CP&L

Carolina Power & Light Company

H. B. ROBINSON STEAM ELECTRIC PLANT
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Mr. Steven A. Varga
Director of Nuclear Reactor Regulation
Division of Licensing
Chief Operating Reactors Branch No. 1
United States Nuclear Regulatory Commission
Washington, D. C. 20555

H. B. ROBINSON STEAM ELECTRIC PLANT
UNIT NO. 2
INTEGRATED STARTUP TESTING
STEAM GENERATOR REPLACEMENT OUTAGE

Dear Mr. Varga:

SUMMARY

Carolina Power & Light Company (CP&L) hereby submits for review the integrated startup test plans for H. B. Robinson Steam Electric Plant Unit No. 2 (HBR2), fulfilling the requirement of Amendment No. 77 to the HBR2 Operating License to submit these plans 60 days prior to fuel loading. This inspection and testing effort will be performed prior to and as a part of returning HBR2 to operation after the current Steam Generator Replacement Outage.

DISCUSSION

As required by Criterion 1 of Appendix A to 10 CFR 50, all structure, systems, and components will be tested or demonstrated operable to levels commensurate with the importance of the safety functions. In addition, the extent of testing will vary directly with the amount of construction done to and around the particular equipment or system. The sequence of tests will be conducted so that the safety of the Plant is not totally dependent on the performance of untested structures, systems, or components. These tests will consist of those currently existing as part of the Plant Operating Manual (POM), those prepared as part of modification procedures implemented during the outage, and some special tests prepared specifically for the startup effort. Tests and procedures will be developed and approved prior to their use and will be scheduled on the official startup milestone schedule.

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Further information, including procedures and schedules, will be available for the NRC Site Inspector at the Plant.

Detailed information pertaining to HBR2 integrated startup testing phase is discussed in Appendix I. The list of tests and checks performed during the preoperational testing phase is discussed in Appendix II, and list of major tests and checks performed during startup phase in Appendix III.

CONCLUSION

This letter outlines the integrated startup test effort CP&L plans to implement to demonstrate the ability to safely return HBR2 to operation. These efforts will provide the necessary assurance that the Plant can be operated in accordance with design requirements, Technical Specifications, and in a manner that will not endanger the health and safety of the public.

If you have any further questions regarding this program, please contact my staff or me.

Yours very truly,

Guy P. Beatty, Jr.
Manager
Robinson Nuclear Project Department

GPB/sr

Appendix I - H. B. Robinson Unit 2 Integrated Startup Testing - Steam Generator Replacement Outage
Appendix II - List of Tests and Checks During Preoperational Phase
Appendix III - List of Major Tests and Checks During Startup Phase

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APPENDIX I
THE H. B. ROBINSON UNIT NO. 2
INTEGRATED STARTUP TESTING
STEAM GENERATOR REPLACEMENT OUTAGE

TEST PHASES

The startup effort can be viewed as three testing phases: construction testing, preoperational testing, and startup testing. These testing phases will be integrated on a system basis with each phase consisting of a series of tests which are described below. It should be noted that these phases of testing, because of the nature of modifications performed, may occur at different times within the schedule and overlap one another.

1. Construction Testing Phase

The tests in the construction testing phase are designed to provide assurance that construction and installation of new, modified, or replaced equipment in the power plant has been accomplished properly and in accordance with the modification requirements. These tests are generally prepared as a part of the modificaiton package but may include existing procedures referenced in the modification package.

These tests consist of non-dynamic instrument, electrical, and mechanical tests for new or modified systems or components. The installed components and systems are tested and evaluated according to approved test procedures. Construction tests are performed to assure the quality implementation of the modification and deficiencies, where found, are corrected prior to satisfactory completion of these tests.

2. Preoperational Testing Phase

The tests in this phase are designed to provide assurance that components and subsystems of new, modified, and original systems function safely within established design criteria. The preoperational testing of new or modified systems is conducted after successful completion of construction testing and prior to declaring a system operable. This test phase generally involves the Plant operating staff and allows them to become familiar with the operation of a new or modified system and to verify, to the extent practical, the adequacy of new operating procedures.

