DUKE POWER COMPANY
P.O. BOX 33189
CHARLOTTE, N.C. 28242

HAL B. TUCKER
VICE PRESIDENT
NUCLEAR PRODUCTION

TELEPHONE
(704) 373-4531

June 25, 1984

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

Attention: Ms. E. G. Adensam, Chief
Licensing Branch No. 4

Re: Catawba Nuclear Station
Docket Nos. 50-413 and 50-414

Dear Mr. Denton:

On June 14, 1984 representatives from Duke Power Company met with the NRC Staff and their consultant to discuss comments related to the initial test program for Catawba Unit 1.

A response to those items requiring a followup are provided in Attachment 1. Five additional changes to FSAR Chapter 14 were identified since the meeting and are discussed in Attachment 2. The revised FSAR pages are provided in Attachment 3. These pages will be included in Revision 11 to the FSAR.

Very truly yours,

Hal B Tucker

Hal B. Tucker

ROS:scs

Attachments

cc: Mr. J. P. O'Reilly, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Mr. Robert L. Gruel
Battelle Pacific Northwest Labs
Battelle Boulevard
Richland, Washington 99352

Robert Guild, Esq.
Attorney-at-Law
P. O. Box 12097
Charleston, South Carolina 29412

Mr. Jesse L. Riley
Carolina Environmental Study Group
854 Henley Place
Charlotte, North Carolina 28207

Palmetto Alliance
2135½ Devine Street
Columbia, South Carolina 29205

NRC Resident Inspector
Catawba Nuclear Station

8001
1/1

ATTACHMENT 1

CATAWBA NUCLEAR STATION
INITIAL TEST PROGRAM REVIEW MEETING
JUNE 14, 1984

640.55

FSAR Subsection 14.2.3.2 states that "approved, safety-related test procedures will be made available for review 60 days prior to their intended use, or as specified in our revised response to Q640.5." The revised response to Q640.5 states that "approved, safety-related preoperational test procedures will be made available for review . . . approximately 60 days prior to their intended use, and not less than 30 days prior to fuel loading for tests to be performed prior to initial criticality, and not less than 60 days prior to criticality for low power and power escalation testing." This revised response is not in conformance with Regulatory Guide 1.68, Appendix B, and is therefore not acceptable unless NRC Regional Personnel accept the revised response (Rev. 8 and 10).

Response

Refer to revised Section 14.2.3.2 and Question 640.5.

640.56

The 125 VDC Vital Instrumentation and Control Power Test (FSAR Table 14.2.12-1, p. 21) has yet to be revised in accordance with the response to Q640.09a. Modify this test abstract accordingly (Rev. 5).

Response

Refer to revised acceptance criteria in Table 14.2.12-1 (Page 21).

640.57a

1. FSAR Subsections 14.2.1 and/or 14.2.4.2 should be modified to state when each safety-related test not accomplished prior to fuel loading will be completed.

Response

Refer to revised Section 14.2.1.

5. FSAR Figure 14.2.11-1 and Table 14.2.12-2 state that the following startup test may not be completed before initial escalation to the next power plateau:

   (1) Process and Effluent Radiation Monitor Test
   (2) Unit Load Transient Test
   (3) Turbine Trip Test
   (4) Feedwater Temperature Variation Test
   (5) Loss of Control Room Test
   (6) Station Blackout Test
   (7) Support Systems Verification Test

640.57a Continued

Regulatory Guide 1.68, Position C.8, specified that "appropriate hold points should be established . . . to ensure that relevant test results are evaluated and approved . . . prior to progressing with the power-ascension test phase." The response to Q640.28 and FSAR Subsection 14.2.5 state that "the results of testing at each major power ascension plateau will be approved . . . prior to escalation to the next power level." Provide technical justification for why the above tests are exempt from this requirement (Rev. 8 and 10).

Response

Items (1) and (4) — No further discussion needed.

Item (2) — The Unit Load Transient Test will be completed at designated test plateaus prior to escalating to the next plateau.

Refer to revised Table 14.2.12-2 (Page 27) and Figure 14.2.11-1.

Item (3) — The Turbine Trip Test will be completed prior to exceeding the 75 percent power level. Refer to revised Figure 14.2.11-1.

Items (5) and (6) — The Loss of Control Room and Station Blackout Tests will be completed prior to exceeding the 30 percent testing plateau. Refer to revised Figure 14.2.11-1.

Item (7) — The Support System Verification Test will be performed at 50 percent power and results reviewed prior to proceeding with power escalation. The procedure will not be completed until 100 percent power level testing is performed. Refer to revised Table 14.2.12-2 (Page 38).

640.57b

Address the concerns regarding the following test abstracts:

- Table 14.2.12-1 (Page 3a) — Reactor Coolant System Hot Functional Test—Discuss the possible deletion of the second sentence of Acceptance Criteria No. 8.

Response

Sentence to be deleted. Refer to revised Table 14.2.12-1 (Page 3a).

- Table 14.2.12-1 (Page 6) — Chemical and Volume Control System Functional Test—State where demineralizer design flow rates and pressure drops are demonstrated (Rev. 8).

Response

Refer to revised test method in Table 14.2.12-1 (Page 6).

- Table 14.2.12-1 (Page 10) — Feedwater Heater and Condensate Systems Functional Test—FSAR Subsection 14.2.1 should be modified to include this test as portions of it will be completed following fuel load (Rev. 10).

640.57b Continued

Response

Refer to revised test method in Table 14.2.12-1 (Page 10) for clarification of preoperational and power escalation testing.

- Table 14.2.12-1 (Page 11) - Condenser Circulating Water System Functional Test—Discuss the revision to the abstract to clarify portions of the system to be tested during preoperational and startup testing phases. Discuss alarms in this system that should be tested.

Response

Refer to revised Table 14.2.12-1 (Page 11).

- Table 14.2.12-1 (Page 16) — Nuclear Service Water System Functional Test—Discuss system operation and testing for a single unit versus simultaneous operation. Provide traceable pump acceptance criteria.

Response

Refer to revised Table 14.2.12-1 (Page 16). Clarification has been added for balanced return flows to the SNSWP during Unit 2 testing. Traceability of acceptable pump performance has been provided.

- Table 14.2.12-1 (Page 21) — 125 VDC Vital Instrumentation and Control Power Test—Discuss clarification in the test method for measurements to be performed during ESF testing.

Response

Measurements to determine battery/charger demand during ESF testing will be performed. Refer to the revised test method in Table 14.2.12-1 (Page 21).

- Table 14.2.12-1 (Page 22) — Diesel Generator Fuel Oil System Functional Test—Discuss auto makeup function to the day tank with the low level alarm.

Response

The auto makeup valve opens before the low level alarm setpoint is reached.

- Table 14.2.12-1 (Page 24) — Containment Air Return and Hydrogen Skimmer System Functional Test—Verify the Technical Specification reference is current to the Draft Specifications.

Response

Refer to the revised Technical Specification reference in Table 14.2.12-1 (Page 24).

- Table 14.12.2-1 (Page 25) — Annulus Ventilation System Functional Test—Provide traceable acceptance criteria regarding system flow requirements (i.e., FSAR Subsection 9.4.9, Table 15.6.5-10, p. 2) (Rev. 8).

640.57b Continued

Response

Traceable acceptance criteria are provided in revised Table 14.2.12-1 (Page 25).

- Table 14.2.12-1 (Page 28) — Electric Hydrogen Recombiner Functional Test— Provide criteria regarding the selection of which controls and indications will be tested (Rev. 8).

Response

Refer to the revised Acceptance Criteria in Table 14.2.12-1 (Page 28).

- Table 14.2.12-1 (Page 32) — Upper Head Injection Functional Test— Provide justification for not performing both low-pressure and high-pressure blow-down tests on the same unit (Rev. 10).

Response

The low pressure test will be performed on both units. The high pressure test will be performed on Unit 1 only. Refer to the revised test method in Table 14.2.12-1 (Page 32).

- Table 14.2.12-1 (Page 33) — Containment Spray System Functional Test— Verify the Technical Specification reference is current to the Draft Specifications.

Response

Refer to the revised Technical Specification reference in Table 14.2.12-1 (Page 33).

- Table 14.2.12-1 (Page 34) — Spent Fuel Cooling System— Provide traceable acceptance criteria regarding pump performance (i.e., FSAR Subsection 9.1.3) (Rev. 8).

Response

Traceable acceptance criteria have been provided in revised Table 14.2.12-1 (Page 34).

- Table 14.2.12-1 (Page 35) — Fuel Handling Area Ventilation System Functional Test— Provide traceable acceptance criteria regarding system flow requirements (i.e., FSAR Subsection 9.4.2) (Rev. 10).

Response

Traceable acceptance criteria have been provided in revised Table 14.2.12-1 (Page 35).

- Table 14.2.12-1 (Page 39) — Nuclear Service Water Structure Ventilation System Functional Test— Provide analysis which demonstrates that fan and heater performance data that is "within - 10 percent of acceptable" will be sufficient to maintain area temperatures within the required temperature range (Rev. 10).

640.57b Continued

Response

Acceptance criteria have been revised. Refer to Table 14.2.12-1 (Page 39).

- Table 14.2.12-1 (Page 44) — Emergency AC Power Systems Preoperational Test— Provide criteria regarding the selection of which breakers, interlocks and alarms will be tested (Rev. 8).

