GULF STATES UTILITIES COMPANY
POST OFFICE BOX 2951 • BEAUMONT, TEXAS 77704
AREA CODE 713 838-6631

May 15, 1985
RBG- 20,994
File No. G9.5
G9.8.6.2

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

Dear Mr. Denton:

River Bend Station - Unit 1
Docket No. 50-458

Enclosed are the Gulf States Utilities Company (GSU) responses to the letters from Mr. A. Schwencer (Nuclear Regulatory Commission - NRC) to Mr. William J. Cahill (GSU) dated April 1 and April 30, 1985. Attachment 1 provides a summary response to each request for additional information (RAI) attached to the referenced letters, while Enclosures 1 through 3 provide revised Final Safety Analysis Report (FSAR) pages supporting statements in Attachment 1. Those FSAR revisions contained in Enclosures 1 through 3 will be included in a future FSAR Amendment.

Sincerely,

J.E. Booker

J.E. Booker
Manager-Engineering
Nuclear Fuels & Licensing
River Bend Nuclear Group

JEB/WJR/JWL/je

Attachment (1)

Enclosures (3)

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ATTACHMENT 1

1. Question 640.1, Item (3): The response to this question should be modified to address revised FSAR subsection 14.2.12.1.26 (Normal and Standby Service Water Systems Preoperational Test).

   Response:

   See revised Q&R page 1.8-3 contained in Enclosure 1.

2. Question 640.6: Test abstracts, as noted, should be modified as follows:

   a. FSAR subsection 14.2.12.1.4 (Nuclear Boiler System Preoperational Test) should provide appropriate acceptance criteria as specified in this item. It is not appropriate to reference the preoperational test description itself for acceptance criteria as this method does not clearly indicate the source of the acceptance criteria to be used in determining that adequacy.

   Response:

   The acceptance criteria for items 4.a and 4.b, "within limits of the test specification," refer to the General Electric Company's (GE) Preoperational Test Specification specific to RBS (Document No. 22A5296AG.) FSAR subsection 14.2.12.1.4.4 is revised accordingly in Enclosure 3.

3. Questions 640.21 and 640.29: The response to these questions are in part or completely addressed by FSAR subsection 14.2.12.1.70 (Safety-Related Ventilation Systems Environmental Design and Technical Requirement Preoperational Test) and should be modified accordingly.

   Response:

   See revised Q&R pages 14.2-27 and 14.2-35 contained in Enclosure 3.

4. Questions 640.25: The exception taken to Regulatory Guide 1.68, Initial Test Programs for Water-Cooled Nuclear Power Plants, as contained in FSAR Table 1.8-1, "Regulatory Guide 1.68, Rev. 2 (August, 1978)," Section II.2 should be modified to state that emergency loads are tested at reduced voltage in FSAR subsection 14.2.12.1.44.

   Response:

   See revised Table 1.8-1, Page 96 of 193 contained in Enclosure 1.

5. Item 14A: FSAR Figure 14.2-6, "Maximum Acceptance Drive Flow Following Pump Trip," should be provided or FSAR subsection 14.2.12.3.27.2 (Recirculation System - Trip of Two Pumps) should reference an appropriate document.

   Response:

   See revised page 14.2-177 contained in Enclosure 3.

6. Item 14B: FSAR subsection 14.2.7 (Conformance of Test Programs with Regulatory Guides) should reinstate Regulatory Guide 1.52 (Amendment 15 modification).

   Response:

   See revised page 14.2-18 contained in Enclosure 3.

7. Item 14C: FSAR subsection 14.2.12.1.36 (Standby Diesel Generator Preoperational Test) and FSAR Table 1.8-1 (Conformance to NRC Regulatory Guides) should be modified to reinstate testing in conformance with Regulatory Guide 1.108, Positions C.2.a(3) and C.2.a(9), or FSAR Table 1.8-1 should be modified to provide additional technical justification for any exceptions to this guide. The statement contained in FSAR Table 1.8-1 and FSAR subsection 8.3.1.1.5.2 does not justify the exception.

   Response:

   As indicated in FSAR Section 8.3.1.1.5.2, the standby diesel generators were run for 24 hours at their rated load of 3500 KW. However, the actual diesel loading will not be above 3130 KW (see Figures 8.3-2a and 2b). The 3500 KW, 24 hour run therefore represents a loading greater than 110% of the qualified load (3130 KW) and thus meets the intent of Regulatory Guide 1.108 Position C.2.a(3). This discussion is reflected in revised Section 8.3.1.1.5.2 as shown in Enclosure 2 and the position clarification statement for Regulatory Guide 1.108 is modified as shown in Enclosure 1. In addition, the RBS HPCS Diesel Generator was subjected to a 24 hour run at its continuous rating of 2600 KW, 2 hours of which it was subjected to a 110 percent overload test. This is reflected in the revised section 8.3.1.1.5.3 contained in Enclosure 2. Finally, no modified starts will be used to meet Regulatory Guide 1.108 Position C.2.a(9). Therefore, the clarification statement in Table 1.8-1, as well as other FSAR references to modified starts, have been deleted as shown in Enclosures 1, 2 and 3.

8. Item 14D: FSAR subsection 14.2.12.3.22.2 (Main Steam Isolation Valves - Full Reactor Isolation) should provide or reference acceptance criteria regarding increase in heat flux and dome pressure.

