed to replace eight load center transformers with air cooled transformers to eliminate PCBs. This task has been completed for Load Centers 3A, 3C, 4A and 4C. The replacement for the Load Centers 3B, 3C, 4B and 4C is in progress.

The four new EDG load sequencer panels are now in place and initial wiring has started.

c. Equipment Testing

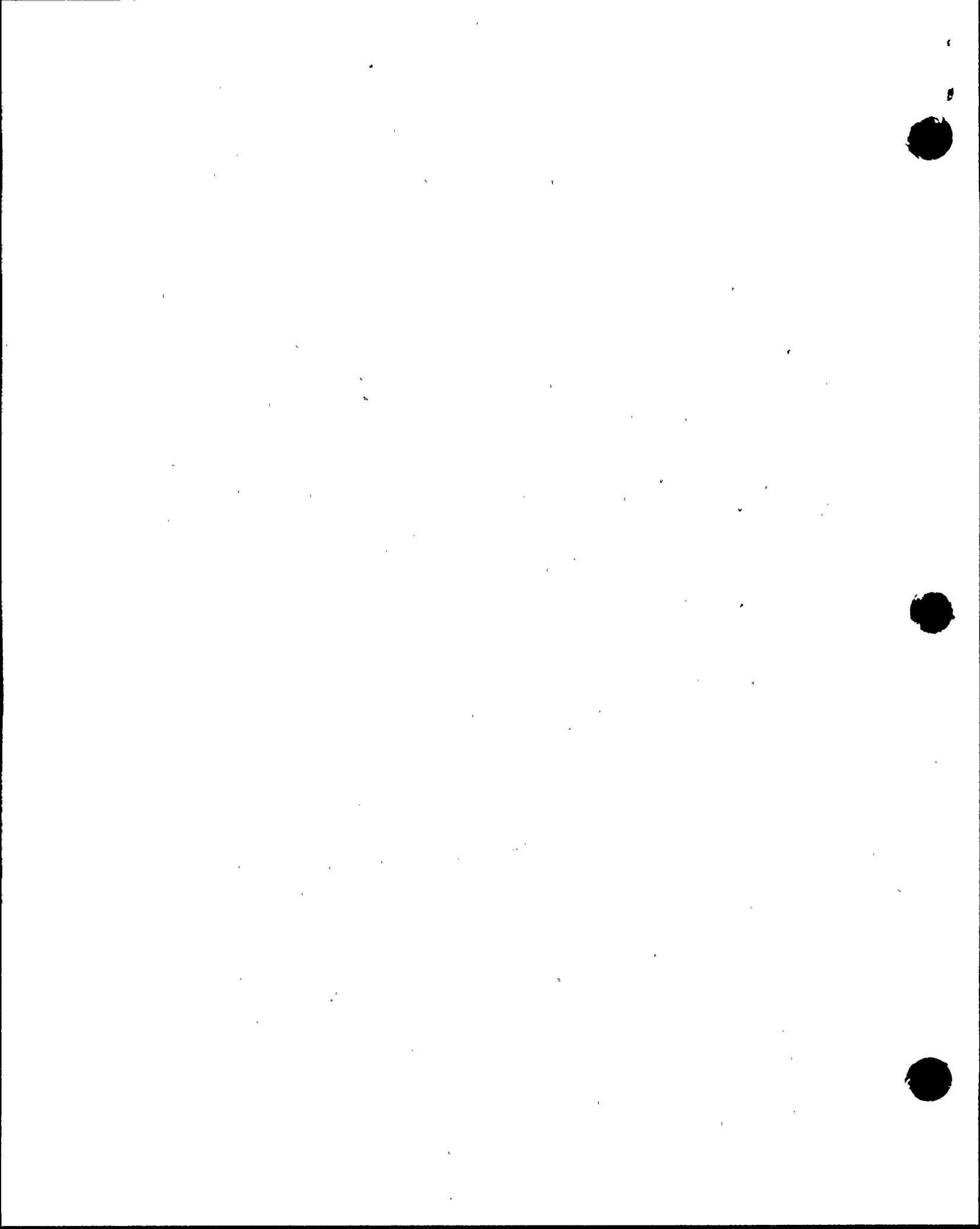
The licensee originally intended to perform vendor tests and portions of the 4A and 4B EDG preoperational testing with the generators tied to a temporary load and their auxiliary equipment being supplied electrical power from a temporary source. This Phase I testing was to include 35 successive starts with EDG 4B to be test first.

During the performance of Preoperational test Procedure .0804.098, EDG 4B System Preoperational Test Phase I, a failure of the pilot exciter regulator (PER) was identified. This circuit provides black start capability for the EDGs. The circuit components were removed from the 4A EDG for replacement items but were also found defective. Preliminary evaluation of the failures indicated that the PER's had been subjected to either an over voltage or a reverse bias condition. Further investigation by the licensee of onsite electrical testing of the generator components indicated that the circuit component failures were due to megger testing.

