

## STARTUP TEST PROCEDURE 1

### CHEMICAL AND RADIOCHEMICAL MEASUREMENTS

#### 1. PURPOSE

- A. The principal objectives of the Chemical and Radiochemical Tests are to secure information on the chemistry and radiochemistry of the reactor coolant, and to determine that the sampling equipment, procedures, and analytical techniques are adequate to supply the data required to demonstrate that the chemistry of all parts of the entire reactor system meet specifications and process requirements.
- B. Specific objectives of the test program include indirect observations of fuel clad integrity, evaluations of demineralizer operations by direct and indirect methods, measurement of filter performance, confirmation of condenser integrity, measurement and calibration of the off-gas system, and calibration of certain process instrumentation. Data for these purposes is secured for a variety of sources: plant operating records, regular routine coolant analysis, radiochemical measurements of specific nuclides, and special chemical test on fluids.

#### 2. CRITERIA

##### Level 1

- A. Water quality must be known at all times and must remain within the guidelines of the water Quality Specifications.
- B. The activities of gaseous and liquid effluents must be known and must conform to license limitations.
- C. Chemical factors defined in the Technical Specifications and Fuel Warranty must be maintained within the limits specified.

#### 3. RESULTS

##### Test Condition 3

Analysis of radiolytic gas in steam and chemical/radiochemical tests of reactor water, condensate demineralizer inlet and effluent, feedwater, off gas pre-treatment and plant vent were conducted. Measurements of stored water (clean demineralized water storage tank, cycled condensate storage tank, suppression pool, condenser hotwell, and heater drain tank) quality and condensate/feedwater systems filterable iron concentrations were taken. Reactor water quality was monitored during the no reactor water cleanup test.

Although all test results were within the Technical Specification limits, some parameters were outside the GE specified values. GE has evaluated these criteria exceptions and has found plant chemistry to be acceptable.

## STARTUP TEST PROCEDURE 2

### RADIATION MEASUREMENTS

#### 1. PURPOSE

The purposes of this test are:

- A. To determine the background radiation levels in the plant environs prior to operation for use as base data on activity build-up.
- B. To monitor radiation at selected power levels to identify potential deficiencies and assure the protection of personnel during plant operation.
- C. To provide sufficient data (exposure rate and dose equivalent rates) to allow comparison of the actual dose rates with the design dose equivalent rates outside selected plant shield structures and room entrances for potentially radioactive equipment.

#### 2. CRITERIA

Level 1

- A. The radiation doses of plant origin and the occupancy times of personnel in radiation zones shall be controlled consistent with the guidelines of the standards for protection against radiation as outlined in 10CFR20, NRC General Design Criteria.

#### 3. RESULTS

This test was performed at test conditions 3 and 5. The results of the radiation surveys showed that the radiation levels were within the above criteria.

## STARTUP TEST PROCEDURE 5

### CONTROL ROD DRIVE SYSTEM

#### 1. PURPOSE

A. The purpose of this test is as follows:

1. To demonstrate that the Control Rod Drive (CRD) system operates properly over the full range of primary coolant temperatures and pressures from ambient to operating.
2. To determine the initial operating characteristics of the entire CRD system.
3. To demonstrate the optimum settings for the CRD flow control loop by analysis of the transients induced in the CRD Hydraulic System by means of CRD flow setpoint changes.
4. To verify that the flow control valve (FCV) closes to a minimum position within 10 to 30 seconds in response to the maximum error signal (scram).
5. To demonstrate that the FCV maintains a constant flow within  $\pm 3$  gpm as the reactor pressure changes from a shutdown condition to the normal operating pressure.

#### 2. CRITERIA

Level 1.

- A. Each CRD must have a normal withdrawal speed less than or equal to 3.6 inches per second indicated by a full 12 foot stroke in greater than or equal to 40 seconds.
- B. The mean scram time of all operable CRDs with functioning accumulators must not exceed the following times: (Scram time is measured from the time the pilot scram valve solenoids are de-energized).

Position Inserted

From Fully

Scram Time

Withdrawn

(Seconds)

45	0.43
39	0.86
25	1.93
05	3.49

- C. The mean scram time of the three fastest CRDs in a two by two array must not exceed the following times: (Scram time is measured from the time the pilot scram valve solenoids are deenergized).



Position Inserted

From Fully

Scram Time

Withdrawn

(Seconds)

45	0.45
39	0.92
25	2.05
05	3.70

- D. The scram insertion time of each control rod from full out to position 5, based on de-energization of the scram pilot valve solenoids as time zero, shall not exceed 7.0 seconds.

Level 2.

- A. Each CRD must have a normal insertion or withdrawal speed of  $3.0 \pm 0.6$  inches per second indicated by a full 12-foot stroke in 40 to 60 seconds.
- B. With respect to the CRD Friction tests, if the differential pressure variation exceeds 15 psid for a continuous drive in, a settling test must be performed, in which case, the differential settling pressure should not be less than 30 psid nor should it vary more than 10 psid over a full stroke. Lower differential pressures are indicative of excessive friction.

3. Results

Test Condition 3

CRD scram timing (section 10.2.J) was performed in conjunction with the Turbine Stop Valve Trip and Generator Load Rejection Scram Test (STP-28).

Scram times for 23 drives were obtained during the scram, and their 90% times were within the level 1 acceptance criteria (less than or equal to 7.0 second). See Table 1..

All CRD testing at test condition 3 was satisfactorily completed with no deficiencies.

Table 1

TEST CONDITION 3 SCRAM TIMES

Slowest 90% scram time: CRD 10-11, 2.89 seconds.

## STARTUP TEST PROCEDURE 8

### CONTROL ROD EXCHANGE

#### 1. PURPOSE

- A. To perform a representative control rod sequence exchange.

#### 2. CRITERIA

##### Level 1

- A. Completion of the exchange of one rod pattern for the complementary pattern with continual satisfaction of licensed core limits for LHGR, APLHGR, MCPR and thermal power constitutes satisfaction of the requirements of this procedure.

##### Level 2

- A. All nodal powers shall remain below their PCIOMR threshold limit during this test.

#### 3. RESULTS

A representative sequence exchange was successfully performed at test condition 3 with all applicable acceptance criteria being met. An initial column by column exchange attempt was terminated due to large power changes, but a later attempt performed as a row-by-row exchange proved satisfactory.

This test was performed at test condition 3 rather than 5 since all prerequisites were met and the core had reached 1100 MWD/T exposure.

## STARTUP TEST PROCEDURE 9

### WATER LEVEL MEASUREMENT

#### 1. PURPOSE

- A. The purpose of this test is as follows:
1. To check the calibration of the various narrow range and wide range indicators.
  2. To measure the reference leg temperature and recalibrate the narrow and wide range instruments if the measured temperature is different than the value assumed during the initial calibration.
  3. To collect plant data which can be used to investigate the effects of core flow velocity, carry-under, and subcooling on indicated wide range level.