   Response:

   See revised page 14.2-164a incorporated in FSAR Amendment 17 and contained in Enclosure 3.

9. Item 14E: Either reinstate, change, or provide technical justification for the following in FSAR Figure 14.2-5, "Startup Test Program:

   a. Test No. 13 "Process Computer" Test at TC6 (Regulatory Guide 1.68, App. A.5.r).

   b. Test No. 26 "Relief Valves" Test at TC6 and Note 24 (Low-Low Set Logic Function Test).

   c. Test No. 27 "Turbine Trip and Generator Load Rejection" - Note 19 should be modified to state that a generator load rejection will be conducted at 100% power in accord with revised FSAR subsection 14.2.12.3.24, "Turbine Trip and Generator Load Rejection."

   Response:

   a. TC6 has been reinstated for Test No. 13, see revised Figure 14.2-5 contained in Enclosure 3.

   b. Test numbers 25b (Full Reactor Isolation) and 27 (Turbine Trip and Generator Load Rejection) will be performed at TC6 to verify the SRV low-low set logic function rather than Test No. 26 (Relief Valves). This is reflected in revised Figure 14.2-5 and on FSAR pages 14.2-164a, and 166 through 169 contained in Enclosure 3.

   c. Note 19 to Figure 14.2-5 has been revised to state that a Generator Load Reject will be conducted at TC6, see Enclosure 3.

Enclosure 1

This Enclosure provides revisions to the position statements for Regulatory Guides 1.68 and 1.108 contained in Table 1.8-1, and revises the response to Question 640.1. As such, this enclosure provides the necessary FSAR changes to address items 1 and 4, in full, and item 7, in part, of Attachment 1.

REGULATORY GUIDE 1.68

TABLE 1.8-1 (Cont)

18. Appendix A, paragraph 5.d.d (p. 1.68-18)

Regulatory Guide 1.68.2 is addressed in a separate compliance statement.

19. Appendix A, paragraph 5.o.o (p. 1.68-18)

Vibration on NSSS piping in the drywell is monitored and evaluated using remote sensing devices.

20. Appendix C, paragraph 1.a. (3)(d) (p.1.68-20)

Regulatory Guide 1.37 is addressed in a separate compliance statement.

II. Exceptions

1. Paragraph C.2 (p. 1.68-4)

Surveillance tests necessary to demonstrate proper operation of interlocks, set points, and other protective features, systems, and equipment required by the technical specifications are performed during the initial test program. This does not include the performance of formal surveillance tests required by 10CFR50.36. The actual performance of these tests is not within the scope of the initial test program. Chapter 16 of this FSAR defines the formal surveillance test requirements. | 5

2. Appendix A, paragraph 1.g(2) (p. 1.68-8)

Emergency loads are tested at normal voltage. Operation at other than rated voltage may be considered as destructive testing. | 16

INSERT

The preoperational tests demonstrate the proper functioning of the diesel generator voltage regulator under an auto-start and loading condition.

3. Appendix A, paragraph 1.h(1)(a) (p. 1.68-9) | 5

Expansion tests are not performed during the preoperational testing of ECCS. RCIC turbine steam supply and exhaust lines are visually

Insert for Table 1.8-1, Page 96 of 193

However, the ECCS Integrated Initiation during Loss of Offsite Power (LOOP) Preoperational Test, Section 14.2.12.1.44 describes a test for the DC system loads (during a LOCA coincident with a LOOP and inoperable battery chargers) to verify the voltage levels remain greater than or equal the minimum design values and load profiles are within their design values.

REGULATORY GUIDE 1.108

TABLE 1.8-1 (Cont)

INSERT →

4 B. Paragraph C.2.a(3) - For the standby diesel generators, ~~exception is taken to~~ performance of the overload test ~~since the diesel generators will not be operated above their rated load.~~ CREDIT IS TAKEN FOR THE AS DESCRIBED IN SECTION 8.3.1.1.5.2. 16

5 B. Paragraph C.2.a(9) - The onsite preoperational reliability tests required by this section were performed ~~with the exception that the standby diesel generators were subjected to two fast starts and ten modified starts~~ as described in ~~Section~~ 8.3.1.1.5.2. SECTIONS 8.3.1.1.4.2.1 AND

6 B. Paragraph C.3.b - Regulatory Guide 1.16 is addressed in a separate compliance statement.

FSAR Sections - 8.3.1, 14.2.12

Insert for Page 146a of 193

3. Paragraph C.2.a - Periodic testing will be as required by Technical Specifications.

QUESTION 640.1 (1.8) (14.2.7)

Regulatory Guide 1.68 - Rev. 2 (Table 1.8-1).

Address the following:

1. Modify your exceptions to Appendix A, Positions 1.c and 5.g.g, to provide a commitment to include in your test program any design features to prevent or mitigate anticipated transients without scram (ATWS) that may in the future be incorporated into your plant design.

2. The staff recognizes that there is currently no Loose Parts Monitoring System at the River Bend Station. Commit to the test requirements of Appendix A, Positions 1.j(6) and 5.n, for such systems that may be installed in the future.

