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ACCESSION NBR: 8704020624 DOC. DATE: 87/03/25 NOTARIZED: NO DOCKET #
FACIL: 50-410 Nine Mile Point Nuclear Station, Unit 2, Niagara Moha 05000410
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SUBJECT: Forwards revised pages to FSAR, Chapter 14, representing changes to initial startup test program, per OL Section 2. C. 8. Changes made either existing FSAR pages or revised pages, per 860530 ltr.

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NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/301 PLAINFIELD ROAD, SYRACUSE, N.Y. 13212/TELEPHONE (315) 474-1511

March 25, 1987
(NMP2L 1009)

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Re: Nine Mile Point Unit 2
Docket No. 50-410

Gentlemen:

Pursuant to Section 2.C.8 of the Operating License for Nine Mile Point Unit 2, please find enclosed revised Final Safety Analysis Report pages from Chapter 14 that represent recent changes made to the Initial Startup Test Program. Changes to the appropriate procedures will be made to reflect the enclosed program changes. Also enclosed is a table that provides a summary of the safety evaluation of each change. Changes were made to either the existing Final Safety Analysis Report pages or the revised pages per our letter of May 30, 1986 (see bottom left corner of revised pages for base line document).

Very truly yours,

NIAGARA MOHAWK POWER CORPORATION

C. V. Mangan
Senior Vice President

GAG/pns
2785G
Enclosures

xc: Regional Administrator, Region I
Ms. E. G. Adensam, Project Director
Mr. W. A. Cook, Resident Inspector
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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of Niagara Mohawk Power Corporation (Nine Mile Point Unit 2)	]]]]]	Docket No. 50-410

AFFIDAVIT

C. V. Mangan, being duly sworn, states that he is Senior Vice President of Niagara Mohawk Power Corporation; that he is authorized on the part of said Corporation to sign and file with the Nuclear Regulatory Commission the documents attached hereto; and that all such documents are true and correct to the best of his knowledge, information and belief.

CVMangan

Subscribed and sworn to before me, a Notary Public in and for the State of New York and County of Onondaga, this 25th day of March, 1987.

MARY FRATESCHI
Notary Public in the State of New York
Qualified in Onondaga County No. 4797550
My Commission Expires March 30, 19 89

Notary Public in and for

_______________ County, New York

My Commission expires:

MARY FRATESCHI
Notary Public in the State of New York
Qualified in Onondaga County No. 4797550
My Commission Expires March 30, 19 89

TABLE A

FSAR PAGE NUMBER/SECTION	BASIS FOR CHANGE	SAFETY IMPACT
Table 14.2-207 page 2 of 2	Clarification of acceptance criteria.	Additions bring criteria in line with Technical Specifications. No impact.
Table 14.2-213 page 1 of 4, page 3 of 4	Additional information.	No impact.
Table 14.2-213 page 2 of 4	Controlled adjustments are already done.	No impact. Test is valid when performed either before or after controller adjustment.
Table 14.2-213 page 4 of 4	Correction: overspeed of RCIC turbine does not initiate isolation signal.	No impact. Item 1 of this acceptance criteria is concerned with overspeed condition only.
Table 14.2-215	Increase test scope to include variable leg temps.	No impact (at NRC request).
Table 14.2-216 page 2 of 2	Intermediate temperature readings are not required for cycle test.	No impact on meeting acceptance criteria.
Table 14.2-218 page 2 of 2	Test condition "b" is performed routinely per Tech. Spec.	No impact since TS surveillance performs check.
Table 14.2-222 page 2 of 3	Typo.	No impact.
Table 14.2-223 page 1 of 2	Increase in test window.	Increase scope of test has no detrimental impact on safety.

TABLE A (Cont.)

FSAR PAGE NUMBER/SECTION	BASIS FOR CHANGE	SAFETY IMPACT
Table 14.2-225	A. Flow nozzles are lab calibrated. B. Correction of reference number. C. Change method of measuring leak rate. D. Test written for turbine driven pump. NMP2 has motor driven pump and flow control valve. E. Addition of specific information.	No impact. No impact. Prior to change, testing would require extrapolation of multiple tests to determine valve position for 0% flow. New method verifies leak rate within acceptable limits, i.e. 5% NBR. No impact. No impact (test same as that used at River Bend). No impact.
Table 14.2-230 page 1 of 3	Typo.	No impact.
Table 14.2-232 page 2 of 2	Test condition changed to meet condition identified in Regulatory Guide 1.68.2.	No impact.
Table 14.2-240 page 1 of 2	Addition information	No impact.
Table 14.2-241 page 3 of 4	Typo.	No impact.
Table 14.2-243 page 1 of 2	Clarify description of "Action."	No impact.
Table 14.2-243 page 2 of 2	Clarification.	Prevents duplication of test. No impact.

