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

Report Nos.: 50-269/93-19, 50-270/93-19 and 50-287/93-19

Licensee: Duke Power Company
422 South Church Street
Charlotte, NC 28242

Docket Nos.: 50-269, 50-270, and 50-287

License Nos.: DPR-38, DPR-47, and DPR-55

Facility Name: Oconee 1, 2 and 3

Inspection Conducted: May 21-22, 1993

Inspectors: M B Shymlock — June 18, 1993
M. Shymlock — Date Signed

Accompanying Personnel:

P. Harmon, Senior Resident Inspector
G. MacDonald, Reactor Inspector
K. Poertner, Resident Inspector
B. Desai, Resident Inspector

Approved by: Candle Julian — June 18, 1993
C. A. Julian, Chief — Date Signed
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope:

This special, announced inspection was conducted to witness a test that was performed to functionally test the Oconee Degraded Grid and Switchyard Isolation features.

Results:

In the areas inspected, violations or deviations were not identified. The overall test controls and coordination for this test were good. The procedure used to control the test was adequate and personnel performing the evolutions were knowledgeable of how the test was to be performed and followed the procedure. The test was well developed, technically correct, and successfully accomplished.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*H. Barron, Station Manager
*D. Deatherage, Operations Support Manager
*G. Rothenberger, Operations Superintendent
*T. Stevens, D' Shift Supervisor

*Attended Exit Meeting

Other licensee employees contacted during this inspection included engineers and operations personnel.

2. Degraded Grid and Switchyard Isolation Functional Test (IP 61701)

On May 22, 1993, Duke Power Company performed periodic test PT/0/A/0610/21 Degraded Grid and Switchyard Isolation Functional Test. The purpose of the test was to demonstrate in an integrated manner the functional verification of the overhead air circuit breaker (ACB) and power circuit breaker (PCB)-9 operation during switchyard isolation. Also, it was to demonstrate operability of the Degraded Grid Protection System (DGPS) by switchyard isolation, a Keowee Unit realignment from generating to the grid to the overhead path, and underground Keowee unit startup. The Keowee unit would be supplying power to the grid. A signal would be fed to the DGPS that indicated a degraded voltage condition existed on the grid. Switchyard isolate would then occur to isolate the yellow bus from the grid so that the Keowee unit supplying the grid could then provide power to the yellow bus.

The DGPS monitors supply voltage at each unit startup transformer (CT1, CT2, CT3) and can provide a switchyard isolate signal (refer to figure 1). Switchyard isolate is a feature of the Oconee Electrical System that removes offsite power from all three units startup transformers. This ultimately results in the isolation of the 230 kV switchyard yellow bus from the Duke grid. It also provides an automatic path from one of the Keowee Hydro units to power the three startup transformers from the isolated yellow bus.

The DGPS initiates a switchyard isolation signal upon receipt of a Channel 1 or 2 engineered safeguards actuation in any of the three Oconee units in conjunction with an undervoltage signal that is sustained for more than nine seconds at any two of the three startup transformers.

Prior to conducting the test on May 22, 1993, the inspectors reviewed activities performed in preparation for the test to be conducted the next day. The licensee was installing test equipment to monitor the RCP motor operation both at Keowee and at Oconee. The inspectors witnessed the test run of the RCP motor and all the monitoring equipment at Oconee operated properly. These activities were performed by procedures that were adequate and followed by personnel conducting the evolutions.

This test was performed with Unit 2 in a refueling outage and Units 1 and 3 operating at full power. The Electrical Power System for all three units was placed in various alignments that were not normal to allow performance of the test. These alignments are categorized into three distinct stages as indicated below:

1) All 4kV and 7kV automatic transfer switches were placed in manual, for all three units, prior to and during the switchyard isolate.