3. Verify that sources of water used for long-term core cooling are tested to demonstrate adequate NPSH and the absence of vortexing over range of basin level from maximum to the minimum calculated 30 days following LOCA. (Clarification of Appendix A, Position 1.h(10).)

RESPONSE

1. The exceptions to Regulatory Guide 1.68 Appendix A, Positions 1.c and 5.g.g have been deleted.

2. A loose parts monitoring system (LPMS) is provided in the River Bend Station design. See revised Section 4.4.6.1, Tables 1.8-1 and 14.2.12.1.69. 11

3. Section 9.2.5.2 describes the ultimate heat sink and its design to provide sufficient NPSH and vortex-free operation. ~~Therefore, no testing is planned to demonstrate these criteria.~~

SECTION 14.2.12.1.26 DESCRIBES THE PREOPERATIONAL TESTS CONDUCTED TO VERIFY VORTEX-FREE OPERATION.

Enclosure 2

This enclosure provides revisions to various pages and sections of FSAR Chapter 8.3 to support revisions to the position statements for Regulatory Guide 1.108 (See Enclosure 1) and to address item 7, in part, of Attachment 1.

8.3.1.1.4.1.1
STANDBY DG QUALIFICATION TESTING

to the equipment that each switch controls (Section 7.1.2.3).

Factory testing of the standby ac power systems was performed as defined in IEEE-387, Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations.

Standby diesel generator 1EGS*EG1A ~~and 1EGS*EG1B were~~ WAS given 37 ~~type~~ qualification tests ~~each~~ in accordance with IEEE 387 and IEEE 323. Qualification tests were performed at River Bend Station in accordance with Regulatory Guide 1.9, Paragraphs C.13 and C.14, and Regulatory Guide 1.108, as discussed in Section ~~1.8~~ 8.3.1.1.5.2. 16

START

AT THE TDI FACTORY. EACH START VERIFICATION TEST WAS PERFORMED FROM A STANDBY TEMPERATURE OF 150° ± 10° AND INCLUDED PICKUP OF 1750 KW WITHIN 10 SECONDS OF THE START SIGNAL (THERE WERE NO START FAILURES.) VARIOUS ADDITIONAL TDI FACTORY QUALIFICATION TESTS WERE PERFORMED FOR BOTH STANDBY DIESEL GENERATORS AS DISCUSSED IN ITEM 2 OF REFERENCE 3. IN ADDITION,

8.3.1.1.4.2.1
HPCS DG QUALIFICATION TESTING

1. Prior to initial fuel loading of the reactor unit, a series of tests will be conducted to establish the capability of the HPCS diesel generator unit to consistently start and load within the required time.

2. With the exception of those diesel engine/generator designs that are identical (minor changes may be justified by analysis) to the diesel generator unit(s) which have been previously qualified for the HPCS application, all other different diesel engine/generator combinations will be individually qualified for reliable start and load acceptance requirements.

3. An acceptable start and load reliability test is defined as follows: A total of ~~20~~ 69/n (WHERE n IS THE NUMBER OF DIESELS, 1) valid start and loading tests with no failure or ~~40~~ 128/n valid start and loading tests with a single failure will be performed. Failure of the unit to successfully complete this series of tests as prescribed will require a review of the system design adequacy, the cause of the failure to be corrected, and the tests continued until ~~40~~ 128 valid tests are achieved without exceeding the one failure. The start and load tests will be conducted ~~as follows:~~ FOR 69 COLD FAST STARTS.

16

~~a. 4 cold fast starts~~

~~b. 4 hot fast starts~~

~~c. 61 modified starts~~

The fast starts are conducted ~~from the main control room by simulation of an ESF signal~~ with the engine in a ready standby status. ~~Following each fast start, the engine is loaded to the ESF bus load shown in Table 8.3-3, and run at that load for approximately 4 hr. The modified starts~~ include a ~~prelube period as recommended by the manufacturer,~~ loading to AT LEAST 50% OF THE CONTINUOUS LOAD ~~approximately 2600 kW within 3 to 5 min,~~ and operation at this load for ~~approximately~~ AND AT LEAST 1 hr. ~~Modified starts may be performed with the engine at its operating temperature.~~ During and/or following this testing, some individual components of the diesel generator or its support systems may require maintenance and/or replacement. This maintenance and/or replacement due to wear does not require retesting.

The capability for testing and calibrating all actuation devices, circuits, electrical protective relays, and related instrumentation during normal operation is designed into the power systems important to safety and in accordance with the recommendations of Regulatory Guide 1.22. Provisions to perform nondestructive tests under simulated fault conditions are provided. This includes but is not limited to the ability of the protection system to initiate the operation of the actuated equipment.

8.3.1.1.5.2 Standby Electrical Power Supply Systems

Maintenance and testing of the standby diesel generators are conducted to ensure that all components and auxiliaries are operational within their design limits.