TABLE A (Cont.)

FSAR PAGE NUMBER/SECTION	BASIS FOR CHANGE	SAFETY IMPACT
Table 14.2-244 page 1 of 3 page 2 of 3 (top)	Test of system from isolated mode unnecessary since system conditions do not differ when operating from reactor.	No impact. The RHR performs the same with or without isolation of the main condenser.
Table 14.2-244 page 2 of 3 (bottom)	Additional information on acceptance criteria.	No impact.
Table 14.2-245(A) page 2 of 3	Change sampling location due to potential hazard of sampling intake line to the hydrogen recombiner.	Change reduces possibility of an accident, i.e. enhance safety.
Tables 14.2-245(B), page 2 of 3, 14.2-302 14.2-306	Engineering input on test procedure allows for immediate evaluation of data without further input from Engineering.	No impact.
Table 14.2-301	Additional Acceptance Criteria.	No change in test. No impact.
Table 14.2-307	Engineer has determined the level 2 criteria is not applicable.	No impact.. (See IOC L. P. Prunotto to J. T. Conway, October 1, 1986.)
Page 3.9A-7	Clarification of test performed during startup and therefore not performed during preoperational testing.	No impact.
Table 14.2-303 page 2a of 3	Additional test.	No impact.

TABLE 14.2-207 (Cont)

Acceptance Criteria

Level 1:

1. There is a neutron signal-to-noise count ratio of at least 2 to 1 on the required operable SRMs or fuel loading chambers.

2. Minimum count rate is in accordance with the technical specifications.

22

Level 2:

Not applicable.

3. Each IRM channel must be on scale before the SRMs exceed their rod block setpoint.

Level 1:

1. There must be a minimum count rate of 3 cps. (with a neutron signal count to noise count ratio of at least 2:1) or a minimum count rate of .7 c.p.s. (with a neutron signal count to noise count ratio of at least 20:1) on all of the ~~SRMs.~~ required operable SRM's per the Technical Specifications.

2. Each required operable IRM channel must be on scale before the required operable SRMs exceed their rod block setpoint.

Level 2:

Not applicable

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TABLE 14.2-213

RCIC SYSTEM

Startup Test (SUT-14)

Test Objectives

1. To verify the proper operation of the RCIC system over its expected operating pressure and flow ranges.

2. To demonstrate reliability in automatic starting from cold standby when the reactor is at power conditions.

Prerequisites

The appropriate preoperational tests have been completed and the SORC has reviewed and approved the test procedures and the initiation of testing. Initial turbine operation (uncoupled) must be performed to verify satisfactory operation and overspeed trip. The auxiliary steam system is available to supply turbine steam. Instrumentation has been installed and calibrated, and sufficient water is available to meet specified purity requirements. The following systems must be operational to the extent necessary to conduct the test: reactor vessel, suppression pool, condensate supply system, and instrument air.

Test Procedure

The RCIC system is designed to be tested in two ways: flow injection into a test line leading to the condensate storage tank (CST) and flow injection directly into the reactor vessel. The first set of CST injections consists of manual and automatic starts at 150 psig and near rated reactor pressure. The pump discharge pressure during these tests is (+20,-0) throttled to 100 psi above reactor pressure to simulate the largest expected pipeline pressure drop. This CST testing is done to demonstrate general system operability and for making most controller adjustments.

Reactor vessel injection tests follow to complete the controller adjustments and to demonstrate automatic starting from a cold (ambient temperature for RCIC operation) standby condition. Cold is defined as a minimum 72 hrs without any kind of RCIC operation. 12

FSAR

TABLE 14.2-213 (Cont)

After all final controller and system adjustments have been determined, a defined set of demonstration tests must be performed with that one set of adjustments. Two consecutive reactor vessel injections starting from cold conditions in the automatic mode must satisfactorily be performed to demonstrate system reliability. Following these tests, a set of CST injections are done to provide a benchmark for comparison with future surveillance tests.

After the auto start portion of certain of the above tests is completed, and while the system is still operating, small step disturbances in speed and flow command are input (in manual and automatic mode respectively) to demonstrate satisfactory stability. This is done at both low (above minimum turbine speed) and near rated flow initial conditions to span the RCIC operating range.

A demonstration of expanded operation of up to 2 hr (or until pump and turbine oil temperature are stabilized) of continuous running at rated flow is scheduled at a convenient time during the test program.

12 Differential pressures measured during rated steam flow will be used to establish appropriate high steam flow setpoints.