Response

Clarification has been provided in revised Table 14.2.12-1 (Page 44).

- Table 14.2.12-1 (Page 46) — Heat Tracing Systems Test— This test should be reinstated as heat tracing systems are utilized on other systems (e.g., RWST vents, liquid radwaste concentrate lines) (Rev. 8).

Response

The abstract has been reinstated. Refer to revised Table 14.2.2-1 (Page 46).

- Table 14.2.12-1 (Page 47) — Containment Ventilation and Purge Functional Test—

  a. Provide the basis for determining which instrumentation, interlocks, and alarms are "essential" (Rev. 8).

  b. Either reinstate testing of instrument controls, or modify the test abstract to state that proper system operation is tested in the "normal" and "refueling" modes (Rev. 8).

  c. Provide traceable acceptance criteria regarding system flow requirements (i.e., FSAR Subsection 9.4.5) (Rev. 10).

  d. Discuss the need for "neutron detector" in purpose section.

Response

  a. "Essential" was clarified. Refer to the revised test method in Table 14.2.12-1 (Page 47).

  b. Refer to the revised test method in Table 14.2.12-1 (Page 47).

  c. Traceable acceptance criteria have been provided in revised Table 14.2.12-1 (Page 47).

  d. "Neutron detector" to be deleted. Refer to the revised prerequisite in Table 14.2.12-1 (Page 47).

- Table 14.2.12-1 (Page 50) — Seal Water Injection System Functional Test—

  a. Provide the basis for determining which alarms and interlocks are "essential" (Rev. 8).

  b. Provide traceable acceptance criteria regarding system leakoff rates (Rev. 8).

640.57b Continued

Response

a. Refer to the revised test method in Table 14.2.12-1 (Page 50).

b. Traceable acceptance criteria are provided in revised Table 14.2.12-1 (Page 50).

- Table 14.2.12-1 (Page 51) — Instrument Air System Functional Test—Provide quantitative bounds regarding allowable system pressures for opening of the crossover valve (Rev. 8).

Response

Specific acceptance criteria have been provided to verify proper crossover valve operation. Refer to revised Table 14.2.12-1.

- Table 14.2.12-1 (Page 53) — Waste Gas System Functional Test—Provide criteria regarding which specific alarms and interlocks will be tested (Rev. 8).

Response

Refer to the revised test method in Table 14.2.12-1 (Page 53).

- Table 14.2.12-1 (Page 54) — Auxiliary Building Filtered Exhaust and Shutdown Ventilation Test—Provide traceable acceptance criteria regarding system flow rates (i.e., FSAR Subsection 9.4.3) (Rev. 8 and 10).

Response

Traceable acceptance criteria have been provided in revised Table 14.2.12-1 (Page 54).

- Table 14.2.12-1 (Page 56) — Refueling Water System Functional Test—Clarify the test method and acceptance criteria to reflect system design and operation.

Response

Refer to revised Table 14.2.12-1 (Page 56).

- Table 14.2.12-1 (Page 60) — Auxiliary Shutdown Panel Test—

    a. Reword the second paragraph of the "purpose" as it is currently unclear (Rev. 10).

    b. To demonstrate conformance with Regulatory Guide 1.68.2, the reactor cooldown should be initiated at the conditions that exist at the completion of the Loss of Control Room Test (FSAR Table 14.2.12-2, p. 32). Either modify the Auxiliary Shutdown Panel Test to initiate the cooldown demonstration from Hot Standby conditions (557°F), or modify the Loss of Control Room Test to demonstrate cooldown capability to 400°F (Rev. 8 and 10).

640.57b Continued

Response

a. Clarification has been provided in the revised purpose of Table 14.2.12-1 (Page 60).

b. The Reactor Coolant System will be cooled down at least 50°F from a stable hot standby condition during the Loss of Control Room Test. Refer to revised Table 14.2.12-2 (Page 32).

- Table 14.2.12-2 (Page 11) — RTD Bypass Flow Verification— Discuss the basis for the acceptance criteria for the low flow alarm.

Response

The acceptance criteria was specified by the NSSS vendor. The acceptance bound is based on accuracy of the process instrumentation.

- Table 14.2.12-2 (Page 31) — Feedwater Temperature Variation Test—The abstract should be expanded to clarify acceptance criteria regarding turbine generator and reactor trips (Rev. 10).

Response

No further clarification is needed regarding trips. The abbreviation has been clarified in revised Table 14.2.12-2 (Page 31).

- Table 14.2.12-2 (Page 32) — Loss of Control Room Test—The reactor trip should be initiated from a location outside the control room in accordance with Regulatory Guide 1.68.2 (Rev. 5).

Response

The reactor will be tripped from outside the control room. Refer to revised Table 14.2.12-2 (Page 32).

ATTACHMENT 2

CATAWBA NUCLEAR STATION
ADDITIONAL PROPOSED CHANGES
TO FSAR CHAPTER 14

1. Table 14.2.12-1 (Page 9) — Reactor Protection System Functional Test—Revise test method.

   Justification

   Test method was revised to more clearly state the channels that are required to be tested.

2. Table 14.2.12-1 (Page 29) — Safety Injection System Functional Test—Delete the first sentence in Prerequisites.

   Justification

   The test is performed with the vessel head removed. Therefore this prerequisite had no bearing on the test results.

3. Table 14.2.12-2 (Page 12) — Reactor Protective System Setpoints Verification—Delete the test abstract and its reference on Figure 14.2.11-1.

   Justification

   The Reactor Protection System setpoint verification, calibration and testing is required by the Technical Specifications. A specific test to verify setpoints is not needed since the Technical Specification surveillance requirements will be in force at fuel loading.

4. Table 14.2.12-2 (Page 37) — Pressurizer Functional Test—In test method, "all pressurizer spray" changed to "the main pressurizer spray" and "Bypass spray valves are then returned to their previously determined settings and" deleted.

   Justification

   These changes were recommended by the NSSS vendor during the review of low power and power ascention test procedures. The changes are necessary because the bypass spray valves must be open to determine the heater/spray response.

5. Table 14.2.7-1 — Compliance with Regulatory Guides—Additional exceptions taken to App. A 5.a, A5.f and A5.z.

   Justification

   See revised Table 14.2.7-1

ATTACHMENT 3

CATAWBA NUCLEAR STATION
REVISED FSAR PAGES

14.2 TEST PROGRAM (FSAR)

14.2.1 SUMMARY OF TEST PROGRAM AND OBJECTIVES

The general objectives of the initial test program at Catawba Nuclear Station is to provide assurance that:

(a) The station has been adequately designed and constructed.

(b) All contractual, regulatory and licensing requirements are satisfied.

(c) The station will not adversely affect the public health and safety.

(d) The station can be operated in a reliable, dependable manner so as to perform its intended function.

(e) Operating and emergency procedures are appropriate to the extent practicable.

(f) Personnel have acquired an appropriate level of technical expertise.

The initial test program at Catawba Nuclear Station is divided into two major portions. The first phase of testing is the preoperational test phase and includes all hot and cold functional testing required prior to fuel loading. The second phase of testing is the initial startup testing phase and includes initial fuel loading and all subsequent testing through the completion of power escalation testing.

Preoperational tests are performed following completion of construction flushing and hydrostatic testing, system turnover and initial calibration of required instrumentation. The major objective of preoperational testing is to verify that structures, systems and components essential to the safe operation of the plant are capable of performing their intended function. Summaries of these individual preoperational tests are provided in Section 14.2.12.

Preoperational testing for satisfying FSAR testing commitments will be completed prior to fuel loading. Tests currently identified which have portions of the test which may be completed following fuel loading are Spent Fuel Cooling System (Table 14.2.12-1, page 34), Rod Control System Functional Test (Table 14.2.12-1, page 7), Ice Condenser Region Functional Test (Table 14.2.12-1, page 26), and Chemical and Volume Control System Functional Test (Table 14.2.12-1, page 6). These tests will be completed prior to initial criticality. Tests currently identified which have portions of the test which may be completed during power escalation testing are Piping Systems Thermal Expansion Test (Table 14.2.12-1, page 4), Piping Systems Vibration Test (Table 14.2.12-1, pages 37 and 38), Reactor Coolant Hot Functional Test (Table 14.2.12-1, pages 3 and 3a), Feedwater and Condensate Systems Functional Test (Table 14.2.12-1, page 10), and Condenser Circulating Cooling Water Systems Functional Test (Table 14.2.12-1, page 11).

Other preoperational tests which are not required prior to fuel loading and which are not safety related, such as Administrative Building Ventilation Tests, may be completed following fuel loading. Tests (or portions of tests), for which abstracts are provided), which do not satisfy any regulatory requirement and which are not required by regulatory guides are identified in Table 14.2.12-1.

Each procedure is approved prior to use by the Station Manager; or by the Operations, Maintenance or Technical Services Superintendents as previously designated by the Station Manager. Approved safety-related test procedures which satisfy FSAR testing commitments will be made available for review 60 days prior to their intended use.

14.2.3.3 Changes to Procedures

Changes to procedures are classified as two types: minor and major. A minor change is a change to an approved procedure which corrects errors in the applicable approved procedure of a typographical or editorial nature. A major change is any change to an approved procedure determined not to be a minor change.