#### 2. CRITERIA

##### Level 2

- A. The narrow range level indicator readings on the instruments used for feedwater level control (1C34-R606A-C) should agree within  $\pm 1.5$  inches of their average reading.
- B. The narrow range level indicator readings on the instruments not used for feedwater level control (1B21-NO24A-D, 1B21-NO38A-B, 1B21-N100A-B, and 1B21-N101A-B) should agree within  $\pm 3.0$  inches of their average reading.
- C. The wide range level system indicators (1B21-NO26A-D, 1B21-NO31A-D, 1B21-NO36A-D, 1B21-NO37A-D, 1B21-R604, 1C61-RO10, 1B21-R623A-B) should agree within  $\pm 6$  inches of the average reading.

#### 3. Results

- A. Test Condition 5.
1. All narrow and wide range level instruments satisfied their respective level 2 criteria (see Table 1).
- B. Test Condition 4.
1. All narrow and wide range level instruments satisfied their respective level 2 criteria (see Table 2).

TABLE 1 (TC 5)

INDICATOR	READING *	WR. AVE*	ACCEPTANCE CRITERIA*	ACTUAL DEVIATION FROM AVERAGE *
1B21-N036C	35.0	33.25	$\pm 6.0$	+1.75
1B21-N026B	34.2	33.25	$\pm 6.0$	+0.95
1B21-N037B	33.0	33.25	$\pm 6.0$	-0.25
1B21-N036D	34.0	33.25	$\pm 6.0$	+0.75
1B21-N037D	32.0	33.25	$\pm 6.0$	-1.25
1B21-N026C	36.3	33.25	$\pm 6.0$	+3.05
1B21-N031B	33.2	33.25	$\pm 6.0$	-0.05
1B21-N031D	36.0	33.25	$\pm 6.0$	+2.75
1B21-N036A	31.0	33.25	$\pm 6.0$	-2.25
1B21-N037C	31.0	33.25	$\pm 6.0$	-2.25
1B21-N037A	31.0	33.25	$\pm 6.0$	-2.25
1B21-N026D	31.5	33.25	$\pm 6.0$	-1.75
1B21-N036B	32.0	33.25	$\pm 6.0$	-1.25
1B21-N026A	31.0	33.25	$\pm 6.0$	-2.25
1B21-N031A	35.5	33.25	$\pm 6.0$	+2.25
1B21-N031C	32.2	33.25	$\pm 6.0$	-1.05
1B21-R623A R284A	36.0	33.25	$\pm 6.0$	+2.75
1B21-R623B R284B	33.0	33.25	$\pm 6.0$	-0.25
1B21-R604	37.0	33.25	$\pm 6.0$	+3.75
1C61-R010	30.0	33.25	$\pm 6.0$	-3.25

\* All Data have units in inches

TABLE 1 (TC 5)

Indicator	Reading*	Ave.*	Acceptance Criteria*	Actual Deviation From Ave.*
1B21-N024A	35.5	34.52	$\pm 3.0$	+0.98
1B21-N024B	36.2	34.52	$\pm 3.0$	+1.68
1B21-N024C	35.0	34.52	$\pm 3.0$	+0.48
1B21-N024D	33.9	34.52	$\pm 3.0$	-0.62
1B21-N038A	32.5	34.52	$\pm 3.0$	-2.02
1B21-N038B	34.5	34.52	$\pm 3.0$	-0.02
1B21-N100A	35.6	34.52	$\pm 3.0$	+1.08
1B21-N100B	34.5	34.52	$\pm 3.0$	-0.02
1B21-N101A	32.5	34.52	$\pm 3.0$	-2.02
1B21-N101B	35.0	34.52	$\pm 3.0$	+0.48

Indicator	Reading*	Ave.*	Acceptance Criteria*	Actual Deviation From Ave.*
1C34-R606A	35.5	36.0	$\pm 1.5$	-0.5
1C34-R606B	36.5	36.0	$\pm 1.5$	+0.5
1C34-R606C	36.0	36.0	$\pm 1.5$	0.0



TABLE 2 (TC 4)

INDICATOR	READING #	WR. AVE#	ACCEPTANCE CRITERIA#	ACTUAL DEVIATION FROM AVERAGE #
1B21-N036C	40.0	40.3	$\pm 6.0$	-0.3
1B21-N026B	42.0	40.3	$\pm 6.0$	+1.7
1B21-N037B	41.0	40.3	$\pm 6.0$	+0.7
1B21-N036D	38.0	40.3	$\pm 6.0$	-2.3
1B21-N037D	40.0	40.3	$\pm 6.0$	-0.3
1B21-N026C	43.0	40.3	$\pm 6.0$	+2.7
1B21-N031B	40.0	40.3	$\pm 6.0$	-0.3
1B21-N031D	44.0	40.3	$\pm 6.0$	+3.7
1B21-N036A	35.0	40.3	$\pm 6.0$	-5.3
1B21-N037C	38.0	40.3	$\pm 6.0$	-2.3
1B21-N037A	39.0	40.3	$\pm 6.0$	-1.3
1B21-N026D	39.0	40.3	$\pm 6.0$	-1.3
1B21-N036B	37.0	40.3	$\pm 6.0$	-3.3
1B21-N026A	40.0	40.3	$\pm 6.0$	-0.3
1B21-N031A	43.0	40.3	$\pm 6.0$	+2.7
1B21-N031C	40.0	40.3	$\pm 6.0$	-0.3
1B21-R604A R884A	41.0	40.3	$\pm 6.0$	+0.7
1B21-R604B R884B	41.0	40.3	$\pm 6.0$	+0.7
1B21-R604	45.0	40.3	$\pm 6.0$	+4.7
1C61-R010	40.0	40.3	$\pm 6.0$	-0.3

# All Data have units in inches

TABLE 2 (TC 4)

Indicator	Reading*	Ave.*	Acceptance Criteria*	Actual Deviation From Ave.*
1B21-N024A	37.8	36.5	$\pm 3.0$	+1.3
1B21-N024B	38.2	36.5	$\pm 3.0$	+1.7
1B21-N024C	37.2	36.5	$\pm 3.0$	+0.7
1B21-N024D	35.6	36.5	$\pm 3.0$	-0.9
1B21-N038A	34.4	36.5	$\pm 3.0$	-2.1
1B21-N038B	36.4	36.5	$\pm 3.0$	-0.1
1B21-N100A	37.4	36.5	$\pm 3.0$	+0.9
1B21-N100B	36.2	36.5	$\pm 3.0$	-0.3
1B21-N101A	34.4	36.5	$\pm 3.0$	-2.1
1B21-N101B	37.0	36.5	$\pm 3.0$	+0.5

Indicator	Reading*	Ave.*	Acceptance Criteria*	Actual Deviation From Ave.*
1C34-R606A	37.5	38.5	$\pm 1.0$	-1.0
1C34-R606B	39.0	38.5	$\pm 1.0$	+0.5
1C34-R606C	39.0	38.5	$\pm 1.0$	+0.5

## STARTUP TEST PROCEDURE 11

### LPRM CALIBRATION

#### 1. PURPOSE

- A. To verify proper response of the Local Power Range Monitoring (LPRM) System to local changes in the reactor power level.
- B. To calibrate the LPRM system.