The following tests are performed:

Action	Test Conditions
1. CST injection first phase manual start.	a. For all RCIC testing; recirculation in POS mode and all other controllers in NORM mode. b. Demonstration ~~without controller adjustments~~ at 150 psig reactor pressure. c. Rated reactor pressure RCIC discharge 100 psi above RPV.
2. CST injection, step changes in flow for controller adjustments.	Immediately after 1c with RCIC discharge to condensate storage tank. Manual and automatic control modes.

FSAR

TABLE 14.2-213 (Cont)

Action	Test Conditions
3. CST injection, extended operation demonstration.	In conjunction with 2.
4. CST injection, second phase. Hot quick start followed by stability demonstration.	a. Rated reactor pressure, RCIC discharge 100 (+20, -0) psi above RPV. b. 150 psig reactor pressure RCIC discharge 100 (+20, -0) psi above RPV.
5. Reactor vessel injection, manual start, step changes for controller adjustments.	Rated reactor pressure, manual and automatic modes.
6. Reactor vessel injection hot quick start.	Rated reactor pressure, automatic mode.
7. Reactor vessel injection, hot or cold quick start followed by stability demonstration.	150 psig reactor pressure, manual and automatic modes.
8. Confirmatory reactor vessel injection, cold quick start.	Rated reactor pressure, final RCIC controller settings.
9. Second consecutive confirmatory reactor vessel injection, cold quick start.	Same as 8.
10. Condensate storage tank injection for surveillance test base data, cold quick start.	a. Rated reactor pressure, final controller settings, RCIC discharge approximately 100 (+20, -0) psi above RPV. b. 150 psig reactor pressure, final controller settings, RCIC discharge approximately 100 (+20, -0) psi above RPV.

FSAR

TABLE 14.2-213 (Cont)

<u>Acceptance Criteria</u>

Level 1:

1. The average pump discharge flow is equal to or greater than the 100-percent rated value after 30 sec have elapsed from automatic initiation at any reactor pressure between 150 psig and rated.

2. The RCIC turbine does not trip on overspeed during auto or manual starts.

If any Level 1 criteria are not met, the reactor is only allowed to operate up to a restricted power level defined by
22 Figure 14.2-213-1 until the problem is resolved. Also, consult the plant Technical Specifications for actions to be taken.

Level 2:

1. In order to provide an overspeed trip avoidance margin, the transient start first and subsequent speed peaks must not exceed 5 percent above the rated RCIC turbine speed.

2. The speed and flow control loops are adjusted so that the decay ratio of any RCIC system-related variable is not greater than 0.25.

3. The turbine gland seal condenser system is capable of preventing steam leakage to the atmosphere.

4. The ΔP switch for the RCIC steam supply line high-flow isolation trip is calibrated to actuate at 300 percent of the maximum required steady-state flow.

FSAR

TABLE 14.2-215

WATER LEVEL REFERENCE LEG TEMPERATURES

Startup Test (SUT-16B)

Test Objective

To measure the reference leg temperatures and recalibrate the instruments if the measured temperatures is different from the values assumed during the initial calibration.

Prerequisites

The preoperational tests have been completed, the SORC has reviewed and approved the test procedures and initiation of testing. System and test instrumentation have been calibrated.

Test Procedures

To monitor the reactor vessel water level, five level instrument systems are provided. These systems and their functions are:

1. Shutdown range - water level measurement in cold, shutdown condition.

2. Narrow range - feedwater flow and water level control functions.

3. Wide range - safety functions.

4. Fuel range - post accident indication.

5. Upset range - water level measurement during transient conditions.

The test for the narrow range, wide range, and upset range level instruments will be done during steady state conditions at rated temperature and pressure. The test for the shutdown range level instrument will be done during cold ambient conditions with the reactor shutdown. No test is possible for the fuel zone water level instrument by virtue of its calibration conditions (i.e., LOCA conditions). The testing will verify that the reference leg temperatures of the instrument is the value assumed during calibration. If

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TABLE 14.2-215 (Cont)

not, the instruments will be recalibrated using the measured reference and variable leg temperatures.

Action	Test Conditions
Monitor drywell temperature.	Hot standby with steady drywell temperatures.

Acceptance Criteria

Level 1:

Not applicable.

Level 2:

The difference between the actual reference and variable leg temperature(s) and the value(s) assumed during initial calibration shall be less than that amount which will result in a scale end point error of 1 percent of the instrument span for each range.