DELETE AND REPLACE WITH 16 INSERT 1

In addition to the qualification tests conducted on each diesel generator set at the engine manufacturer's factory, ~~these standby diesel generator sets were subjected to two fast starts and ten modified starts after their installation at the site. A modified start is defined as a start which includes a prelube period as recommended by the engine manufacturer, loading to 75 percent of the maximum design load within 3 to 5 min, and operation at this load for approximately 1 hr. The modified starts may be performed with the engine at its operating temperature. The fast starts are conducted from the main control room in a ready standby status. During each fast start the engines are loaded to the ESF bus load shown in Table 8.3-2 and run at that load for approximately 4 hr.~~

Each diesel generator set was given a load capability test at their rated load of 3,500 kW for 24 hr. ~~The engines were not tested at their 2-hr rating since these sets will not be operated above the rated load.~~

INSERT 2

The following tests were performed in accordance with IEEE-387 after complete installation of the standby diesel generator system at River Bend Station.

a. Starting test

b. Load acceptance test

c. Rated load tests

Insert 1 for Page 8.3-36

the Standby Diesel Generators are subjected to 69/n (where n is the number of diesels, 2) start and load tests with no single failure or 128/n start and load tests with a single failure. Failure of a diesel to complete this series of tests will require a review of system design adequacy, the cause of failure to be corrected, and the tests continued until 128/n valid tests are achieved without exceeding the one failure criterion. The start and load tests are conducted with the engine in a ready standby status and include a loading to at least 50% of the continuous load and operation at this load for at least 1 hour.

Insert 2 for Page 8.3-36

However, as indicated in Tables 8.3-2a and 2b, the standby diesel generators will not be loaded above 3130 KW. Therefore, the 24-hour, 3500 KW load capability test more than satisfies the 10% overload requirement of paragraph C.2.a(3) of Regulatory Guide 1.108 when applied to the qualified load of 3130 KW.

surveillance or system operating procedure to place the diesel in an automatic standby readiness condition.

Compliance with Technical Specifications, administrative and system operating procedures, and the preventive maintenance and surveillance testing schedule ensures optimum equipment readiness and availability upon demand.

8.3.1.1.5.3 High Pressure Core Spray Power Supply System

12 Readiness of the HPCS diesel generator is demonstrated by periodic testing according to Regulatory Guide 1.108 and is described in the Technical Specifications. The testing program is designed to test the ability to start and accept the HPCS diesel generator design loads connected to bus 1E22*S004. ~~Af~~ ~~or the HPCS diesel generator has reached its engine temperature equilibrium, it is run under its rated load for 2 hr and then run for 22 hr under the rated load.~~ This ensures that cooling and lubrication are adequate for extended periods of operation. Full functional tests of the automatic control circuitry are conducted on a periodic basis to demonstrate correct operation (Section 7.3.2).

DELETE AND 16 15 REPLACE WITH INSERT 2

Means are provided for periodically testing the chain of system elements from sensing devices through driven equipment to assure that the HPCS power supply is functioning in accordance with design requirements. The drawout feature of protective relays allows replacement relays to be installed while the relay that is removed is bench tested and calibrated.

16 Startup of onsite power units can be initiated by simulation of LOCA signal or loss of power to the plant auxiliary power system. Connection of the HPCS diesel generator to the HPCS bus takes place automatically on loss of plant auxiliary power to the HPCS bus (HPCS bus low voltage). The HPCS diesel generator bus directional overcurrent, ground overcurrent, and phase overcurrent protective relaying provides a trip to the offsite power feeder breaker in case of loss of offsite power while the diesel generator is in the test mode operation.

Insert for Page 8.3-38

The HPCS Diesel Generator is run for 24 hours at its continuous rating of 2600 KW, two hours of which it is subjected to a 110 percent overload test (see Table 8.3-3).

Regulatory Guide 1.9

In accordance with Regulatory Guide 1.9, the ratings of standy diesel generators 1EGS*EG1A and 1EGS*EG1B are continuous load rating of 3,500 kW each, and a 2-hour rating of 3,850 kW each, which exceeds the sum of the loads required.

The sequencing of large loads at predetermined intervals (Table 8.3-2) ensures that large motors will have reached rated speed and that voltage and frequency will have stabilized before the succeeding loads are applied. The decrease in frequency and voltage has been verified to be within 95 and 80 percent of nominal, respectively. 16

Recovery of voltage and frequency to within 10 percent and 2 percent of nominal, respectively, has been verified to be accomplished within 40 percent of the sequencing interval of 5 sec. Step loading and disconnection of the total diesel generator nameplate-rating load does not cause the standby diesel generator to exceed 110 percent of normal speed, thus precluding an inadvertent overspeed trip.

The reliability of the standby diesel generators has been substantiated by an extensive test program. The tests verify the following diesel functions:

1. Diesel fast start ~~and modified start~~ capabilities 16
2. Load carrying capabilities
3. Load shedding capabilities
4. Ability of the system to accept and carry the applied loads up to its rated capacity
5. Long-term no load running of the diesel unit without any detrimental effects.

The reliability of the system to start and accept loads in a prescribed time interval has been demonstrated by prototype qualification test data augumented by analysis to verify the ability of the River Bend Station standby diesel generators to perform their intended function, and has been further verified by preoperational tests. The preoperational tests described in Section 8.3.1.1.5.2 verify reliability after plant installation. 16 Full-load tests have been performed during preoperational testing at the River Bend Station on each diesel generator set to demonstrate the start and load capability of the units within the 16

Regulatory Guide 1.9, Position 1 Conformance

Table 8.3-3 shows that the continuous rating of the diesel generator is greater than the maximum coincidental steady-state loads requiring power at any time. Intermittent loads such as motor-operated valves are not considered for long-term loads.

