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June 21, 1988

Mr. Richard J. Clark
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Division of Reactor Projects I/II
US Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, D.C. 20555

Subject: Limerick Generating Station, Unit 2
Power Ascension Test Program

Docket No.: 50-353

File: GOVT 1-1 (NRC)

Enclosure: LGS-2 Power Ascension Test Program Changes

Dear Mr. Clark:

On September 8, 1987, we presented our proposed Power Ascension Test Program to Region I at their offices in King of Prussia. On November 18, 1987, we presented our program to the NRR in Bethesda, Maryland. At our November meeting with you, we indicated that we would submit a package consisting of the FSAR changes required to implement our accelerated test program and technical justifications for these changes.

We have finalized our program and the following tests require FSAR changes:

STP-3	Fuel Loading
STP-5	CRD System/Hot Friction Testing
STP-16	Selected Process Temperatures
STP-22	Pressure Regulator
STP-27	Turbine Trip and Generator Load Rejection
STP-30	Recirculation System Cavitation

In addition, STP-3 will require Technical Specification fuel loading provisions different from those in place for Unit 1.

The attached package consists of writeups describing and justifying each test simplification. A markup of the applicable changes to the FSAR and the Technical Specification change described above are included with each writeup. The FSAR changes will be reflected in FSAR Revision 52 to be submitted in June 1988. The Technical Specification

A001
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change will be included in PECo's submittal of the Limerick 2 proposed Technical Specifications.

Should any additional information be required, please do not hesitate to contact us.

Very truly yours,

John S. Kemper

John S. Kemper

tj/sw/05118801

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STARTUP TEST 3 - FUEL LOADING
TEST SIMPLIFICATION - ELIMINATE FUEL LOADING CHAMBERS

OBJECTIVE:

Regulatory Guide 1.68 (Revision 2, August 1978), Appendix A, paragraph 2, establishes guidelines for initial fuel loading to prevent inadvertent criticality. Requirements for continuous monitoring of the neutron flux throughout the core loading must be established. In addition, paragraph 2.a indicates that the shutdown margin should be verified for a partially and fully loaded core. Startup Test 3, Fuel Loading, provides the procedures to load fuel safely and efficiently to the full core size, and includes subcriticality checks, shutdown margin verification (including Startup Test 4 - Full Core Shutdown Margin) and control rod functional testing (in conjunction with Startup Test 5 - Control Rod Drive).

Historically, Fuel Loading Chambers (FLC's) have been used to measure the neutron count rate during initial fuel loading because of their high sensitivity and ability to be moved near initial fuel loading and neutron sources. It is proposed to simplify the fuel loading procedure by replacing the FLC's with the Source Range Monitor (SRM) instrumentation. In addition, the startup sources will be positioned in their alternate locations (to be closer to the SRM detectors) and the fuel loading sequence will be modified such that initial fuel loading will begin between an SRM detector and a neutron source. Fuel loading will continue in a spiral pattern around the initial SRM until the core is fully loaded.

DISCUSSION:

Requirements during fuel loading are established to preclude inadvertent criticality. A thorough pre-fuel loading checklist is performed to verify that all systems required during fuel loading are operable. Prior to fuel loading, all control rods are verified to be fully inserted and remain fully inserted throughout the proposed fuel loading, except during the functional/subcritical checks and the partial core shutdown margin test at which time rod movement is controlled by strict procedural requirements and refueling interlocks which prevent the withdrawal of more than one control rod at a time. No control rod movement will be performed until the minimum count rate is achieved on at least one SRM.

Predictions of the core reactivity and shutdown margin are prepared in advance for Limerick Generating Station Unit 2 fuel design to support the safe fuel loading under subcritical conditions. These predictions will be performed with core physics calculation methods that have been extensively qualified and have been demonstrated to be highly accurate for criticality predictions based on tests/experiments, Monte Carlo benchmark calculations and Shutdown Margin (SDM) demonstration tests for initial and reload cores (Reference 1).

In addition, rigorous Quality Assurance (QA) programs during fuel design and fuel and control blade manufacturing ensure that the fuel and control blades are manufactured as specified. These QA programs (described in Reference 2) apply quality system elements necessary to provide assurance that systems and components meet the quality requirements of applicable codes, standards and regulatory agency requirements. General Electric's QA program has been reviewed by the NRC and found to comply with all applicable requirements of Appendix B to 10CFR50 (Reference 3). As a result, these pre-fuel loading precautions and measures provide significant assurances against inadvertent criticality during initial fuel loading.

For the proposed fuel loading procedure, the fuel will be initially loaded between a source at its alternate location and the closest SRM. Figure 1 shows the proposed fuel loading sequence. Because of the fixed location of the SRM's and the distance from the sources, the SRM count rate will initially be less than 0.7 counts per second (cps), the LGS-

1 Technical Specification minimum SRM count rate. As fuel is loaded, neutronic coupling between the source and detector will occur and the count rate will increase. The estimated minimum SRM count rate with 16 bundles loaded as a function of the source strength has been determined based on past BWR startup test results from seven plants using FLC's and three recent startups using SRM's only. Startups using SRMs have shown much greater than 3 cps with 16 bundles loaded. Similar performance is expected during fuel loading at Limerick Generating Station Unit 2. Nevertheless, a change from the LGS-1 Technical Specification requirement for a minimum count rate (0.7 cps) during the loading of the initial 16 bundles is required. Since the SRM system is not safety related and no credit is taken for the SRM's in the safety analysis for these conditions (Reference 4, paragraph 15.9.6.2.3.3), this change will not adversely affect any safety systems or the safe operation of the plant.