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TABLE 14.2-216 (Cont)

Action	Test Conditions
1. Visual inspection	a. All control systems in NORM mode. b. Approximately 275°F at accessible locations. c. At ambient and rated temperature.
2. Record displacement sensor readings.	a. At approximately 275°F. b. At approximately 400 to 450°F. c. At approximately rated recirculation temperature. d. Repeat a, b, and c for approximately two to four heatup and cooldown cycles.

Acceptance Criteria (as described in response to Question F210.37)

Level 1:

1. There shall be no obstructions which will interfere with the thermal expansion of the recirculation piping systems.

2. The displacements at the established transducer locations shall not exceed the allowable values provided by the plant piping design subsection. The allowable values of displacement shall be based on not exceeding ASME Section III Code stress allowables.

Level 2:

The displacements at the established transducer locations shall not exceed the expected values provided by the plant piping design subsection.

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TABLE 14.2-218 (Cont)

If neither BUCLE nor the process computer is available the manual calculation techniques can be used for the core performance evaluation.

The following test is performed:

Action	Test Conditions
Evaluate core thermal power flow, and compute the thermal and hydraulic parameters associated with core behavior. Use plant process computer, offline computer system, or manual calculations	a. TC-1, 2, 3, 5*, and 6 are necessary for documentation. ~~Additional points as necessary to assure compliance with technical specification limits~~

Acceptance Criteria

Level 1:

1. The MLHGR of any rod during steady-state conditions does not exceed the limit specified by the plant technical specifications.

2. The steady-state MCPR does not exceed the limits specified by the technical specifications.

3. The MAPLHGR does not exceed the limits specified by the technical specifications.

4. Steady-state reactor power is limited to rated core thermal power and values on or below the rated power flow control line. Core flow does not exceed its rated value.

Level 2:

Not applicable.

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*At mid-power range and natural circulation.

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TABLE 14.2-222 (Cont)

Acceptance Criteria

Level 1

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

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 must be less than or equal to 0.25.

2. The open loop dynamic flow response of each feedwater actuator (control valve) to small (<10 percent NBR) step disturbances shall be:

a)	Maximum time to 10 percent of a step disturbance	≤1.2 sec
b)	Maximum time from 10 percent to 90 percent of a step disturbance	≤2.1 sec
c)	Peak overshoot (percent of step disturbance)	≤15 percent
d)	Settling time (100 percent ±5 percent of step disttribution)	≤14.0 sec

3. The average rate of response of the feedwater actuator to large (>10 percent of NBR) step disturbances shall be between 10 and 25 percent nuclear boiler rated feedwater flow/second. This average response rate will be assessed by determining the time required to pass linearly through the 10 percent and 90 percent response points.

4. At steady-state operation for the 3/1 element systems, input scaling to the mismatch gains should be adjusted such that the level error due to biased mismatch gain output should be within ±1 in.

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TABLE 14.2-223

LOSS OF FEEDWATER HEATING

Startup Test (SUT-23B)

Test Objective

To demonstrate adequate response to a feedwater temperature loss.

Prerequisites

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

Test Procedure

The condensate/feedwater system is studied to determine the single failure that causes the largest loss in feedwater heating. This event is then performed at between 80- and 90-percent power with the recirculation flow near its rated value.

The following test is performed:

Action	Test Condition
Single event that causes largest decrease in feed-water temprature.	During TC-6 reduce power to between about ~~85~~ 70 and 90-percent thermal power, and near 100-percent core flow.

Acceptance Criteria

Level 1:

1. For the feedwater heater loss test, the maximum feedwater temperature decrease due to a single-failure case must be ≤100°F. The resultant MCPR must be greater than the fuel thermal safety limit.

2. The increase in simulated heat flux does not exceed the predicted Level 2 value by more than 2 percent. The predicted value is based on the actual test values of feedwater temperature change and initial power level. 22

FSAR

TABLE 14.2-225

MAXIMUM FEEDWATER RUNOUT CAPABILITY

Startup Test (SUT-23D)

Test Objective

A. To determine that the maximum feedwater runout capability is compatible with licensing assumptions. [illegible]

Prerequisites

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

Test Procedure

The test is divided into two parts: 1) the initial calibration of the valve controllers and 2) verification of calibration by measured data, which includes a verification that the maximum feedwater flows do not exceed the flows (different flows at different vessel pressures) in

B. Section [illegible] 15.1.2.3.2

1. The valve controller calibration is done by first obtaining vendor pump and valve performance curves. The pump and valve performance curves are then used to determine the valve position corresponding to the maximum allowable flow at rated vessel pressure specified by the FSAR. [illegible] Additionally, for good level control system performance, it is desirable to be able to reach 115.5 percent NBR flow at 1,071 psia and 68 percent NBR flow at 1,021 psia in the one-pump-tripped condition. Adjustable equipment (i.e., valve control loops, feedwater control system function generators, etc) are set to prevent the feedwater pumps from exceeding their maximum allowed output, and yet allow the desirable performance.