#### 2. CRITERIA

##### Level 2

- A. Each LPRM reading will be within  $\pm 10\%$  of its calculated value.

#### 3. RESULTS

The LPRM detectors were successfully calibrated to read proportion<sup>al</sup> to the neutron flux at their locations. This was accomplished by using the Traversing Incore Probe (TIP) System.

The test was satisfactorily completed at test condition 3 and all applicable criteria were met.

## STARTUP TEST PROCEDURE 12

### APRM CALIBRATION

#### 1. PURPOSE

- A. The purpose of this test is to calibrate the Average Power Range Monitor (APRM) system.

#### 2. CRITERIA

##### A. Level 1

1. The APRM channels must be calibrated to read greater than or equal to the actual core thermal power. However, recalibration of the APRM system will not be necessary from safety considerations if at least two APRM channels per RPS trip circuit have readings greater than or equal to actual core thermal power.
2. The APRM scram and rod block setpoints shall be set no higher than the limits specified in the Technical Specifications and the fuel warranty document.
3. In the STARTUP mode, all APRM channels must produce a scram at less than or equal to 15% of rated core thermal power.

##### B. Level 2

1. If the above level 1 criteria are satisfied, then the APRM channels will be considered to be reading accurately if they agree with the heat balance to within  $\pm 7\%$  of rated core thermal power.

#### 3. RESULTS

Testing at test conditions 3 and 5 were successfully completed, and all applicable criteria were met. The APRM's were adjusted to the results of an OD-3 heat balance, and alarm and trip settings were demonstrated to be less than or equal to their respective limits.

## STARTUP TEST PROCEDURE 13

### PROCESS COMPUTER

#### 1. PURPOSE

- A. The purpose of this test is to verify the performance of the process computer under plant operating conditions.

#### 2. CRITERIA

##### A. Level 2

- 1. Programs OD-1, P1 and OD-6 will be considered operational when:

- A. The MCPR calculated by BUCLE and the process computer either:

- 1. Are in the same fuel assembly and do not differ in value by more than 2%, or
    - 2. For the case in which the MCPR calculated by the process computer is in a different assembly than the calculated by BUCLE, for each assembly, the MCPR calculated by the two methods shall agree within 2%.

- B. The maximum LHGR calculated by BUCLE and the process computer either:

- 1. Are in the same fuel assembly and do not differ in value by more than 2%, or
    - 2. For the case in which the maximum LHGR calculated by the process computer is in different assembly than that calculated by BUCLE, for each assembly, the maximum LHGR's calculated by the two methods shall agree within 2%.

- C. The MAPLHGR calculated by BUCLE and the process computer either:

- 1. Are in the same fuel assembly and do not differ in value by more than 2%, or

2. For the case in which the MAPLHGR calculated by the process computer is in a different assembly than that calculated by BUCLE, for each assembly, the MAPLHGR's calculated by the two methods shall agree within 2%.

D. The LPRM calibration factor calculated by BUCLE and the process computer agree to within two percent (2%).

E. The remaining programs will be considered operational upon successful completion of the static and dynamic testing.

### 3. RESULTS

#### Test Condition 3

Program testing at test condition 3 has been successfully completed. All applicable criteria were satisfied.

Thermal Limit data at 70% power:

#### A. MLHGR Comparison

<u>Method</u>	<u>MFLPD</u>	<u>Location</u>
P1	0.658	7-24-12
BUCLE	0.656	7-24-12

#### B. MAPLHGR Comparison

<u>Method</u>	<u>MAPLHGR</u>	<u>Location</u>
P1	7.91	7-24-12
BUCLE	7.89	7-24-12

#### C. MCPR Comparison

<u>Method</u>	<u>MCPR</u>	<u>Location</u>
P1	2.1562	25-20
BUCLE	2.157	25-20



STARTUP TEST PROCEDURE 16  
SELECTED PROCESS TEMPERATURES

1. PURPOSE

A. The purposes of this test are as follows:

1. To assure that the measured bottom head drain temperature corresponds to bottom head coolant temperature during normal operations.
2. To identify any reactor operating modes that could cause temperature stratification.
3. To determine the proper setting of the low flow control valve limiter for the recirculation pumps to avoid coolant temperature stratification in the reactor pressure vessel bottom head region.
4. To familiarize plant personnel with the temperature differential limitations of the reactor system.

2. CRITERIA

A. Level 1.

1. The reactor recirculation pumps shall not be started nor flow increased unless the coolant temperatures between the steam dome and bottom head drain are within 145°F (81°C).
2. The recirculation pump in an idle loop must not be started unless the loop suction temperature is within 50°F (28°C) of the active loop suction temperature if one pump is idle or the steam dome temperature if two pumps are idle.

B. Level 2.

1. During two pump operation at rated core flow, the bottom head coolant temperature, as measured by the bottom drain line thermocouple, should be within 30°F (17°C) of the recirculation loop temperatures.

### 3. RESULTS

#### Test Condition 3

Analysis of the test data showed no evidence of thermal stratification in the event of single or double recirculation pump trips. The following maximum delta temperatures were observed during testing.

One Pump Trip:	Steam Dome - Bottom Head	33°F
	Idle Loop - Active Loop	25°F
Two Pump Trip:	Steam Dome - Bottom Head	33°F
	Idle Loop - Steam Dome	25°F
Two Pump Operation:	Bottom Head - Recirc Loop	5°F

#### Test Condition 4

Analysis of the test data taken while both recirculation pumps were tripped for test condition 4 showed no evidence of thermal stratification. The following maximum delta temperatures were observed during 10.3 hrs. of natural circulation testing.

Steam Dome - Bottom Head	37°F
Idle Loop - Steam Dome	42°F

Testing at test conditions 3 and 4 was successfully completed with all criteria being met.

## STARTUP TEST PROCEDURE 17

### SYSTEM EXPANSION

#### 1. PURPOSE

- A. Verify that the reactor drywell piping system is free and unrestrained with regard to thermal expansion.
- B. Verify that suspension components are functioning in the specified manner.

#### 2. CRITERIA

##### A. Level 1

- 1. There shall be no evidence of blocking of the displacements of any system component caused by thermal expansion of the system.
- 2. Electrical cables shall not be fully stretched.
- 3. Hangers shall not be bottomed out or have the spring fully stretched.
- 4. Snubbers shall be in the operating range about the midpoint of the total travel range at operating temperature.
- 5. The measured steady state displacement of the recirculation and main steam systems shall not exceed the allowable values.