To further support this change, a core reactivity calculation was performed for the initial 16 bundles loaded to demonstrate that even with all of the control rods withdrawn, the partial loading would remain subcritical with significant margin. A two dimensional (conservatively neglecting axial leakage) 16 bundle analysis was performed using a neutron transport Monte Carlo code. The fuel bundle types and loading configuration of the 16 bundles were based on the proposed fuel loading procedure for Figure 1. For a moderator temperature of 20°C, the resulting effective neutron multiplication factor was 0.9[illegible].003 (one standard deviation) which includes the model critical benchmark bias for use with the ENDF/B-IV cross section data. This analysis demonstrates that the initial 16 bundle loading will remain subcritical by 2.7% Δk even if the control rods are withdrawn, thus further assuring that the SRM monitoring requirements can be changed during this portion of the fuel loading procedure. Similar changes of SRM monitoring requirements during fuel loading have been approved by the NRC for several reload licenses (References 5, 6, and 7) and three recent initial core loadings (References 8, 9, and 10).

After the initial 16 bundles are loaded and an SRM is on scale, the fuel loading will continue in a spiral fashion as shown in Figure 1. Since only one SRM will initially be on scale, a portable source will be used to periodically demonstrate operability of the SRM's located in areas with no fuel. One of the SRM's will be required to maintain continuous visual indication in the control room until other SRM's are on scale. Use of a portable source to demonstrate operability of the remaining SRM's has previously been approved by the NRC for other plants (References 5, 7, 8, 9, and 10). The portable source is widely used in the nuclear industry as a bugging source for detector calibration and is an easy device to operate with no complex or unsafe maneuvers required.

When 144 fuel bundles have been loaded (Step 36 in Figure 1), two SRM's will be surrounded by fuel and indicating greater than 0.7 cps. At this time, a partial core shutdown margin test will be performed as required by Regulatory Guide 1.68. The partial core configuration (fuel bundle types) for this off-center loading is almost identical to the partial core configuration resulting from a standard center spiral loading. Core physics calculations for the off-center partial SDM test will be performed for the proposed fuel loading sequence. After the partial core SDM test, the remaining fuel will be loaded based on the sequence shown in Figure 1 until the core is fully loaded. During this portion of the fuel loading, at least two SRM's will be operable, with at least one providing continuous visual indication in the control room. SRM's not surrounded by fuel will be periodically checked for operability using the portable source. Once the core is fully loaded, the full core SDM test will be performed using the standard procedures. Attachment 1 provides a summary of the major fuel loading steps.

Currently, LGS-1 Technical Specifications require that at least two SRM's are operable and continuously visible in the control room. The SRM's are required to be located in the quadrant where fuel loading occurs and in an adjacent quadrant. For the proposed fuel loading procedure, a Special Test Exception (3/4.10.7, Special Instrumentation - Initial Core Loading) is required for the proposed LGS-2 Technical Specifications to incorporate the changes to the flux monitoring requirements (Attachment 2). Initially, continuous visual indication and minimum count rate requirements for the SRM's are changed for the first 16 fuel bundles loaded since the core will be subcritical even with all control rods withdrawn. Thereafter, two SRM's, one in the quadrant where fuel loading is taking place and one in an adjacent quadrant, will still be required to be operable, but one will be allowed to be demonstrated operable by using a portable neutron source. This operability check will be periodically performed for those SRM's located in areas with no fuel loaded. As stated before, this method of demonstrating SRM operability has been previously approved for other BWRs (Reference 5, 7, 8, 9, and 10).

The SRM system is not safety related and no credit is taken for the SRM's under these conditions (fuel loading with control rods inserted, i.e. core subcritical) in the safety analysis of accidental positive reactivity insertions. The SRM's provide indication of neutron flux changes as a matter of good practice during fuel loading and thus no safety requirements exist for an SRM detector. Therefore, continuous visual indication of only one SRM does not adversely affect any safety systems or the safe operation of the plant since the core will be subcritical during fuel loading and at least two SRM's will be demonstrated operable prior to and during fuel loading.

CONCLUSION:

By locating the startup neutron sources in alternate positions and modifying the fuel loading sequence, the SRM's will be capable of providing continuous monitoring of the neutron flux throughout the loaded core after the minimum count rate is initially achieved. Monitoring requirements during loading of the initial fuel bundles (up to 16 bundles) can be changed because even with all of the control rods withdrawn, this configuration would be subcritical because of the high neutron leakage. Pre-fuel load activities ensure that systems required for fuel loading are operable, control rods are inserted during the fuel loading except during special controlled tests and core reactivity predictions aid in the evaluation of the measured responses during fuel loading. Together, these procedures and precautions provide assurance against inadvertent criticality. Since the safety analysis does not require a minimum count rate on the SRM system under these conditions, the proposed change in the fuel loading procedure will not adversely affect any safety system or safe operation of the plant. Startup Test 3, Fuel Loading, can therefore be simplified by replacing the Fuel Loading Chambers with SRM's and using an off-center spiral loading sequence.