C.

2. During the data collection and verification of calibration portion of the test, pressure, flow, and controller data will be collected between 60 and 100 percent power. Measured data will be compared against expected values to ensure proper calibration.

The high pressure high flow valve leakage will be measured prior to startup and verified to be less than 5% NBR.

FSAR

TABLE 14.2-225 (Cont)

The measured maximum flow will be adjusted to the FSAR pressures using the measured data. The maximum flows stated in the FSAR are used as licensing assumptions; therefore, the FSAR maximum flows should not be exceeded. If, however, the FSAR maximum flows are exceeded, there exist two options. The system can be adjusted so that the licensing assumption is not exceeded, or an additional penalty can be applied to the CPR. This penalty will be calculated by the appropriate engineering component, and operating limits will be modified, where necessary.

Action	Test Conditions
1. Record master controller output, feedwater pump suction, discharge and reactor pressures, feedwater flow rate and flow control valve positions.	a. Four equally spaced feedwater flow points. This can be done at TC-3 or any high-power point achieved prior to commercial operation. b. All systems in NORM mode. c. Maximum number of condensate and feedwater pumps normally operated at 100 percent power shall be running.
D. ~~Determine sensitivity of feedwater flow to reactor pressure over a 30-psi range in 5-psi increments.~~	~~a. Reactor power between 80 and 90 percent rated.~~ ~~b. All systems in NORM mode.~~ ~~c. Maximum number of condensate and feedwater pumps normally operated at 100 percent power shall be running.~~

Acceptance Criteria

Level 1:

Maximum valve position attained shall not exceed the position which will give the following flows with the normal complement of pumps operating.

FSAR

TABLE 14.2-225 (Cont)

1. ~~A~~ 145 percent NBR at ~~P psia~~ 1060 psig.

2. ~~XX percent XXXX rated~~ 155 percent NBR at ~~P rated psia~~ 1010 psig. 18

~~The maximum flow, F, the pressure, P, and the slope of the flow variation with pressure, A, can be obtained from the plant parameters specified in Section 15.1.2.3.2.~~

Level 2:

The maximum valve position must be greater than the calculated position required to supply:

1. With rated complement of pumps - 115.5 percent NBR at 1,071 psia.

2. One feedwater pump tripped condition - 68 percent NBR at 1,021 psia.

FSAR

TABLE 14.2-230

RELIEF VALVES

Startup Test (SUT-26)

Test Objectives

1. To verify that the relief valves function properly (can be opened and closed manually).

2. To verify that the relief valves reseat properly after operation.

3. To verify that there are no major blockages in the relief valve discharge piping.

Prerequisites

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

Test Procedure

A functional test of each SRV is made as early in the startup program as practical. This is normally the first time the plant reaches 950 psig with steam flow greater than the individual relief valve capacity. Bypass valve or electrical output response is monitored during the test. The test duration is about 10 sec to allow turbine valves and tailpipe sensors to reach a steady state.

The tailpipe sensor responses are used to detect the opening and subsequent closure of each SRV. The BPV or power level (MWe) response is analyzed for anomalies indicating a restriction in an SRV tailpipe. In addition, lead BWR plants measure SRV tailpipe back pressure on the longest and shortest tailpipes.

Valve capacity is based on certification by ASME code stamp and the applicable documentation being available in the onsite records. The nameplate capacity/pressure rating assumes that the flow is sonic. This is true if the back pressure is not excessive. A ~~[illegible]~~ major blockage of the line may prevent sonic flow and it should be determined that no major

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TABLE 14.2-232 (Cont)

The following tests are performed:

Action	Test Conditions
1. Functionally check use of remote shutdown panels (RSP) to shutdown reactor.	a. Steady-state power operation (10-25%) b. Reactor initially critical with MSIVs open. c. T-G online.
2. Functionally check use of RSP to cooldown reactor.	
3. Functionally check use of RSP to place shutdown cooling systems in operation.	

Acceptance Criteria

Level 1:

Not applicable.

Level 2:

During a simulated control room evacuation, the reactor must be brought to the point where cooldown is initiated and under control, and the reactor vessel pressure and water level are controlled using equipment and controls outside the control room.

FSAR

TABLE 14.2-240

LOSS OF TURBINE GENERATOR AND OFFSITE POWER

Startup Test (SUT-31)

Test Objective

To determine the electrical equipment and reactor transient performance during the loss of auxiliary power.

