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APR 17 1984

MEMORANDUM FOR: Elinor G. Adensam, Chief
Licensing Branch No. 4
Division of Licensing

FROM: Dennis L. Ziemann, Chief
Procedures and Systems Review Branch
Division of Human Factors Safety

SUBJECT: VOGTLE ELECTRIC GENERATING PLANT UNITS 1 AND 2
REQUEST FOR ADDITIONAL INFORMATION AND STAFF
POSITIONS - INITIAL TEST PROGRAM

Contractor personnel from Battelle Pacific Northwest Laboratories (PNL) have reviewed the initial test programs described in Chapter 14.0, Section 14.2, of the FSAR for the Vogtle Electric Generating Plant Units 1 and 2. PSRB has reviewed the PNL input and our questions and staff positions are enclosed for your transmittal to the applicant.

The PSRB reviewer for this task is R. A. Becker (X29689).

Original signed by
Dennis L. Ziemann

Dennis L. Ziemann, Chief
Procedures and Systems Review Branch
Division of Human Factors Safety

Enclosure:
As stated

cc w/enclosure:
M. Miller

8405290128 XA

DW/RAB1/RAI VOGTLE

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STAFF POSITIONS AND REQUESTS FOR ADDITIONAL INFORMATION
Vogtle Electric Generating Plant Units 1 & 2
INITIAL TEST PROGRAM

640.02 (1.9.68) (14.2.8) FSAR Subsection 1.9.68.2 does not provide adequate technical justification for not demonstrating the operability and automatic closure of all main steam isolation valves (MSIVs) at power in accordance with Regulatory Guide 1.68 (Initial Test Programs for Water-Cooled Nuclear Power Plants):

1. The exception to Regulatory Guide 1.68, Appendix A.5.u, is acceptable only if the operability and response times of the MSIVs are demonstrated at temperature. The Main Steam System Preoperational Test abstract (FSAR Subsection 14.2.8.1.1), or other appropriate test abstracts, should demonstrate proper operation and response times of the MSIVs during hot functional or startup testing.

2. The exception to Regulatory Guide 1.68, Appendix A.5.m.m, is acceptable only if MSIV system isolation is demonstrated during the initial test program. The Main Steam System Preoperational Test abstract (FSAR Subsection 14.2.8.1.1), or other appropriate test abstracts, should be modified to demonstrate MSIV system isolation.

640.03 (1.9.68) (14.2.8) FSAR Subsection 1.9.68.4.2 does not provide adequate technical justification for not performing loss-of-instrument-air tests in accordance with Position C.8 of Regulatory Guide 1.68.3 (Preoperational Testing of Instrument and Control Air Systems). Delete this exception and modify the Service Air System Preoperational Test abstract (FSAR Subsection 14.2.8.1.56), the Instrument Air System Preoperational Test abstract (FSAR Subsection 14.2.8.1.57), or other appropriate test abstracts to demonstrate this testing, or provide technical justification for retaining this exception.

640.04 (14.2.5) (14.2.8) NUREG-0694, "TMI Related Requirements for New Operating Licenses," Item I.G.1, requires applicants to perform "a special low power testing program approved by NRC to be conducted at power levels of greater than 5% for the purposes of providing meaningful technical information beyond that obtained in the normal startup test program and to provide supplemental training." The Low-Power Natural Circulation Test abstract (FSAR Subsection 14.2.8.2.47) does not reflect the comprehensiveness of the testing or operator training requirements. Modify the Low-Power Natural Circulation Test abstract (FSAR Subsection 14.2.8.2.47) and other test abstracts as appropriate to demonstrate the testing and training requirements, or their equivalent, as described in Attachment 4 to a letter from E. P. Rahe (Westinghouse) to H. R. Denton (NRC) dated July 8, 1981, which contains an acceptable approach for accomplishing the testing objectives listed below. Also, refer to a letter from R. L. Tedesco (NRC) to W. E. Ehrensperger (Georgia Power) dated June 10, 1981. The response should ensure accomplishment of the following objectives:

Testing--The tests should demonstrate the following plant characteristics: length of time required to stabilize natural circulation, core flow distribution, ability to establish and maintain natural circulation with or without onsite and offsite power, the ability to uniformly borate and cool down to hot shutdown conditions using natural circulation, and subcooling monitor performance. Test data should be used as feedback for simulator verification and update.