STARTUP TEST 3 - FUEL LOADING
TEST SIMPLIFICATION - ELIMINATE FUEL LOADING CHAMBERS

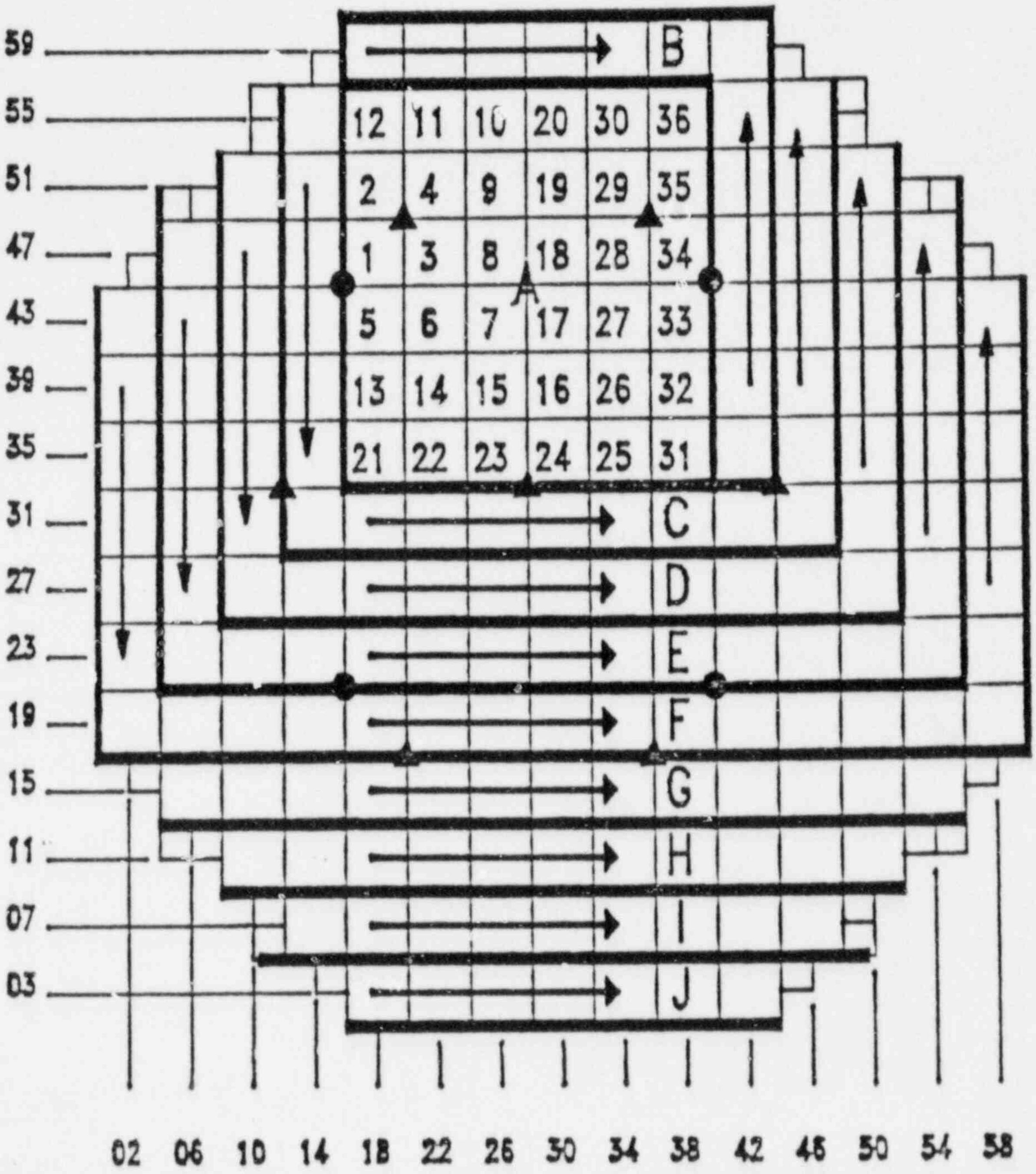
REFERENCES:

1. "Steady State Nuclear Methods", General Electric Company Licensing Topical Report, May 1985 (NEDO-30130A).
2. "Nuclear Energy Business Operation Quality Assurance Program Description," General Electric Company, March 1985 (NEDO-11209, Revision 5).
3. Letter, G.G. Zech (NRC) to J.M. Case (GE), "NRC Acceptance of Revised General Electric Quality Assurance Topical Report," April 19, 1985.
4. LGS-2 Final Safety Analysis Report (FSAR), Chapter 15.
5. Amendment No. 27 to Facility Operating License No. DPR-63, Niagara Mohawk Power Co., Nine Mile Point Station Unit No. 1, Docket No. 50-220, March 2, 1979.
6. Amendment No. 66 to Facility Operating License No. DPR-57, Georgia Power Co. et. al., Edwin I. Hatch Nuclear Station Unit No. 1, Docket No. 50-321, June 12, 1979.
7. Amendment No. 5 to Facility Operating License No. NPF-29, Grand Gulf Nuclear Station Unit No. 1, Docket No. 50-416, October 12, 1985.
8. Hope Creek Power Ascension Program, Test No. 3 Elimination of Fuel Loading Chambers During Fuel Loading, NRC SER, Docket No. 50-354, January 1986.
9. Clinton Power Station, Proposed Changes to Power Ascension Program, Test No. 3, Fuel Loading, NRC SER, Docket No. 50-461, April 1986.
10. Technical Specification Nine Mile Point Nuclear Station Unit 2 Docket No. 50-410, Appendix "A" to License No. NPF-69.

ATTACHMENTS:

1. Summary of Major Fuel Loading Steps
2. Technical Specification Change - Special Test Exception 3/4.10.7

Figure 1 - Proposed Fuel Loading Sequence



▲ = Alternate Source Locations

● = SRM Detectors

(Note: Letters denote fuel loading regions)

Attachment 1 - Summary of Major Fuel Loading Steps

1. Prerequisites

   a. Neutron sources have been loaded into the alternate sou ce locations and blade guides have been properly oriented.

   b. Nuclear instrumentation (SRM's and IRM's) has been installed and activated in the design configuration.

   c. The "shorting links" have been removed from the Reactor Protection System (RPS) and the non-coincident scram setpoints have been set.

   d. All control rods are fully inserted and have been functionally tested within approximately two weeks prior to the start of fuel loading and have been scram tested within approximately six weeks prior to fuel loading.

   e. Fuel support castings are installed and locations verified to assure proper orificing.

   f. The operability of the SRM's has been verified.

   g. All other systems required to be operable by Technical Specifications shall be determined to be operable.

   h. The reactor mode switch is locked in the REFUEL mode during fuel loading.

Attachment 1 - Summary of Major Fuel Loading Steps (cont'd)

2. Procedure

   a. Begin fuel loading following the steps shown in Figure A-1. (Off-center loading).

   b. Fuel loading begins at cell location 18,47 and continues until the first 16 bundles have been loaded (Steps 1-4, Figure A-1).

   c. Perform SRM operability check for SRM adjacent to the initial 16 bundles (16,45). Perform channel checks for other SRMs according to Technical Specification requirements. A portable source is to be used for this purpose when an SRM is not surrounded by fuel.

   d. Continue fuel loading according to Figure A-1 until Region A is completely loaded (144 bundles). During the process of fuel loading, SRM(s) count rate should be recorded. This is used to generate 1/M plots. Perform control rod functional tests and subcritical tests when the minimum SRM count rate is achieved on at least one SRM channel.