Regulatory Guide 1.9, Position 2 Conformance

See Table 8.3-3 for the 2,000-hr rating of the HPCS diesel generator, the 30-min rating, and the maximum coincidental load for conformance with this position. The ratings are described in Table 8.3-3. The long-term steady-state load shown therein is within the continuous rating of the diesel generator.

Regulatory Guide 1.9, Position 3 Conformance

The load requirements ~~will be~~ WERE verified ~~and test data will be included in this SAR following the~~ DURING THE preoperational tests DESCRIBED IN FSAR SECTIONS 14.2.12.1.8 AND 14.2.12.1.44.

Regulatory Guide 1.9, Position 4 Conformance

The design function of the HPCS diesel generator unit is considered to be a justifiable departure from strict conformance to Regulatory Guide 1.9, regarding voltage and frequency limits during the initial loading transient. The HPCS diesel generator loads consist of one large pump and motor combination (approximately 2,500 hp), one medium size pump (450 hp), and other miscellaneous loads; consequently, limiting the momentary voltage drop to 25 percent and the momentary frequency drop to 5 percent would not significantly enhance the reliability of HPCS operation. To meet these regulatory guide requirements, a diesel generator unit approximately two to three times as large as that required to carry the continuous full load would be necessary. However, the frequency and voltage overshoot requirements of Regulatory Guide 1.9 are met. A factory testing program on a prototype unit has verified the following functions:

16

16

1. System fast-start capabilities
2. Load carrying capability
3. Load rejection capability
4. Ability of the system to accept and carry the required loads

Reference - 8.3

1. Henrie, D.K. and Subramanian, C.V., Seismic Qualification Review Team (SQRT), Technical Approach for Re-Evaluation of Equipment, NEDE-24788-2, December 1982. 12

2. Letter from J. E. Booker, Gulf States Utilities Company, Beaumont, Texas, to H. R. Denton, U.S. Nuclear Regulatory Commission, Washington, DC, February 10, 1984. 13

3. LETTER FROM J.E. BOOKER, GULF STATES UTILITIES COMPANY, BEAUMONT, TEXAS, TO H.R. DENTON, U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, D.C., APRIL 11, 1985 (GSU LETTER NO. RBG-20684).

Enclosure 3

This Enclosure provides revisions to various pages, tables and sections of FSAR Chapter 14.2 to address items 2, 3, 5, 6, 7 (in part), 8 and 9 of Attachment 1.

power plateau are reviewed evaluated, and approved by the augmented FRC before proceeding to the next test plateau.

14.2.6 Test Records

A single copy of each test procedure is designated as the official field copy to be used for test documentation. The official field copy of each test procedure and information specifically called for in the procedure, such as completed data sheets, tables, logs, chart recordings, etc., constitutes the completed test procedure. Completed preoperational and initial startup test procedures are made a part of the permanent plant file and are retained for the life of the plant.

14.2.7 Conformance of Test Program with Regulatory Guides

The following matrix lists regulatory guides used in the development of the Initial Test Program and the phase(s) of the program (as described in Section 14.2.1) to which they apply. The program complies with the intent of these and other regulatory guides following the interpretations, clarifications, and/or exceptions discussed in Section 1.8.

INSERT

15

Test Phases

Reg. Guide	Preliminary	Preoperational	Initial Startup
1.8	x	x	x
1.20		x	x
1.30	x	x	x
1.33		(1)	x
1.37	x	x	x
1.41		x	x
1.58	(2)		
1.68		x	x
1.68.1		x	x
1.68.2		x	x
1.80		x	x
1.108		x	
1.140	x	x	x

(1) For systems in the Preoperational Test Phase, only Sections 5.2.19 and 5.3.10 of ANSI N18.7-1976 are applicable.

(2) SWEC personnel directly involved in Preliminary Test Phase testing activities are qualified in accordance with Regulatory Guide 1.58, Rev. 1 with exceptions as

Reg. Guide	Test Phases Preliminary	Preoperational	Initial Startup
Insert for Page 14.2-18			
1.52	x	x	x

13

4. Acceptance Criteria

a. Nuclear boiler process instrumentation set points are within limits of the ^ test specification. GE PREOPERATIONAL

b. Isolation valve operating times are within limits of the test specification.

13 GE PREOPERATIONAL

c. Capacity of the MSIV accumulators is sufficient to operate the MSIVs the required number of times.

d. Operability of the main steam drain valves is verified.