##### B. Level 2.

- 1. At a steady-state condition, the displacements of instrumented points with displacement measuring devices shall not vary from the calculated values. If measured displacements do not meet these criteria, the piping design engineer must be contacted to analyze the data with regard to design stresses.
- 2. During the heatup cycle, the trace of instrumented points on the main steam and recirculation systems shall fall within a range of 150 percent of the calculated value from the initial cold position in the direction of the calculated value and 50 percent of the calculated value from the initial position in the opposite direction of the calculated value.
- 3. Hangers will be in their operating range between the hot and cold settings.

### 3. RESULTS

As stated in the June 1983 report, General Electric analyzed and found the exceptions to the thermal expansion criteria for the Main Steam and Recirc Systems to be acceptable.

Also, since the last report (June 1983), the Feedwater System data analysis by Sargent and Lundy was completed. The two instrumented Feedwater points which exceeded the thermal expansion criteria were analyzed to be acceptable with actual displacements yielding acceptable stress levels.

## STARTUP TEST PROCEDURE 18

### CORE POWER DISTRIBUTION

#### 1. PURPOSE

A. The purposes of this test are:

1. To determine the core power distribution in three dimensions.
2. To determine the reproducibility of the Traversing In-Core Probe (TIP) system readings.

#### 2. ACCEPTANCE CRITERIA

A. Level 2

1. The total TIP uncertainty (including random noise and geometric uncertainties) obtained by averaging the uncertainties for all data sheets must be less than 6.0%.

#### NOTE

A minimum of two and a maximum of six data sets may be used to meet the above criterion.

#### 3. RESULTS

Test Condition 3

Tip data was taken at this test condition. As this is the first data set of STP-18 and a minimum of two data sets are required for criteria evaluation, the evaluation will be performed following the second data set acquisition scheduled for test condition 6.

## STARTUP TEST PROCEDURE 19

### CORE PERFORMANCE

#### 1. PURPOSE

A. The purpose of this test is to evaluate the following core performance parameters at Test Conditions 1 through 6:

1. Maximum Linear Heat Generation Rate (MLHGR).
2. Minimum Critical Power Ratio (MCPR).
3. Maximum Average Planar Linear Heat Generation Rate (MAPLHGR).
4. Core Thermal Power (CTP).

#### 2. CRITERIA

A. Level 1.

1. The Maximum Linear Heat Generation Rate (MLHGR) of any rod during steady state conditions shall not exceed 13.4 Kw/ft.
2. The steady state Minimum Critical Power Ratio (MCPR) shall not exceed the limits specified in the plant technical specifications.
3. The Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) shall not exceed the limits shown specified in the plant technical specifications.
4. Steady State reactor power shall be limited to 3323 MWt and values on or below the analyzed flow control line.

#### 3. RESULTS

The core performance parameters were demonstrated to be within the range required by the Technical Specifications for Test Condition 3, 4 and 5 (Table 1).

This test was successfully completed for test conditions 3, 4 and 5 with all applicable criteria met.



Table 1

Core Performance Data				
<u>Core Parameter</u>	<u>Value TC 3</u>	<u>Value TC 4</u>	<u>Value TC 5</u>	<u>Level 1 Criteria Limit</u>
CTP (MWt)	2219			2930
		1344		1581
			2255	2272
MLHGR	8.60	5.27	8.99	13.4
MCPR	2.12			1.27
		2.33		1.69
			1.86	1.48
MAPLHGR	7.73			12.0
		7.71		12.04
			8.10	12.03

## STARTUP TEST PROCEDURE 21

### Core Power-Void Mode Response

#### 1. PURPOSE

A. The purposes of this test are:

1. To measure the stability of the core power-void dynamic response.
2. To demonstrate that the behavior of the stability of the core power-void dynamic response is within specified limits.

#### 2. ACCEPTANCE CRITERIA

Level 1.

A. The decay ratio must be less than or equal to 0.25 for each total core process variable that exhibits oscillatory response.

#### 3. RESULTS

##### Test Condition 4

The stability of the response to a rapid reactivity insertion (control rod motion and simulated pressure regulator failure) was demonstrated to be within the acceptance criteria (decay ratios less than 0.25). This test was successfully completed at this test condition.

##### Test Condition 5

The response of various total core process variables failed the level 2 decay ratio criteria during the simulated pressure regulator failure test at this test condition. The largest decay ratio was 0.6 for reactor water level. However, it was determined that since the plant response to this transient was stable, no operational problems would result from the small oscillation induced by this rather severe transient. This test was successfully completed at this test condition.

All applicable acceptance criteria (except as note above) were met for test condition 4 and 5.

## STARTUP TEST PROCEDURE 22

### PRESSURE REGULATOR

#### 1. PURPOSE

- A. To determine the optimum settings for the pressure control loop by analysis of the transients induced in the reactor pressure control system by means of the pressure regulators.
- B. To demonstrate the takeover capability of the backup pressure regulator via simulated failure of the controlling pressure regulator and to set the regulator setpoint difference between the two regulators to an appropriate value.
- C. To demonstrate smooth pressure control transition between the turbine control valves and bypass valves when the reactor steam generation exceeds the steam flow used by the turbine.

#### 2. CRITERIA

##### A. Level 1.

- 1. The transient response of any EHC system-related variable to any test input must not diverge.

##### B. Level 2.

- 1. System-related variables may contain oscillatory modes of response. In these cases, the decay ratio for each controlled mode of response must be less than or equal to 0.25.
- 2. The response time from pressure setpoint input until the pressure peak of the pressure peak of the pressure regulator inlet pressure must be less than or equal to 10 seconds, with the Recirculation Flow Control System in the Position Command Mode only.
- 3. Pressure control system deadband, delay, etc., shall be small enough that steady state limit cycles (if any) shall produce steam flow variations no larger than  $\pm 0.5$  percent of rated steam flow.
- 4. The normal difference between regulator setpoints must be small enough that the peak neutron flux and peak vessel pressure remain below the scram settings by 7.5 percent and 10 psi respectively, for the Regulator Failure Test performed at Test Condition 6.

### 3. RESULTS

#### A. Test Condition 3

Pressure regulator system testing was performed with the turbine generator load selector set so the pressure transients were controlled by the turbine control valves. Pressure setpoint step changes and simulated regulator failure tests were performed with the Recirculation System in the position command and Flux command modes.

All applicable test results were acceptable and there were no criteria violations.

#### B. Test Condition 5

Pressure regulator system testing was performed with the turbine-generator load selector set so the pressure transients were controlled by 1) the turbine control valves, 2) turbine control valves and the turbine bypass valves, or 3) the turbine bypass valves. For each of the above operating conditions, pressure setpoint step changes were performed with the Recirculation System in the position command and flux command modes.

Also, simulated regulator failure testing was performed with pressure transients being controlled by the control valves and the Recirculation System in the position command and Flux command modes.

All applicable test results were acceptable and there were no criteria violations.

