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Vogtle Project

April 8, 1985

Director of Nuclear Reactor Regulation
Attention: Ms. Elinor G. Adensam, Chief
Licensing Branch #4
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

File: X3BC35
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NRC DOCKET NUMBERS 50-424 AND 50-425
CONSTRUCTION PERMIT NUMBERS CPPR-108 AND CPPR-109
VOGTLE ELECTRIC GENERATING PLANT - UNITS 1 AND 2
DSER OPEN ITEM 99 - INITIAL TEST PROGRAM

Dear Mr. Denton:

Attached for your staff's review is the information requested on the VEGP initial test program. This information includes the items discussed in a teleconference with your staff on April 2, 1985 and will be included in Amendment 16 to the VEGP FSAR.

If your staff requires any additional information, please do not hesitate to contact me.

Sincerely,

J. A. Bailey

J. A. Bailey
Project Licensing Manager

JAB/sm
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REVISED RESPONSE TO NRC QUESTION 640.02

Revise item D to read:

"D. Each licensed reactor operator (RO or SRO who performs RO or SRO duties, respectively) will participate in the initiation, maintenance, and recovery from natural circulation during the low power natural circulation test or receive training on the simulator."

[redacted]

Q 640.20 RESPONSE

Testing will be performed to demonstrate that each Class 1E DC inverter, motor-operated valve, and solenoid-operated valve would receive adequate operating voltage if its respective battery were operating at the low voltage limit. The voltage drop for each of these feeders will be determined by measuring voltage as near as practicable to the component, while operating under load, and subtracting from prevailing nominal battery voltage. The resulting voltage drop will then be subtracted from the battery low voltage limit to demonstrate that available component operating voltage would be within its design range if the battery were discharged to this voltage without the availability of a battery charger. Each distribution air circuit breaker which receives control power from the Class 1E DC systems is separately tested during construction acceptance testing to demonstrate operability at minimum specified operating voltage.

preoperational test (paragraph 14.2.8.1.1), and pressurizer safety valve testing has been added to the reactor coolant system preoperational test abstract (paragraph 14.2.8.1.7). 9

The capacity of the pressurizer power-operated relief valves and the power-operated atmospheric relief valves is certified by the manufacturer. The pressurizer power-operated relief valves will be opened during hot functional testing as part of the pressurizer pressure and level control preoperational test (paragraph 14.2.8.1.11) which will verify that the discharge piping is clear and does not produce backpressure affecting the set/reset pressures. The testing to verify that the power-operated relief valves or the steam generator atmospheric release valves do not exceed the maximum analyzed capacity 15
is unnecessary. ~~The analyzed cases (see section 15.6) are for a safety release valve which in both the case of the pressurizer and steam PORVs exceed the PORV capacity by a factor of approximately 2. Exceeding the analyzed case is not credible.~~ ← insert The pressurizer power-operated relief valves are designed to prevent actuation of the reactor high pressure trip and the opening of the pressurizer safety valves on a 50 percent load reduction transient as described in subsection 5.4.13. This verification of the capacity of the pressurizer power-operated relief valves will be demonstrated in the large load reduction test (paragraph 14.2.8.2.5.2). The main steam atmospheric relief valves will be operated during hot functional testing which will verify the discharge piping is clear. The main steam atmospheric relief valves are designed to pass sufficient flow to achieve 50°/h plant cooldown rate as described in subsection 10.3.2. The capacity of the main steam atmospheric relief valves will not be verified inplace, but with the manufacturer's certification and the demonstrated 9
operability of the relief valves, VEGP meets the criteria of 15
Regulatory Guide 1.68, Revision 2, Appendix A, in regard to main steam atmospheric relief valves.