The actual sequence of individual tests is formulated prior to performing the tests and is maintained on a Plant startup milestone schedule.

This phase consists of tests, adjustments, calibrations, and system operations necessary to assure that subsequent operation and/or testing can be safely undertaken. As an example, the hot functional test includes heatup of the primary system to hot shutdown condition, thermal expansion checks of affected systems, and a primary system operational pressure test.

Where performance of components or systems deviates from predicted results, further engineering evaluations, rework and/or retesting will be performed to resolve the discrepancies before the test is considered satisfactory. Components and/or systems which have to be modified as a result of the preoperational testing will be retested to verify acceptable performance. Preoperational testing, in accordance with approved procedures, is performed to verify as near as possible the performance of the systems under actual operating conditions.

3. Startup Testing Phase

The startup testing phase is designed to provide assurance that systems which were previously demonstrated as functioning safely and the newly modified systems will safely function under normal operating and transient conditions, without substantial reduction in the safety margin for the protection of public health and safety.

This phase will be similiar to a normal refueling startup and will consist of tests such as; fuel handling equipment tests, containment leakrate tests, safeguards tests, low power physics tests, and power escalation tests.

EXTENT OF TESTING

Because of the various amounts of construction done to and around each system, a graded approach for the extent of testing is employed. In areas such as containment, where extensive work has been performed, nuclear safety related equipment and systems will be checked by visual inspection during the construction testing, preoperational testing or startup testing phase. In other areas such as the Auxiliary Building where little work has been performed, selected system walkdowns will be performed. These system walkdowns will be employed in conjunction with the normal Plant startup procedures to verify the operability of the equipment.

Those systems that are new or have undergone major design basis changes will undergo complete component testing and performance testing, as part of the modification process to verify design and installation.

ORGANIZATIONAL RESPONSIBILITIES

The management and direction of the startup testing effort is under the direct control of CP&L with principal authority assigned to the Robinson Nuclear Project Department Manager. The Outage Manager is responsible to the Robinson Nuclear Project Department Manager for managing, coordinating and overviewing the overall outage and startup effort.

The outage organization is responsible to the Outage Manager and is composed of engineers and technical personnel drawn from the various disciplines on site with assistance from offsite CP&L personnel or consultants as required.

The Plant General Manager has overall responsibility for the preparation and implementation of procedures governed by the HBR2 Administrative procedures. Other members of the Plant Management staff, namely Unit Managers, are delegated development, review, and approval responsibilities for certain volumes of the Plant Operating Manual. These Unit Managers may designate a Supervisor who will be responsible for procedure development and review. Approval responsibility will be retained by the Unit Manager in accordance with the Plant Technical Specifications. In the absence of the Unit Manager, approval reverts to the General Manager or his designated alternate. Administrative control for making changes to approved procedures are also provided in the existing procedures.

In addition to the Robinson Department Organizations described above, an independent pre-startup readiness evaluation will be performed by the Onsite Nuclear Safety Unit to assess the Plant capability to start up safely.

APPENDIX II

LIST OF TESTS AND CHECKS DURING PREOPERATIONAL PHASE

TITLE OF TEST OR CHECK	TEST CHECK OBJECTIVE
I. SECONDARY HYDROSTATIC TESTING	
1. Steam Generator (S/G) Secondary Side Integrity Test	To verify the integrity of secondary side and associated piping following the installation of the new S/G assemblies.
II. BALANCE OF PLANT (BOP) CLEANUP	
1. BOP Cleanup	To perform functional tests to verify the operability of the modified BOP systems. In addition, the systems are integrally operated to cleanup and bring the secondary plant into compliance with the new All Volatile Treatment (AVT) chemistry requirements. The tests and checks are performed in accordance with the test procedures contained in each modification package and with the integrated BOP cleanup procedures.
III. HOT FUNCTIONAL TEST	
1. RCS Operational Pressure Test	The pressure testing of the RCS will be performed at test pressures specified by the ASME standards for the system.
2. Process Instrumentation (Temperature pressure, level, and flow instruments)	Plant equipment and instrumentation are calibrated, aligned and tested, as appropriate, in accordance with the Plant procedures.
3. Expansion and Restraint	During the heat-up to operating temperature, selected points on components and piping of the Reactor Coolant System are checked at various temperatures to verify unrestricted expansion.