A minor change may be made by an individual with no special reviews or approvals. Minor changes, by definition, cannot alter the intent or methodology of the test procedure as originally approved. Because of this, minor changes require no additional review or approval. A major change to a procedure is handled in an identical manner as the original review and approval of a procedure-see Section 14.2.3.2.

14.2.3.4 Procedure Format

The format for test procedures will be uniform to the extent practicable and will consist of the following sections: Purpose, references, time required, prerequisite tests, test equipment, limits and precautions, required station (or unit) status, prerequisite system conditions, test method, data required, acceptance criteria, procedure and enclosures. Procedures are written in sufficient detail to permit qualified personnel to perform the required tasks.

Data sheets in procedures used to verify the acceptability of Engineered Safeguards pumps and fans will include all essential information to allow extrapolation of performance from test conditions to post accident design conditions. Adequate documentation is provided by the test procedure to allow determination of system operating configurations at the time test data is obtained.

14.2.4 CONDUCT OF TEST PROGRAM

14.2.4.1 Administrative Procedures

All aspects of the startup test program are conducted under appropriate administrative procedures. The use of properly reviewed and approved procedures are required for all preoperational and startup tests. The results of each preoperational test are reviewed and approved by the responsible group superintendent before they are used as the basis of continuing the test program. The results of startup testing will be reviewed and approved by the Superintendent of Technical Services prior to proceeding to the next significant power plateau. In addition, the results of each individual startup test will receive the same review as that described for preoperational tests. All modifications to safety related systems which are found necessary are reviewed and approved by the responsible group superintendent and the station manager.

TABLE 14.2.7-1 (Page 2a)

COMPLIANCE WITH REGULATORY GUIDES

Regulatory Guide	Compliance	Affected Section(s)	Exception Taken	Justification
		App. A 4.c App. A 5.e	Pseudo-ejected-rod measurements will not be performed on Unit 2.	The calculational codes and analytical methods used for nuclear analysis of the reactor core are presented in FSAR Section 4.3.3. The validity of these codes and safety analysis assumptions for ejected rod worth will be verified as part of the extensive startup testing on Unit 1. The core design and control rods utilized on Unit 2 are identical to those for Unit 1. Control rod bank worths measurements should be sufficient to verify adequacy of ejected rod predictions. Therefore, without any gross errors in the measured bank rod worths, the Unit 2 pseudo ejected rod worth should be within the safety analysis assumptions.
		App. A 4.g A 5.z	Demonstration of proper process or effluent monitoring system response based on correlation with independent laboratory analysis will be conducted only for those monitors for which process or effuent levels exceed the minimum sensitivity of the detector.	During initial startup testing historical data has shown that process and effluent monitors may not experience levels in excess of the minimum sensitivity of the monitor. A meaningful correlation with laboratory analysis is not possible for these monitors.
		App. A 4.h A.4.r A.5.a.a.	Demonstration of the operability of reactor coolant/secondary purification and clean up systems. Formal testing will not be performed.	Refer to responses to Q640.52 items A.4.h, A.4.r., A.5.a.a.
		App. A.4.i	Specific testing to demonstrate the operability of control rod sequences and inhibit/blocking functions over the reactor power level range during low power testing will not be performed.	Refer to Q640.52 item 4.i response.
		App. A.4.j	Specific testing to demonstrate the capability of primary containment ventilation during low power testing will not be performed.	Refer to Q640.52 item 4.j response.

TABLE 14.2.7-1 (Page 3)

COMPLIANCE WITH REGULATORY GUIDES

Regulatory Guide	Compliance	Affected Section(s)	Exception Taken	Justification
1.68 Rev. 2	Partial	App. A 5	Tests and acceptance criteria will be developed to demonstrate the ability of major principal plant control systems to automatically control process variables within design limits around the nominal reference value.	Control system testing should verify proper control of process variables within the design control deadband, not over the range of design values of process variables. Proper control of process variables will be demonstrated during power escalation over the range of 0 to 100% F.P.
	Partial	App. A 5.a	Power coefficient measurements will not be performed at 100% power but will be performed at 90% power instead.	NSSS vendor does not recommend performing this test at 100% power due to potential of violating axial flux difference Technical Specification.
		App. A 5.b	Departure from nucleate boiling ratio (DNBR), maximum average planar linear heat generation rate (MAPLHGR), and minimum critical power ratio (MCPR) will not be directly verified during power escalation testing.	Axial, Radial, and Total Peaking will be directly measured and verified during power escalation testing and will be used to verify DNBR and linear heat rate margin by analysis.
	Partial	App. A 5.f	Core thermal and nuclear parameters will not be demonstrated to be in accordance with predictions following a return of the rod to its bank position.	The reactor core will be under xenon transient conditions at this time. There would be insufficient time to gather data under transient conditions. There are no NSSS vendor predictions for this configuration.
		App. A 5.g	Special testing to demonstrate control rod sequencers/withdrawal block funtions operation will not be performed.	Refer to Q640.52 item 4.i response.
		App. A 5.h	Rod drop times will not be measured at power.	Measuring rod drop times at power would require disabling all position indication for the rods in violation of plant Technical Specifications.
		App. A 5.i	Test to demonstrate incore/excore instrumentation sensitivity to detect rod misalignment will not be performed at full power.	From vendor predictions the Xenon and power distributions at 50% and 100% are similar. The performance of this test at 50% should adequately demonstrate the capability and sensitivity of incore/excore instrumentation to detect control rod misalignments equal to or less than Technical Specifications.

TABLE 14.2.7-1 (Page 3a)

COMPLIANCE WITH REGULATORY GUIDES

Regulatory Guide	Compliance	Affected Section(s)	Exception Taken	Justification
		App. A 5.k	Special testing to demonstrate ECCS operation will not be performed during low power ascension testing.	Refer to Q640.52 item 5.k response.
	Partial	App. A 5.l	Specific testing to demonstrate capabilities of RHR systems will not be performed during power ascension testing.	Refer to Q640.52 item 5.l response.
	Partial	App. A 5.m	Differential pressure measurements will not be made across the core or major reactor coolant system components.	Measured Reactor Coolant System loop flows will be compared with predicted Reactor Coolant System loop flows. Any gross deviation of actual loop or core pressure drops from predicted values will be identified by detection of the corresponding deviation of measured flow from prediction.
			Idle loop flows will not be determined during power ascension testing.	Tech. Specs. does allow for less than full flow operation.
			Specific measurements for vibration levels of reactor coolant system components will not be performed during power ascension testing.	Refer to Q640.39 and Q640.52 item 5.m responses.
		App. A 5.o	Calibration and demonstration of the response of reactor coolant system leak detection systems will not be performed during power ascension.	Refer to Q640.52 item 5.o.
		App. A.5.p	Vibration monitoring of reactor vessel internals will not be performed during power ascension testing.	Refer to Q640.39 response.
		App. A.5.q	Proper operation of failed fuel detection systems will not be performed during power ascension testing.	Refer to response Q640.52 item 5.q.
		App. A 5.r	A verification of computer inputs and performance calculations which are utilized to ensure compliance with provisions of the station operating license or accident analysis bases will be performed.	Inputs and calculations which do not serve to ensure compliance with provisions of the station operating license or accident analysis bases do not need to be verified.

Table 14.2.12-1 (Page 3a)

REACTOR COOLANT SYSTEM HOT FUNCTIONAL TEST
Astract

Acceptance Criteria

1. Pressurizer level and pressure control during heatup, hot operation, and cooldown maintains NC system parameters within Technical Specification limits.

2. The ability to maintain charging, letdown, and seal injection flow is demonstrated through performance of the Chemical and Volume Control System Functional Test.

3. Control of reactor coolant system cooldown rate within the Technical Specification limits is demonstrated.

4. Concrete temperature adjacent to main steam line penetrations do not exceed 150°F.

5. Main steam, steam dump, and feedwater systems operate within design limits as specified by Duke Power Company Design Engineering Department System Descriptions.

6. Condenser vacuum is maintained within normal operating limits, as specified by Duke Power Company Design Engineering Department.

7. Feedwater heater controls systems and hotwell level controls function within limits as specified by Duke Power Company Design Engineering Department Specifications.

8. The main steam isolation valves close in <5 seconds, and part-stroke capability is successfully demonstrated.

9. The main steam safety valve setpoints are within the limits provided by Duke Power Company Design Engineering Department.

CHEMICAL AND VOLUME CONTROL SYSTEM FUNCTIONAL TEST
Abstract

Purpose

To demonstrate the capability of the Chemical and Volume Control System to provide required flows, pressures, temperatures, and proper flow paths for charging, letdown, seal water, and make-up to the Reactor Coolant System. To demonstrate operability of the features necessary for sampling, chemical addition and control of the primary system.

Prerequisites

The Reactor Coolant System Hot Functional Test is in progress. Chemical and Volume Control System components and piping are cleaned, flushed and hydro tested. System instrumentation and controls are available and calibrated. Component cooling and Nuclear Service Water Systems are operable to the extent required to operate the system.

The proper functioning of the sampling features may be tested prior to the Hot Functional Test, as the systems are filled and hydro tested.

