

VIRGINIA ELECTRIC AND POWER COMPANY  
RICHMOND, VIRGINIA 23261

August 13, 1979

Mr. Harold R. Denton  
Office of Nuclear Reactor Regulation  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Serial No. 550  
PO/RWC:jh  
Docket No. 50-281  
License No. DPR-37

Attention: Mr. Albert Schwencer  
Operating Reactors Branch 1

Dear Mr. Denton:

We are submitting, for your review, our Integrated Startup Test Program for inspection and testing to be completed prior to returning Surry Power Station Unit No. 2 to operation after the Steam Generator Repair Program. This letter is to meet the requirements of admendment 46 to the Operating License for Surry Power Station Unit No. 2 to submit the test program sixty days prior to fuel loading. The Integrated Startup Test Program is comprised of three phases: Construction Tests, Preoperational Tests and Startup Tests. The format of the program follows the intent of Regulatory Guide 1.68, Revision 2, August, 1978, "Preoperational and Initial Startup Test Programs for Water-Cooled Power Reactors." In some cases interpretation is necessary since Surry Unit No. 2 is a previously licensed PWR plant that has undergone major equipment replacement and modification rather than being new construction.

The tests in the Construction Test phase are designed to provide assurance that construction and installation of new, modified or replaced equipment in the power station has been accomplished properly and in accordance with the Design Change requirements.

The tests in the Preoperational Test phase are designed to provide assurance that components and subsystems of new, modified and original systems function safely within established design criteria. The Preoperational Tests on a new or modified system are conducted after successful completion of Construction Tests and prior to fuel loading. This test phase also allows the plant operating staff to become familiar with the operation of a new or modified system and to verify by trial use, to the extent practical, that the operating procedures are adequate.

The tests in the Startup Test phase are designed to provide assurance that systems that were previously demonstrated as functioning safely, and the new or modified systems will function to "(1) provide for safe normal operation and high tolerance for systems malfunctions and transients, (2) ensure that, in the event of errors, malfunctions, and off-normal conditions, the reactor protection systems and other design features will arrest the event or limit its consequences to defined and acceptable levels, and (3) ensure that adequate safety margins exist for events of extremely low probability or for

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arbitrarily postulated hypothetical events without substantial reduction in the safety margin for the protection of public health and safety". The Start up Tests are performed during and after fuel loading to confirm the design basis and demonstrate that the plant will continue to operate in accordance with design.

Per Criterion 1 of Appendix A to 10 CFR Part 50 all structures, 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 never totally dependent on the performance of untested structures, systems or components.

This letter does not address other items restricting the startup of Surry Power Station Unit No. 2 such as the Vepco response to the Show Cause Order of March 13, 1972. The impact of any design change or maintenance associated with this or any other work will be reflected in the system matrix (Appendix D, Attachment 8.4) and included in the Integrated Startup Test schedule.

The key points of the Integrated Startup Test Program are presented below. The referenced Appendices provide additional details of the program. Further information including the Integrated Startup Test schedule is available for the NRC site inspector at the station. These Appendices are working documents that will be revised as required within the framework of this letter.

#### ORGANIZATION

Appendix D contains the "Procedure for Conducting the Integrated Startup Test Program for Post Steam Generator Replacement and PO&M Design Changes. This document defines the organizations, responsibilities, actions and administrative controls for each phase of the program.

The management and direction of the Integrated Startup Test Program is under the direct control of Vepco with principal authority assigned to the Superintendent of Operations for Surry Power Station. The Startup Group is composed of Stone and Webster Engineering Corporation advisory engineers, and Vepco station operations and engineering personnel. The Construction Test Group is composed of construction engineers under the direction of the release coordinator. Both these groups report directly to the Vepco Startup Coordinator. The Startup Group has overall responsibility for implementation and documentation of the program. Attachment 9.6 of Appendix D shows the overall organization for the program.

The conduct and direction of the tests in the Construction Tests phase are controlled by the Vepco Construction Test Group with technical advice from the Startup Group. The conduct and direction of the tests in the Preoperational Test phase are controlled by the Startup Group. The conduct and direction of the tests in the Startup Test phase are controlled by Vepco Station operations and engineering staff with technical support from the Startup Group.

In all cases the test procedures require approval of the Station Nuclear Safety and Operating Committee prior to implementation. Deviations to approved test procedures are documented and become part of the final test results. Administrative control for making changes to approved procedures are provided in the Vepco Nuclear Power Station Quality Assurance Manual. The acceptance criteria for all tests are approved by the Station Nuclear Safety and Operating Committee. Construction related deficiencies are resolved by the Construction Test Group. Design related deficiencies are resolved by the responsible test group with the assistance of the Vepco project engineer and Vepco operations or outside consultants as deemed necessary.

### TEST PHASES

The Construction Test, Preoperational Test and Startup Test Phases are shown on the network in Appendix A and defined in more detail in Appendix D. Each phase of the Integrated Startup Test Program is composed of a series of tests as described below:

#### 1. Construction Test Phase

The Construction Test phase is comprised of non-dynamic instrument, electrical and mechanical tests included in Design Change packages for new or modified systems or components.

The installed components and systems are tested and evaluated according to approved Design Change test procedures. Construction tests are performed to assure the quality implementation of the Design Change.

This phase also includes testing of any rework associated with deficiencies found by testing or quality control in the Construction Test, Preoperational Test or Startup Test phase.