TITLE OF TEST OR CHECK	TEST CHECK OBJECTIVE
4. Pressurizer	During the course of the Plant heatup, the pressure controlling capability of the pressurizer will be demonstrated. The Pressurizer Safety Valves are tested to verify setpoints using existing Plant procedures prior to reinstallation.
5. Reactor Coolant Pumps and Motors	As the pumps and motors are placed in operation, routine preventive maintenance and vendor recommended inspections are performed. The reactor coolant pumps will be placed in service using normal Plant operating procedures.
6. Steam Generators	The proper operation of the level indication of each steam generator is checked during heat-up and at temperature.
7. Chemical Tests to Establish Water Quality	Water for Reactor Coolant System fill and makeup will be analyzed to ensure compliance with the requirements specified in the Plant procedures.
8. Steam Generator Safety Valves	The setpoint of safety valves will be verified by tests at appropriate pressure and temperature conditions in accordance with existing Plant procedures.
9. Residual Heat Removal System	The residual heat removal system's capability to remove heat in the normal Plant cooldown mode will be verified.
10. Component Cooling Water (CCW) System Operational Check	The CCW will be placed in service to the components requiring CCW service during the test.
11. Primary Sampling System	Primary sampling will be performed as required during the test to support the chemistry requirements.
12. Steam Generator Water Hammer Test	A test for the feedwater piping inside containment (and close to the steam generators) will be performed to provide a means for verifying the absence of water hammer.

NOTE: The sequence of tests and checks is not necessarily in the order that will be performed during the Hot Functional Test phase.

APPENDIX III

LIST OF MAJOR TESTS AND CHECKS DURING STARTUP PHASE

TITLE OF TEST OR CHECK	TEST OR CHECK OBJECTIVE
I. FUEL LOAD	
1. Reactor Component Handling System (Polar Crane)	Testing was performed on the polar crane during the construction phase of the S/G repair.
2. Refueling Equipment (Hand Tools, Power Equipment and Associated Protective Interlocks)	Prior to core loading, tests and checks will be performed in accordance with existing Plant procedures to demonstrate the operability of the fuel handling equipment and Fuel Transfer System.
3. Nuclear Instrumentation System (Source Range)	Nuclear instruments are aligned and operability will be verified.
4. Process Instrumentation (Temperature Pressure, Level and Flow Instruments)	Equipment will be aligned and calibrated using existing Plant procedures.
5. Area Radiation Monitor Tests	Prior to core loading, the Radiation Monitoring System alarms associated with core loading will be checked and the alarm setpoints verified.
6. Chemical and Volume Control System	Makeup and letdown operations will be conducted with the Chemical and Volume Control System to check the different modes of dilution and boration and to verify flow in the different modes. The adequacy of heat tracing to maintain the required boric acid concentration in solution will be verified. In addition, the ability to adequately sample will be demonstrated.
7. Safety Injection System	The ability of the Safety Injection System to inject borated water into the Reactor Coolant System, will be verified during refueling cavity fill and by appropriate surveillance test.