Test Method

The capacities of the letdown paths and the reactor coolant filter differential pressure are measured. Letdown temperature and pressure controller responses are demonstrated. Proper operation of the excess letdown flow path is verified. Demineralizer design flow rates and pressure drops will be demonstrated during precritical testing. Charging pumps are tested for design flow rates and pressure drops. Charging pumps are tested for capability to deliver varying flow rates. Volume control tank level and pressure control indications and alarm setpoints are checked. Operational calibration and operation of the different modes of dilution and boration are verified. Flow rates within the charging, letdown, seal water and make-up flow paths are measured and verified. Emergency boration is verified along with boric acid transfer pumps discharge pressure in recirculation. Boric acid tank low level and low temperature alarms are verified. Auto-opening of INV455 (boric acid batching tank temperature control valve) upon a low temperature signal is also verified.

Operability and flow paths for sampling and chemical addition are verified by the use of normal chemistry control procedures, and successful verification is documented as a part of this test.

Acceptance Criteria

System flows, temperatures, and pressures are within limits specified by Westinghouse, and are conservative with respect to values assured in Chapter 15. Level setpoints and alarms within the flow paths tested actuate at the values specified by Westinghouse.

Sampling and chemical addition components function in accordance with design system descriptions.

Table 14.2.12-1 (Page 9)

REACTOR PROTECTION SYSTEM FUNCTIONAL TEST
Abstract

Purpose

To demonstrate the capability of the Reactor Protection System to respond properly to logic initiation signals prior to initial fuel loading.

Prerequisites

The instrument and protection systems are energized, calibrated and aligned in accordance with the test documents.

Test Method

Proper operation of the Reactor Protection System is verified under various logic conditions. Testing is performed utilizing signals or simulated signals on each of the nuclear and process protection system analog inputs in accordance with the applicable manufacturer's instruction manual. Response timing of channels is verified through insertion of signal into the sensor and measuring the time from when the process reaches its set point and the Reactor trip breakers open. The response time of the below listed protection channels will be tested.

1. Power Range Neutron Flux
2. Power Range Neutron Flux, high Negative rate
3. OTΔT
4. OPΔT
5. PZR pressure - low
6. PZR pressure - high
7. Low reactor coolant flow
8. S/G water level lo-lo
9. RCP undervoltage
10. RCP underfrequency

Acceptance Criteria

Instrument channels and solid-state logic trains for reactor protection and protection permissives function as specified by Westinghouse. Annunciators, channel status lights and permissive interlock lights function to indicate the correct status of the input signal levels.

FEEDWATER AND CONDENSATE SYSTEMS FUNCTIONAL TEST
Abstract

Purpose

To demonstrate the ability of these systems to provide a steady, properly regulated supply of feedwater flow to the steam generators during normal and upset conditions. To demonstrate the operability of the secondary Chemical Addition and Sampling Systems. This test is considered to be non-safety related.

Prerequisites

Support systems necessary to operate the condensate and feedwater systems are sufficiently in service. Steam generators are in service at hot standby temperature and pressure conditions for applicable portions of the procedure.

Test Method

Feedwater flow rates will be varied with the bypass feedwater control valves in manual to demonstrate manual control of steam generator levels during hot functional testing. Feedwater flow rates will be varied with the main feedwater control valves in manual to demonstrate manual control of steam generator levels during power escalation. Manual control of feedwater pump speeds will be demonstrated during power escalation. Operability of the feedwater heaters and feedwater heater drains will be verified during power escalation. The ability to obtain samples at designated points in the system and to add chemicals to control feedwater chemistry are verified by the use of normal station chemistry procedures.

Acceptance Criteria

Valve operations which are required to supply the required flows are demonstrated by operating the required valves from the Control room. The proper response to feedwater isolation as described in Section 10.4.7.2 is verified.

Doghouse high water level alarms actuate in Control room upon simulation of high water level.

Samples are obtained from the feedwater and condensate systems. Chemical Addition capability is verified to be operable.

CONDENSER CIRCULATING WATER SYSTEMS FUNCTIONAL TEST
Abstract

Purpose

To demonstrate pre-fuel load, the proper operation of pumps and towers. To initially set flow the balance of the cooling towers.

To demonstrate during power escalation, the capability of the condenser circulating water system to supply cooling water to the main and feedwater pump turbine condensers to condense the turbine exhaust steam and to provide a sufficient heat sink for the steam dump system. This test is considered to be non-safety related.

Prerequisites

The condenser circulating water system is complete and filled. All support systems are operational to the extent necessary to perform the test. Alarms are calibrated and loop checked.

Test Method

Circulating pumps, cooling towers, and instrumentation are tested to demonstrate proper operation. System flow rates are verified where applicable. Initial flow balancing to the cooling towers will be performed by setting inlet valve open limit switches and adjustable weir levels around the cooling tower distribution flumes.

During power escalation the main and feedwater pump turbine condensers' performance parameters will be monitored to show adequate heat removal capability.

Acceptance Criteria

Circulating pumps can be started remotely and operated. Cooling tower fans can be started remotely and operated. Instrumentation functions and provides remote indication of operating conditions. Initial flows are balanced by adjustment of valve limit switches and adjustable weir levels.

Main and feedwater pump condensers maintain proper vacuum.

NUCLEAR SERVICE WATER SYSTEM FUNCTIONAL TEST
Abstract

Purpose

To verify acceptable pump performance by obtaining at least three points on the head/capacity curve and verifying against acceptance criteria.

Balance system flows to individual components with manually balanced flows to assure minimum acceptable cooling flow to each essential component in each of the following modes of operation:

- Sump recirculation after containment spray (limiting mode, essential flows)
- Blackout and shutdown after 4 hours (limiting mode, non-essential flows)
- SI with a small LOCA or steam line break
- Refueling mode

| Balance return flows to each finger of the Standby Nuclear Service Water Pond (SNSWP) during the Unit 2 functional test.

Verify Nuclear Service Water System (RN) pump motor cooler inlet isolation valve interlocks.

Verify strainer backwash on simulated high strainer ΔP and associated alarms.

Verify proper dynamic response (including setpoints) of the RN System to lake isolation and resulting low level swapover to the SNSWP - generic demonstration to be performed for one train only (not performed on Unit 2).

The following alarms are verified during the course of the test:

- RN pit level alarms
- RN System low flow alarms
- RN essential header pressure alarms

Proper system response at the proper setpoint is verified for a simulated low intake pit level for the train not used for the actual dynamic swapover at low intake pit level (this verification is performed for both trains of Unit 2).

Prerequisites

All components and essential instrumentation of the Nuclear Service Water System are installed and operational. Portions of the components served by the Nuclear Service Water System are installed and operational.

Test Method

The Nuclear Service Water Pumps will be run singularly to allow data to be collected in order to evaluate their performance.

Table 14.2.12-1 (Page 16a)

NUCLEAR SERVICE WATER SYSTEM FUNCTIONAL TEST

Abstract

With each RN Pump in operation with its respective train of components, manual throttling valves and control valve travel stops will be set. The RN System will be lined up for its Sump Recirculation After Containment Spray mode (Mode 5). Then, flows will be verified and others set with the RN System lined up for the three (3) other modes.

The RN System will be lined up witn its return flow to the SNSWP. Verification that the flow to each finger of the pond is balanced will be performed during the Unit 2 functional test. With each RN train in normal operation, the RN pump motor cooler inlet isolation valves will be verified to have opened. Also, a strainer simulated high ΔP will be given to verify initiation of an automatic strainer backwash.

The Lake Wylie source of cooling water will be isolated from the RN Pump Pit. The RN Pump in operation will pump the pit level down. A dynamic low level swapover to the SNSWP will be verified. For the other RN Pump, a simulated low pit level will be given to verify proper system response.

Essential alarms and annunciators initiated during any of the above tests will be verified.

Acceptance Criteria

Each nuclear service water pump develops less than or equal to 226 feet of head after adjustment for instrumentation error at a minimum flow of 9000 gpm ± 1.9%. Flows to essential components are equal to or greater than the values listed in FSAR Table 9.2.1-2 for modes 3-2, 4, 5, and 6.

Each nuclear service water pump motor cooler inlet isolation valve interlock allows valve to open upon pump start.

Dynamic swapover is accomplished as described in FSAR Section 9.2.1.2.1, for the pump and pit tested.

125 VDC VITAL INSTRUMENTATION AND CONTROL POWER TEST
Abstract

Purpose

To demonstrate that the 125 VDC Vital Instrumentation and Control batteries and chargers are capable of providing power during normal operation and under abnormal conditions.

Prerequisites

Battery area ventilation must be adequate. Sufficient DC loads are available to allow testing of the system.

Test Method

The system is energized for normal operation and a load equal to the maximum accident-condition steady-state dc load as measured during the Engineered Safety Features Actuation System Functional Test is applied. The capability of each battery charger to individually maintain a float charge on its associated battery, while concurrently maintaining the maximum bus dc loads, is demonstrated.

The capability of each charger to supply sufficient current to recharge a completely discharged battery within 24 hours while supplying the steady-state loads of its own load group is verified.

The capability of the system to transfer each bus from battery charger to battery power is demonstrated by de-energizing the chargers while the applicable bus is carrying its normal station loads.

A battery service test is performed in accordance with IEEE 450-1975.

The actual load on the vital buses recorded during the performance of the Engineered Safety Features Actuation System functional test is compared with the design loads for the system.

The operability of vital loads is verified at reduced system voltage by the operation of selected equipment.

Acceptance Criteria

All battery chargers provide float charge while concurrently maintaining maximum bus loads. The system responds properly to loss of normal unit power by maintaining power to the normal loads from the batteries. Batteries are capable of supplying dc power upon de-energization of their chargers. The battery capacities as determined in the battery service tests are greater than or equal to the capacity necessary to carry the vital loads during the critical period of the accident analysis.