#### C. Test Condition 4

Pressure regulator system testing was performed with the turbine-generator load selector set so the pressure transients were controlled by 1) the turbine control valves, 2) turbine control valves and the turbine bypass valves, 3) the turbine bypass valves. For each of the above operating conditions, pressure setpoint step changes and simulated regulator failure tests were performed. All applicable test results were acceptable.

## STARTUP TEST PROCEDURE 23A

### FEEDWATER CONTROL SYSTEM

#### 1. PURPOSE

A. The purpose of this test is as follows:

1. To demonstrate satisfactory reactor water level and feedwater flow rate control. Measurements of feedwater system stability and performance are analyzed for this determination.

#### 2. ACCEPTANCE CRITERIA

A. Level 1

1. In the automatic mode, the response of any level system controlled variable to any test input change or disturbance must not diverge.

B. Level 2

1. Level control system-related variables may contain oscillatory modes of response. In these cases, the decay ratio for each controlled mode of response. In these cases, the decay ratio for each controlled mode of response must be less than or equal to 0.25.
  2. The average rate of response of the feedwater turbines to large (greater than 20%) step disturbance shall be between 10 percent to 25 percent of pump rated flow/second. This average response rate will be assessed by determining the time required to pass linearly through the 10% and 90% response points of the flow transient.
  3. The dynamic flow response of each feedwater actuator (turbine or valve) to small (less than 10%) step disturbances in the manual mode shall be:
    - a. Dead Time  $\leq 1.0$  sec
    - b. Maximum time to 10%\*  $\leq 1.1$  sec.
    - c. Maximum time from 10% to 90%\*  $\leq 1.9$  sec.
    - d. Settling time to within  $\pm 5\%$ \* of the final value  $\leq 14.0$  sec.
    - e. Peak overshoot\*  $\leq 15\%$
- \* % of input step disturbance.

### 3. RESULTS

#### A. Test Condition 3

The following tests were successfully performed in this test condition:

- open flow loop steps for MDRFP, TDRFP "A", and TDRFP "B",
- manual steps into closed flow loops for MDRFP, TDRFP "A", and TDRFP "B",
- level setpoint steps on startup controller for TDRFP "A", and TDRFP "B",
- level setpoint steps on Master Controller for MDRFP, TDRFP "A", TDRFP "B", MDRFP and TDRFP "A", MDRFP and TDRFP "B", and 2-TDRFP.

Controller settings were chosen to obtain:

- stable level response at higher (normal operating) flows, and
- to match the response of the reactor feed pump turbines, which is necessary for optimum level response when both turbine driven reactor feed pumps are in 3-element control.

With the control system tuned in this manner, the level 2 dynamic response criteria (decay ratio, overshoot, etc.) was not satisfied at all times. Even though this criteria was not satisfied, the feedwater control system is able to achieve steady control of reactor water level and provides stable response (recovery) from a transient.

#### B. Test Condition 5

Level setpoint steps with both turbine driven reactor feed pumps in 3-element were successfully completed. There were no criteria violations during the test.

#### C. Test Condition 4

Level setpoint steps with both turbine driven reactor feed pumps in 3-element were successfully completed. There were no criteria violations during the test.



## STARTUP TEST PROCEDURE 24

### TURBINE VALVE SURVEILLANCE

#### 1. PURPOSE

A. The purpose of this test are as follows:

1. To demonstrate acceptable procedures and maximum power levels for surveillance testing of the main turbine control, stop, and bypass valves without producing a reactor scram.
2. To establish baseline data for evaluating test condition acceptability with respect to PCIOMR during future startup tests.

#### 2. ACCEPTANCE CRITERIA

A. Level 1

1. The decay ratio of an oscillatory response must be less than 1.0.

B. Level 2

1. The peak neutron flux must be at least 7.5 percent below the scram trip setting. The peak heat flux must remain at least 5 percent below its scram trip setting. The peak vessel pressure must remain at least 10 psi below the high pressure scram setting.
2. The peak steam flow in each line must remain 10 percent below the high steam flow isolation trip setting.
3. The decay ratio of any oscillatory response must be less than 0.25, when operating above the minimum core flow for the recirculation master manual mode.

#### 3. RESULTS

The performance of this test at test condition 3 showed that turbine valve surveillance testing with the turbine load limit set low (bypass valves handling the transient) is not an acceptable testing method. This is due to the fact that a single control valve has a larger steam flow capacity than all 5 bypass valves.

Testing with the load limit set high yielded satisfactory results with the following margins to scram:

Neutron Flux	47%
Heat Flux	43%
Vessel Pressure	85 psig

No oscillatory behavior was observed in the monitored plant variables.

This test was satisfactorily completed at test condition 3 and all applicable criteria were met.

STARTUP TEST PROCEDURE 25  
MAIN STEAM ISOLATION VALVES

1. PURPOSE

A. The purpose of this test is as follows:

1. To functionally check the main steam line isolation valves (MSIV's) for proper operation at selected power level.
2. To determine isolation valve closure times.
3. To determine the maximum power at which full closures of a single valve can be performed without a scram.
4. To determine the reactor transient behavior resulting from the simultaneous full closure of all MSIV's.

2. CRITERIA

A. Level 1

1. MSIV closure time, excluding electrical delay shall be no faster than 3.0 seconds and including electrical delay shall no slower than 5.0 seconds (each valve, not averaged).
2. The positive change in vessel dome pressure occurring within 30 seconds after the full MSIV closure from greater than 95% of rated power must not exceed the Level 2 criteria, 6.2.D, by more than 25 psi. The positive change in simulated heat flux shall not exceed the Level 2 criteria, 6.2.D, by more than 2% of rated value.
3. Feedwater control systems settings must prevent flooding of the steam lines.

B. Level 2.

1. During full closure of individual valves:
  - a. Peak vessel pressure must be 10 psi (0.7 Kg/cm ) below scram.
  - b. Peak neutron flux must be 7.5% below scram.
  - c. Steam flow in individual lines must be 10% below the isolation trip setting.
  - d. Peak heat flux must be 5% less than its trip point.

2. Initial action of RCIC and HPCS shall be automatic if the level 2 setpoint is reached, and system performance shall be within specification.
3. The relief valves must reclose properly (without leakage) following the pressure transient.
4. For the full MSIV closure from greater than 95% power, predicted analytical results based on beginning of cycle design basis analysis, assuming no equipment failures and applying appropriate parametric corrections, will be 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:

<u>Initial Conditions</u>		<u>Criteria</u>	
Power (%)	Dome Pressure (psia)	Increase In Heat Flux (%)	Increase In Dome Pressure (psi)
100	1020	0	*

- \* To be determined based upon actual plant conditions at the time the test is performed.

### 3. RESULTS

The MSIV's were "slow closed" to functionally demonstrate proper valve operations. This test was successfully completed with all applicable acceptance criteria being met for test condition 5.