See attachment for inserts

Amend. 8 7/84
Amend. 9 8/84
Amend. 15 3/85

The analyzed case (15.6. for the pressurizer ~~PORV~~ is for a safety valve stuck open. The analyzed steam flow exceeds the maximum capacity of the PORV by a factor of approximately 2. The analyzed case for the steam line is a steam flow of 970,000 lbs/hr. @ 1200 psia. The maximum capacity of the PORV is 883,000 lbs/hr @ 1200 psia. as certified by the manufacturer. This is a difference of 9%. In addition this maximum ~~does~~ is conservative in that no credit is taken for line losses either between the main steam line and the valve or from the valve to the restrictor plate. Exceeding the analyzed case is not credible ....

3. Installation corrections for individual RTDs and isothermal corrections for individual thermocouples are determined from the recorded data. 15

4. After disconnecting special test instrumentation and reconnecting RTDs to normal plant terminations, temperature data are taken to verify that all temperature instruments are reading correctly. 15

D. Acceptance Criteria

1. Test data are recorded for future alignment purposes only, and specific acceptance criteria are not provided. However, any individual RTD reading that differs from the calculated average temperature by a specified amount will not be used for average temperature calculations. 15

2. All temperature instruments operate properly after reconnecting RTDs to their normal plant terminations. 15

3 All temperature instruments disconnected for measurement indicate approximately reactor coolant system average temperature when their RTD's are reconnected to normal plant terminations

14.2.8.1.16 RTD Bypass Flow Measurements

A. Objectives

1. To determine the flowrate necessary to achieve the design reactor coolant transport time in each RTD bypass loop.

2. To measure the flowrate in each RTD bypass loop and ensure that the transport times are acceptable.

B. Prerequisites

1. Required component testing and instrument calibration are complete.

2. The installed pipe length measurements are made with the plant cold before insulation is installed.

containment spray actuation load, load shed, and load sequencing signals. (See figure 7.3.11-2.) 15

2. Containment spray pump and system performance characteristics are within design specifications. (See NSSS Startup Manual, SU-4.1.8.) 15

3. Spray additive eductor operating characteristics are within design specifications. (See FSAR 6.2.2-4) 15

4. All containment spray nozzles are unobstructed, as evidenced by air passing through each nozzle. (See NSSS Startup Manual, SU-4.1.8.) 15

5. Containment spray pump and room cooler fan interlocking operates properly. (See figure 7.3.13-1.) 15

6. Containment spray system valve response times are within design specifications. (See table 6.2.4-1.) 15

7. Available net positive suction head (NPSH) requirements are met for the containment spray pumps, centrifugal charging pumps, safety injection pumps, and RHR pumps when all eight pumps are run simultaneously. (See figure 6.2.2-4, 6.3.2-3, 6.3.2-4, 6.3.2-5) 15

14.2.8.1.27 Reactor Makeup Water Storage Tank and Degasifier System Preoperational Test

A. Objective

To demonstrate operation of the reactor makeup water storage tank and degasifier system.

B. Prerequisites

The required portions of the following prerequisites are completed as necessary to support the preoperational test: 11

1. Construction acceptance testing completed.

2. Component testing and instrument calibration completed.

3. Test instrumentation available and calibrated.

14.2.8.1.35 Auxiliary Feedwater Pumphouse HVAC System Preoperational Test

A. Objective

To demonstrate operation of the auxiliary feedwater pumphouse HVAC system.

B. Prerequisites

The required portions of the following prerequisites are completed as necessary to support the preoperational test: 11

1. Construction acceptance testing is complete.

2. Component testing and instrument calibration are complete.

3. Test instrumentation is available and calibrated.

4. Support systems are available.

5. The turbine and motor driven AFW pumps are available for operation

C. Test Method

1. Verify manual and automatic system controls.

2. Verify alarms ~~indicating instruments~~, and status lights are functional.

3. Verify design airflow.

4. Each ESF fan will be shown to meet design requirements with the motor driven pump running and without assistance from any non-ESF equipment.

C.5 The non-ESF fan will be tested with the turbine driven pump operating.

