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

Report Nos.: 50-424/88-06

Licensee: Georgia Power Company
P. O. Box 4545
Atlanta, GA 30302

Docket No.: 50-424 License No.: NPF-68

Facility Name: Vogtle 1

Inspection Conducted: January 12-13 and 25-29, 1988

Inspector: [signature] 2-11-88
P. T. Burnett Date Signed

Approved by: Frank Jape 2/18/88
F. Jape, Section Chief Date Signed
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope: This routine, unannounced inspection addressed the areas of completed startup tests, thermal power monitoring, ECP and shutdown margin calculations, response to an Information Notice, and followup of open items.

Results: One violation was identified - Inadequate program for review of software used in surveillances - paragraph 6.

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REPORT DETAILS

1. Persons Contacted

   Licensee Employees

   *G. Bockhold, General Manager, Vogtle Nuclear Operations
   *R. M. Bellamy, Plant Manager
   W. L. Burmeister, Operations Superintendent
   *C. L. Cross, Senior Regulatory Specialist
   *R. J. Florian, Reactor Engineering Supervisor
   *W. Gabbard, Senior Regulatory Specialist
   B. Gover, Engineering Supervisor
   *W. F. Kitchens, Operations Manager
   *W. C. Marsh, Deputy Operations Manager
   *W. E. Mundy, Quality Assurance Supervisor
   *W. T. Nicklin, Regulatory Compliance Supervisor
   *K. Pointer, Senior Plant Engineer, Nuclear Safety and Compliance
   *P. Rushton, Plant Training Manager
   *D. H. Smith, Superintendent of Nuclear Operations
   *R. E. Spinnato, Independent Safety Engineering Group Supervisor

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

   Other Organizations

   C. B. Holland, Westinghouse
   *W. C. Phoenix, Consul Tec
   J. Willis, Westinghouse

   NRC Resident Inspectors

   *J. F. Rogge, Senior Resident Inspector, Operations
   R. J. Schepens, Senior Resident Inspector, Construction
   C. W. Burger, Resident Inspector

   *Attended exit interview

2. Exit Interview

   The inspection scope and findings were summarized on January 29, 1988, with those persons indicated in paragraph 1 above. The inspector described the areas inspected and discussed in detail the inspection findings. Licensee management made a commitment to continue using the inverse-multiplication approach to criticality until a more reliable method of xenon analysis, than the currently used power-block-averaging method, is justified. Dissenting comments were not received from the licensee. Proprietary information is not contained in this report. The findings included:

Violation 424/88-06-01: Failure to have an adequate program to control computer software used in surveillances - paragraph 6.

3. Licensee Action on Previous Enforcement Matters

This subject was not addressed in the inspection.

4. Unresolved Items

No unresolved items were identified during this inspection.

5. Completed Startup Test Procedures (72400, 72616, 72624)

The completed startup test procedures listed below were reviewed for completeness, adherence to FSAR test descriptions, and conformance to Regulatory Guide 1.68.

a. 1-5SQ-01, Metal Impact Monitoring System Test, is described in FSAR 14.2.8.2.19. It was started on February 3, 1987 and completed on June 30, 1987. All acceptance criteria were satisfied.

b. 1-6AE-01, Steam Generator Level Control Test, is described in FSAR 14.2.8.2.25. This test was performed on November 9, 1987 in conjunction with test 1-6SC-02, and used data obtained from that test. The acceptance criteria were satisfied, but one performance criterion was not; steam generator level swings were greater than 10%. This deficiency was evaluated in TER 16 for this test. The evaluation stated the larger swings were acceptable because the power change was greater than the planned 10%, actually 12%. This correlation of power change with level seems to miss the point of the test and the function of the level controller. However, see the evaluation performed under test 1-6SC-02 below.

c. 1-6SC-02, Load Swing Test, is described in FSAR 14.2.8.2 27. It was performed at 100% RTP on November 9, 1987, by first decreasing power by 10% and then, after stabilizing the unit, by increasing power 10%. All acceptance criteria were satisfied; neither the reactor nor turbine tripped and safety injection was not initiated. No manual intervention was necessary to maintain reactor power. RCS temperature, pressurizer pressure and level, steam generator levels and pressures remained within acceptable ranges throughout the test. One performance criterion was not satisfied; steam generator level swings were greater than the 5% specified in step 6.3.26. The steam generator level variations were reviewed by Westinghouse, the NSSS vendor, and documented in a letter, S.O. No: GAE301, dated December 15, 1987 The vendor found the actual performance satisfactory in all respects. Westinghouse did recommend specific actions to improve plant performance. Those to reduce feedwater flow oscillations have been completed. Fine tuning the steam generator level controllers for higher power operation has not been done. The licensee believes the tuning completed for low-power operation is the best compromise; since that will reduce the number of low-power steam generator level trips, which have plagued the plant in the past. The test is complete except for removal of test equipment, which was in progress during this inspection. The test results are summarized graphically in Supplement 1 to the Startup Report.

d. 1-6SE-01, Axial Flux Difference Calibration Test, is described in FSAR 14.2.8.2.29. The test was performed at 75% RTP (nominal) on May 9, 1987. The test was performed at 100% RTP on June 3, 1987 and completed on June 30, 1987.