2) When the switchyard isolate signal was reset and the system grid re-aligned to Units 1 and 3 startup transformers (CT1 and CT3), the 4kV and 7kV transfer switches for Units 1 and 3 were be placed in the automatic position. The Unit 1 and 3 startup transformers and all three units main step-up transformers (1T, 2T, 3T) were connected to the grid through the red bus tie breakers only. The Unit 2 4kV auxiliaries were powered by back-feeding through the 2T main step-up transformer. One 7kV bus (2TB) was tied to the isolated yellow bus through the CT2 startup transformer to power a decoupled reactor coolant pump (RCP) motor.

3) When the decoupled RCP motor start test was completed, the 230kV yellow bus was disconnected from the overhead Keowee unit and re-energized from the grid. This restored normal electrical configuration.

The inspectors attended a pre-job briefing just before starting the test for all personnel involved. The pre-job briefing was well organized and emphasized important aspects of the test, i.e., declaration of Limiting Conditions of Operation (LCO), potential loss of power and Turbine trip action, use of the test procedure, and proper communication. During the performance of the test, inspectors were present in the Oconee and Keowee Control Rooms.

The inspectors had reviewed the procedure. There had been a conference call between the licensee, NRC Headquarters, and the Region II staff to discuss the procedure several days prior. Due to the complexity and the potential for a loss of power to the decay heat removal system, the Operations Unit Supervisor and at least one Reactor Operator had no other duties than to support the test. One Management Designee, identified by the Superintendent of Operation, would monitor the test and provide support to the Shift Supervisor during critical portions of the test. This individual had the authority to abort the test and, if

necessary, provide recommendation to the Shift Supervisor on actions to place the plant in a stable condition. There was also one designated System Engineer assigned to resolve any technical questions. There was one Keowee operator to perform actions per the procedure and monitor the Hydro Unit during the test. Communication was established with all remote locations from which actions would be performed. The center for communication was located in the Oconee Control Room where the procedure directions were controlled.

Per the test procedure, the Lee Turbine was started and energized CT-5. Specific Electrical Power System alignments were performed. Keowee Unit 1 was started and loaded to the grid carrying 20 megawatts (MW). The switchyard isolate signal was initiated. The Keowee Emergency Start signal caused Keowee Unit 1 to separate from the grid and then properly re-align and energized CT-1, CT-2, and CT-3 through the overhead path. Keowee Unit 2 also started and energized CT-4 through the underground path.

The yellow bus being fed from Keowee Unit 1 was aligned such that if either of the operating units were to trip, the RCP loads would not overload the running Keowee unit. Following reset of the Switchyard Isolate signal, the 2B2 RCP motor was started. After sufficient run time for recording data, the RCP motor was secured. The Electrical Power Systems was then returned to normal alignment and the test was completed.

The inspectors reviewed the test results and noted the following:

The test was successful; no abnormalities or failures occurred during the test. The test verified proper operation of the switchyard isolate function and the overhead emergency power path from Keowee. During the test all breaker logic worked properly. The starting and running of the RCP motor provided data for validation of the new dynamic analysis software program that will be used in modeling the Oconee electrical system. The transient starting RCP motor load was approximately 48.5 mega-volt amperes (MVA).

The data gathered during the test was taken to Duke Engineering in Charlotte where the recorded data was translated into computer generated transient oscillographs. The inspectors reviewed the initial oscillographs produced and the following information was noted:

Starting Data for RCP Motor monitored at Keowee:
Initial voltage = 14.2kV
Transient starting voltage first cycle = 12.6kV
Transient starting voltage starting to recover after about 20 cycles = 13.3kV
Transient starting voltage after 100 cycles or approximately 1.66 seconds = 13.8kV

The data reviewed indicated that the response of Keowee during the loading of the RCP motor was good. The Keowee generator accepted the RCP motor load and its voltage returned to 13.8kV in approximately two seconds. During the start of the RCP, no alarms or actuation of electrical protective features occurred.

The overall performance of this test was good and due to its complexity was well controlled. The entry into and exit from LCOs was also well controlled. The licensee indicated that additional tests of the Oconee Electrical System will be considered.

2. Exit Interview

The inspection scope and results were summarized on May 22, 1993, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection findings. Dissenting comments were not received from the licensee. Proprietary information is not contained in this report.