All safety related equipment or systems removed for maintenance work will undergo instrument, electrical and mechanical tests included in the maintenance procedure, as applicable. All maintenance tests will be conducted by station personnel.

#### 2. Preoperational Test Phase

The Preoperational Test phase consists of functional tests of new, modified and affected original equipment and systems. This phase includes tests, adjustments, calibrations and system operations necessary to assure that the subsequent testing can be safely undertaken. This phase also includes a walkdown of systems adjacent to construction work for damage. Any repairs and subsequent testing of equipment will be accomplished by a field change to the Design Change. Major milestones during the Preoperational Test phase are outlined in Appendix A. Major Preoperational Tests are listed in Appendix B. The actual sequence of individual tests is formulated prior to performance of the tests considering equipment and system availability and is maintained on an Integrated Startup Test Schedule.

The Startup Group analyzes the preoperational test results. The acceptance criteria for all tests are approved by the Station Nuclear Safety and Operating Committee. In instances where performance of components or systems deviates from predicted results, further engineering evaluations, rework and or retesting is performed to resolve the discrepancies before the test is considered satisfactory. Assistance from the Vepco project engineer and Vepco operations or outside consultants is solicited as deemed necessary. Systems which have to be modified as a result of the Preoperational tests are retested to verify acceptable performance. The major prefuel loading Preoperational Tests are outlined in Appendix B. Components and systems are tested and evaluated according to approved testing procedures. Prooperational tests are performed to verify as near as possible, the performance of the system under actual operating conditions. Where required simulated signals or inputs are used to verify the full operating range of the system and to calibrate and align the systems and instruments at these conditions.

### 3. Startup Test Phase

The major testing milestones during the Startup Test phase are identified on the network (Appendix A) and discussed below. Major Start-up Tests are listed in Appendix C.

#### a. Postfuel Loading Tests

Systems that are not used during normal plant operation, but must be in a state of readiness to perform safety functions, are tested or demonstrated operable prior to plant conditions requiring them to be available as defined in the Technical Specifications. Abnormal unit conditions are simulated during testing as required and when such conditions do not endanger personnel or equipment, or contaminate systems whose cleanliness has been established. Fuel Loading begins when all prerequisite system tests and operations are satisfactorily completed. Upon completion of fuel loading, the reactor upper internals and pressure vessel head are installed. Additional mechanical and electrical tests are performed on the rod control system, rod position indication and in-core moveable detection system. The purpose of this segment of the Startup Test Phase is to prepare the system for nuclear operation and to establish that all design requirements necessary for operation are achieved.

#### b. Hot Functionals

Prior to initial criticality the following hot functional tests are performed: heatup of the primary system, thermal expansion testing of affected systems, vibration testing of construction affected equipment, reactor coolant pump coastdown time check and steam generator water hammer testing (auxiliary feed). The final pressure test is conducted in accordance with Technical Specifications.

c. Criticality and Low Power Physics Tests

On completion of hot functional tests, nuclear operation of the reactor begins. These final segments of Startup testing include criticality and low power physics testing. The purpose of these tests is to verify the operational characteristics of the unit and core, to acquire data for the proper calibration of set points, and to ensure that operation is within license requirements. Appendix C includes the major Startup Tests which are performed from initial core loading to rated power. The actual sequence of tests is formulated by station engineering and operating personnel considering test requirements and equipment availability.

Procedures are prepared to specify the sequence of tests and measurements conducted and the conditions under which each is to be performed to ensure safety of operation and consistency of the results obtained. If significant deviations from design calculation exist, or if unacceptable behavior is revealed, or if apparent anomalies develop, the testing would be suspended and the situation reviewed to determine whether a question of safety is involved prior to resumption of testing.

d. Power Level Escalation Testing

When the operating characteristics of the reactor and unit are verified by low power physics testing, a program of power level escalation in successive stages is used to bring the unit to its full rated power level. Both reactor and unit operational characteristics are examined at each stage of the power escalation program.

e. At Power Testing

On completion of power level escalation testing the following at power tests are performed: final steam generator carryover testing, final recirculation ratio testing, secondary plant heat balance work, condensate polishing chemistry performance testing and load rejection testing with the condensate polisher.

EXTENT OF TESTING

All Unit No. 2 systems and systems common to Unit No. 1 and 2 are included in the Integrated Startup Test Program. These programs are listed in the System Matrix (Attachment 8.4 of Appendix D). This listing includes all systems associated with Unit No. 2 that have undergone major modification, small or no modification, new systems, and systems that have remained operational since Unit 2 shut down.

The purpose of this breakdown is to identify all station systems and to determine the degree of Construction and Preoperational testing required. Because of the various amounts of construction done to and around each system a graded

approach for the extent of testing is employed. The tests required for individual components within a system will be developed by the Startup Group and listed on a test matrix for that system.

In areas such as Unit No. 2 containment where extensive work has been performed, all equipment and systems will be checked 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 employed in conjunction with normal station 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 to verify design and installation.

#### SUMMARY

This letter outlines in detail the Integrated Startup Test Program we plan to implement to demonstrate our ability to safely return Surry Power Station Unit No. 2 to power. The Integrated Startup Test Program will provide the necessary assurance that the plant can be operated in accordance with design requirements and in a manner that will not endanger the health and safety of the public.

Your truly,



C. M. Stallings  
Vice President Power Supply  
and Production Operations

cc: Mr. James P. O'Reilly, Director  
Office of Inspection and Enforcement, Region II