14.2.12.1.5 Residual Heat Removal System Preoperational Test

1. Test Objectives

To verify that the residual heat removal (RHR) system provides the following safeguards and operational functions:

a. Low pressure coolant injection (LPCI)

b. Suppression pool cooling

c. Shutdown cooling

load in which overspeed limits are not exceeded.

g. Demonstrate full-load carrying capability of the diesel generators for a period of not less than 24 hr at 3,500 kW. Verify that voltage and frequency are maintained within test limits and that the diesel cooling systems function within test limits. 15

h. Demonstrate functional capability at operating temperature conditions by reperforming tests d and e above immediately (within 5 min), after completion of the 24-hr load test g above.

i. Demonstrate the ability to:

(1) Synchronize the diesel generators with offsite power while connected to the standby load

(2) Transfer the load from the diesel generators to the offsite power

(3) Isolate the diesel generators and restore them to standby status.

j. Demonstrate that the rate of fuel consumption while operating at the DBA load is such that the requirements for 7-day storage inventory are met for each diesel generator.

k. The reliability of each diesel generator unit is demonstrated as per the RBS position on Regulatory Guide 1.108, paragraph C.2.a(9), as stated in Section ~~1.8~~ 8.3.1.1.5.2 16 15

l. Demonstrate that the capability of the diesel generators to supply standby power within the required time is not impaired during periodic surveillance testing.

m. Demonstration of reliability and independence of the redundant diesel generator units is

14.2.12.3.22.2
TEST NUMBER 25B

flux does not exceed the Level 2 criteria by more than 2 percent of rated value.

Feedwater control system settings prevent flooding of the steam lines.

INSERT 1 →

Level 2

The RCIC system adequately takes over water level protection. The relief valves reclose properly (without leakage) following the pressure transient.

For the full MSIV closure from full power, predicted analytical results based on beginning of cycle design-basis analysis, assuming no equipment failures and applying appropriate parametric corrections, are used as the basis to which the actual transient is compared. The following table specifies the upper limits of these criteria during the first 30 seconds following initiation of the indicated conditions.

Initial Conditions		Criteria		
Power (%)	Dome Pressure (psia)	Increase In Heat Flux (%)	Increase In Dome Pressure (psi)	13
100	1040	<4 NBR	<132.7	17

Initial action of the RCIC and HPCS is automatic when water Level 2 is reached, and system performance is within specifications.

Recirculation runback occurs. Recirculation pump trip is initiated when Level 2 is reached.

INSERT 2 →

14.2.12.3.22.3 Test Number 25C - Main Steam Line Flow Venturi Calibration

1. Test Objective

The purpose of this test is to calibrate the main steam flow venturis at selected power levels over the entire core flow range. The final calibration takes place with the data accumulated along the 100 percent rod line.

Insert 1 for Page 14.2-164a

The low-low set pressure relief logic functions to preclude subsequent simultaneous SRV actuations following the initial SRV actuation due to original pressurization transient.

Insert 2 for Page 14.2-164a

When the low-low pressure relief logic functions, the open/close actions of the SRVs occur within ±13 psi and ±20 psi, respectively, of their design points.

14.2.12.3.23
TEST NUMBER 26

flow is sonic. This is true if the back pressure is less than 55 percent of inlet pressure. The GE design specification required the back pressure to be less than 40 percent of the inlet pressure, and present designs have back pressures on the order of 30 percent of the inlet pressures. Methods of calculating line losses and pressure drops are reliable enough to assure that the 15 percent to 25 percent conservatism in the design more than offsets any slight inaccuracies in the calculations. A major blockage of the line would not necessarily be offset and it should be determined that none exists through the BPV response signatures.

Vendor bench test data of the SRV opening responses are available onsite for comparison with design specifications.

During operation transients, such as MSIV full closures and turbine trips/generator load rejection, the operation of the safety grade low-low pressure relief logic system is monitored. A comparison between the reactor pressure behavior and SRV actuations are made to confirm open/close set points and containment load mitigation through the prevention of subsequent simultaneous SRV actuations. Recirculation drive flow, loop vibration, and pump head are recorded for one pump as a noncavitation check during low-low SRV action.

4. Acceptance Criteria

Level 1

a. There is positive indication of steam discharge during the manual actuation of each valve.

~~b. The low-low set pressure relief logic functions to preclude subsequent simultaneous SRV actuations following the initial SRV actuation due to original pressurization transient.~~

Level 2

a. Pressure control system - related variables (RPV dome pressure, neutron monitoring) may contain oscillatory modes of response. In

14.2.12.3.23
TEST NUMBER 26

these cases, the decay ratio for each controlled mode of response is less than or equal to 0.25. 5

b. The temperature measured by thermocouples on the discharge side of the valves returns to within 10°F of the temperature recorded before the valve was opened. If pressure sensors are available, they return to their initial states upon valve closure.

c. During the 250 psig functional test the steam flow through each relief valve, as measured by the initial and final bypass valve position, is not less than 10 percent of valve position under the average of all valve responses.

d. During the rated pressure test the steam flow through each relief valve, as measured by MWe, is not less than 0.5 percent of rated MWe less than the average of all the valve responses.

~~e. When the low-low pressure relief logic functions, the open/close actions of the SRVs occur within ±13 psi and ±20 psi, respectively, of their design points.~~

14.2.12.3.24 Test Number 27 - Turbine Trip and Generator Load Rejection 5

1. Test Objective

The purpose of this test is to demonstrate the response of the reactor and its control systems to protective trips in the turbine and generator.

2. Prerequisites

The appropriate preoperational tests have been completed; the FRC has reviewed and approved the test procedures and initiation of testing. All controls and interlocks are checked and instrumentation calibrated.

14.2.12.3.24
TEST NUMBER 27

3. Test Procedure

Turbine trip (closure of the main turbine stop valves within approximately 0.1 sec) and generator trip (closure of the main turbine control valves in about 0.1 to 0.2 sec) are performed at selected power levels. A generator trip is performed at low power level such that steam generation is just within bypass valve capacity to demonstrate scram avoidance. At an intermediate power level, in excess of bypass capacity, a turbine trip is performed, and the response of the plant to this trip and scram is determined.