D. Acceptance Criterion

1 The auxiliary feedwater pumphouse HVAC system operates as described in subsection 9.4.8. 10

2. The ESF fan maintain the motor driven pump room at or below 120°F (9.4.8.2.3)

3. The non-ESF fan maintains the turbine driven pump room at or below 104°F (9.4.8.2.

14.2.8.1.36 Fuel Handling Building HVAC System Preoperational Test

A. Objective

To demonstrate operation of the fuel handling building HVAC system.

B. Prerequisites

The required portions of the following prerequisites are completed as necessary to support the preoperational test: 11

C. Test Method

1. Verify instrument response to simulated external inputs.

2. Verify sampling system operation.

3. Verify emergency response facilities communication systems.

D. Acceptance Criteria

1. The emergency response facilities function as described in subsection 9.5.10 ~~when using the above test methods~~.

2. The post-accident sampling system operates as described in subsection 9.3.2 ~~when using the above test methods~~.

3. The post-accident monitoring system operates as described in subsection 7.5.3.

4. Verify the turbine plant sampling system operates as described in subsection 9.3.2. 10

5. Verify the nuclear sampling system operates as described in subsection 9.3.2.

14.2.8.1.84 Reactor Protection System and Engineered Safety Features Actuation System (ESFAS) Logic Preoperational Test

A. Objectives

1. To demonstrate operation of the ESFAS and reactor protection system and their ability to initiate appropriate reactor trip and safety actuation signals on receipt of simulated input signals.

2. To demonstrate operation of the reactor protection system block and permissive interlocks.

B. Prerequisites

1. Required component testing and instrument calibrations are complete.

Amend. 10 9/84
Amend. 11 11/84

D. Acceptance Criterion

The combined leakage from containment penetrations and isolation valves ~~is within design limits.~~ is .6La where L_a is a leakage of 0.020% by weight of the containment air per 24 hrs at a pressure of not less than Pa (design accident pressure).

14.2.8.1.100 Reactor Containment Structural Integrity Test

A. Objective

To demonstrate the structural integrity of the reactor containment building.

B. Prerequisites

1. Containment penetrations are installed, and penetration leak tests are complete.

2. Containment penetrations, including equipment latches and personnel airlocks, are closed.

C. Test Method

The containment is pressurized to the test value and deflection measurements, and concrete crack inspections are made to determine that the actual structural response is within the limits predicted by the design analyses.

D. Acceptance Criterion

The containment structural response is within the limits predicted by design analyses (FSAR 3.8.1.7)

14.2.8.1.101 High-Efficienty Particulate Air Filters Preoperational Test

A. Objective

To demonstrate operation of the high-efficiency particulate air (HEPA) filters.

B. Prerequisites

The required portions of the following prerequisites are completed as necessary to support the preoperational test: 11

1. Construction acceptance testing is complete.

2. The ventilation systems containing HEPA filters and charcoal absorbers have been air balanced and are operational and available to support this test.

B. Prerequisites

1. This test is conducted simultaneously with hot functional testing.

2. Supports, restraints, and hangers are installed; and reference points and predicted movements are established.

3. Temporary instrumentation is installed as required to monitor the expansion of the components under test.

4. A preservice examination has been performed on snubbers as defined in paragraph 14.2.8.1.103.A.2. 1

C. Test Method

1. During the reactor coolant system heatup and cooldown, deflection data are recorded.

2. Snubber thermal movements are verified by recording positions during initial system heatup and cooldown.

3. Snubber swing clearance is verified at specified heatup and cooldown intervals. 1

D. Acceptance Criteria

1. There shall be no evidence of blocking of the thermal expansion of any piping or components, other than by ~~design~~ installed supports, restraints and hangers. (FSAR 3.9.B.2.1)

2. Spring hanger movements must remain within the hot and cold setpoints, and snubbers must not become fully retracted or extended.

3. Piping and components must return to their approximate baseline cold position.

14.2.8.1.104 Power Conversion and Emergency Core Cooling System Dynamics Test

A. Objective

To demonstrate during specified transients that the system's monitored parts respond in accordance with design calculations.