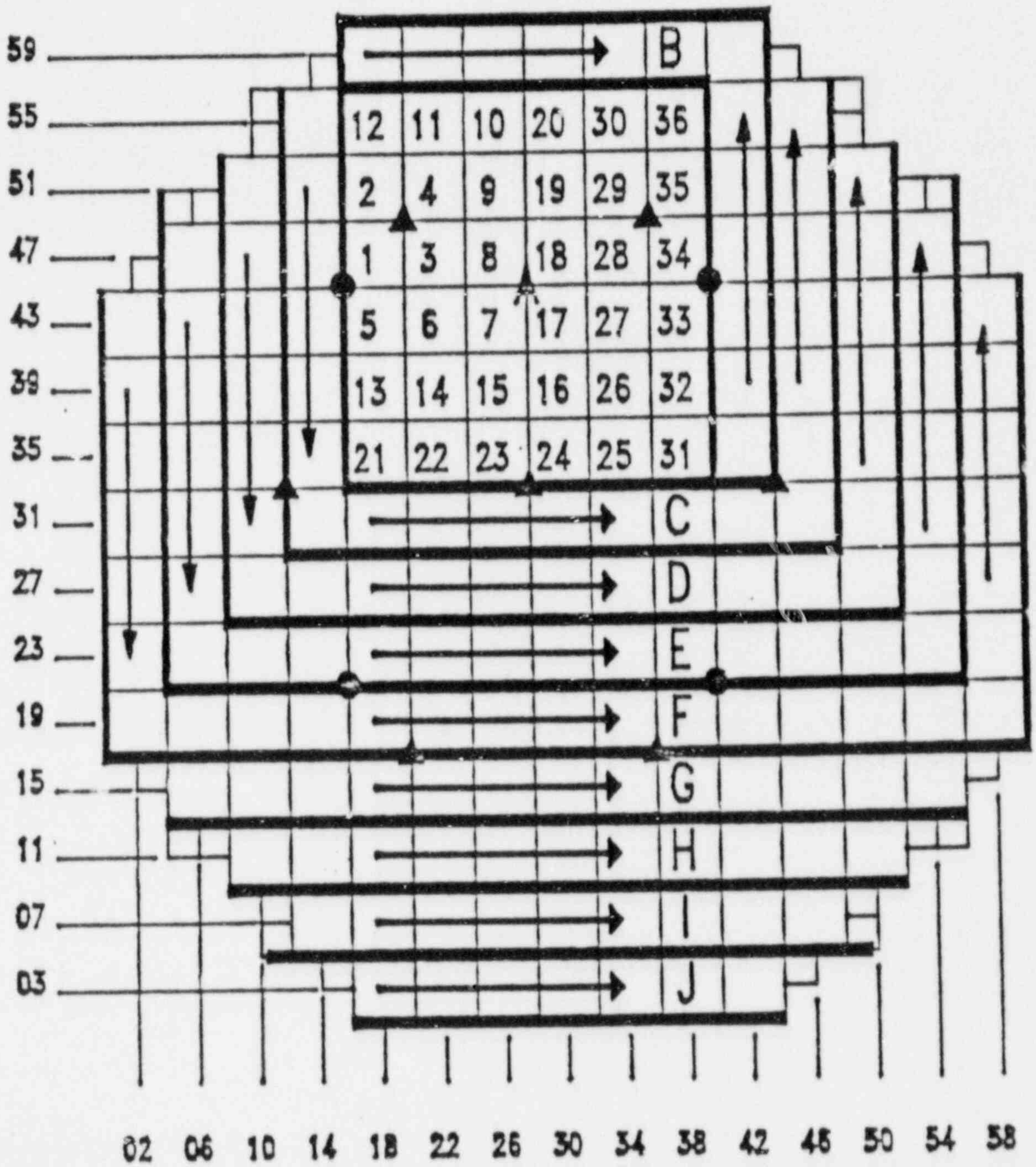
   e. Perform the partial core shutdown margin test after 144 bundles are loaded (Region A, Figure A-1). Core physics calculations will be performed to support this test.

   f. Continue fuel loading in Region B. The loading is continued according to sequential order of regions (Figure A-1) until the core is fully loaded.

   g. As soon as each SRM is on scale (0.7 cps or higher) during loading, SRM calibration is performed and documented.

STARTUP TEST 3 - FUEL LOADING
TEST SIMPLIFICATION - ELIMINATE FUEL LOADING CHAMBERS

Figure A-1 - Proposed Fuel Loading Sequence



▲ = Alternate Source Locations

● = SRM Detectors

(Note: Letters denote fuel loading regions)

ATTACHMENT 2
TECH SPEC CHANGE

3/4.9.2 INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.9.2 At least two source range monitor (SRM) channels* shall be OPERABLE and inserted to the normal operating level with:

a. Continuous visual indication in the control room,

b. At least one with audible alarm in the control room,

c. One of the required SRM detectors located in the quadrant where CORE ALTERATIONS are being performed and the other required SRM detector located in an adjacent quadrant, and

d. Unless adequate shutdown margin has been demonstrated, the shorting links shall be removed from the RPS circuitry prior to and during the time any control rod is withdrawn.**

APPLICABILITY: OPERATIONAL CONDITION 5.***

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS and insert all insertable control rods.

SURVEILLANCE REQUIREMENTS

4.9.2 Each of the above required SRM channels shall be demonstrated OPERABLE by:

a. At least once per 12 hours:

1. Performance of a CHANNEL CHECK,
2. Verifying the detectors are inserted to the normal operating level, and
3. During CORE ALTERATIONS, verifying that the detector of an OPERABLE SRM channel is located in the core quadrant where CORE ALTERATIONS are being performed and another is located in an adjacent quadrant.

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*These channels are not required when sixteen or fewer fuel assemblies, adjacent to the SRMs, are in the core. The use of special movable detectors during CORE ALTERATIONS in place of the normal SRM nuclear detectors is permissible as long as these special detectors are connected to the normal SRM circuits.