Training--Each licensed reactor operator (RO or SRO who performs RO or SRO duties, respectively) should participate in the initiation, maintenance, and recovery from the natural circulation mode. Operators should be able to recognize when natural circulation has been stabilized and should be able to control saturation margin, RCS pressure, and heat removal rate without exceeding specified operating limits.

640.05 (14.2.6) (14.2.8) The description of the approach to criticality in FSAR Subsection 14.2.6.2 (Post-loading Tests) or in the Initial Criticality Test abstract (FSAR Subsection 14.2.8.2.39) should be modified to include the following in accordance with Regulatory Guide 1.68, Appendix A.3:

1. A neutron count rate at least 1/2 count per second should register on the startup channels before startup begins, and the signal-to-noise ratio should be known to be greater than two.

2. Criticality should not be achieved on a period shorter than approximately 30 seconds (<1 decade per minute).

640.06 (14.2.6) (14.2.7) It is not apparent from the discussion in FSAR Subsections 14.2.6 and 14.2.7 that the commencement of fuel loading requires completion of all preoperational tests. For portions of any preoperational tests (including review and approval of test results) which are intended to be conducted after fuel loading: (a) list each test; (b) state what portions of each test will be delayed until after fuel loading; (c) provide technical justification for delaying these portions; and (d) state when each test will be completed.

640.07 (14.2.8) It is not appropriate to indicate that test abstract prerequisites are "established as required by the test instructions." The following startup test procedure abstracts (FSAR Subsection 14.2.8.2) should contain appropriate prerequisites (Regulatory Guide 1.68, Appendix C.1.a): 7, 8, 10, 12-14, 16, 17, 24-26, 29, 31, 33, 35, 37, 40, and 54.

640.08 (14.2.8) The acceptance criteria provided in FSAR Subsection 14.2.8 should include, for all tests subject to FSAR Chapter 17 (Quality Assurance) considerations, acceptance criteria or a discussion of the sources for the acceptance criteria to be used when test procedures are prepared. This information is necessary for the NRC inspectors who review test procedures and evaluate test results. The test description should provide "traceability" to acceptance

criteria sources such as: specific FSAR Subsections, Technical Specifications, topical reports, vendor-furnished test specifications, and/or accident analysis assumptions.

1. Appropriate acceptance criteria should be provided for the following listed test abstracts. The individual acceptance criteria could be modified, or a table could be provided which lists the acceptance criteria (preferably the appropriate FSAR subsection) for each test:

   a. Preoperational test abstract numbers (FSAR Subsection 14.2.8.1): 2, 7, 8, 10, 11, 14-26, 28, 31, 32, 34, 41, 43, 47-50, 53, 59-64, 69, 71, 74, 76, 80, 81, 84-86, 88-91, 93, 95-100, and 102-105.

   b. Startup test abstract numbers (FSAR Subsection 14.2.8.2): 2-4, 5, 7, 9, 10, 12, 13, 15-19, 24-27, 31, 33, 35-37, 40, 42-48, 52, and 53.

2. It is not appropriate to indicate that test abstract acceptance criteria are "in accordance with test instructions." The following startup test procedure abstracts (FSAR Subsection 14.2.8.2) should be modified to contain acceptance criteria as noted above: 10, 16, 17, 24-26, 31, 37, 40, and 53.

