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

Report Nos.: 50-425/89-20

Licensee: Georgia Power Company
P. O. Box 1295
Birmingham, AL 35201

Docket Nos.: 50-425 License No.: NPF-81

Facility Name: Vogtle 2

Inspection Conducted: May 16 - 20, 1989

Inspector: C. A. Taylor for P. T. Burnett 6-14-89
Date Signed

Accompanying Personnel: B. R. Eaton, PWR Instructor
NRC Technical Training Center

Approved by: C. A. Taylor for G. A. Belisle, Chief 6-14-89
Date Signed
Test Programs Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope: This special, announced inspection addressed the areas of Unit 2 response to loss of turbine load transient of May 14, 1989, review of completed startup tests, and witnessing of 100 percent loss of load test.

Results: It was determined that Unit 2 did not reach a condition during the loss of turbine load transient that should have initiated an automatic trip or demanded a manual trip from the operators. These conclusions were supported by approximate simulation at the plant simulator.

The licensee's procedures for review of plant events that do not lead to a plant trip were found to have two weaknesses: There is insufficient guidance to personnel on the collection of data for detailed review of such events and early involvement of operations personnel in the review of all plant events is not assured.

No violations or deviations were identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*M. J. Ajluni, Operations Superintendent
*G. B. Bockhold, Jr., General Manager, Vogtle Nuclear Operations
*W. L. Burmeister, Operations Superintendent
J. A. Dobbs, Onshift Operations Supervisor
S. S. Dodds, Simulator Instructor, Licensed Operator Training
R. E. Dorman, Licensed Operator Training Supervisor
*W. C. Gabbard, Senior Regulatory Specialist
*C. G. Garrett, Operations Engineer
D. E. Gustafson, Plant Engineering Supervisor
J. B. Joyner, Plant Engineer
*W. F. Kitchens, Assistant General Manager, Operations and Maintenance
*A. L. Mosbaugh, Plant Support Manager
R. O. Odom, Plant Engineering Superintendent

Other licensee employees contacted included engineers, shift supervisors, operators, and office personnel.

Other Organizations

R. J. Florian, Southern Company Services
C. B. Holland, Westinghouse
W. C. Phoenix, Consul Tec
O. D. Hayes, Consul Tec

NRC Resident Inspectors

*R. F. Aiello, Resident Inspector
J. F. Rogge, Senior Resident Inspector

*Attended exit interview on May 19, 1989.

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

2. Turbine Load Transient on May 14, 1989 (92705)

During the morning of May 14, 1989, Vogtle Unit 2 was operating at a nominal 90% RTP with a generator output of approximately 980 Mwe. All control systems were in automatic except for rod control, which was in manual. Two of three banks of backup pressurizer heaters were turned on manually. The RCS C_B had recently been diluted to compensate for xenon

buildup, and the heaters were on to increase pressurizer spray to bring the pressurizer C_B in equilibrium with that of the RCS.

At approximately 8:02 am CDT, the turbine control and combined intermediate valves closed. Generator output dropped to zero. The valves then opened and generator output increased to 920 Mwe. The total elapsed time for this event was less than two minutes, and the generator unloading and loading rates were approximately 200%/min, each way.

The following observations of plant performance during that two minute period were made from review of plant recorder traces and output of the alarm typer. On the secondary side, all steam dumps and atmospheric relief valves opened as steam pressure rose from 980 psig to a peak of 1180 psig. As load picked up and stabilized, these valves and dumps reseated without any difficulty. Steam generator levels fell in response to the secondary pressure increase, but did not fall to the trip setpoint. Once steam flow was reestablished, the levels swelled, but not to the trip setpoint.

On the primary side, pressurizer pressure rose from the normal 2235 psig to 2306 psig. One pressure-rate sensitive PORV opened briefly. The alarm typer records do not indicate the degree of PORV opening, but do show that the valve was not fully shut for 13 seconds. Subsequently, pressure dropped to 2120 psig in response both to the PORV opening and the cooldown of the RCS as the heat sink was reestablished. With the loss of heat sink, average RCS temperature rose from 586°F to 601°F with a concomitant increase in pressurizer level from 60 to 80%. Also, with the rapid increase in pressurizer level, the third stage of backup pressurizer heaters came on automatically. The inspector calculated the loss of RCS mass by thermal dilution to be 12,512 lbs of water. The corresponding increase in pressurizer inventory from the 20% level change was calculated, by the inspector, to be 12,350 lbs of water. This close agreement in inventory values indicates the instrumentation used was performing acceptably. The 162 lbs of water difference in the two masses is equivalent to 3 seconds of full-flow PORV operation. Since the PRT level was not recorded, no further correlation could be made. The difference between the two mass calculations is probably as indicative of the precision possible in the calculations as it is of PORV operation.

The records show that, during the transient, both the OPdT and OTdT trip setpoints lowered as expected, but with the loss of heat sink the actual dT also dropped and maintained a margin to the changing trip setpoints. The reactor power, as indicated by the recorder for the selected PRNI, dropped from 91% to 87% and returned to 91% during the transient. This response is consistent with nominal values of MTC and DPC, but can not be used to evaluate either. The response of the recorder is much slower than the response of the reactor to changes in temperature and power level. Furthermore, the increased temperature of the water in the downcomer, at the time of minimum power, would have increased the leakage flux at the detectors partially offsetting the flux reduction from power reduction. Hence, the actual reduction in reactor power may have been greater than

indicated on the PRNI recorder, but precise determination of the drop in reactor power is not necessary for the evaluation of this transient.