No individual cell voltages shall reach a level of +1 volt or less during a discharge test.

Table 14.2.12-1 (Page 21a)

125 VDC VITAL INSTRUMENTATION AND CONTROL POWER TEST
Abstract

The battery chargers provide sufficient current to recharge a fully discharged battery within 24 hours while supplying the steady-state loads of their own load group, as described in the test method.

CONTAINMENT AIR RETURN AND HYDROGEN SKIMMER SYSTEM FUNCTIONAL TEST
Abstract

Purpose

To demonstrate the capability of the system to respond to an actuation signal as designed.

Prerequisites

The Containment Air Return and Hydrogen Skimmer System, solid state protection system, and associated support systems are functional to the extent required to test the system. The ice condenser inlet doors are blocked closed to prevent operation.

Test Method

Q 640.11 Each containment air return fan and hydrogen skimmer fan is operated. Automatic operation of the Containment air return fans is verified for a simulated high-high containment pressure signal (Sp). Proper operation of the 0.25 psid permissive interlock is verified.

Acceptance Criteria

Containment air return fan motor current and hydrogen skimmer fan current are within the limits of Technical Specification 4.6.5.6. Automatic opening of the containment air return fan damper and interlocks that prevent containment air return fan from starting with low containment pressure function as required by Technical Specification 4.6.5.2.

ANNULUS VENTILATION SYSTEM FUNCTIONAL TEST
Abstract

Purpose

To demonstrate the capability of the Annulus Ventilation System to produce and maintain a negative pressure in the annulus following a LOCA and to minimize the release of radioisotopes following a LOCA by recirculating a large volume of filtered annulus air relative to the volume discharged for negative pressure maintenance.

Prerequisites

All essential system components, including fans, filter trains, dampers, and Class 1E power systems are operational to the extent necessary to perform the test.

Test Method

Each ventilation train is operated in conjunction with its respective fan, filter train, dampers, and associated ductwork to demonstrate required capacity per ANSI N510-1980. Essential electrical components, switchovers, and starting controls are demonstrated to be functional. The ability to obtain and maintain the required negative pressure inside the annulus will be demonstrated. The acceptability of the annulus ventilation system HEPA and charcoal filters will be demonstrated per use of test procedures as specified in Regulatory Guide 1.52 Rev. 2.

Acceptance Criteria

1. Each train of the annulus ventilation system, operating independently of the other train, is capable of achieving a system flow of 9000 cfm ± 10% when tested per the requirements of ANSI N510-1980.

2. HEPA filter banks demonstrated an efficiency of greater than or equal to 99.0% when they are tested in-place in accordance with ANSI N510-1980 while operating the system at a flow rate of 9000 cfm ± 10%.

3. Laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Rev. 2 meets the laboratory testing criteria of Regulatory Position C.6.a of Regulatory Guide 1.52, Rev. 2.

4. Charcoal absorbers remove greater than or equal to 99.0% of a halogenated hydrocarbon refrigerant test gas when they are tested in accordance with ANSI N510-1980 while operating at 9000 cfm ± 10%.

5. The annulus ventilation system demonstrates the ability to achieve a negative pressure of greater than or equal to 0.5 in W.G. within the time period assumed by the station safety analysis. (This criteria may be verified during the Integrated ESF Test).

Table 14.2.12-1 (Page 28)

ELECTRIC HYDROGEN RECOMBINER FUNCTIONAL TEST

Abstract

Purpose

To demonstrate the capability of each electric hydrogen recombiner to achieve recombination temperatures at an air flow equal to or greater than the minimum air flow assumed in Chapter 6 of the FSAR. The test also demonstrates the proper functioning of controls, instrumentation, and indications necessary for post-accident operation.

Prerequisites

The hydrogen recombiners and associated controls are functional to the extent required to test the system.

Test Method

The electric hydrogen recombiners will be energized. Minimum acceptable heater sheath heatup rate required in order to satisfy Technical Specifications surveillance requirements will be verified. The capability of the heaters to maintain a temperature in excess of the recombination temperature as measured on the heater sheath will be verified. Air flow to each recombiner will then be measured. Following completion of the heatup test, heater resistance to ground will be verified. The results of the heatup test will be used to establish a reference power setting for use in station operating procedures.

Acceptance Criteria

A flow rate greater than or equal to the value assumed in the FSAR analysis is verified. Heater sheath heatup rate satisfies the surveillance requirement of Technical Specifications. The ability to achieve and maintain heater sheath temperatures above the hydrogen recombination temperature is verified. All controls and indications which performs a safety-related function are verified to operate as specified in Duke Power Company Design Engineering Department system descriptions, and post-heatup continuity and resistance to ground checks are satisfactory.

SAFETY INJECTION SYSTEM FUNCTIONAL TEST
Abstract

Purpose

To demonstrate the capability of the system to provide design flows during each of the injection phases using centrifugal charging pumps, safety injection pumps, accumulators and residual heat removal pumps. To demonstrate proper operation of all pumps and valve motors when supplied from normal offsite power or emergency power sources. To demonstrate the capability to obtain the necessary balanced flows to the Reactor Coolant System loops with the safety injection pumps running in hot leg or cold leg recirculation.

Prerequisites

For the ambient temperature portion of the test, the system is cold and the vessel head is removed. The hot temperature portion of the test is conducted during the hot functional test program. The refueling water storage tank contains sufficient water to perform the required testing, and the refueling canal is available to accept excess water drained from the Reactor Coolant System. Normal and emergency power sources are available to all safety injection equipment.

Test Method

Each pump is tested separately with water drawn from the refueling water storage tank. The overflow from the reactor vessel passes into the refueling canal. Pump head and flow are determined during this period. Pumps are then operated to determine a second point on the head/flow characteristic curve. The safety injection pumps are each run in both hot leg and cold leg recirculation modes. Flows to each branch are balanced, with each branch flow within the required range.

Each accumulator is filled and partially pressurized with the motor operated discharge valve closed. The valve is opened and the accumulators allowed to discharge into the reactor vessel. Additionally, the capability to operate the valve under maximum differential pressure conditions of maximum expected accumulator precharge pressure and zero RCS pressure is verified.

The Safety Injection System is aligned for normal power operation, with the exception that the accumulators are not pressurized. A safety injection signal ("S" signal) is manually initiated, allowing all affected equipment to actuate. Proper system alignment, flow capability and acceptable net positive suction head performance under maximum system flow conditions are demonstrated. The Safety Injection System is operated in its various modes of operation, using the Refueling Water Storage Tank as the source of water. Proper system and component response times are demonstrated in the Engineered Safety Features Actuation System Functional Test.

Table 14.2.12-1 (Page 32)

UPPER HEAD INJECTION FUNCTIONAL TEST
Astract

Purpose

To demonstrate that the upper head injection portion of the Safety Injection System is capable of performing as required.

Prerequisites

The Reactor Coolant System is cold and the reactor vessel head installed with the upper internals removed. The Reactor Coolant System water inventory is sufficiently low and the reactor coolant piping vented to minimize pressure buildup in the Reactor Coolant System during injection.

Test Method

Blowdown tests are performed by filling and pressurizing the upper head injection water and nitrogen accumulators with the isolation valves closed. The isolation valves are subsequently opened and the accumulator is allowed to discharge into the reactor vessel.

Two blowdown tests are performed - one with low accumulator pressure (about 100 psi) and one with gas pressure in the normal operating range. The low pressure test provides piping resistance information utilized in determining the level set points for isolation valves closure. The high pressure test provides verification of isolation valve operation under maximum differential pressure and verification that the required volume of water is injected into the Reactor Coolant System prior to isolation valve closure. During these tests, the proper operation of alarms, indications and controls will be verified.

The low pressure blowdown test is performed on both units. The high pressure test is performed only on the Unit 1 UHI System.

During Reactor Coolant System cooldown from hot conditions during Hot Functional Testing, check valves operability is demonstrated by injection of small flow of water upstream of the valve.

Acceptance Criteria

The volume of water delivered to the reactor vessel is equal to or greater than the value assumed in the analysis in FSAR Section 15.6.5. Check valves are demonstrated operable at elevated temperatures.

Hydraulic isolation valve closure time is within the range assumed in the Chapter 15 analysis.

Alarms, indications and controls function as specified by Westinghouse and in the Duke Power Company Design Engineering Department system description document.

CONTAINMENT SPRAY SYSTEM FUNCTIONAL TEST
Abstract

Purpose

To demonstrate the capability of the system to respond to an actuation signal and to provide the required flows. Also, Containment Pressure Control Cabinet annunciator is verified on loss of control power.

Prerequisites

The refueling water storage tank is available and contains sufficient water for demonstration tests. The system is aligned to isolate the spray nozzles, obtain suction from the refueling water storage tank and recirculate water back to the refueling water storage tank.

Test Method

With the spray nozzles bypassed, the system is operated with suction from the refueling water storage tank to demonstrate design flow rates to the spray headers and to verify the pump head curve. Proper operation of the controls and interlocks associated with valves relied on to effect a transfer to the recirculation mode is demonstrated. Interlocks associated with the 0.25 psid permissive are verified to function as designed.

Proper spray nozzle performance and orientation is visually verified by blowing air through the spray ring headers and nozzles and observing the flow from the nozzles.