The megger testing was the result of the change to the storage and testing requirements of Plant Change/Modification (PC/M) No. 87-263, New EDG's Installation, which was revised by Change Request Notice (CRN) No. M-2788, called for meggering of the generator field coils while in storage. However, these instructions did not consider the various vendor manual caution and warning statements to insure that solid state power and control circuits are electrically isolated during insulation resistance measurement of the generator rotor pole windings.

Once the problem was identified the licensee took actions to insure that instructions for all megger testing of components and cables were carefully reviewed and vendor instructions for testing are observed.

This item is identified as a noncited violation, 50-250, 251/91-03-01, Inadequate Procedures for Megger Testing. This licensee identified violation is not being cited because criteria specified in Section V.G.1 of the NRC Enforcement Policy was satisfied.



During testing of 4B EDG a failure of the jacket cooling water header occurred. The change out of the header required dismantling a portion of the engine which would delay the testing and possibly impact on the testing schedule. The decision to test 4A EDG was made.

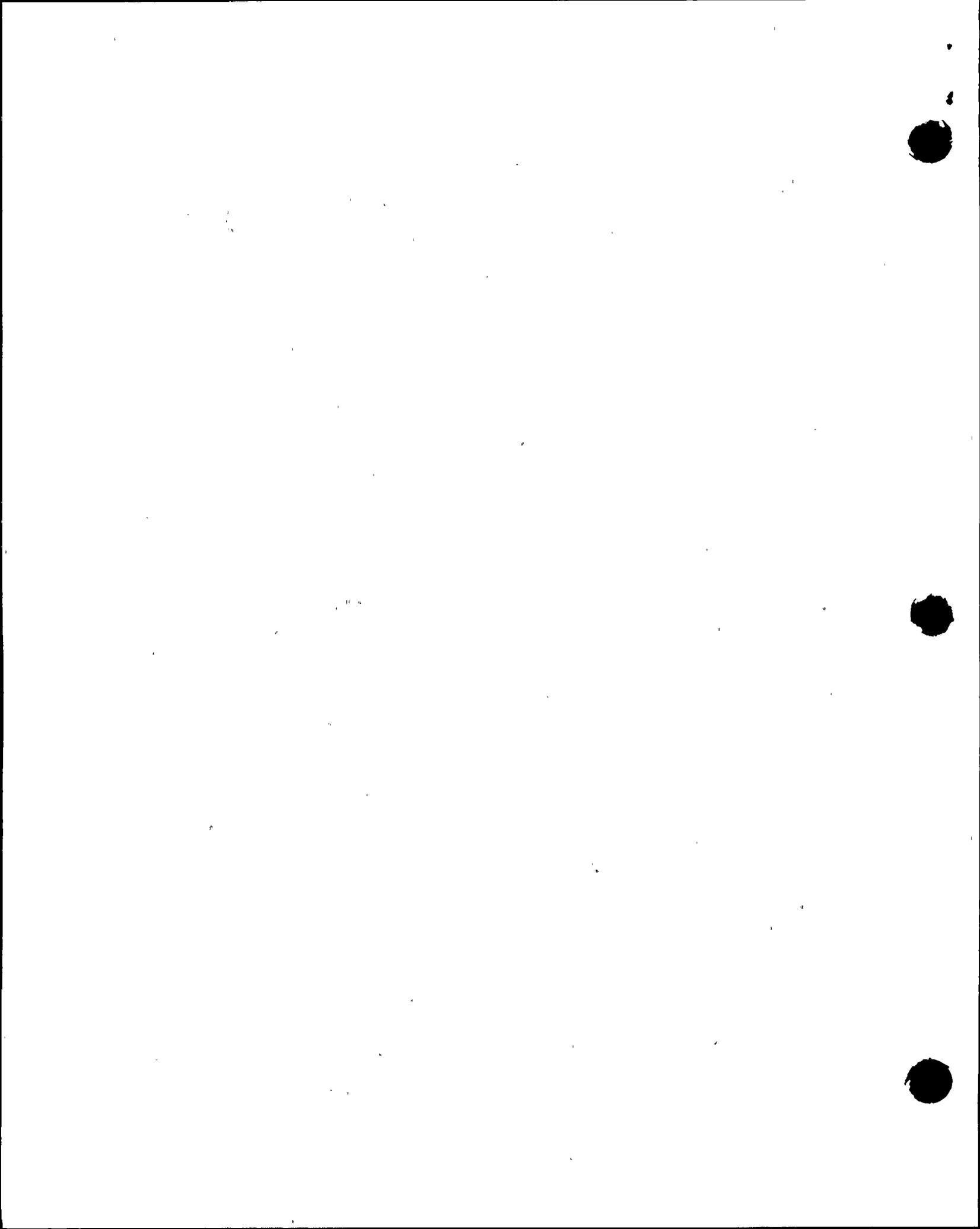
The inspector returned to the site on February 5-7 to observe and review the testing of 4A EDG. However, even though 35 starts were accomplished certain components (Pilot Exciter Regulatory) were found incorrectly assembled on the 4A EDG which caused the licensee representatives to disqualify the first 16 starts later, after the 35 starts had been completed. Additionally, during the test requiring five starts without recharging the starting air receivers, an air start motor failed. While there are four air start motors for each engine during the test two were intentionally valved out. The inspector was advised that the engine did start with only the one starting motor but the licensee considered in view of the overall difficulties encountered during this testing phase, decided that the 35 starts would be redone after each EDG was permanently wired into the plant systems.