Following review of the records discussed above and discussions with members of the event evaluation team, the inspectors interviewed separately the members of the control room crew on duty during the transient. By sheer coincidence, the OSOS was in the Unit 2 control room when the transient began. From his description of his activities and recollections of the details of the event, the inspectors concluded he had performed his duty of maintaining an overview of the entire plant status and the activities of control room personnel in a thoroughly professional and proficient manner. His past experience as a simulator instructor contributed to his ability to maintain a broad overview rather than becoming too focused on a particular plant parameter. He did maintain cognizance of those parameters, which would dictate ordering a manual trip of the unit.

The Unit 2 shift supervisor too was in the control room throughout the transient, and also appeared to have a good recollection of the entire status of the unit as it went through its perturbation. He stated that one of his first actions following the apparent recovery of the unit was to confirm by reference to the TS that the safety limit on temperature and pressure had not been exceeded. It was his judgement also that no plant parameter he observed had reached a limit that should initiate an automatic trip or require a manual trip of the reactor.

There were two licensed operators in the control room. One was assigned to BOP and the other to MCB. Both appeared to the inspectors to have focused on the significant parameters within their individual purviews and to have responded appropriately to those parameters. In particular, the BOP operator took feedwater pressure control in hand immediately after power recovery to increase feed flow and reduce the chance of a trip on steam generator low level.

Although there was no similar event programmed on the plant simulator, manual simulations were performed with the active cooperation of the simulator instructor staff. When the turbine control valves were closed and reopened rapidly, the simulator unit did not trip, nor did the response lead to a condition requiring a trip. When the valve positions were changed slowly, the simulated unit tripped on low steam generator level.

The inspectors concluded that, unusual as the transient was, no plant parameter reached a state that should have required either an automatic or manual trip.

An event review team was formed shortly after the occurrence. By virtue of its makeup and its charter, the team focused on the cause of the turbine valve closures and the performance of the secondary system. Little early effort was spent by the team in evaluating primary side performance, and an operations department member was not appointed to the team until three days after the event. Team membership aside, it did

appear to the inspectors that the operations staff did perform a prompt and thorough evaluation of primary plant performance. It was only the integration of evaluation efforts that was delayed.

Because the event did not lead to a reactor trip, much of the data collected automatically following a trip or manually, in accordance with procedure 1006-C, Reactor Trip Review, were not captured. More data would have facilitated the event review.

The cause of the turbine valve closure had not been determined with certainty by the end of the inspection and will be inspected in the future.

No violations or deviations were identified.

3. Review of Completed Startup Tests (72578)

The following completed startup test procedures were reviewed:

a. 2-BB-01 (Revision 0), Reactor Coolant System Flow Measurement at Power, was performed during the period April 20 to May 16, 1989, at nominal power levels of 30% 50%, 78%, 90%, and 100% RTP. The minimum value of 403,578 gpm, at 100% RTP, satisfied the TS 3.2.5.c minimum limit of 396,198 gpm.

b. 2-6SE-02 (Revision 0), Incore Movable Detector and Thermocouple Mapping, was performed repeatedly during the period April 19 to May 18, 1989. Proper functioning of the equipment under test was confirmed.

No violations or deviations were identified.

4. Witnessing of the Plant Trip from 100 Percent Power (72580)

Startup test procedure 2-700-02 (Revision 0), Plant Trip from 100% Power, was performed on Saturday morning, May 20, 1989. Prior to performance of the test, the inspector reviewed the procedure and discussed it with test and operations personnel. The inspector confirmed the test met the description of FSAR 14.2.8.2.53 and satisfied the requirements of RG 1.67, Appendix A, paragraph 1.1.

The inspector attended the pretest briefing of shift and test personnel and witnessed control room activities during the test. All systems appeared to perform satisfactorily. One minor casualty occurred as a result of the test: a safety-relief valve blew off the feedwater side of the 6B feedwater heater. The inspector viewed the area; noted that the steam from a line about two inches in diameter was blowing straight up through a grating floor above and that no safety related equipment appeared to be in the path of the steam. After conferring with the shift

supervisor and receiving his assurance that the plant response to the trip had been normal and that a normal shutdown procedure was nearly completed without identifying any problems, the inspector left the site. The completed test procedure will be inspected during a future routine inspection.

No violations or deviations were identified.

5. Exit Interview (30703)

The inspection scope and findings were summarized on May 19, 1989, with those persons indicated in paragraph 1 above. The inspectors described the areas inspected and discussed in detail the inspection findings. In particular, the inspectors discussed the need for more guidance to personnel on the collection of data for detailed review of events that do not lead to a plant trip. The inspectors emphasized the need for early involvement of operations personnel in the review of all plant events. Dissenting comments were not received from the licensee. Proprietary information is not contained in this report.

6. Acronyms and Initialisms Used in This Report

DPC - doppler power coefficient
dT - delta temperature
FSAR - final Safety Analysis Report
gpm - gallons per minute
lbs - pounds
MCB - main control board
MTC - moderator temperature coefficient
Mwe - megawatts electrical
OPdT - overpower delta temperature
OSOS - onshift operations supervisor
OTdT - overpower delta temperature
PORV - power operated relief valve
PRNI - power range nuclear instrument
PRT - pressurizer relief tank
psig - pounds per square inch - gauge
RCS - reactor coolant system
RG - Regulatory Guide
RTP - rated thermal power
TS - Technical Specification