An unobstructed flow path is verified by the overlapping of the water flow test and the air test at the headers. Power is isolated to both trains of the Containment Pressure Control Cabinets to verify Control Room annunciators.

Acceptance Criteria

Flow nozzles are unrestricted.

Pump head vs. flow performance meets or exceeds the manufacturer's performance curve, within the error of the measurement. Pump performance in recirculation mode meets or exceeds the requirements of Technical Specification 4.6.2.b.

Interlocks which operate or prohibit operation of valves or components based upon the position of valves or containment pressure are verified to operate as designed.

System response to high-high containment pressure logic is verified during the ESF Functional Test.

Control Room annunciators actuate when control power is isolated to the Containment Pressure Control Cabinets.

Table 14.2.12-1 (Page 34)

SPENT FUEL COOLING SYSTEM
Abstract

Purpose

To demonstrate the capability of the system to provide the proper flow paths and flow rates required to remove decay heat from the Spent Fuel Pool. The purification capability of the system is verified by demonstrating the proper purification flow paths and flow rates.

Prerequisites

The component cooling water system is operational to the extent required to operate the Spent Fuel Cooling System.

Test Method

The spent fuel cooling pipe anti-suction holes are visually verified to be free of obstructions. Flow Paths and Flow Rates are verified for each of two cooling paths from the fuel pool through the pumps, heat exchangers, and returning to the Spent Fuel Pool. Proper operation of the Spent Fuel Pool purification and skimmer loops is also demonstrated by verifying proper flow paths. Operation of the spent fuel pool low level alarm at the proper setpoint is verified.

Acceptance Criteria

The specified flow paths are verified.

Spent fuel cooling pump performance meets or exceeds design values listed in FSAR Sectin 9.1.3. Spent fuel pool low level alarm actuates at a level equal to or higher than the value assumed in FSAR Section 15.7.4.

The anti-siphon holes are free of obstructions.

FUEL HANDLING AREA VENTILATION SYSTEM FUNCTIONAL TEST
Abstract

Purpose

To demonstrate the ability of the system to maintain the fuel handling and storage building at slightly less than atmospheric pressure, to control airborne acitvity, and to maintain a suitable temperature in the area.

Prerequisites

The system is operable to the extent required to conduct this test. The unit vent is capable of receiving air flow from the system.

Test Method

The system is operated in the normal filter train bypass mode. The ability of the system to automatically direct air flow through the filter trains upon a high radiation level in the exhaust duct system is demonstrated. The pressure in the fuel handling area is measured. The ability of the system to provide cooling and heating of the area is demonstrated by changing the temperature error signal.

Acceptance Criteria

1. Each train operating independently of the other train, is capable of achieving a flow rate of 33,130 cfm ± 10% when tested per the requirements of ANSI N510-1980.

2. Satisfactory performance of all components, controls, alarms, and interlocks required in order for the system to fulfill its required function, as described in FSAR Section 9.4.2, is demonstrated.

3. HEPA filter banks demonstrated an efficiency of greater than or equal to 99.0% when they are tested in-place in accordance with ANSI N510-1980 while operating each train at a flow rate of 33,130 cfm ± 10%.

4. Laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Rev. 2 meets the laboratory testing criteria of Regulatory Position C.6.a of Regulatory Guide 1.52, Rev. 2.

5. Charcoal absorbers remove greater than or equal to 99.0% of a halogenated hydrocarbon refrigerant test gas when they are tested in accordance with ANSI N510-1980 while operating each train at a flow rate of 33,130 cfm ± 10%.

6. The Fuel Handling Area Ventilation System demonstrates the ability to achieve a negative pressure of greater than or equal to 0.25 in W.G. within the Spent Fuel Storage Pool area relative to the outside atmosphere.

7. The Fuel Handling Area Ventilation System responds to changes in the temperature error signal by providing heating or cooling as appropriate, to maintain the set temperature in the fuel handling area.

NUCLEAR SERVICE WATER STRUCTURE VENTILATION SYSTEM FUNCTIONAL TEST
Abstract

Purpose

To verify that the Nuclear Service Water Structure Ventilation System can maintain the space temperature between 55°F and 104°F at design conditions.

Prerequisites

The structure and system must be complete to the extent necessary to perform the test. For the summer heat load test, the Nuclear Service Water pumps must be operable.

Test Method

The ventilation system will be operated at times when the external conditions are expected to approach the two (2) external design day conditions, 10°F and 95°F. Data will be recorded to verify that the internal environment is maintained within it's acceptable range. If the external design day conditions are not reached, the internal versus external temperature data taken during the test will be used to extrapolate to find the internal temperature which would have been reached at the design external conditions.

Design Hot Day testing will not be done to Unit Two "A" and "B" Train, and design Cold Day testing will not be done to Unit One "A" Train and Unit Two "A" and "B" Train. Instead, fan and unit heater performance data will be taken and compared with acceptable performance on either train of Unit One for Hot Day capabilities and with Unit One "B" Train for Cold Day capabilities.

Acceptance Criteria

The nuclear service water pump structure internal temperature remains between 55°F and 104°F at both the external design day conditions of 10°F and 95°F.

For those trains in which design day testing is not being done, fan and heater performance data is $>$ -10% of the tested train.

EMERGENCY AC POWER SYSTEMS PREOPERATIONAL TEST
Abstract

Purpose

To demonstrate the proper operation of the essential 4160 volt, 600 volt and 125 volt A.C. power systems. To demonstrate proper operation of feeder breakers, interlocks, and alarms. To verify proper voltages at load centers during operation.

Prerequisites

The systems to be tested are completed with no outstanding deficiencies or discrepancies which could affect the test.

Test Method

For each system, the feeder breakers are operated manually, associated interlocks and alarms are verified to operate when appropriate conditions are simulated or reached during the test, voltages at load centers are measured to assure proper operation within the design range.

Acceptance Criteria

| Feeder breakers, interlocks and alarms which perform a safety-related function operate in accordance with Duke Power Company Design Engineering Department System Descriptions for the appropriate systems. Voltages measured at load centers or panels are within the limits specified by Duke Power Company Design Engineering Department for the appropriate system.

HEAT TRACING SYSTEMS TEST
Abstract

Purpose

To demonstrate the ability of the heat tracing system to maintain proper temperature control in the various piping systems (liquid and solid wastes, chemical volume control and boron recycle).

Prerequisties

Heat tracing system installation and component checks completed. Associated systems completed to the extent necessary to allow conduct of this test.

Test Method

Energize heat tracing system.

Monitor temperatures maintained by each heat tracing circuit with the system in a static condition.

Place associated system pump in operation and establish flow path.

Monitor temperatures maintained by each heat tracing circuit.

Acceptance Criteria

Primary circuit maintains temperature 175 ± 8°F for 12% boric acid or 85 ± 5°F for 4% boric acid lines.

Backup circuit maintains temperature 160 ± 8°F for 12% boric acid lining or 70 ± 5°F for 4% boric acid lines.

CONTAINMENT VENTILATION AND PURGE FUNCTIONAL TEST
Abstract

Purpose

To demonstrate the capability of the Containment Ventilation System to provide containment air recirculation, control rod drive mechanism cooling and containment purging.

Prerequisites

A cooling water supply is available for the fan-cooling units of the system. For testing portions of the system as applicable, the control rod drive mechanisms are capable of being energized, and plant conditions are established as required.

Test Method

Actual expected building heat loads are simulated during Reactor Coolant System Hot Functional Testing and data is taken to demonstrate the capability of the Containment Ventilation System to provide for containment recirculation and heat removal, by testing operation of the axial fans, centrifugal water chillers and the cooling coils, and by ensuring adequate flow is delivered to components and areas inside Containment as required.

Data will also be taken to verify that the control rod drive mechanisms shroud ventilation units are capable of maintaining temperatures within the shroud within design limits.

The capability of the containment purge exhaust filtration units to provide filtration is verified by testing of the filtration units.

Proper operation of the containment purge supply and purge exhaust equipment is demonstrated in normal and refueling modes.

Proper operation of Containment Ventilation and Purge System instrumentation, interlocks, and alarms which perform a safety-related function is verified.

Acceptance Criteria

1. The Containment Ventilation System components function in accordance with Duke Power Company Design Engineering Department System Descriptions. Adequate ventilation flow is provided to containment areas to maintain or limit temperatures to design valves. System interlocks, instrumentation and alarms operate as described in Duke Power Company Design Engineering Department System Descriptions.

2. The filter unit must be structurally sound after filter installation per applicable sections of ANSI N510-1980, Section 5, Table 2.

CONTAINMENT VENTILATION AND PURGE FUNCTIONAL TEST
Abstract

3. HEPA filter banks demonstrated an efficiency of greater than or equal to 99.0% when they are tested in-place in accordance with ANSI N510-1980 while operating the system at 12,500 cfm ± 10% per train.

4. Charcoal absorbers remove greater than or equal to 99.0% of a halogenated hydrocarbon refrigerant test gas when they are tested in accordance with ANSI N510-1980 while operating at 12,500 cfm ± 10% per train.

Table 14.2.12-1 (Page 50)

SEAL WATER INJECTION SYSTEM FUNCTIONAL TEST
Abstract

Purpose

To verify proper operation of the isolation valve seal water in jection system, including interlocks and alarms. To measure the overall leakoff of the system.