TITLE OF TEST OR CHECK	TEST OR CHECK OBJECTIVE
8. Primary Chemistry Sampling	Prior to, during, and following core loading, primary sampling will be performed to verify that chemistry in the Reactor Coolant System is within Technical Specification limits.
II. LEAK RATE TESTING	
1. Containment Tests	Integrated leakrate tests are performed in accordance with the established Plant program on the requirements of Technical Specifications.
III. INTEGRATED SAFEGUARDS TESTING	
1. Engineered Safety Features	The Engineered Safety Features logic matrices are tested to demonstrate operability, proper logic, redundancy and coincidence in accordance with Technical Specifications.
2. Emergency Power Systems	The automatic starting and loading of the the emergency diesel generators is demonstrated during the Safeguards testing.
3. Containment Isolation Systems	The operation of actuation systems and components used for containment isolation is verified during the Safeguards testing.
4. Auxiliary Feedwater System	Automatic operation of pumps and valves is verified during the Safeguards testing.
5. Safety Injection System	Automatic operation of pumps and valves is verified during the Safeguards testing.
6. Residual Heat Removal System	Automatic operation of pumps and valves is verified during the Safeguards testing.
7. Containment Spray System	Automatic operation of pumps and valves is verified during the Safeguards testing.
8. Emergency Containment Coolers	Automatic operation of coolers, valves and required water flow is verified during the Safeguards testing.
9. Emergency Containment Filters	Automatic operation of filter fans is verified during the Safeguards testing.

TITLE OF TEST OR CHECK	TEST OR CHECK OBJECTIVE
10. Accumulator Check Valves	Operation of check valves will be verified during the Safeguards testing.
11. Service Water System	Automatic operation of pumps and valves is verified during the Safeguards testing.
12. Isolation Valve Seal Water System	Automatic initiation of the IVSW is verified during the Safeguards testing.
13. Control Room Ventilation Isolation System	Automatic initiation of Control Room Emergency Ventilation System into the recirculation mode is verified during the Safeguards testing.
14. Steam Line Isolation	Operation of isolation valves will be verified during the Safeguards testing.

IV. CRITICALITY AND LOW POWER PHYSICS TESTS

1. Reactor Protection System	Prior to criticality, this system is tested to demonstrate operability, proper logic, redundancy and coincidence. The operability of the protection channels are verified using the Plant procedures.
2. Nuclear Instrumentation (Excore)	Prior to criticality, all channels are checked to verify high level trip functions, and alarm setpoints.
3. Control Rod Systems Tests	
A. Rod Control System	The ability of the system to step is verified, the alarm and inhibit functions tested and the system parameters adjusted to specified values.
B. Rod Drop Tests	At hot shutdown conditions, the drop times of full length rods are tested. The drop time is measured from the release of the rod until the rod enters the top of the dashpot. This time is verified to be less than the maximum value specified in the Technical Specifications.

TITLE OF TEST OR CHECK	TEST OR CHECK OBJECTIVE
C. Rod Position Indication	During Rod Control System tests, the Position Indication System is aligned to provide rod movement indication. At hot shutdown conditions, individual rod positions are calibrated to within tolerances specified in existing Plant procedures.
4. Steam Generator Blowdown System Test	At hot shutdown conditions, a functional test is performed to verify that blowdown flow is consistent with system design parameters.
5. Initial Criticality	The objective is to bring the reactor critical from the Plant hot shutdown condition. Prior to start of rod withdrawal, the nuclear instrumentation has been aligned, checked, and conservative reactor trip setpoints made per existing Plant procedures. At preselected points during rod withdrawal, data is taken and inverse count rate plots are made to enable extrapolating to the expected critical rod position. Initial criticality and low power physics tests are performed in accordance with existing Plant procedures to verify core design parameters.

V. FULL POWER OPERATION

1. Power Level Escalation	Normal Post Refueling Technical Specification required testing will apply for power level escalation. In addition, steam generator thermal output and RCS flow measurement test will be performed.

TITLE OF TEST OR CHECK	TEST OR CHECK OBJECTIVE
2. Power Conversion System (Turbine Generator)	
A. Vibration Frequency and Amplitude	When the main turbine is rolled, vibration readings are continuously monitored and alarmed when excessive vibration is indicated. (Turbine vibrations are also monitored throughout the Power Escalation Program). Major equipment (e.g., feedwater pumps and condensate pumps) are operated as they become available and are observed for indications of excessive vibration.
B. Feedwater and Feedwater Control System	During power level escalation, the ability of the Feedwater Pumps and Control System to maintain level in the steam generators is verified.
C. Steam Generator Makeup Water and Chemical Treatment	The Makeup System to the steam generators is checked to verify operability. The Chemical Treatment System is checked when chemicals are added to the Feedwater System.