3. It is inappropriate (too circumscriptive) when referencing a specific FSAR subsection for acceptance criteria to add the phrase "when using the above test methods." The following listed preoperational test abstracts (FSAR Subsection 14.2.8.1) should be modified accordingly: 1, 2, 27, 33, 35-40, 42, 44-47, 51, 52, 54, 58, 78, 79, 82, 83, 87, 92, and 94.

640.09 (14.2.8) The Motor-Driven and Turbine-Driven Auxiliary Feedwater System Preoperational Test abstracts (FSAR Subsections 14.2.8.1.5 and 14.2.8.1.6) should include the following testing:

1. A 48-hour endurance test on all Auxiliary Feed Water (AFW) system pumps, if such a test or continuous period of operation has not been accomplished to date (to comply with Standard Review Plan Section 10.4.9). Following the 48-hour pump run, the pumps should be shut down and cooled down and then restarted and run for one hour. (Letter to all W System OL applicants from NRC - D. F. Ross, dated March 10, 1980.)

2. To verify conformance with Item GS-5 of the above referenced letter, the AFW system should be tested for capability to start and operate for two hours under simulated loss of all AC power conditions.

3. Manual and simulated automatic cold, quick starts for turbine-driven AFW pumps. At least one simulated automatic cold, quick start should follow an idle period of sufficient duration to demonstrate that the unit is not subject to startup overspeed trip due to drain-down of oil from the speed control

mechanism.

Test acceptance criteria for the above tests should include demonstrating that (a) the pumps remain within design limits with respect to bearing/bearing oil temperatures and vibration, (b) both normal and backup water supply source flowpaths are verified, and (c) pump room ambient conditions (temperature, humidity) do not exceed environmental qualification limits for safety-related equipment in the room.

640.10 (14.2.8) The Containment Spray System Preoperational Test abstract (FSAR Subsection 14.2.8.1.26) should include testing to verify that paths for the air-flow test of the spray nozzles overlap the water-flow test paths of the pumps to demonstrate that there is no blockage in that section of the flow path.

640.11 (14.2.8) The Nuclear Service Cooling Water System Preoperational Test abstract (FSAR Subsection 14.2.8.1.33) should include tests which demonstrate the operability and availability of the ultimate heat sink (FSAR Subsection 9.2.5). Such tests should demonstrate adequate NPSH and the absence of vortexing at the worst postulated conditions (minimum basin level and maximum basin temperature).

640.12 (14.2.8) The initial plant test program should ensure that the emergency ventilation systems are capable of maintaining all safety equipment within their design temperature range with the equipment operating in a manner that will produce the maximum heat load in the compartment. If it is not practical to produce maximum heat loads in a compartment during preoperational or startup testing, describe the methods that will be used to develop acceptance criteria that verify design heat removal capability of the emergency ventilation systems (i. e. , validation of analytical models using part load data).

Note that it is not apparent that post-accident design heat loads will be produced in ESF equipment rooms during the scheduled test phase; therefore, simply assuring that area temperatures remain within design limits during this period will not demonstrate the design heat removal capability of these systems. It will be necessary to include measurement of air and cooling water temperatures and flows, and the extrapolations used to verify that the ventilation systems can remove the postulated post-accident heat loads.

640.13 (14.2.8) The Service Air and Instrument Air System Preoperational Test abstracts (FSAR Subsections 14.2.8.1.56 and 14.2.8.1.57) should include testing to ensure that credible failures resulting in an increase in the supply system pressure will not cause loss of operability (Regulatory Guide 1.68.3, Position C.11).

640.14 (14.2.8) The Fire Protection System Preoperational Test abstract (FSAR Subsection 14.2.12.1.58) should provide assurance that:

1. Upon automatic sprinkler actuation, adequate drainage in the

affected spaces is provided to preclude flooding (including expected hand-held hose volume).

2. Nozzles serving indoor facilities are air-flow tested and that these tests overlap the water flow tests.

3. A walk-down of plant equipment is conducted to identify potential incidences where the actuation of fire suppression systems could cause damage to or inoperability of systems important to safety.