Prerequisites

The system is complete with no identified discrepancies which could affect the test. Valves supplied by the system are installed and operable.

Test Method

The system alarms and interlocks which perform a safety related function are tested by operation of components or simulation of sensor signals. Overall system leakoff is determined by measuring the CIV Leakages in valve subsets and then totaling the subsets to obtain an overall average.

Acceptance Criteria

Alarms and interlocks function as specified by Duke Power Company Design Engineering Department. Total train leakoff does not exceed the following makeup capacity:

For train A, ≦ 1.3818 gpm with tank pressure ≧ 45.71 psig.

For train B, ≦ 1.3616 gpm with tank pressure ≧ 45.71 psig.

INSTRUMENT AIR SYSTEM FUNCTIONAL TEST
Abstract

Purpose

To demonstrate that the system can supply instrument quality air at the design capacity. The test will also verify the correct compressor start, loading/unloading and Station Air System backup pressure setpoints. The Containment Leak Rate Test dessiccant air dryer discharge dewpoint temperature will be determined.

Prerequisites

The Instrument Air System is in normal operation.

Test Method

The start and loading/unloading pressure setpoints are verified with one compressor in "BASE," one in "STANDBY 1," and the third in "STANDBY 2." The system air pressure is lowered while pressures are recorded corresponding to compressor starts and loading. The system air pressure is then allowed to increase while pressures are recorded corresponding to the compressor's unloading. Setpoints are verified using this same procedure with compressors in each control combination.

Each compressor's flow capacity is determined by directing all the flow from the compressor through a calibrated flow orifice. The refrigerant air dryers and the CLRT air dryers discharge dewpoint temperature is determined with design air flow rate through the air dryers.

The Station Air System crossover valve is demonstrated to automatically open when Instrument Air System pressure is lowered to the design setpoint.

The Instrument Air System product air is verified to be of sufficient quality by testing of air samples taken off locations near the end of main supply headers, for a total of five samples. Samples are taken downstream of filter regulators supplying individual instrument groups. The samples are examined for particulate matter size and oil concentration.

Acceptance Criteria

The compressors start and load/unload in accordance with Duke Power Company Design Engineering Department at the correct pressures. Refrigerant and CLRT air dryers meet their maximum allowable discharge dewpoints with design flow rate. Station Air System crossover valve opens at the design setpoint ± 10%. The product air meets instrument air quality requirements as stated in the test procedure. The compressor performance meets or exceeds the acceptance flow rate specified by Duke Power Company Design Engineering Department.

WASTE GAS SYSTEM FUNCTIONAL TEST
Abstract

Purpose

To demonstrate the operability of the Gaseous Waste Processing System including its capability to remove and process gases from specified sources including the volume control tank, boron recycle evaporator, reactor coolant drain tank, and waste evaporator.

Prerequisites

The system is complete, with no discrepancies which would affect the test. All necessary supporting equipment is operational.

Test Method

The system will be operated to verify the flow paths from the sources through the system. Alarms and interlocks which perform a safety-related function will be verified to operate properly. The ability of the hydrogen recombiner to combine hydrogen and oxygen will be verified by operation of the recombiner.

Acceptance Criteria

Flow paths are verified to be unblocked. Alarms and interlocks function as specified by Duke Power Company Design Engineering Department.

The hydrogen recombiner successfully combines hydrogen and oxygen when operated within normal limits.

Table 14.2.12-1 (Page 54)

AUXILIARY BUILDING FILTERED EXHAUST AND SHUTDOWN VENTILATION TEST
Abstract

Purpose

To verify proper operation of alarms, interlocks and controls. To verify the capability of the filtration units to fulfill their design function.

Prerequisites

The system is complete with no outstanding discrepancies which would affect the test. Supporting systems are complete to the extent necessary to operate the system.

Test Method

The system will be operated in both normal and LOCA (Ss) modes. Flow rates will be verified during operation. Switchover on receipt of a simulated LOCA (Ss) signal will be verified. Proper operation of alarms and interlocks will be verified by simulation of the appropriate conditions or injection of simulated sensor signals. Filtration units will be tested to verify their capabilities in accordance with ANSI N510-1980.

Acceptance Criteria

System alarms and interlocks function as specified by Duke Power Company Design Engineering Department. Filtered exhaust flow rate is 30,000 cfm ± 10%. System realigns to draw suction only from safety-related equipment rooms upon receipt of LOCA (Ss) signal and flow is 30,000 cfm ± 10%.

HEPA filter banks demonstrated an efficiency of greater than or equal to 99.0% when they are tested in-place in accordance with ANSI N510-1980 while operating the system at a flow rate of 30,000 cfm ± 10% for Unit 1.

Charcoal absorbers remove greater than or equal to 99.0% of a halogenated hydrocarbon refrigerant test gas when they are tested in accordance with ANSI N510-1980 while operating at a flow rate of 30,000 cfm ± 10% for Unit 1.

For the interim flow balance for this system, the Unit 2 filtered exhaust fans will exhaust 30,000 cfm + 0% - 35%. Once the interim barrier is removed, the system balance will be changed. Exhaust flows will be 30,000 cfm ± 10%.

REFUELING WATER SYSTEM FUNCTIONAL TEST
Abstract

Purpose

To demonstrate the operability of the refueling water storage tank heaters, in both automatic and manual modes. To demonstrate the operability of level, temperature and flow alarms.

Prerequisites

The refueling water storage tank, heaters and electrical circuits are complete with no outstanding exceptions which would affect the test.

Test Method

The operation of both sets of refueling water storage tank heaters is verified by energizing the heaters in each mode of operation. Current flow is verified to both sets of heaters. Control of the heaters in the automatic mode is verified by input of a test signal. The operation of the heaters is verified as this test signal is varied. Level, temperature and flow alarms are verified to operate in accordance with designs.

Acceptance Criteria

The heater banks are verified to energize and deenergize at the proper setpoints in each mode of operation as specified by Duke Power Company Design Engineering Department. The low recirculation flow, low recirculation line temperature, low refueling water storage tank temperature, low level, low-low level and puncture alarms all actuate as specified by Duke Power Company Design Engineering Department.

Table 14.2.12-1 (Page 60)

AUXILIARY SHUTDOWN PANEL TEST
Abstract

Purpose

To verify automatic valve realignment following transfer of control to auxiliary shutdown panel A (B). To demonstrate operability of auxiliary shutdown panel A (B) controls and isolation of control room following transfer of control to LOCAL. To demonstrate operability of control room controls and isolation of auxiliary shutdown panel A (B) following control transfer back to the control room.

To demonstrate that the unit can be operated from the auxiliary shutdown panels prior to loading fuel. During the Reactor Coolant System Hot Functional Test (HFT), from a hot standby condition, the ability to establish a heat transfer path to the ultimate heat sink using the Residual Heat Removal System and lowering the Reactor Coolant System temperature by 50°F is demonstrated. Instrumentation on the auxiliary shutdown panels is verified operable during this test.

Prerequisites

All systems interlocked or that can be controlled from auxiliary shutdown panel A (B) are available as required for this test.

For the demonstration portion during HFT, Hot Functional Testing is in progress with primary system at approximately 400°F.

Test Method

Prior to HFT, control is transferred to auxiliary shutdown panel A (B) and these controls are verified to be operable. All automatic interlocks are verified. Controls are verified by cycling valves and running Boric Acid Transfer Pump 1A (B). The remainder of the pumps and Pressurizer Heater Bank 1A (B) control circuits are verified operable with associated breakers in the "TEST" position. At the same time, main control room controls are verified to be isolated. Upon transfer back to the main control room, control is verified to be regained and auxiliary shutdown panel A (B) control is isolated. This is accomplished in the same manner as the previous section.

During HFT, with the primary system at approximately 400°F, control is transferred to the auxiliary shutdown panels. Also, Reactor Coolant temperature and pressure is lowered sufficiently to permit operation of the Residual Heat Removal System from the auxiliary shutdown panels. While using the Residual Heat Removal System the Reactor Coolant temperature is reduced at least 50°F.

Table 14.2.12-2 (Page 12)

Test Abstract Deleted

(This page deleted in Revision 11)

Table 14.2.12-2 (Page 27)

UNIT LOAD TRANSIENT TEST

Abstract

Purpose

To demonstrate satisfactory unit response to a 10 percent load change.

Prerequisites

The various control systems have been tested and are in automatic. All pressurizer and main steam relief and safety valves are operable. The control rods are in the maneuvering band for the power level existing at the commencement of the test. Unit conditions are stabilized and all pertinent parameters to be measured are connected to high speed recorders.

Test Method

Turbine output is manually reduced at a rate sufficient to simulate a step load change equivalent to approximately a 10 percent load decrease. After stabilization of systems, output is manually increased at a rate sufficient to simulate a step load change equivalent to approximately a 10 percent load increase. Pertinent parameters affected by a load change are measured and recorded. At various power levels, as required by the test procedure, the test is repeated.

Acceptance Criteria

Neither the turbine nor the reactor trips, and no initiation of safety injection is experienced. No pressurizer, main steam relief or safety valves lift. No operator action is required to restore conditions to steady state. Parameters affected by the load change do not incur sustained or divergent oscillations.