3. Action on Previous Inspection Findings (92701, 92702)

(Closed) IFI 250,251/89-203-21, Plant Operating Diagram Errors. This item identified an error in the load shedding diagram for the component cooling water (CCW) pump 3B. The logic indicated that the CCW breaker would close on load shedding due to the loss-of-offsite power (LOOP) when in actuality the breaker should be opened. There was also an error identified regarding the start/stop selection switch for all CCW pumps except pump 3B. The licensee has corrected the load shedding logic in PC/M 90-157 and 90-158. This item is closed.

(Closed) IFI 250,251/89-203-22, DC Ground Fault Administrative Controls, This item requested an evaluation of the administrative controls addressing the response time to ground fault alarms. Off Normal Operating Procedures 9608.1 "125V DC System Location of Grounds" and 9608.2 "Auxiliary 125V DC System Location of Grounds" have been revised and now require action to isolate a ground within four hours of receiving the ground alarm. Instructions are included which detail the steps for corrective actions required to isolate the grounded circuit. This item is closed.

(Closed) URI 250,251/89-203-23, Acceptability of the Minimum Battery Terminal Voltage. This finding was opened due to the concern that the minimum end-of-life battery terminal voltage would not be adequate to power all safety related devices. The finding stated that the licensee had not performed a bounding calculation to show that remotely located devices would operate at the minimum battery terminal voltages. Therefore adequate assurance did not exist that the combination of minimum battery terminal voltage and system voltage drop considerations would yield sufficient equipment voltages to maintain equipment functionally.



The licensee stated that there was no licensing requirement for Turkey Point to have a bounding calculation. However, a purchase order was issued to an Architect Engineering (AE) firm to perform a DC Voltage Drop Study to Demonstrate Acceptability of Equipment at 105V Minimum Battery Terminal Voltage and is scheduled for completion by March 2, 1991. This item is closed.

(Closed) Inspector Followup Item (IFI) 50-250,251/90-42-01, Potential Early Failure of EDG Pilot Exciter Regulator Components. This item has been upgraded to a Noncited Violation identified as 50-250,251/91-03 Inadequate Procedures for Megger Testing, which is discussed in this report. This item is closed.

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

During a preoperational test of the 4B EDG on December 12, 1990, an unknown problem caused Load Center 3F breaker 31402 to trip. The loss of breaker 31402 resulted in a loss of power to Load Center 3F, 4F and 4G since at the time these load centers were cross tied because of a 4C 4 kv bus outage. As the auxiliary equipment for the 4B EDG was temporarily powered from Load Center 3F breaker 31407, the load center outage resulted in an aborted 4B EDG test.

There was a concern that a construction load had been added to the Load Center 4G, breaker No. 41508 which may not have been authorized. The licensee found that breaker 31407 had tripped on overload current as evidenced by the trip indicator. Testing of the breaker trip device identified a problem with the long time trip element. The trip device appeared not to have the capacity for starting currents as would normally be expected based on the as found breaker setting. Testing results reviewed by the inspector supported this conclusion.

In addition the licensee identified the fact that breaker 41508 on Load Center 4G had previously been a motor feeder breaker but was now used to supply construction loads. The breaker had been used for construction loads during previous outages and was over looked during the development of the breaker control program. The licensee has since reevaluated the use of breakers for construction loads and has developed adequate controls for their use. This item is closed.

(Closed) Unresolved Item 50-250,251/90-42-03, Potential Inadequate M-K Relay Design for EDG Solenoid Valves. This item was identified at the end of the 24 hour run on the 4B Diesel Generator Load Test. A Day Tank High Level Alarm was received that when investigated revealed that the DC solenoid valve on the day tank fill line was open (energized). The transfer pump had shutdown as designed but with the fill line valve still open, gravity flow from the storage tank through the pump was occurring thus causing the day tank high level. Further investigation determined that an auxiliary relay in the fill shut off circuit had failed with the contacts closed thus keeping the fill line valve solenoid energized in the open position.



The licensee and the AE site engineers determined that the contact rating of the relay had been exceeded. The corrective action through a design change replaced the relay with one having much higher contact ratings and installing a suppression diode in the solenoid valve circuit. In addition, all the other circuits using the same type relay that failed were reviewed to check for current that would exceed the relay contact ratings. No other relays in solenoid valve circuits in this control system supplied with the EDGs were identified that would exceed the relay contact rating.

#### 4. Exit Interview

The inspection scope and results were summarized on January 18 and February 7, 1991, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results listed below. Proprietary information is not contained in this report. The inspector identified the noncited Violation 50-250, 251/91-03-01, Inadequate Procedures for Megger Testing. Dissenting comments were not received from the licensee.