   The inspector independently analyzed the data using a least-squares analysis spreadsheet with the micro computer program SUPERCALC3(V1.1). The inspector's values for zero-offset currents and slope of current against offset agreed closely with the licensee's at 75%. To analyze the data obtained at 100%, the inspector merged them with those from 75%; since only three sets of data, all at negative offsets, were obtained at 100%. The resulting slopes and zero-offset currents were little-changed from the earlier values, but the variances of each parameter were increased. The correlation coefficients of the fits were all decreased, but none dropped below 0.92. The licensee choose to analyze the three full-power observations separately and to recalibrate the PRNIs. Further inspection of the licensee's routine surveillance results for incore-excore correlations will be performed before reaching a conclusion on which is the better practice.

e. 1-800-01, Plant Performance, is described in FSAR 14.2.8.2.55. It was completed for 100% power operations on December 14, 1987. The test had no acceptance criteria, but the data for evaluating plant performance were obtained, and from their review specific recommendations for future improvements in plant performance and reliability were developed for consideration by management.

f. 1-600-13, Power Ascension Test Sequence, is described in FSAR 14.2.8.2.50. It is complete at 100% power except for the following steps:

   6.13.9 Perform 1-700-03, Steam Generator Moisture Carryover Test, (management has stated this test will not be performed), and

   6.13.15 Perform 1-6SD01, PERMS (an environmental monitoring system test).

None of the tests left to be performed are essential. Therefore, the inspection program for Unit 1 startup tests is closed.

No violations or deviations were identified.

6. Thermal Power Monitoring (61706)

The licensee has completed the review of the plant computer and manual procedure calculations of thermal power that was first addressed in inspection report 424/87-67. The PROTEUS (plant computer) calculation of thermal power accessed at point U1118, has been traced and validated. No change in the programming proper was required. A data base of constants is used in the calculation. Some of the constants required modification to reflect the plant or to assure a degree of conservatism when bounding values were used. The review is documented in the internal report, "Reactor Engineering Validation of U1118" (REV-1118).

In reviewing the default values entered into the database, the inspector found one to be based upon a non-conservative assumption. If a blowdown flow element is faulty, the program turns to the database for substitute value. The substitute value assigned was 90 gpm. Since steam flow is obtained by subtracting blowdown flow from feedwater flow, power would be under estimated if blowdown were less than 90 gpm. To be conservative, the substitute value should be zero. The licensee was informed of this finding during the first phase of this inspection. Prior to the second phase of inspection, the licensee had confirmed the finding of non-conservatism and evaluated the maximum effect as +0.2% RTP per affected steam generator or 28Mwth over power if all four loops were affected.

By the end of the inspection, steps were underway to change the default value of blowdown flow to 0 gpm prior to restart of the unit.

Procedure 00410-C (Revision 2), Computer Software Control, defines software as computer programs and data files containing programmer-specified constants, flags and setpoints. The data base discussed above was classified as a set of addressable or accessible constants and, hence, changes thereto were not subject to the review requirements of the procedure. The licensee recognized their vulnerability to unauthorized or unreviewed changes to the data base and changed the access level to the highest, level 8, on December 18, 1987. From that time on, only the computer engineer has had access to the data base, and, presumably, future changes to the database will be made only in conformance with the requirements of 00410-C, which requires proper review by qualified reviewers prior to implementation (step 3.1.1).

However, no retrospective review of the changes to the database by a qualified reviewer was performed, but the PRB did require that the values in the database be confirmed to be those recommended in REV-1118. Although [illegible] REV-1118 was discussed in detail with the PRB, it did not function as a qualified peer or interdisciplinary reviewer.

As written, 00410-C does not assure that a change in a database constant, which could affect surveillances performed with the computer or using a computer-generated result, as in procedures 14030-1 and 12004-1, would be recognized and reviewed as a change to a surveillance procedure.

This programmatic weakness has been identified as Violation 424/88-06-01: Failure to have an adequate program to control computer software used in surveillances.