Prerequisites

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

Test Procedure

The loss of auxiliary power test is performed at 20 to 30 percent of rated power. The proper response of reactor plant equipment, automatic switching equipment, and the proper sequencing of the diesel generator load are checked. Appropriate reactor parameters are recorded during the resultant transient. The loss of power will be maintained long enough for plant conditions to stabilize (≥30 min). Systems which do not affect vessel level and pressure may be manually started and operated, as necessary.

The following test is performed:

Action	Test Conditions
After transferring auxiliary loads to the unit auxiliary transformer and starting main turbine dc oil pump, use the trip relay [or turbine manual trip mechanism] to trip the main [turbine] generator. (SUT-33, Action Item 1, can be done in conjunction with this test.)	a. At TC-2. b. Recirculation system in POS mode. All other systems in NORM mode.

FSAR

TABLE 14.2-241 (Cont)

Acceptance Criteria

Level 1:

1. Operating transients: Level 1 limits on piping displacements are prescribed in GE Test Specification No. 23A4138. These limits are based on keeping the loads on piping and suspension components within safe limits. If any one of the transducers indicates that these movements have been exceeded, the test is placed on hold.

2. Operating vibration: Level 1 limits on piping displacement are prescribed in GE Test Specification No. 23A4138. These limits are based upon keeping piping 22 stresses and pipe mounted equipment accelerations within safe limits. If any one of the transducers indicates that the prescribed limits are exceeded, the test is placed on hold.

Level 2:

1. Operating transients: Transducers have been placed near points of maximum anticipated movement. Where movement values have been predicted, tolerances are prescribed for differences between measurements and predictions. Tolerances are based on instrument accuracy amd suspension free play. Where no movements have been predicted, limits on displacement have been prescribed. GE Test Specification No. 23A4138 tabulates allowable movements or movement tolerances for each transducer.

2. Operating vibration: Acceptable levels of operating vibration are prescribed in GE Test Specification No. 23A4138. The limits have been set based on consideration of analysis, operating experience, and protection of pipe mounted components.

FSAR

TABLE 14.2-243

REACTOR WATER CLEANUP SYSTEM

Startup Test (SUT-70)

Test Objective

To demonstrate specific aspects of the mechanical ability of the RWCU. (This test, performed at rated reactor pressure and temperature, is actually the completion of the preoperational testing that could not be done without nuclear heating.)

Prerequisites

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

Test Procedure

With the reactor at rated temperature and pressure, process variables are recorded during steady-state operation in three modes as defined by the system process diagram: hot standby, normal, and blowdown. A comparison of the bottom head flow indicator and the RWCU inlet flow indicator is made during these modes. The RWCU system sample station is tested at hot process conditions as part of SUT 1. 22

The following test is performed:

Action	Test Conditions
~~Make heat balance and pressure data~~ Record process data	a. Reactor at rated temperature and pressure during heatup. b. Cleanup system operate in hot standby, normal, and blowdown modes.

Acceptance Criteria

Level 1:

Not applicable.

FSAR

TABLE 14.2-243 (Cont)

Level 2:

1. The temperature at the tube side of the nonregenerative heat exchangers does not exceed 130°F in the blowdown mode or 120°F in the normal mode.

2. The pump available NPSH at least 13 ft during the hot standby mode is as defined in the process diagrams. *

3. The cooling water supplied to the nonregenerative heat exchangers shall be less than 6 percent above the flow corresponding to the heat exchanger capacity (as determined from the process diagram). [illegible] The outlet temperature shall not exceed 180°F.

22 4. Recalibrate bottom head flow indicator against RWCU flow indicator if the deviation is greater than 25 gpm.

22 5. Pump vibration shall be less than or equal to 2 mils peak-to-peak (in any direction) as measured on the bearing housing, and 2 mils peak-to-peak shaft vibration as measured on the coupling end.

ADD

* If measurements and calculations made during the system preoperational test show that NPSH requirements for this mode can be met, then this requirement need not be addressed during startup testing.

FSAR

TABLE 14.2-244

RESIDUAL HEAT REMOVAL SYSTEM

Startup Test (SUT-71)

Test Objective

To demonstrate the ability of the RHR system to:

1. Remove heat from the reactor system so that the refueling and nuclear system servicing can be performed.
2. Condense steam from the reactor. ~~while the reactor is isolated from the main condenser~~

Prerequisites

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

Test Procedure

With the reactor at a convenient thermal power, the steam condensing mode of the RHR system is tuned and demonstrated. Condensing heat exchanger performance characteristics are demonstrated. ~~[illegible]~~ During the first suitable reactor cooldown, the shutdown cooling mode of the RHR system is demonstrated. Unfortunately, the decay heat load is insignificant during the startup test period. Use of this mode with low core exposure could result in exceeding the 100°F/hr cooldown rate of the vessel if both RHR heat exchangers are used simultaneously. Late in the test program after accumulating significant core exposure, this demonstration would more adequately demonstrate the heat exchanger capacity. The RHR heat exchangers will also be tested in the suppression pool cooling mode. | 22