Table 14.2.12-2 (Page 31)

FEEDWATER TEMPERATURE VARIATION TEST
Abstract

Purpose

To demonstrate the ability of the unit to sustain a reduction in feedwater temperature from opening a feedwater heater train bypass valve. To evaluate interaction between control systems and to evaluate system responses to the transient to determine if any control system changes are required to improve transient response. This test is not required to be completed to escalate to the next testing plateau.

Prerequisites

The unit is at steady state conditions at the specified power level. Pressurizer and main steam safety valves are operable. The following systems are in the automatic mode:

1) Reactor Rod Control
2) Pressurizer Pressure Control
3) Pressurizer Level Control
4) Steam Dump Control
5) Feedwater Pump Speed Control
6) Steam Generator Level Control

Pertinent plant parameters (such as feedwater temperature, feedwater and steam flows, flux, steam generator and pressurizer levels, feedwater pump speeds) are connected to recording devices.

Test Method

The A-B heater train bypass valve is opened. Pertinent plant parameters are recorded and the data evaluated to determine control system responses to the transient.

Acceptance Criteria

Turbine generator and reactor do not trip due to Reactor Coolant System transients. Safety injection is not initiated. Main steam and pressurizer safety valves do not lift. No sustained or divergent oscillations occur in the parameters affected by the feedwater temperature variation.

Table 14.2.12-2 (Page 32)

LOSS OF CONTROL ROOM TEST
Abstract

Purpose

To demonstrate that the unit can be brought to hot standby conditions from a moderate power level using Auxiliary Shutdown Panel controls and only the minimum shift crew required for operation. To demonstrate that hot standby conditions can be maintained from outside the control room. This test is not required to be completed to escalate to the next testing plateau.

Prerequisites

Power escalation testing is in progress with the reactor at a moderate power level (10-25%) sufficiently high that plant systems are in normal configuration with the turbine - generator in operation. All personnel in the control room area not actively participating in the test as well as those performing the test are identified and their authority and responsibility documented in the test procedure.

Test Method

The control room is evacuated of normal operating personnel following the Normal Loss of Control Room operating procedure. Additional operators, not actively participating in the test, remain in the control room to monitor unit behavior. The reactor is tripped and the unit is brought to hot standby conditions using local controls and indications and maintained at this condition for at least 30 minutes. The Reactor Coolant System temperature will then be reduced by at least 50°F. Control is then transferred back to the control room and power escalation testing continued.

Acceptance Criteria

The unit is satisfactorily brought to hot standby conditions from a moderate power level and maintained at this condition for at least 30 minutes from outside the control room. The Reactor Coolant System temperature can be reduced by at least 50°F from outside the control room. Only the minimum number of personnel required to be assigned to the unit at any one time take an active part in this demonstration.

Table 14.2.12-2 (Page 37)

PRESSURIZER FUNCTIONAL TEST
Abstract

Purpose

To establish the continuous spray flow rate, determine the effectiveness of the pressurizer normal control spray and of the pressurizer heaters, and verify the response time of the pressurizer power operated relief valves.

Prerequisites

The Reactor Coolant System is at hot standby temperature and pressure. The Reactor Coolant System is lined up for normal operation in accordance with applicable operating procedures. All reactor coolant pumps are operating. Each bank of pressurizer heaters is operable.

Test Method

While maintaining pressurizer level constant, spray bypass valves are adjusted until a minimum flow is achieved which maintains less than a 125°F temperature difference between the spray line and the pressurizer steam space.

To determine pressurizer heater and spray capability, the main pressurizer spray valves are closed. All pressurizer heaters are then energized and the time to reach a 2300 psig system pressure is measured and recorded. Full spray is initiated through each spray valve individually and in parallel. Pressure versus time is recorded for each transient. The transient is terminated at a Reactor Coolant System pressure of 2000 psig by shutting the spray valves.

With the Unit at normal operating no load temperature and pressure, each PORV shall be cycled for repsonse time testing. The 2185 psig interlock closes the valve and original conditions are re-established.

This test is performed following initial fuel loading due to the need to establish the effectiveness of actual spray flow with core pressure drop acting as the driving head. This test is a prerequisite test for initial criticality.

Acceptance Criteria

For setting of continuous spray flow, the flow through each bypass valve is established such that the temperature difference between the spray line and the pressurizer steam space is less than 125°F.

For pressurizer PORV response times, each PORV reponse time is $\leq$2 seconds.

For spray and heater response tests, the response to induced transients is within limits specified in vendor guidelines.

Table 14.2.12-2 (Page 38)

SUPPORT SYSTEMS VERIFICATION TEST
Abstract

Purpose

To verify that temperatures within rooms containing engineered safety features pumps and motors are maintained within design limits during power operation by normal operation of the cooling systems serving those areas.

Prerequisites

Unit in power operation at the power level specified in the procedure.

Test Method

Temperature readings will be taken within the rooms in the auxiliary building which contain engineered safety features pumps. These readings will be compared with the design limits for these rooms.

Acceptance Criteria

Temperature readings do not exceed the design limits specified by Duke Power Company Design Engineering Department.

Response:

Copies of approved test procedures for satisfying FSAR testing commitments will be made available for review by NRC regional personnel approximately 60 days prior to their intended use, and (for Unit 1) not less than 30 days prior to fuel loading for tests to be performed prior to the initial criticality and not less than 60 days prior to criticality for low power and power escalation testing, and (for Unit 2) not less than 60 days prior to fuel loading for startup testing.

640.6 (14.2.12) The initial test program should verify the capability of the offsite power system to serve as a source of power to the emergency buses. Tests should demonstrate the capability of each starting transformer to supply power (as the alternate supply) to its unit's emergency buses while carrying its maximum load of plant auxiliaries and the other unit's emergency buses (as perferred supply). Tests should also demonstrate the transfer capabilities of the unit's emergency bus feeders upon loss of one source of offsite power. These tests should be performed as early in the test program as the availability of necessary components allows. Provide descriptions of the tests that will demonstrate these capabilities.

Response:

The Unit Main Power System for each unit at Catawba, which connects the unit to the offsite power source, is described in Section 8.3. The Unit Main Power System does not utilize startup transformers. It is divided into two separate trains, each capable of supplying power to the unit 6.9 KV Auxiliary Power System. Each train contains one step-up transformer connecting the train to the 230 KV switchyard grid, and a pair of auxiliary transformers. During times when the main generator is not supplying power for in-house loads, power is supplied from the switchyard through the main step-up transformer to the pair of auxiliary transformers, to the 6.9 KV Auxiliary Power System, and on to the 4160 V vital buses. The unit main step-up transformer is sized to carry approximately one-half the full-load electrical output of the main generator, and will carry this load during normal operation. This adequately demonstrates it's ability to carry any necessary in-house loads during shutdown.

The capability of a pair of the auxiliary transformers to carry the unit's auxiliary load plus the unit emergency bus loads will be verified during the Electrical Load Capacity Test (refer to Table 14.2.12-1, page 40). This will assure that ample capacity is available with one pair of auxiliary transformers to carry one unit's engineered safety features for a DBA while supplying the loads required for a concurrent shutdown of the other unit.

The transfer of vital bus feeders upon loss of one source of offsite power will be verified during the 6900 Volt Auxiliary Power System Preoperational Test (refer to Table 14.2.12-1, page 41).

1.i.2: The functional and closure time tests for containment isolation valves will be verified during the performance of the Engineered Safety Features Actuation System Functional Test (Abstract, Table 14.2.12-1, page 31). As stated in the Abstract, "Proper response of appropriate systems and components to a containment isolation signal... is demonstrated... This testing provides response timing of valve and pump operation." In addition, individual functional testing and closure time measurements are performed for each containment isolation valve as a part of the inservice inspection program, in accordance with ASME Section XI, Article IWV.

1.i.8: This requirement is satisfied by the performance of the Engineered Safety Features Actuation System Functional Test (Abstract, Table 14.2.12-1, page 31). As stated in the abstract proper response to each of the three initiating signals will be verified, by demonstrating the initiation from the detector, through the logic to actuation of the components.

1.i.9: Refer to test Abstract for the Containment Purge Functional Test, Table 14.2.12-1, page 47.

1.i.10: The Catawba Nuclear Station design does not incorporate vacuum-breaker valves. The capability to provide air to the containment to relieve an underpressure situation is demonstrated by the Containment Air Release and Addition System Functional Test (Abstract, Table 14.2.12-1, page 48).

1.i.21: Please refer to the response to question 640.15.

1.j.3: The proper operation of the secondary system steam pressure controls will be demonstrated during the unit Reactor Coolant System Hot Functional Test, (Abstract, Table 14.2.12-1, page 3).

1.j.5: There is no RCS Leak Detection System at Catawba Nuclear Station. Technical Specification 3.4.6.1 lists systems or features used in the determination of Reactor Coolant system leakage, and Technical Specification 4.4.6.1 sets calibration and test requirements for these items. The calibrations and tests required by Technical Specification 4.4.6.1 will be performed prior to initial criticality. This will assure that the capability of the appropriate features necessary for the determination of reactor coolant system leakage has been verified, which is in line with the intent of Regulatory Guide 1.68, Revision 2, Appendix A, 1.j.5.

1.j.6: The testing to be performed on the Loose Parts Monitoring System is outlined in the response to question 492.1. This testing will be performed as a part of the normal plant surveillance program for periodic testing and calibration.

1.j.9: The testing of systems designed to maintain differential pressures to prevent leakage across boundaries as required