7. Shutdown Margin and Estimated Critical Position Calculations (61707)

Procedure 14005-1 (Revision 3), Shutdown Margin Calculations, addresses the surveillance requirements of Technical Specifications 4.1.1.1.1 and 4.1.1.2. The procedure is used in concert with curves and tables in the PTDB. Ten procedures completed in the period June 3 to November 11, 1987 were reviewed for completeness and arithmetical accuracy. Two were compared in detail with the PTDB to assure that proper values had been abstracted from that document for use in the procedures. No discrepancies were found.

Procedure 14940-1 (Revision 5), Estimated Critical Condition Calculation, is used to calculate critical control rod position for a preset boron concentration or critical boron concentration for a preset rod pattern. It too uses curves and tables from the PTDB. Completed procedures for the startups on November 12, 1987, November 6, 1987, and October 31, 1987 were reviewed for completeness, accuracy in using the PTDB data, and comparison of predicted and actual critical configurations. No discrepancies were found, and the agreement between predicted and measure configurations ranged from 12 to 284 pcm, which were within the allowable limits specified in the procedure.

One potential problem was identified with both procedures. For periods when the reactor has not been at constant power for more than 36 hours, an "Equivalent Xenon Power Worksheet" (Tab 1.4.3 of the PTDB) is used to calculate an equivalent, xenon-at-saturation power. Experience at another facility has shown that a similar worksheet greatly over estimated xenon concentration when there had been periods of no or low power operation included in the average. The xenon reactivity error contributed to the occurrence of a startup rate in excess of 16 decades per minute (see Inspection Report 395/85-12-04). It appears that a similar potential exists at Vogtle 1; since the review of shutdown margin calculations revealed that in the period 0800 6/6/87 to 0538 6/7/87 the calculated xenon reactivity increased from -247pcm to -517pcm with only zero power operation in the interval.

The licensee is currently developing improved methods of calculating xenon. Until a better method is justified, the licensee has made a commitment to compensate for the potential non-conservatism in the present method by continuing the practice of approaching criticality by inverse multiplication monitoring. The licensee will also review the shutdown margin procedure to assure errors in xenon calculations do not compromise shutdown margin.

No violations or deviations were identified.

8. Resolution of Open Items (92701)

   (Closed) UNR 424/86-99-01: Natural circulation test and loss of offsite power test were scheduled to be performed after achieving 75% power rather than before power ascension and before exceeding 25% power respectively. The test descriptions in the FSAR, 14.2.8.2.46 and 14.2.8.2.47, were changed by amendment 33. The tests were successfully performed in accordance with amended descriptions.

   (Closed) IFI 424/86-99-02: Sample and control refueling canal boron concentration during initial fuel loading. Technical Specification 3.9.1 was amended to exempt sampling the refueling canal during initial fuel loading with the canal level below the vessel flange.

9. Followup of Information Notice (92703)

   (Closed) Information Notice 87-20: Hydrogen Leak in Auxiliary Building. From discussion with an engineering supervisor the inspector learned:

   a. A poll of the industry revealed no consensus on the the valve type to be used in hydrogen service. However, the licensee has judged it prudent to replace all packing valves passing hydrogen in the auxiliary building with diaphragm valves, except for one air operated control valve to the VCT, for which no diaphragm equivalent was found. A DCP was written for completion during the first refueling outage.

   b. The hydrogen lines meet seismic design criteria.

   c. The low normal flow of hydrogen coupled with normal service transients make use of the excess flow check valves on the skid impractical; since they would have to be set so low.

   d. The normal use of hydrogen is 600 SFC/day. Recently it has risen to 13,000 SCF/day. This problem is being corrected during the current outage. The hydrogen lost during recent operation did not enter the auxiliary building atmosphere, but went directly to a stack which exited the turbine building roof. The hydrogen concentration in the stack was as high as 17%.

   e. The HVAC system has been operation since the first event, which generated the notice; so the potential for building up hydrogen within the facility has been greatly reduced.

   f. An inline flow meter is being added to the system. It is expected to arrive on site on February 2, 1988.

   This item is closed.

Attachment:
Acronyms and Initialisms

ATTACHMENT

ACRONYMS AND INITIALISMS

BD - blow down
CFR - Code of Federal Regulations
DCP - design change procedure
ECP - estimated critical position
EFPD- effective full power days
FSAR- Final Safety Analysis Report
gpm - gallon per minute
HVAC- heating, ventillating and air conditioning
LER - licensee event report, required by 10 CFR 50.73
MCB - main control board
Mwth- megawatts of thermal power
NSS - nuclear steam system
NSSS- nuclear steam supply system
pcm - percent milli-rho
PRB - Plant Review Board
PRNI- power range nuclear instrument
PTDB- Plant Technical Data Book
RCP - reactor coolant pump
RCS - reactor coolant system
RTP - rated thermal power, the licensee limit in Mwth,
TER - test evaluation report
VCT - volume control tank