**Not required for control rods removed per Specification 3.9.10.1 or 3.9.10.2.

*** See Special Test Exception 3.10.7.

SPECIAL TEST EXCEPTIONS

3/4.10.7 SPECIAL INSTRUMENTATION - INITIAL CORE LOADING

LIMITING CONDITION FOR OPERATION

3.10.7 During initial core loading within the Startup Test Program the provisions of Specification 3.9.2 may be suspended provided that at least two source range monitor (SRM) channels with detectors inserted to the normal operating level are OPERABLE with:

a. One of the required SRM channels continuously indicating* in the control room,

b. One of the required SRM detectors located in the quadrant where CORE ALTERATIONS are being performed and the other required SRM detector located in an adjacent quadrant,**

c. The RPS "shorting links" shall be removed prior to and during fuel loading,

c. The reactor mode switch is OPERABLE and locked in the REFUEL position.

APPLICABILITY: OPERATIONAL CONDITION 5

ACTION

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS and insert all insertable control rods.

SURVEILLANCE REQUIREMENTS

4.10.7 Each of the above required SRM channels shall be demonstrated OPERABLE by:

a. Within 1 hour prior to and at least once per 12 hours during CORE ALTERATIONS:

1. Performance of a CHANNEL CHECK***

2. Confirming that the above required SRM detectors are at the normal operating level and located in the quadrants required by Specification 3.10.7.

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*Up to 16 fuel bundles may be loaded without a visual indication of count rate.

**The use of special movable detectors during CORE ALTERATIONS in place of the normal SRM nuclear detectors is permissible as long as these special detectors are connected to the normal SRM circuits.

***Check may be performed by use of movable neutron source.

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SURVEILLANCE REQUIREMENTS (Continued)

4.10.7. (Continued)

3. The RPS "shorting links" are removed.

4. The reactor mode switch is locked in the REFUEL position.

b. Performance of a CHANNEL FUNCTIONAL TEST within 24 hours prior to the start and at least once per 7 days during CORE ALTERATIONS.

c. Verifying for at least one SRM channel that the count rate is at least 0.7 cps*:

1. Immediately following the loading of the first 16 fuel bundles.

2. At least once per 12 hours thereafter during CORE ALTERATIONS.

*Provided signal-to-noise is ≥ 2. Otherwise, 3 cps.

3/4.10.1 PRIMARY CONTAINMENT INTEGRITY

The requirement for PRIMARY CONTAINMENT INTEGRITY is not applicable during the period when open vessel tests are being performed during the low power PHYSICS TESTS.

3/4.10.2 ROD SEQUENCE CONTROL SYSTEM

In order to perform the tests required in the technical specifications it is necessary to bypass the sequence restraints on control rod movement. The additional surveillance requirments ensure that the specifications on heat generation rates and shutdown margin requirements are not exceeded during the period when these tests are being performed and that individual rod worths do not exceed the values assumed in the safety analysis.

3/4.10.3 SHUTDOWN MARGIN DEMONSTRATIONS

Performance of shutdown margin demonstrations with the vessel head removed requires additional restrictions in order to ensure that criticality does not occur. These additional restrictions are specified in this LCO.

3/4.10.4 RECIRCULATION LOOPS

This special test exception permits reactor criticality under no flow conditions and is required to perform certain startup and PHYSICS TESTS while at low THERMAL POWER levels.

3/4.10.5 OXYGEN CONCENTRATION

Relief from the oxygen concentration specifications is necessary in order to provide access to the primary containment during the initial startup and testing phase of operation. Without this access the startup and test program could be restricted and delayed.

3/4.10.6 TRAINING STARTUPS

This special test exception permits training startups to be performed with the reactor vessel depressurized at low THERMAL POWER and temperature while controlling RCS temperature with one RHR subsystem aligned in the shutdown cooling mode in order to minimize contaminated water discharge to the radioactive waste disposal system.

3/4.10.7 SPECIAL INSTRUMENTATION - INITIAL CORE LOADING

This special test exception permits relief from the requirements for a minimum count rate while loading the first 16 fuel bundles to allow sufficient source-to-detector coupling such that minimum count rate can be achieved on an SRM. This is acceptable because of the significant margin to criticality while loading the initial 16 fuel bundles.

activity buildup and shielding adequacy; and to monitor radiation at selected power levels to ensure the protection of personnel, and continuous compliance with the guideline standards of 10 Code of Federal Regulations (CFR) Part 20 during plant operation.

Prerequisites - A survey of natural background radiation is made at selected locations throughout the plant site.

Test Method - Subsequent to fuel loading, during reactor heatup, and at various selected power levels, gamma radiation level measurements and, where appropriate, neutron dose rate measurements are made at significant locations throughout the plant site. Potentially high radiation areas are surveyed.

Acceptance Criteria - Plant radiation doses and personnel occupancy times are controlled within allowable limits as defined in 10 CFR Part 20.

(STP-3) Fuel Loading (Formerly SUT-3)

Test Objective - The test objective is to load fuel safely and efficiently to the full core size.

Prerequisites - The preoperational test program test results have been reviewed and approved, and a Nuclear Regulatory Commission (NRC) license has been issued to Philadelphia Electric Company (PECo). A neutron source is installed near the center of the core. At least three neutron detectors, calibrated and connected in a non-coincident mode to high flux scram trips, are located to produce acceptable signals during loading. Final testing of this reactor protection system and final reactor coolant leak rate testing have been completed.

Test Method - The fuel loading procedure includes the loading sequence, pattern, and records for logging, a running inventory of fuel status, control rod checks, minimum shutdown checks, neutron monitoring, subcritical multiplication behavior, communication requirements, safety requirements, emergency procedures, and additional checks to be performed during fuel loading.

For Unit 1, ~~F~~fuel loading begins at the center of the core and proceeds radially to the fully loaded configuration. During the loading of each cell, two fuel assemblies will be loaded in the location not occupied by the blade guide. The blade guide will be removed, and loading of the cell will be completed. A functional check to verify the operability of the control rod and drive will be performed on each cell after the cell is loaded. This functional check may also serve as a subcritical check to verify that the next cell may be safely loaded.

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Acceptance Criteria - The core is fully loaded in accordance with established procedures, and the core is subcritical.