## STARTUP TEST PROCEDURE 26

### RELIEF VALVES

#### 1. PURPOSE

A. The purpose of this test is as follows:

1. To verify the proper operation of the primary system relief valves.
2. To determine each relief valve's capacity.
3. To verify that the discharge piping is not blocked.
4. To verify that each relief valve reseats following operation.
5. To obtain a transient recorder signature of each relief valve operation for subsequent comparisons.
6. To confirm proper overall functioning of the Low-Low Set Pressure Relief Logic.
7. To verify proper safety/relief valve discharge line backpressure.

#### 2. CRITERIA

##### Level 1.

- A. There should be positive indication of steam discharge during the manual actuation of each valve.
- B. The sum total of the percentage corrected flow rates must be greater than 111.5% of the Nuclear Boiler warranted steam flow at 103% of the spring setpoint pressure of 1165 psig.
- C. The Low-Low Set Pressure Relief logic shall function to preclude subsequent simultaneous SRV actuations following the initial SRV actuation due to the original pressurization transient.

##### Level 2.

- A. No observable leakage shall exist following closure.
- B. The pressure regulator must satisfactorily control the reactor transient and close the control and/or bypass valves by an amount equivalent to the relief valve steam flow.

- C. The transient recorder signatures for each valve must be analyzed for a relative system response comparison. The delay time (between trip and motion) shall be less than or equal to 0.1 seconds, and the response time (main disk stroke time) shall be less than or equal to 0.15 seconds.
- D. No individual relief valve may have a flow rate (corrected to the setpoint pressure) that, considering measurement uncertainties, is less than 90%, or greater than 122.5%, of its expected flow rate of 862,400 lbs/hr at 103% of the spring setpoint pressure of 1146 psig.
- E. No more than 25% of the installed relief valves may have an individual corrected flow rate that is between 90% - 100% of their expected flow rates.
- F. The total flow capacity of the safety relief valves used in the Automatic Depressurization System must be equal to or greater than  $4.8 \times 10^6$  lbs/hr. at 1125 psig when the valve having the highest measured capacity is assumed to be out of service.
- G. The selected MSRV with the highest nominal safety spring setting must indicate full open when manually actuated with its accumulator air supply isolated and vented.
- H. Discharge line backpressure shall be comparable with information presented on the Nuclear Boiler Process Diagram.
- I. When the Low-Low Pressure Relief logic functions, the open/close actions of the SRV's shall occur within  $\pm 13$  psi and  $\pm 20$  psi of their design points respectively.

### 3. RESULTS

Testing done during Test Condition 3 determined that the relief valve capacity measurements were inconclusive due to the low accuracy of the in-field measurement techniques. General Electric has revised the Startup Test Instructions to delete the capacity test and any applicable criteria (Level 1-B., Level 2-D,E,F,) from the test program. These deletions have been approved by the NRC and appropriate FSAR revisions have been submitted.



The following level 2 criterion was not satisfied during test condition 3:

A. SRV Timing

SRV D had a delay time of 0.107 second, and a stroke time of 0.086 second. The sum of these, the time from initiation to full open position, is 0.193 second. The value is well within the 0.25 second value stated in the FSAR for total time to full open position and is therefore considered operationally acceptable.

The level 1 & 2 criteria for the Low-Low Set Pressure Relief logic was not applicable at test condition 3 because the pressure spike resulting from the turbine trip (STP-27) did not reach the trip setpoint for the SRV's. Further testing at test condition 6 will address this criteria.

This test was successfully completed for Test Condition 3. All applicable criteria were met except as stated above.

## STARTUP TEST PROCEDURE 27

### GENERATOR LOAD REJECTION

#### 1. PURPOSE

- A. The purpose of this test is to demonstrate the response of the reactor and its control system to protective trip in the turbine and the generator.

#### 2. CRITERIA

##### Level 1

- A. For Turbine and Generator trips there should be a delay of less than 0.1 seconds following the beginning of control or stop valve closure before the beginning of bypass valve opening. The bypass valves should be opened to a point corresponding to approximately 80 percent of their capacity within an additional 0.2 seconds, or 0.3 seconds total, from the beginning of control or stop valve closure motion.
- B. Feedwater system settings must prevent flooding of the steam lines following these transients.
- C. The two recirculation pump drive flow coastdown transient during the first three seconds must be equal to or faster than that specified in this procedure.
- D. The positive change in vessel dome pressure occurring within 30 seconds after either generator or turbine trip must not exceed the Level 2 criteria by more than 25 psi.
- E. The positive change in simulated heat flux shall not exceed the Level 2 criteria by more than 2% of rated value.
- F. Turbine speed does not reach the point where a mechanical overspeed turbine trip would occur.

##### Level 2

- A. There shall be no MSIV closure in the first three minutes of the transient and operator action shall not be required in that period to avoid the MSIV trip.
- B. The positive change in vessel dome pressure and in simulated heat flux which occurs within the first 30 seconds after the initiation of either generator or turbine trip must not exceed the predicted values.

- C. Electrical load transfers occur as designed.
- D. The reactor shall not scram for initial thermal power at less than or equal to 25% of rated.
- E. If the Level 1 criterion (6.1.c of this procedure) for the two recirculation pump drive flow coast down transient is passed, the data shall be analyzed within 3 weeks for compatibility with the safety analysis.

### 3. RESULTS

A trip of the main turbine from an intermediate power level was successfully performed at test condition 3. All applicable test criteria were satisfied.

STARTUP TEST PROCEDURE 29  
RECIRCULATION FLOW CONTROL SYSTEM

1. PURPOSE

The purposes of this test are:

- A. To demonstrate the core flow system's control capability over the entire flow control range, including valve position, core flow, neutron flux, and load following modes of operation.
- B. To determine that all electrical compensators and controllers are set for desired system performance and stability.

2. CRITERIA

Level 1

A. Position Loop Criteria

- 1. The position loop response to test inputs shall not diverge.

B. Flow Loop Criteria.

- 1. The flow loop response to test inputs shall not diverge.

C. Flux Loop Criteria.

- 1. The flux loop response to test inputs shall not diverge.

D. Load Following Loop Criteria.

- 1. The load following loop response to test inputs shall not diverge.

E. Scram Avoidance and General Criteria.

- 1. None.

F. Flow Control Valve Duty Test Criteria.

- 1. None.

## Level 2

### A. Position Loop Criteria.

Gains and limiters shall be set to obtain the following response:

1. Maximum steady state rate of change of valve position shall be between 9 & 11% per second for a 100% position demand input. (Initial valve velocity may exceed this limit for a short time).
2. Gains shall be set to give as fast a response as possible for small position demand input within the overshoot criterion and without additional valve duty cycle. (See FCV duty criterion for valve duty cycle requirement.)
3. The decay ratio of any oscillatory controlled variable must be less than or equal to 0.25, when operating above the minimum core flow for Recirculation Master Manual mode. Below this minimum core flow, the decay ratio must be less than or equal to 0.50 with the recommendation that each control system be adjusted to meet less than or equal to 0.25 unless there is an identifiable performance loss involved at higher power levels.