B. Prerequisites

1. Reference points for measurement of the systems are established, and required temporary instrumentation is installed and calibrated.

2. Hot functional testing is in progress.

3. All subject systems are available for the specified dynamic operations.

C. Test Method

Deflection measurements are recorded during various plant transients.

D. Acceptance Criteria

1. The movements due to flow-induced loads shall not exceed design limits. (FSAR 3.9.2)

2. Flow-induced movements and loads will not cause malfunctions of plant equipment or instrumentation.

14.2.8.1.105 Remote Shutdown Preoperational Test

A. Objectives

1. To demonstrate the capability to cool down the plant from the hot standby condition to the cold shutdown condition using controls and instrumentation located outside the control room.

2. To demonstrate the capability to control plant parameters during a simulated loss of ac power using manual control and the steam-driven auxiliary feedwater pump. 9

B. Prerequisites

1. The controls and instrumentation associated with the remote shutdown panel are available.

2. Hot functional testing is in progress with the RCS temperature above that at which the RHR system is in operation.

3. Test instrumentation is available and calibrated.

4. Support systems are available.

C. Test Methods

1. Extraction line isolation and drain valves will be tested to verify the valves function in accordance with the control logic.

2. Each nonreturn valve will be observed ~~in its normal operating mode to verify that the valve is open and is free to move and~~ to verify that the valve shuts following a turbine trip signal.

D. Acceptance Criteria

1. The extraction line isolation valves close and drain ~~and drain valves function in accordance with the control logic~~. Valves open following a turbine trip signal

2. Each nonreturn valve ~~operates properly in its~~ closes ~~normal operating mode and~~ following a turbine trip. 9

14.2.8.1.108 Condensate and Feedwater Chemical Injections System Test

A. Objective

To verify the operability of the condensate and feedwater chemical injection system.

B. Prerequisities

1. Required construction acceptance testing is complete. 11

2. Required system flushing/cleaning is complete.

3. Required electrical power supplies and control circuits are operational.

4. The condensate and feedwater systems are available.

C. Test Method

1. The operating parameters of the positive displacement chemical feed pumps and the wet lay-up pumps will be measured.

2. The operating parameters of the mixing pumps will be measured.

D. Acceptance Criterion

1. The ~~op~~ isolation valves operate as described in 10.4.7.2.2 5

~~The ability to mix and inject chemicals into the secondary plant is demonstrated.~~

2. The automatic functions required to add chemicals performs as described in 10.4.7.5

14.2.8.1.109 Proteus Computer Preoperatonal Test

A. Objectives

1. To verify computer hardware is operational.

2. To verify all analog and digital inputs are conditioned correctly.

3. To verify computer software functions correctly.

B. Prerequisites 9

1. Required electrical power supplies are operational.

2. Test instrumentation is available and calibrated.

D. Test Method

1. Diagnostic programs are run on each section of hardware.

2. Test signals are injected into the computer to simulate all analog and digital inputs.

3. Software routines are run to verify operability of the software.

D. Acceptance Criteria

1. The diagnostic programs run on computer hardware without error (equipment technical manual).

2. The computer conditions all analog ~~and digital inputs according to the data base~~ inputs to outputs in agreement with the Proteus computer data base.

3. All software routines run without error, when subject to the diagnostics of the applications program test procedure.

Amend. 9 8/84
Amend. 11 11/84

14.2.8.1.110 Equipment Building HVAC and Piping Penetration Preoperational Test

A Objective 9

To demonstrate operation of the containment penetration cooling system and the equipment building HVAC system.