The following tests are performed:

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TABLE 14.2-244 (Cont)

Action	Test Conditions
1. Controller adjustment based on subsystem perturbations	a. Reactor not isolated above 10% rated power but ≤25% rated power. b. RHR system in steam condensing mode. c. RCIC flow to CST/ or RPV
~~2. Demonstration of steam condensing mode~~	~~a. Reactor at hot standby and isolated.~~ ~~b. RCIC flow to RPV~~
2. Take heat exchanger capacity data.	a. RHR in shutdown cooling mode. b. After trip or cooldown from TC-6 or during the first shutdown after the test program in order to provide sufficient decay heat. c. RHR in suppression pool cooling mode.

Acceptance Criteria

Level 1:

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

Level 2:

1. The RHR system must be capable of operating in the steam condensing, suppression pool cooling, and shutdown cooling modes (with one or both heat exchangers) at heat removal rates equivalent to or greater than the values indicated on the process diagrams.

2. 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.

For the steam condensing mode, a steam condensing rate equivelent to or greater than the one derived from the process diagram with the temperature of the heat exchanger discharge less than 140°F can be considered to satisfy this Level 2 criterion.

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TABLE 14.2-245 (Cont)

range, it will be inspected closely in this range for correct initial operation.

A. 5. Recombiner Feed - A hydrogen concentration measurement of the off-gas flow is taken downstream of the recombiner condenser. This concentration must be less than .5% by volume to ensure that the hydrogen concentration entering the recombiner is less than 4% by volume.

6. Radionuclide residence times - Provided that reasonable and sufficient fission gasses are present in the off-gas, measurements will be made of at least one radionuclide to determine the decontamination factor(s) across one or several charcoal beds.

7. HEPA filters - If sufficient particulate fission gas daughter products are present, measurements of decontamination factors across the filters will be made. This is to confirm that the filters are operating properly during normal operating conditions.

8. Radiolytic gas production - Calculate the radiolytic gas production rate based on recombiner differential temperatures and verify that the production rate is within the design value.

9. Freeze-out dryer performance - Monitor the effluent dewpoint of the freeze-out dryer during its operating cycles to verify that discharge limits are met.

B 10. The test data will then be provided to the appropriate engineering personnel for evaluation to verify that the system will perform adequately under design conditions.

Acceptance Criteria

Level 1:

The release of radioactive gaseous and particulate effluents must not exceed the limits specified in the site technical specifications.

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TABLE 14.2-302

ESF AREA COOLING

Startup Test (SUT-76)

Test Objective

The purpose of this test is to verify that the unit coolers serving the RCIC, RHR, LPCS, HPCS, SGTS, service water, and diesel generator equipment rooms can maintain the equipment room temperature below the maximum design limits under postulated accident conditions.

Prerequisites

The appropriate preoperational tests have been completed. The SORC has reviewed and approved the test procedures and the initiation of testing. Instrumentation has been checked and calibrated as appropriate. The service water system is operational to the extent required to conduct the test.

Test Procedure 22

The ESF areas listed above will be isolated from the normal ventilation system and major equipment in the area will be run in the mode providing the maximum practical heat load. Numerous temperature measurements will be made in the area. Adequate temperature and flow data will be collected to perform a heat balance across the area coolers under test conditions. ~~The test data will then be provided to appropriate engineering personnel for evaluation to verify the system will perform adequately under design basis conditions.~~

Acceptance Criteria

Level 1:

All ESF area air space temperatures measured shall not exceed the design limits specified in Table 9.4-1.

Level 2:

Evaluation of test data shall demonstrate that all ESF area air space temperatures will remain below the design limits in Table 9.4-1 under design basis conditions.

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TABLE 14.2-306

EMERGENCY RECIRCULATION VENTILATION

Startup Test (SUT-80)

Test Objective

To verify that the emergency recirculation ventilation system can maintain the required reactor building area temperatures below the maximum design limits under postulated accident conditions.

Prerequisites

The appropriate preoperational tests have been completed. The SORC has reviewed and approved the test procedures and the initiation of testing. Instrumentation has been checked and calibrated as appropriate. The service water system is operable to the extent required to conduct the test.