### B. Flow Loop Criteria.

1. The decay ratio of any oscillatory controlled variable must be less than or equal to 0.25, when operating above the minimum core flow for Recirculation Master Manual mode. Below this minimum core flow, the decay ratio must be less than or equal to 0.50, with the recommendation that each control system be adjusted to meet less than or equal to 0.25 unless there is an identifiable performance loss involved at higher power levels.
2. The flow loops provide equal flows in the two loops during steady state operation. Flow loop gains should be set to correct 90% of a flow imbalance in  $20 \pm 5$  sec.

C. Flux Loop Criteria.

1. The decay ratio of any oscillatory controlled variable must be less than or equal to 0.25, when operating above the minimum core flow for Recirculation Master Manual mode (loops A and B receive command from a common point). Below this minimum core flow, the decay ratio must be less than or equal to 0.50, with the recommendation that each control system be adjusted to meet less than or equal to 0.25 unless there is an identifiable performance loss involved at higher power levels.
2. For small flux command step changes of between 1%-5%, at near rated power, the following apply:
  - a. Deadband, percent rated flux demand: less than or equal to 0.5.
  - b. Delay time for flux demand steps, sec.: less than or equal to 0.8.
  - c. Reponse time for flux demand steps, sec.: less than or equal to 2.5.
  - d. Maximum allowable flux overshoot, for step demand of less than or equal to 20% of rated is, in percent: 2.
  - e. Flux settling time, sec.: less than or equal to 15.
3. Switching between estimated and actual flow should not exceed 5 times/5 minutes at steady state
4. During flux step transient there should be no switching to actual flux or if switching does not occur, it should switch back to estimated flux within 20 seconds of the start of the transient.
5. The deadband of the flux controller for a flux demand step shall be less than or equal to .5% of rated flux demand.



D. Load Following Loop Criteria.

1. The decay ratio of any oscillatory controlled variable must be less than or equal to 0.25, when operating above the minimum core flow for Recirculation Master Manual mode. Below this minimum core flow, the decay ratio must be less than or equal to 0.50, with the recommendation that each control system be adjusted to meet less than or equal to 0.25 unless there is an identifiable performance involved at higher power levels.
2. The response to a step input of less than 10% in load demand shall be such that the load demand error is within 10% of the magnitude of the step within 10 seconds.
3. When a load demand step of greater than 10% is applied (N%), the load demand error must be within 10% of the magnitude of the step within N seconds.
4. For large Auto Load following Recirculation system maneuvers along the 100 percent rod line, 90 percent of the commanded step power change (P) must be completed within (t) seconds:
  - a. For 10 percent change, 9 percent within 10 seconds.
  - b. For 20 percent change, 18 percent within 20 seconds.
  - c. For 35 percent change, 31.5 percent within 35 seconds.
5. The Automatic Load following range along the 100 percent (Flow Control) rod line shall be at least 35 percent power (i.e., between 65 percent - 100 percent power).

E. Scram Avoidance and General Criteria. For anyone of the above loops' test maneuvers, the trip avoidance margins must be at least the following:

1. For APRM greater than or equal to 7.5%.
2. For simulated heat flux greater than or equal to 5.0%.

3. The system response in any mode response shall produce steady steam flow limit cycle variations no larger than 0.5% of rated steam flow.

F. Flow Control Valve Duty Test Criteria.

1. The flow control valve duty cycle in any operating mode shall not exceed 0.2% -Hz. Flow control valve duty cycle is defined as:

$$\frac{\text{Total valve travel (\%)}}{2 \times \text{time span in sec.}} \quad (\% - \text{Hz})$$

3. RESULTS

All applicable level 1 criteria were met while testing at test condition 3.

Level 2 time response criteria were not met at this test condition. Testing determined that relatively slow controller settings were necessary in order to obtain minimum overshoot. These control system settings resulted in stable responses to the test inputs while maintaining acceptable response times.

STP-29 was satisfactorily completed at test condition 3 and all applicable criteria were met except as stated above.

## STARTUP TEST PROCEDURE 30

### RECIRCULATION SYSTEM

#### 1. PURPOSE

- A. Obtain recirculation system performance data under different operational conditions, such as pump trip, flow coastdown, pump restart, and flow induced vibration.
- B. To verify that no recirculation system cavitation will occur in the operating region of the power-flow map.
- C. To verify that during the trip of one recirculation pump, the feedwater control system can satisfactorily control water level without a resulting turbine trip and/or scram.
- D. To record and verify acceptable performance of the recirculation two pump circuit trip system.

#### 2. CRITERIA

##### Level 1

- A. The two pump drive flow coastdown transient during the first 3 seconds must be equal to or faster than that specified on Figure 14.2-7 of the FSAR.

##### Level 2

- A. The water level, APRM and transients of simulated heat flux, pressure, drive and core flow for the one pump trip shall not exceed the predicted values.
- B. The reactor water level margin to avoid a high level trip shall be greater than or equal to 3.0 inches during the one pump trip.
- C. The simulated heat flux (TPM) margin to avoid a scram shall be greater than or equal to 5.0 percent during the one pump trip.
- D. The recirculation system cavitation runback feature shall be adjusted such that a flow runback (transfer of recirc. pump power supplies from 60 Hz to 15 Hz) occurs prior to any observable cavitation in the Recirculation System.

- E. During recirculation pump restart(s) the scram trip avoidance margins must be at least the following:
1. For APRM, greater than or equal to 7.5%.
  2. For simulated heat flux, greater than or equal to 5.0%.
- F. If the level 1 criteria for the two pump trip coastdown transient is met, the data shall be analyzed within two weeks to ensure compatibility with the safety analysis.

### 3. RESULTS

#### A. Test Condition 3

The following tests were successfully performed:

- system performance data acquisition,
- recirculation one pump trip and restart,
- trip and start of both recirculation pumps,
- recirculation pump runback,
- jet pump and flow control valve cavitation interlock verification test.

During the cavitation interlock test, the delta temperature interlock was not reached during the power reduction from 65% power (98% core flow) to 45% power. There was no evidence of cavitation anywhere in the recirculation system during this power descent. Due to the fact that the predicted delta temperature setpoint should have been achieved by approximately 53% power, the accuracy of the delta temperature instrumentation is being investigated. However, there is no operational or safety concern since no cavitation was observed.

There were no procedure criteria violations during test condition 3.

#### B. Test Condition 5.

System performance data was collected with the Recirculation System in the normal operating mode (Flow Command Mode). The test was successfully completed and there were no criteria violations during this test condition.

C. Test Condition 4.

System performance data was collected with the Recirculation System pumps tripped and the plant in a natural circulation condition. The test was successfully completed and there were no criteria violations during this condition.

## STARTUP TEST PROCEDURE 33

### DRYWELL PIPING VIBRATION

#### 1. PURPOSE

- A. The purpose of this test is to verify that the main steam, reactor recirculation, and feedwater piping have acceptable vibration.