See I&E Information Notice 83-41: Actuation of Fire Suppression System Causing Inoperability of Safety-Related Equipment, June 22, 1983.

640.15 (14.2.8) The Diesel Generator Preoperational Test abstract (FSAR Subsection 14.2.8.1.64) or the Integrated Safeguards and Blackout Sequence Preoperational Test abstract (FSAR Subsection 14.2.8.1.97) should include a description of the following tests (Regulatory Guide 1.108, Periodic Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants):

1. Full-load-carrying capability test (Regulatory Guide 1.108, Position C.2.a.3)

2. Simultaneous start of redundant units (Regulatory Guide 1.108, Position C.2.b).

640.16 (14.2.8) The Main, Unit, and Reserve Auxiliary Transformers Preoperational Test abstracts (FSAR Subsections 14.2.8.1.66 and 14.2.8.1.67) should demonstrate the proper operation of transformer cooling under rated load or describe how data from testing under available load will be extrapolated to verify cooling capability under design loading.

640.17 (14.2.8) The Non-Class 1E AC Distribution Preoperational Test abstract (FSAR Subsection 14.2.8.1.68) references FSAR Subsection 8.3.2 (DC Power System) as part of the acceptance criterion. This test should be expanded to include testing of the DC distribution system, or a test absract should be provided which demonstrates testing of the DC distribution system.

640.13 (14.2.8) Provide assurance that NUREG - 0800, Appendix 3-A, Branch Technical Position PSB 1 voltage measurements will be taken at each load required for safe shutdown to assure an acceptable voltage drop from the appropriate Class 1E bus to the load.

640.19 (14.2.8) In accordance with Regulatory Guide 1.41, (Preoperational Testing of Redundant On-Site Electric Power Systems to Verify Proper Load Group Assignments), Positions C.2 and C.3, abstracts of preoperational tests involving sources of power to vital buses should address the following:

1. Full-load testing, or extrapolation to full-load testing

conditions, should be accomplished.

2. Buses and related loads not under test should be monitored to verify the absence of voltage.

3. Verify absence of cross-ties between units which could degrade emergency power on one unit due to testing on the other unit.

640.20 (14.2.8) The 125-V DC Preoperational Test abstracts (FSAR Subsection 14.2.8.1.69 and 14.2.8.1.74) should address the following:

1. The individual cell limits should be checked following the discharge test to ensure that they are within limits [Regulatory Guide 1.68, Appendix A.1.g(4)].

2. Incorporate testing to verify that at the minimum and maximum design battery voltages, required Class 1E loads can be started and operated. The battery chargers should not be put in use until after the 1E loads have started (IEEE 308-1980). For more information on problems with maximum battery voltage conditions, see I&E Information Notice 83-08, March 9, 1983.

640.21 (14.2.8) The Reactor Protection System Preoperational Test abstract (FSAR Subsection 14.2.8.1.85) should provide assurance that a manual reactor trip will cause both removal of voltage from the undervoltage trip coil as well as energization of the shunt trip coil (see I&E Bulletin 83-01, February 25, 1983).

640.22 (14.2.8) The Reactor Trip and ESFAS Response Time Test abstract (FSAR Subsection 14.2.8.1.106) should include or reference testing that will (Regulatory Guide 1.68, Appendix A.1.c):

1. Account for delay times of process-to-sensor hardware (e.g., instrument lines, hydraulic snubbers).

2. Provide assurance that the response time of each primary sensor is acceptable.

3. Provide assurance that the total reactor protection system response time is consistent with the accident analysis assumptions.

NOTE: Item 2 can be accomplished by measuring the response time of each sensor during the preoperational test, stating that the response time of each sensor will be measured by the manufacturer within two years prior to fuel loading, or describing the manufacturer's certification process in sufficient detail for use to conclude that the sensor response times are in accordance with design.

640.23 (14.2.8) The Rod Drop Time Measurement Test abstract (FSAR Subsection 14.2.8.2.14) should include retest (>3 times) of those control rods whose drop time falls outside the two-sigma limit (Regulatory Guide 1.68, Appendix A.2.b).