(STP-4) Full Core Shutdown Margin (Formerly SUT-4)

Test Objective - The test objective is to demonstrate that the reactor is sufficiently subcritical throughout the first fuel cycle, with any single control rod fully withdrawn.

Prerequisites - The core is fully loaded; the subcritical checks are completed; and the source range monitors (SRMs) and intermediate-range monitors (IRMs) are installed in the vessel and connected in a non-coincident mode, to scram at a high neutron level. The rod worth minimizer and rod sequence control system are operational.

Test Method - The shutdown margin test is performed by fully withdrawing a series of previously selected rods until criticality is reached. The empirical data are analyzed and compared with calculated data to determine the test results.

Acceptance Criteria - The basic criterion for reactivity control is that the core, in its maximum reactivity state at any time in the cycle, be sufficiently subcritical, with the strongest rod withdrawn, and all other rods fully inserted. Satisfactory completion of the shutdown margin test ensures, at the time of fuel loading, that this criterion has been met.

(STP-5) Control Rod Drive (CRD) System (Formerly SUT-5)

Test Objectives - The test objectives are to demonstrate that the CRD system operates over the full range of primary coolant temperatures and pressures, from ambient to operating, and to determine the initial operating characteristics of the entire CRD system.

Prerequisites - The process computer, scram time recorder, or equivalent recording equipment is online and available to monitor events; the CRD electrical and hydraulic system preoperational testing is completed satisfactorily; and the vessel water level is always above the upper core grid during all CRD movements. The reactor protection system preoperational test is completed, and the scram pilot valves are ready for energization.

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For Unit 2, fuel loading will begin off-center so that loading can begin between an SRM and the closest source, and will continue in a spiral pattern to the full loaded configuration. During the loading of each cell, two fuel assemblies will be loaded in the location not occupied by the blade guide. The blade guide will be removed, and loading of the cell will be completed. A functional check to verify the operability of the control rod and drive will be performed on each cell after the cell is loaded. This functional check may also serve as a subcritical check to verify that the next cell may be safely loaded. Subcritical checks are not required for the first 16 fuel bundles loaded since an analysis has been performed which indicates that the first 16 fuel bundles loaded cannot establish a critical geometry.

STARTUP TEST 5 - CONTROL ROD DRIVE SYSTEM/HOT FRICTION TESTING
TEST SIMPLIFICATION - REDUCED NUMBER OF TESTS

OBJECTIVE:

Regulatory Guide 1.68 (Revision 2, August 1978), Appendix A, paragraph 2.b establishes guidelines to friction test (for BWRs) control rods after the core is fully loaded. Startup Test 5, Control Rod Drive (CRD) System, performs friction testing of all CRDs at both rated pressure/temperature and cold conditions. It is proposed to reduce the number of CRDs to be hot friction tested to four.

Additionally, it is proposed that CRD friction testing be performed by measuring the differential pressure between the insert and withdraw lines or between the drive water header pressure downstream of the CRD Friction Testing Station and reactor pressure.

DISCUSSION:

A centralized CRD Friction Testing Station is to be installed at Unit 2 of the LGS. The test station is designed to measure CRD drive line friction and collet friction while eliminating the need to tap into the piping of each HCU. A single point tap is installed in the main drive water header (common to all HCUs) along with a special valving arrangement. The new valve arrangement allows the control rod motion to be regulated from a central point as opposed to being regulated at each individual HCU. A ΔP transducer is also employed at this central point to provide a measure of the "under piston" pressure. Since the over piston pressure is primarily regulated by the reactor vessel pressure, the other side of the ΔP cell is connected to a reactor vessel pressure instrument line. This combination provides a measure of the CRD piston ΔP.

STARTUP TEST 5 - CONTROL ROD DRIVE SYSTEM/HOT FRICTION TESTING
TEST SIMPLIFICATION - REDUCED NUMBER OF TESTS

The CRD Friction Testing Station is installed permanently in the drive water header and with the exception of the data acquisition equipment no disconnects or transfers of equipment are necessary. The benefits derived from this modification are ease of operation and reduction of testing time and associated radiation exposure during testing of CRDs after irradiation of plant CRD piping.

A central CRD Friction Testing Station was fabricated and tested at GE to demonstrate the feasibility of the testing concept and to verify that the quality of the test station pressure traces was comparable to those obtained at the HCU location. NEDE-31511, Final Test Report, CRD Friction Test Station Evaluation dated November 1987 describes the test program and results.

Performance of the control rod drives during friction testing is compared to acceptance criteria which require that during continuous insertion, the differential pressure variation for the CRD must not exceed a specified limit. If the limit is exceeded during continuous insertion, a settling test is performed to determine the differential settling pressure and variation.

CRD friction testing at the cold condition satisfies the intent of Regulatory Guide 1.68, Appendix A, paragraph 2.b. The additional testing of Startup Test 5 at rated pressure/temperature is not required by the regulations. Substantial testing of CRD systems at other previously licensed BWRs has shown that testing of four selected CRDs at rated pressure conditions provides adequate information on the response of the system since all of the CRDs will be scram tested at rated pressure conditions. The scram test is the verification of the safety feature of the control rods. Testing at other previously licensed BWR 4/5 plants (Hope Creek, LaSalle-1 and 2, and Hanford-2) has been performed on only four CRDs at rated pressure. In addition, more recent testing of BWR/6 plants has included friction testing on all drives at rated pressure and none have failed to meet the criteria. The NRC safety evaluation for the Clinton Power Station, Proposed Changes to the Power Ascension Program, issued in April of 1986, found the change to Startup Test 5, CRD Hot Friction Testing, Test Simplification to be acceptable. The change proposed for Limerick is identical to that approved for Clinton.