B. Prerequisites

The required portions of the following prerequisites are completed as necessary to support the preoperational test: 11

1. Construction acceptance testing is complete.

2. Component testing and instrumentation calibration are complete.

3. Test instrumentation is available and calibrated.

4. Support systems are available.

C. Test Method

1. Verify manual and automatic system controls.

2. Verify alarms, ~~indicating instruments~~, and status lights are functional. 9

3. Verify design airflow.

D. Acceptance Criteria

1. All FSF fans, dampers, and heaters operate ~~manually and in automatic according to design. As~~ as described in 9.4.3.2 and 9.4.9.2.

2. All alarms, indicators, and control switches operate according to design.

3. ~~Design airflow is verified.~~ Air flow for FSF fans is as described in 9.4.3.2 and 9.4.9.2

14.2.8.1.111 Steam Generator Blowdown Processing System

A. Objective 10

To demonstrate that the steam generator blowdown processing system accepts water from each steam generator blowdown line, processes the blowdown as

14.2.8.1. 125 Vdc Class 1E Minimum Load Voltage Verification

A. OBJECTIVES

1. To measure the voltage drops, at nominal battery voltage, to 125-Vdc Class 1E inverters and power-operated valves.
2. To determine the voltage which would be available at the 125-Vdc Class 1E inverters and power-operated valves if the batteries were discharged to the minimum voltage limit.
3. To verify that the voltage available to 125-Vdc Class 1E inverters and power-operated valves exceeds the design minimum.

B. Prerequisites

1. Required construction acceptance testing is complete.
2. The 125-Vdc Class 1E inverters and power-operated valves are operable.
3. Required load test devices are available.

C. Test Method

1. Each 125-Vdc Class 1E inverter will be loaded to its design capacity

   and the voltage drop from the battery to the inverter input measured.
2. Each 125-Vdc Class 1E power-operated valve will be operated and the voltage drop from the battery to the motor or solenoid measured.
3. The minimum available voltage at each 125-Vdc Class 1E inverter and power-operated valve will be determined from the measured voltage drops and the battery minimum voltage limit.

D. Acceptance Criteria

1. The minimum available input voltage for the 125-Vdc Class 1E inverters equals or exceeds 104 Vdc. (DC-1806)
2. The minimum available input voltage for the 125-Vdc Class 1E power-operated valves equals or exceeds 100 Vdc. (DC-1806).

C. Test Method

1. The flowrate necessary to achieve the design reactor coolant transport time for each hot and cold leg bypass loop is calculated utilizing the piping length of each leg.

2. The hot and cold leg RTD bypass loop flow data are recorded at operating temperature and pressure.

D. Acceptance Criterion

1. Using VEGP Unit 1 actual piping lengths the minimum flowrates were calculated to meet the transport time specified in the Westinghouse NSSS Startup Manual.

2. Actual flow rates in all RTD bypass manifolds exceed the minimum required flow rates required to achieve a 1.0 second tranport time. 15

3. Each RTD loop bypass low flow alarm has been verified to activate at the flow specified in the Westinghouse NSSS Startup Manual.

C. Test Method

1. Plant conditions are stabilized at selected power levels (30, 50, 75, and 90 percent). The plant 11 15
load is varied, using the turbine-generator controller, in a manner approximating step changes of about 2- to 4-percent power.

2. The differential power coefficient is obtained by dividing the total reactivity added, by rod movement, by the change in power.

D. Acceptance Criterion

The average value of the power coefficient agrees with the value given in the nuclear fuel design report. 9

14.2.8.2.27 Load Swing Test

A. Objective

To verify nuclear plant transient response, including automatic control system performance, when step load changes are introduced to the turbine-generator at 30, 9
50, 75, and 100 percent and at power levels.

B. Prerequisite

The plant is operating in a steady state condition at the desired power level.

C. Test Method

The turbine-generator output is manually charged as rapidly as possible to achieve a step load increase or decrease. Selected plant parameters are monitored and recorded during the load transients.

D. Acceptance Criterion

Insert A

The control systems, with no manual intervention, maintain reactor power, RCS temperature, pressurizer pressure and level, and steam generator levels and pressures without exceeding trip setpoints or
producing diverging ocillations during steady-state 15
and transient operation.