#### 2. CRITERIA

##### Level 1.

- A. The measured amplitude for vibration of the recirculation system during recirculation pump trips and subsequent coast down shall not exceed the allowable values.
- B. The measured amplitude for vibration of the main steam lines during relief valve operation shall not exceed allowable values.
- C. The measured amplitude for steady state vibration of the recirculation and main steam systems shall not exceed allowable values.
- D. The measured amplitude for vibration of the main steam lines due to turbine stop valve trip and relief valve operation shall not exceed allowable values.

##### Level 2.

- A. The measured amplitude of vibration of the main steam system following relief valve operation and turbine stop valve trip should not exceed the expected values.
- B. The measured amplitude of vibration of the main steam and recirculation systems during steady state operation should not exceed the expected values.
- C. The measured vibrational stresses induced in the feedwater system following trip of one and both turbine driven feed pumps and during steady state operations should not exceed the expected stresses.



### 3. RESULTS

At Test Condition 3, steady-state vibration requirements were made and found to be acceptable. Transient vibration measurements were also made at this test condition. Vibration in the main steam lines due to relief valve capacity checks (STP-26) were found to be acceptable. Vibration induced in the recirculation lines due to recirc pump trip and start (STP-30) were within criteria limits. Vibration induced in the main steam lines due to main turbine trip (STP-27) were found to be acceptable.

During the course of testing it was determined by General Electric that two (2) of the installed sensors were inoperative. The loss of this instrumentation had no impact on the test because the measurements from the functioning instrumentation indicated values which did not even approach the acceptance criteria limits.

All Test Condition 3 data for STP-33 has been reviewed and found to be acceptable.

## STARTUP TEST PROCEDURE 34

### REACTOR INTERNALS VIBRATION

#### 1. PURPOSE

- A. The purpose of this test is to obtain vibration measurements on the jet pumps to confirm the mechanical integrity of the system with respect to flow induced vibration and to verify the accuracy of the analytical vibration model. This test is in conformance with Regulatory Guide 1.20 requirements for Non-Prototype, Category II Plants (similar to prototype but some component differences).

#### 2. CRITERIA

##### Level 1.

- A. The peak stress intensity may exceed 10,000 psi (single amplitude) when the component is deformed in a manner corresponding to one of its normal or natural modes but the fatigue usage factor must not exceed 1.0.

##### Level 2.

- A. The peak stress intensity shall not exceed 10,000 psi (single amplitude) when the component is deformed in a manner corresponding to one of its normal or natural modes. This is the low stress limit which is suitable for sustained vibration in the reactor environment for the design life of the reactor components.

#### 3. RESULTS

##### Test Condition 3

During test condition 3 testing, some of the vibration measurements during single loop operation did not meet the Level 2 criteria. Further analysis on fatigue usage is being performed by GE and further data accumulation will be accomplished during test condition 6 testing. All applicable criteria were met during balanced flow testing.

## STARTUP TEST PROCEDURE 35

### RECIRCULATION SYSEM FLOW CALIBRATION

#### 1. PURPOSE

- A. The purpose of this test is to perform a complete calibration of the installed recirculation system flow instrumentation.

#### 2. ACCEPTANCE CRITERIA

##### A. Level 2.

1. Jet pump instrumentation shall be adjusted such that the jet pump total flow recorder will provide a correct core flow indication at rated conditions.
2. The APRM/RBM flow bias instrumentation shall be adjusted to function properly at rated conditions.

#### 3. RESULTS

The recirculation system flow calibration was successfully performed at test condition 3. The core flow instrumentation was adjusted to provide accurate flow indication based on jet pump flows and a total of three data sets were taken to permit the calculation of a flow distribution factor for the double tap jet pumps in each recirc loop.

No adjustments were performed on the loop drive flow instrumentation since these flows were already conservatively adjusted per normal plant surveillance procedures.

All applicable criteria were met at this condition.

## STARTUP TEST PROCEDURE 74

### OFF-GAS SYSTEM

#### 1. PURPOSE

A. The purpose of this test is as follows:

1. To verify the proper operation of the Off-Gas System over its expected operating parameters.
2. To determine the performance of the activated carbon absorber.

#### 2. CRITERIA

A. Level 1

1. The release of radioactive gaseous and particulate effluents must not exceed the limits specified in the site Technical Specifications.
2. There shall be no loss of flow of dilution steam to the non-condensing stage when the steam jet air ejectors are pumping.

B. Level 2

1. The system flow, pressure, temperature, and relative humidity shall comply with the design specifications.
2. The catalytic recombiner, the hydrogen analyzer, the activated carbon beds, and the filters shall be operating properly during operation, i.e., there shall be no gross malfunction of these components.

#### 3. RESULTS

The release of radioactive gaseous and particulate effluents was demonstrated to be within the limits specified in the Technical Specifications during test condition 3.

There was no loss of dilution steam to the uncondensing stage when the SJAE's are pumping during test condition 3.

The following level 2 design specification criteria were not satisfied during Test Condition 3:

- a. Off-Gas Flow to After Filter (Normal Mode)
- b. Standby Loop Catalytic Recombiner Temperatures (Normal Mode)

- c. Gas Reheater Outlet Dewpoint (Normal Mode)
- d. Relative Humidity (Normal Mode)

The actual values and criteria are included in Table 1.

The Off-Gas Flow to the After Filters is roughly 30 scfm above the design value. It has been determined that there is a leak in the condenser boot. The air in-leakage is being addressed by a station work request.

The Standby Loop Catalytic Recombiner Temperatures indicated low while obtaining normal mode data. This problem was identified in a previous test condition, and during the preoperational testing. It was determined that the Standby Recombiner would require a longer heatup period prior to admitting off gases to the recombiner. This additional heatup time will not effect the overall performance of the Recombiners.

The low Gas Reheater Outlet Dewpoint was identified as an instrument calibration problem. The low dewpoint caused the relative humidity to be low. This was evaluated as being on the conservative side as high humidity would decrease the efficiency of the Adsorber beds.

This test was successfully completed for Test Condition 3. All applicable criteria were met except as stated above.

TABLE 1

## DESIGN SPECIFICATION DEVIATION (TEST CONDITION: 3)

Parameter	Actual Value	Criteria Value
Off-Gas Flow to After Filter	60 SCFM	6-30 SCFM
<hr/>		
Standby Loop Catalytic Recombiner Temperatures:		
Bottom	315 <sup>0</sup> F	325 <sup>0</sup> F
Middle	320 <sup>0</sup> F	325 <sup>0</sup> F
Top	320 <sup>0</sup> F	325 <sup>0</sup> F
<hr/>		
Gas Reheater Outlet Dewpoint	32.2 <sup>0</sup> F	34-45 <sup>0</sup> F
<hr/>		
Relative Humidity	21.3%	22-38%
<hr/>		