The accident analysis shows the generator trip to be more limiting than the turbine trip. Therefore, a generator trip is performed at full rated power. The trip is initiated by an electrical signal condition indicating a generator trip is required. The turbine generator overspeed response is monitored. Other parameters, such as reactor power and pressure, are also monitored.

4. Acceptance Criteria

Level 1

For turbine and generator trips there is a delay of less than 0.1 sec following the beginning of control or stop valve closure before the beginning of bypass valve opening. The bypass valves are opened to a point corresponding to greater than 80 percent of their capacity within 0.3 sec from the beginning of control or stop valve closure motion.

Feedwater system settings prevent flooding of the steam line following these transients.

The positive change in vessel dome pressure occurring within 30 sec after either generator or turbine trip does not exceed the Level 2 criteria by more than 25 psi.

The positive change in simulated heat flux does not exceed the Level 2 criteria by more than 2 percent.

INSERT

Insert for Page 14.2-168

The low-low set pressure relief logic functions to preclude subsequent simultaneous SRV actuations following the initial SRV actuation due to original pressurization transient.

14.2.12.3.24
TEST NUMBER 27

Level 2

There is no MSIV closure during the first 3 min of the transient from low water level, and operator action is not required during that period to avoid the MSIV trip. 13

The positive change in vessel dome pressure and in simulated heat flux which occurs within the first 30 sec after initiation of either generator or turbine trip does not exceed the predicted values, as determined by the nuclear engineer at the time of the test.

(NOTE: Predicted values are referenced to actual test conditions of initial power level and dome pressure and use beginning-of-life nuclear data. Worst case design or Technical Specification values of all hardware performance are used in the prediction, with the exception of control rod insertion time and delay from the beginning of turbine control valve or stop valve motion to the generation of the scram signal. The predicted pressure and heat flux are corrected for the actual measured values of these two parameters.) 5

For the generator trip within the bypass valves capacity, the reactor does not scram for initial thermal power levels within that bypass valve capacity.

Low water level total recirculation pump trip, HPCS, and RCIC are not initiated.

Feedwater level control avoids loss of feedwater due to a high level (L8) trip during the event.

INSERT →

14.2.12.3.25 Test Number 28 - Shutdown From Outside the Main Control Room

1. Test Objective

The purpose of this test is to demonstrate that the reactor can be brought from a normal initial steady-state power level down to the point where normal low pressure shutdown cooling is initiated and is under control with reactor vessel pressure and water level controlled from outside the main control room.

Insert for Page 14.2-169

When the low-low pressure relief logic functions, the open/close sections of the SRVs occur within ±13 psi and ±20 psi, respectively, of their design points.

14.2.12.3.27.2 Test Number 30B - Trip of Two Pumps | 5

1. Test Objective

The purpose of the test is to record and verify acceptable performance of the recirculation two-pump trip.

2. Prerequisites

The appropriate preoperational tests have been completed and the FRC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

3. Test Procedure

Both recirculation pumps are tripped at the desired power level, and the flow coastdown transient is recorded. | 5

4. Acceptance Criteria

Level 1

The two-pump drive flow coastdown transient during the first 5 sec is equal to or greater than that specified ~~on Fig. 14.2-6.~~ | 5 | 16

INSERT

14.2.12.3.27.3 Test Number 30C - System Performance | 5

1. Test Objective

The purpose of this test is to record recirculation system parameters during the power test program.

2. Prerequisites

The preoperational tests are complete. The FRC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

3. Test Procedure

Recirculation system parameters are recorded at several power-flow conditions and in conjunction with single pump trip recoveries.

Insert for Page 14.2-177

in General Electric Company's (GE) Transient Safety Analysis Design Report (TSADR).