Amend. 9 8/84
Amend. 11 11/84
Amend. 15 3/85

Insert A

D. Acceptance Criterion -

1. The primary and secondary control systems, with no manual intervention, maintain reactor power, RCS temperature, pressurizer pressure and level, steam generator levels and pressures within accept ble ranges during steady-state and trans. nt operation.*

*Control system response is reviewed and adjustments to the control systems are made, if necessary, prior to proceeding to the next power plateau.

3. Core exit thermocouples will be monitored to assess core flow distribution.

D. Acceptance Criteria ~~Criterion~~ Insert 1

~~Natural circulation must occur in the primary system, and primary temperature and pressures are within the design limits of FSAR Section 5.1.2.~~ 15

14.2.8.2.48 Thermal Expansion Test

A. Objective

To demonstrate that essential NSSS and BOP components can expand without obstruction and that the expansion is in accordance with design. Also, during cooldown the components return to their approximate baseline cold position. Testing will be conducted to resolve discrepancies from hot functional testing and to test modifications made since hot functional testing was completed. Systems not tested during hot functional will be tested (e.g., main feedwater).

B. Prerequisite

Temporary instrumentation is installed as required to monitor the deflections for the components under test.

C. Test Method

For the components being tested the following will apply:

1. During plant heatup and cooldown, deflection data are recorded.

2. Snubber movements are verified by recording hot and cold positions.

D. Acceptance Criteria

For the components being tested the following will apply:

1. There shall be no evidence of blocking of the thermal expansion of any piping or component, other ~~than by design~~ other than by installed supports, restraints, and hangers (FSAR 3.9.B.2.1)

Insert 1

D.1 Natural circulation must occur in the primary system, and primary temperatures and pressures are within the design limits of FSAR 5.1.2.

2. Delta T across the reactor core is less than the full power delta T.

3. Decay heat removal capability is demonstrated by maintaining natural circulation conditions for a minimum of one hour.

C. Test Method

1. The turbine-generator is tripped by opening the generator main breakers. 8

2. Selected plant parameters are monitored and recorded.

3. If necessary, the control systems setpoints are adjusted to obtain optimal response.

D. Acceptance Criterion

Insert 2

Plant control systems and operator actions can control and stabilize the plant from a 100 percent load rejection. 8 15

14.2.8.2.54 Steam Generator Moisture Carryover Test

A. Objective

To determine the moisture carryover performance of the steam generators.

B. Prerequisites

1. Necessary licensing arrangements have been made for receipt and handling of approximately 1.0 Ci of sodium 24 isotope.

2. A suitable chemical addition system is available, with the capabilities for mixing the radioactive tracer solution in demineralized water and injecting it into the steam generator. 9

C. Test Method

1. Inject a radioactive tracer into the steam generator and perform activity analysis of selected water and steam samples.

2. Using the resulting data, calculate the average steam generator moisture carryover.

D. Acceptance Criterion

The measured steam generator moisture carryover is less than or equal to the warranted value.

Insert 2

D. Acceptance Criterion -

1. Following a 100 percent load rejection primary and secondary control systems and operator actions can stabilize RCS temperature, pressurizer pressure and level, and steam generator levels to no load operating temperature and pressure.

2. The steam dump control system operates to prevent opening of primary and secondary safety valves.

14.2.8.2.59 Gross Failed Fuel Detector Test

A. Objective

1. To calibrate the gross failed fuel detector

2. To establish baseline activity levels.

B. Prerequisites

1. Required electrical power supplies and control circuits are energized and operational

2. A neutron source is available

C. Test Method

1. Using a neutron source, the detector is calibrated and alarms checked.

2. At specified power levels (25, 100%) baseline activity levels are recorded.

D. Acceptance Criteria

1. The gross failed fuel detector is calibrated in accordance with the Westinghouse technical manual .

2. Base line activity levels are established.