640.24 (14.2.8) The RCS Sampling for Core Loading Test abstract (FSAR Subsection 14.2.8.2.18) should include appropriate acceptance criterion.

640.25 (14.2.8) The Load Swing Test abstract (FSAR Subsection 14.2.8.2.27) should be accomplished at 25%, 50%, 75%, and 100% of full power (Regulatory Guide 1.68, Appendix A.5.h.h).

640.26 (14.2.8) The Remote Shutdown Test abstract (FSAR Subsection 14.2.8.2.45) should address the following (Regulatory Guide 1.68.2, Initial Startup Test Program to Demonstrate Remote Shutdown Capability for Water Cooled Nuclear Power Plants):

1. The test abstract should state that plant systems are in the normal configuration with the turbine-generator in operation (Regulatory Guide 1.68.2, Position C.3).

2. The test should demonstrate that the plant can be maintained at stable hot standby conditions for at least 30 minutes (Regulatory Guide 1.68.2, Position C.3.b).

640.27 (14.2.8) The Loss of Offsite Power at Greater Than 10-Percent Power Test abstract (FSAR Subsection 14.2.8.2.46) should state that the loss-of-power condition is maintained long enough (>30 minutes) for conditions to stabilize (Regulatory Guide 1.68, Appendix A.5.j.j).

640.28 (14.2.8) The response to Item 640.1 states that the Primary and Secondary Chemistry Test abstract (FSAR Subsection 14.2.8.2.49) will not be included in the initial test program. Either modify the response to Item 640.1 and provide this test abstract, or modify FSAR Subsection 1.9.68.2 to provide technical justification for the exception to Regulatory Guide 1.68, Appendix A.4.h and A.5.a.a).

640.29 (14.2.8) The Plant Trip from 100-Percent Power Test abstract (FSAR Subsection 14.2.8.2.53) states that the "turbine-generator is manually tripped." The test abstract should state that the trip is initiated by a direct electrical signal such that the turbine-generator will be subjected to the maximum credible overspeed condition, or a full load rejection test should be accomplished (Regulatory Guide 1.68, Appendix A.5.l.l and A.5.n.n).

640.30 (14.2.8) Regulatory Guide 1.68, Revision 2, Appendix A.1.a(2), A.1.e, A.4.p, and A.5.t prescribe testing for various valves. Modify appropriate FSAR Subsection 14.2.8 test abstracts to provide for a more complete demonstration of the operability of pressurizer power operated relief and safety valves, main steam line relief and safety valves, and main steam bypass valves. Such testing should include verification that:

1. Response times, and open and reclosure setpoints are checked.

2. Open and reclosure setpoints for all relief valves are checked at temperature.

3. The capacity of the pressurizer power operated relief valves and the power operated atmospheric relief valves is consistent with the accident analysis assumptions for both the minimum and maximum capacity conditions.

When referencing bench tests instead of performing installed capacity checks, technical justification should be provided. Where valves are not tested in-situ with the process fluid, testing should be conducted to verify that discharge piping is clear and will not choke or produce back-pressure affecting set-reset pressures and capacities of the valves.

640.31 (14.2.8) It is important that motor operated valve torque switches be set at the manufacturer's recommended values to ensure that the valves will operate under accident conditions (I&E Information Notice 84-10). If preoperational testing is conducted under low differential pressure conditions, it is possible that torque switch settings may have been reduced to prevent applying excessive force that could cause the valve to jam in the closed or open position during testing. Appropriate test abstracts (FSAR Subsection 14.2.8) should be modified to include (a) as prerequisites that the torque switch settings are at the manufacturer's recommended values prior to the beginning of preoperational testing, or (b) testing of valve operability with the torque switch settings at the required values. This may mean repeating tests when at rated differential pressure if lower torque switch settings were used for earlier testing.