TEST[2] NO.	TEST NAME	OPEN VESSEL	HEAT UP	TEST CONDITIONS 1	2	3	4	5	6	WARRANTY
1	CHEMICAL AND RADIOCHEMICAL	X	X	X		X			X[25]	
2	RADIATION MEASUREMENT	X	X	X		X			X	X
3	FUEL LOADING	X								
4	FULL CORE SHUTDOWN MARGIN	X								
5	CONTROL ROD DRIVE SYSTEM	X	X	X[3]		X[3]			X[3]	
6	SRM PERFORMANCE	X								
10	IRM PERFORMANCE		X	X						
11	LPRM CALIBRATION		X[26]	X[26]	X				X	
12	APRM CALIBRATION		X	X	X	X		X	X	
13	PROCESS COMPUTER		X	X[4]					X	
14	RCIC SYSTEM		X	X[26]	X[26]					
16A	SELECTED PROCESS TEMPERATURES		X			X[5]			X[5]	
16B	WATER LEVEL REF. LEG TEMPS		X						X	
17	SYSTEM EXPANSION		X	X[27]	X[27]					
18	TIP UNCERTAINTY					X			X	
19	CORE PERFORMANCE			X	X	X	X	X	X	
20	STEAM PRODUCTION									X
21	CORE POWER-VOID MODE RESPONSE						X	X		
22	PRESSURE REGULATOR			X	X	X[7]	X	X	X[8]	
23A	WATER LEVEL SETPOINT CHANGES				X	X	X	X	X	
23B	FEEDWATER SYS-LOSS OF FW HEATING								X[9]	
23C	FEEDWATER SYS-PUMP TRIP									
23D	FEEDWATER SYS-MAX RUNOUT CAPABILITY								X[10]	
24	TURBINE VALVE SURVEILLANCE					X		X[9]	X[11]	
25A	MSIV FUNCTIONAL TEST		X	X[4]	X[11,12]			X[28]	X[11]	
25B	MSIV FULL CLOSURE								X	(29)
25C	MAIN STEAM LINE FLOW VENTURI CALIB					X			X[13]	
25D	MAIN STEAM LINE ELBOW TAP CALIB					X			X[14]	
26	RELIEF VALVES		X		X[15]					
27	TURBINE TRIP AND GENERATOR LOAD REJECTION			X[16]		X[4]			X[17]	(29)
28	SHUTDOWN FROM OUTSIDE CONTROL ROOM			X						
29	RECIRCULATION FLOW CONTROL	X		X	X[18]	X		X[19]		
30A	RECIRCULATION SYSTEM-ONE PUMP TRIP					X			X	
30B	RECIRCULATION SYSTEM-TWO PUMP TRIP					X				
30C	RECIRCULATION SYSTEM PERFORMANCE					X[3]			X[3]	
30D	RECIRCULATION SYSTEM-PUMP RUNBACK					X				
30E	RECIRCULATION SYSTEM CAVITATION				X	X				
31	LOSS OF TURB. GENERATOR & OFFSITE PWR				X					
33	DRYWELL PIPING VIBRATION		X	X		X[20]			X[20]	
35	RECIRCULATION SYSTEM FLOW CALIBRATION					X			X	
70	REACTOR WATER CLEANUP SYSTEM		X							
71	RESIDUAL HEAT REMOVAL SYSTEM		X[21]						X[22]	
103	DRYWELL ATMOSPHERE COOLING SYSTEM		X						X	
105	PENETRATION TEMPERATURE		X							

NOTES:

(1) TEST CONDITIONS REFER TO CONDITIONS STATED ON FIGURE 14.2-4 OF THE FSAR
(2) TEST NUMBER INFERS THE SECTIONS NUMBERS OF SECTION 14.2.12.3. OF THE FSAR
(3) PERFORM TEST 5. TIMING OF 4 SLOWEST CONTROL RODS IN CONJUNCTION WITH EXPECTED SCRAMS
(4) TO BE COMPLETED BETWEEN TEST CONDITIONS 1 AND 3
(5) AFTER RECIRC PUMP TRIPS
(6) DOWN SETPOINT ONLY
(7) NU BYPASS VALVE RESPONSE
(8) NO CONTROL VALVE RESPONSE
(9) BETWEEN 80% AND 90% POWER
(10) BETWEEN TEST CONDITIONS 5 AND 6. BETWEEN 70% AND 90% POWER
(11) AT MAXIMUM POWER THAT WILL NOT CAUSE SCRAM
(12) ON ASCENSION TO TEST CONDITIONS
(13) BETWEEN 40% AND 55% POWER
(14) BETWEEN 80% AND 85% POWER
(15) BETWEEN TEST CONDITIONS 2 AND 3
(16) GREATER THAN 75% POWER. FULL ISOLATION
(17) GENERATOR LOAD REJECTION, WITHIN BYPASS SYSTEM CAPACITY
(18) TURBINE TRIP SCRAM 60% TO 80% POWER AT 95% CORE FLOW
(19) ~~TURBINE TRIP OR~~ GENERATOR LOAD REJECT
(20) AT STEADY STATE AND IN CONJUNCTION WITH NOTE 27
(21) DEMONSTRATON OF STEAM CONDENSING
(22) AFTER TRIP OR COOLDOWN FROM TEST CONDITION 6
(23) SINGLE VALVE
(24) MAY BE DEFERRED UNTIL WARRANTY
(25) RESPONSE CHECK ONLY
(26) REFERS TO RCIC COLD QUICK STARTS ONLY
(27) INSPECTION AFTER 2ND AND 3RD THERMAL CYCLE
(28) MAY BE DONE AT TEST CONDITION 3 INSTEAD

(29) SRV LOW-LOW SET LOGIC VERIFICATION

FIGURE 14.2-5

STARTUP TEST PROGRAM

RIVER BEND STATION
FINAL SAFETY ANALYSIS REPORT

QUESTION 640.21 (14.2.12.1)

14.2.12.33. Expand the Reactor Plant Ventilation System Preoperational test to provide acceptance criteria for those components or processes described in Test Objectives 1.b, 1.c, and 1.e.

RESPONSE

The response to this request is provided in revised Section 14.2.12.1.33b AND 14.2.12.1.70.

QUESTION 640.29 (14.2.12.1)

14.2.12.1.47. Expand the Fuel Building Ventilation System Preoperational Test to provide acceptance criteria for the pressure differential between the various areas maintained by the fuel building ventilation system and the outside atmosphere.

RESPONSE

The response to this request is provided in ~~revised~~ Section ~~14.2.12.1.47~~ 14.2.12.1.70