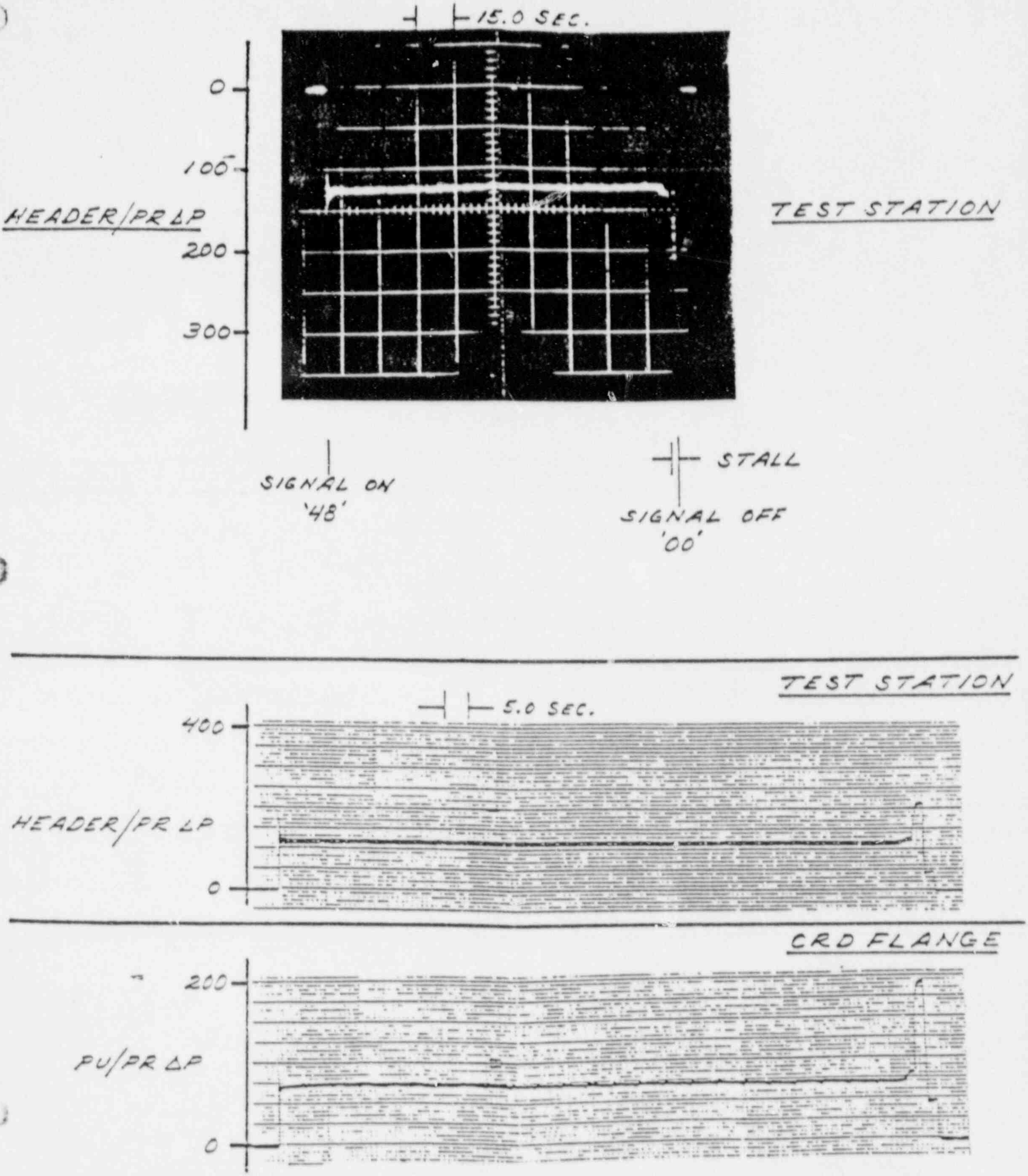
Therefore, it is unnecessary to friction test all the CRDs at hot conditions and it is recommended that only four CRDs be hot friction tested to demonstrate that there is no thermal expansion problem. The four CRDs chosen should be the same as those for which scram timing is to be repeated during subsequent test conditions.

CONCLUSION:

CRD friction testing at the cold condition during Startup Test 5 demonstrates the acceptable performance of the CRD system and satisfies the intent of Regulatory Guide 1.68, Appendix A, paragraph 2.b for friction testing. The proposed change to reduce the number of CRDs to be hot friction tested does not adversely affect any safety systems or safe operation of the plant. Startup Test 5, Control Rod Drive System, can therefore be simplified by reducing the number of CRDs to be hot friction tested to four.

Additionally, the differential pressure between the drive water header downstream of the CRD Friction Testing Station and reactor pressure is an acceptable substitute for the differential pressure between the insert and withdraw lines for performance of CRD friction testing and either method may be used. Figure 4, taken from NEDE-31511, shows a comparison of pressure differentials between header pressure and reactor pressure (PR) for the test station and pressure differential between pressure under piston (PU) and reactor pressure (PR) for pressures sensed across the CRD flange.

FULL STROKE DRIFT FRICTION



functional check may also serve as a subcritical check to verify that the next cell may be safely loaded.

Acceptance Criteria - The core is fully loaded in accordance with established procedures, and the core is subcritical.

(STP-4) Full Core Shutdown Margin (Formerly SUT-4)

Test Objective - The test objective is to demonstrate that the reactor is sufficiently subcritical throughout the first fuel cycle, with any single control rod fully withdrawn.

Prerequisites - The core is fully loaded; the subcritical checks are completed; and the source range monitors (SRMs) and intermediate-range monitors (IRMs) are installed in the vessel and connected in a non-coincident mode, to scram at a high neutron level. The rod worth minimizer and rod sequence control system are operational.

Test Method - The shutdown margin test is performed by fully withdrawing a series of previously selected rods until criticality is reached. The empirical data are analyzed and compared with calculated data to determine the test results.

Acceptance Criteria - The basic criterion for reactivity control is that the core, in its maximum reactivity state at any time in the cycle, be sufficiently subcritical, with the strongest rod withdrawn, and all other rods fully inserted. Satisfactory completion of the shutdown margin test ensures, at the time of fuel loading, that this criterion has been met.

(STP-5) Control Rod Drive (CRD) System (Formerly SUT-5)

Test Objectives - The test objectives are to demonstrate that the CRD system operates over the full range of primary coolant temperatures and pressures, from ambient to operating, and to determine the initial operating characteristics of the entire CRD system.