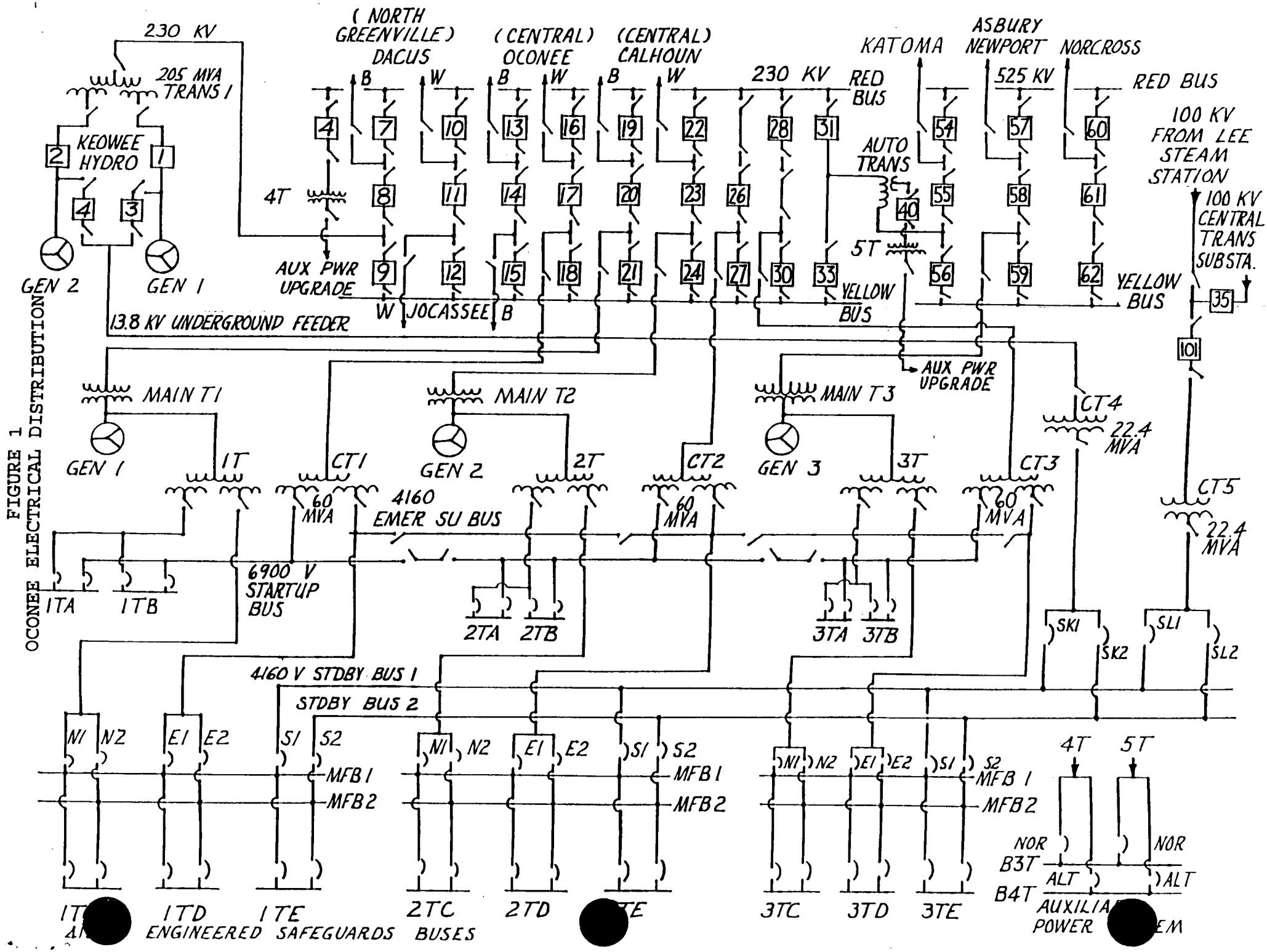

FIGURE 1
OCONEE ELECTRICAL DISTRIBUTION