Test Procedure 22

and The normal reactor building HVAC system will be shut down during power operation. The standby gas treatment and emergency recirculation systems will be placed in operation. Temperature measurements will be made in various areas of the reactor building. Adequate temperature and flow data will be collected to perform a heat balance across the emergency recirculation coolers under the test conditions. ~~The test data will then be provided to appropriate engineering personnel for evaluation to verify adequate system performance under design basis conditions.~~

Acceptance Criteria

Level 1

All critical reactor building area temperatures measured shall not exceed the design limits specified in Table 9.4-1.

Level 2

Evaluation of test data shall demonstrate that critical reactor building area temperatures will remain below the design limit in Table 9.4-1 under design basis conditions.

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TABLE 14.2-301

DRYWELL COOLING SYSTEM

Startup Test (SUT-75)

Test Objective

To demonstrate the capability of the drywell cooling system to maintain peak and average drywell temperatures within the maximum design limits during power operation at rated temperature and pressure.

Prerequisites

The appropriate preoperational tests have been completed. The SORC has reviewed and approved the test procedures and the initiation of testing. Instrumentation has been checked and calibrated as appropriate. The service water and closed loop cooling systems are operational to the extent required to conduct the test.

Test Procedure

The following data will be recorded and evaluated at the test conditions listed.

Action	Test Conditions
1. Record temperature and flow data to perform a heat balance across the coolers, check average space temperature, and check suspected hot spot temperatures.	a. During heatup to rated temperature and pressure, TC-2 and TC-6.
2. Check suspected hot spot temperatures as well as average space temperature, during both normal and post-scram conditions.	a. TC-2 and TC-6.

Acceptance Criteria

Level 1:

1. Drywell average air space temperature shall not exceed the limit specified in plant technical specifications.

Level 2:

The maximum temperature measured in any area of the Drywell shall not exceed the design limits specified in Table 9.4-1.

2. Reactor pressure vessel skirt area temperature shall not be less than the minimum design value specified in Table 9.4-1 and shall be greater than 100°F with the vessel exterior surface temperature at normal operating conditions (528°F – 544°F).

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TABLE 14.2-307

DRYWELL HIGH ENERGY PENETRATIONS

Startup Test (SUT-81)

Test Objective

The purpose of this test is to demonstrate the capability of the drywell high energy penetrations to maintain the surrounding concrete below design temperature limits.

Prerequisites

The SORC has reviewed and approved the test procedure and the initiating of testing. Instrumentation has been checked and calibrated as appropriate.

Test Procedure

Selected thermally hot high energy penetrations to the primary containment will be tested at various power levels during plant startup while at steady-state conditions:

1. Temperature - Monitor the thermal rise of the process piping, flued head, and the liner insert sleeve.

2. The data will then be compared to values predicted for normal operation or for design conditions as required. to verify compliance with the acceptance criteria.

Acceptance Criteria

Level 1:

1. The temperatures measured four inches from the containment wall / penetration outer collar on the wall insert sleeve shall not exceed the values predicted to cause surrounding concrete temperatures to exceed 200°F.

Level 2: Deleted

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3.9.2.1.2A Preoperational Vibration Testing

Safety-related piping systems designated as Safety Class 1, 2, or 3 are designed in accordance with ASME Section III. Each system is designed to withstand dynamic loadings from operational transient conditions that are encountered during expected service as required by Paragraphs NB-3622, NC-3622, and ND-3622 of the ASME code.

During the preoperational test program, vibration testing is performed on the following systems: | 19

1. Reactor recirculation system.*
2. Residual heat removal (RHR) system.
3. High pressure core spray (HPCS) system.
4. Low pressure core spray (LPCS) system.
5. Reactor core isolation cooling (RCIC) system.*
6. Feedwater system.
7. Main steam system.*
8. Condensate system.*
9. Other piping systems that have exhibited significant vibration response based upon past operating experiences with similar systems or similar system operating conditions. These additional systems will be identified in the test program.
10. See Section 3.9.2.1B for additional GE-supplied systems.

Vibration measurements are conducted for steady-state and transient conditions such as pump starts and valve operation. Also, visual inspections to determine vibration response, are performed with emphasis placed on vents, drains, and branch piping.

3.9.2.1.3A Preoperational Thermal Expansion Testing

Preoperational tests for BWRs are conducted at near ambient conditions; therefore, thermal expansion testing during the preoperational test phase is very limited. For the systems

* Testing on these systems is accomplished during the Startup Test phase as described in Table 14.2-303

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TABLE 14.2-303 (Cont)

Action	Test Conditions
9. Record vibration of main steam instrumentation lines.	a. In conjunction with MSIV closure (SUT-25 at TC-6).
10. Record vibration of selected nitrogen system lines.	a. In conjunction with containment inerting.

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