640.32 (14.2.8) Our review of the initial test program description disclosed that the operability of several of the systems and components listed in Regulatory Guide 1.68 (Revision 2) Appendix A may not be adequately demonstrated by the initial test program. Expand FSAR Subsection 14.2.8 (Individual Test Descriptions) to address the following items:

NOTE: Inclusion of a test description in FSAR Chapter 14 does not necessarily imply that the test becomes subject to FSAR Chapter 17 (Quality Assurance) controls. Certain tests to be performed prior to fuel loading to verify system operability may be referred to as "acceptance tests" to distinguish them from "preoperational tests" subject to FSAR Chapter 17 test control, thereby reflecting a "graded approach" to testing consistent with Regulatory Guide 1.68, Position C.1.

Preoperational Testing

| R.G. 1.68 Appendix A | FSAR Section | Description |
|---|---|---|
| 1.d.7 | 10.2.2 | Extraction nonreturn valves |
| 1.d.9 | 9.2.6 | Condensate storage facility |

| | | |
|---|---|---|
| 1.e.5 | 10.3.2 | Steam Extraction System |
| 1.e.6 | 10.2.2 | Main stop, control, intercept, and intercept stop valves |
| 1.e.7 | 10.4.1 | Main condenser hotwell level control system |
| 1.e.11 | 10.4.10 | Condensate and feedwater chemical injection system |
| 1.i.21 | | Containment penetration cooling system tests |
| 1.j.17 | 10.4.7 | Feedwater heater temperature, level, and bypass control systems |
| 1.j.25 | | Process computers |
| 1.l.4 | 11.5 | Isolation features for steam generator blowdown |
| 1.l.6 | 11.5 | Isolation features for ventilation systems |
| 1.l.7 | 11.5 | Isolation features for liquid radwaste effluent systems |
| 1.m.1 | 9.1.3, 11.5 | Spent fuel pit cooling system tests of high radiation alarms and low water level alarms |
| 1.m.3 | 9.1.4 | Operability and leak tests of sectionalizing devices and drains and leak tests of gaskets or bellows in the refueling canal and fuel storage pool |
| 1.m.4 | 9.1.4 | Dynamic (100%) and static (125%) tests of cranes, hoists and associated fuel storage and handling systems. |
| 1.n.5 | 9.3.2 | Turbine plant water sampling systems |
| 1.n.8 | | Seal water systems |
| 1.n.15 | | Shield cooling systems |
| 1.o.1 | 9.1.5 | Polar crane dynamic (100%) and static (125%) loading tests. |
| Initial Fuel Loading and Precritical Tests | | |
| 2.b | | Control rod decelerating devices |

Low power testing

| | |
|---|---|
| 4.d | Adequate overlap of source- and intermediate- range neutron instrumentation |
| 4.j | Containment ventilation operability with RCS at rated temperature |
| 4.k | MSIV operability and response time tests at rated temperature (see Item 640.02) |
| 4.n | Computer |

Power Ascension Tests

| | |
|---|---|
| 5.q | Failed fuel detector |
| 5.r | Computer |
| 5.w | Containment penetration coolers. Provide a preoperational test description or, on those penetrations where coolers are not used, provide a startup test description that will demonstrate that concrete temperatures surrounding not penetrations do not exceed design limits. |
| 5.c.c | Gaseous and liquid radwaste systems |
| 5.f.f | Ventilation and air conditioning systems |
| 5.g.g | ATWS systems which may be inscalled in the future |
| 5.k.k | Loss of or bypass of feedwater heaters |

640.33 (14.2.8) List and provide technical justification for any tests or portions of tests described in FSAR Chapter 14 which you believe should be exempted from the license condition requiring prior NRC notification of major test changes to tests intended to verify the proper design, construction, or performance of systems, structures, or components important to safety [fulfill General Design Criteria (GDC) functions and/or are subject to 10 CFR 50 Appendix B Quality Assurance requirements].