Prerequisites - The process computer, scram time recorder, or equivalent recording equipment is online and available to monitor events; the CRD electrical and hydraulic system preoperational testing is completed satisfactorily; and the vessel water level is always above the upper core grid during all CRD movements. The reactor protection system preoperational test is completed, and the scram pilot valves are ready for energization.

For Unit 1,
Test Method - during fuel load, a visual check is made of the position indication of each control rod, and the four-rod displays are checked for missing numbers. Insert and withdrawal times are verified during fuel load, and again at rated pressure for selected rods. Scram testing will be performed following fuel loading and at rated pressure. Coupling checks are again verified by the operator. Friction testing is conducted by measuring the pressure differential between the insert and withdrawal lines during the continuous insertion of a control rod.

- INSERT "B" -

Acceptance Criteria - Scram times and friction test results fall within acceptance limits. Each CRD has normal insert and withdrawal times within the limits indicated.

(STP-6) SRM Performance and Control Rod Sequence (Formerly SUT-6)

Test Objective - The test objective is to demonstrate that the sources and SRM system provide sufficient information for knowledgeable and controlled reactor startup at low neutron levels.

Prerequisites - Fuel loading is completed, neutron sources are in place, and the core is clean and cold with all control rods inserted.

Test Method - All control rod movement or operation is in compliance with approved owner operating procedures. The SRMs are connected, and subcritical testing verifies SRM response to control rod withdrawal. With the SRMs operational, criticality is approached. Records are maintained of count rate, rod configuration, and times. Criticality is achieved by withdrawing rods in the designated sequence.

Acceptance Criteria - SRMs are operational and read onscale within the designed range for a cold clean core.

(STP-9) Water Level Reference Leg Temperature (Formerly SUT-7)

Test Objective - The test objective is to demonstrate the calibration and agreement of the installed reactor vessel water level instrumentation at normal operating pressure and temperature.

Prerequisites - The following are determined and recorded: elevations of instrument taps, condensing [illegible], head chambers

INSERT "B"

For Unit 2, during fuel load, a visual check is made of the position indication of each control rod, and the four-rod displays are checked for missing numbers. Insert and withdrawal times are verified during fuel load, and again at rated pressure for selected rods. Scram testing will be performed following fuel loading and at rated pressure. Coupling checks are again verified by the operator. Friction testing is conducted by measuring the pressure differential between the insert and withdrawal lines or between the drive water header pressure downstream of the CRD Friction Testing Station and reactor pressure during the continuous insertion of a control rod.

TEST CONDITION (1)

TEST NO	PROCEDURE DESCRIPTION	OPEN VESSEL	HEAT UP	1	2	3	4	5	6	WARRANT
1	CHEMICAL AND RADIOCHEMICAL	x	x	x	x	x		x(6)	x	
2	RADIATION MEASUREMENTS	x	x		x	x			x	
3	FUEL LOADING	x								
4	FULL CORE SHUTDOWN MARGIN		x (4)							
5	CONTROL ROD DRIVE SYSTEM	x	x		x	x(11)			x	
6	SRM PERFORMANCE AND CONTROL ROD SEQUENCE		x (4)							
9	WATER LEVEL REFERENCE LEG TEMPERATURE		x	x	x	x	x	x	x	
10	IRM PERFORMANCE		x (4)	x						
11	LPRM CALIBRATION		x	x		x			x	
12	APRM CALIBRATION		x	x	x	x		x	x	x
13	PROCESS COMPUTER PERFORMANCE VERIFICATION	x	x	x	x	x			x (5)	
14	RCIC SYSTEM PERFORMANCE VERIFICATION		x	x	x (5,8)					
14.1	RCIC SYSTEM STARTUP AFTER LOSS OF AC POWER TO THE SYSTEM			x (6)						
14.2	RCIC SYSTEM OPERATION WITH A SUSTAINED LOSS OF AC POWER TO THE SYSTEM			x (6)						
15	HPCI SYSTEM PERFORMANCE VERIFICATION		x			x				
16	SELECTED PROCESS TEMPERATURES VERIFICATION		x(13)			x	x(12)		x(12)	
17	SYSTEM EXPANSION	x	x		x (6)				x (6,8)	
18	TIP UNCERTAINTY					x			x	
19	CORE PERFORMANCE			x	x	x	x	x	x	x
20	STEAM PRODUCTION									x
21	DELETED									
22	PRESSURE REGULATOR RESPONSE			x	x	x	x(10)	x	x	
23	FEEDWATER CONTROL SYSTEM DEMONSTRATION			x	x	x	x	x	x (5)	
24	MAIN TURBINE VALVES SURVEILLANCE TEST					x			x (5,9)	
25	MAIN STEAM ISOLATION VALVES PERFORMANCE VERIFICATION		x	x		x (3)		x (3)	x, SD (2,5,9)	
26	MAIN STEAM RELIEF VALVES PERFORMANCE		x		x					
27	TURBINE TRIP AND GENERATOR LOAD REJECTION DEMONSTRATION				x (7)	x, SD (2,5), 11)			x, SD (2)	
28	SHUTDOWN FROM OUTSIDE THE MAIN CONTROL ROOM DEMONSTRATION				x, SD (2)					
29	RECIRCULATION FLOW CONTROL DEMONSTRATION					x (5)			x (5)	
30	RECIRCULATION SYSTEM				x	x	x		x	
31	LOSS OF TURBINE - GENERATOR AND OFFSITE POWER				x SD					
32	ESSENTIAL HVAC SYSTEM OPERATION AND CONTAINMENT HOT PENETRATION TEMPERATURE VERIFICATION		x			x			x	
33	PIPING STEADY STATE VIBRATION		x		x	x (5)		x	x (5,8,9)	
34	OFFGAS SYSTEM PERFORMANCE VERIFICATION		x	x		x			x (5)	
35	RECIRCULATION FLOW CALIBRATION					x (5)			x	
36	PIPING DYNAMIC TRANSIENT		x		x	x			x	
37	MAIN STEAM SYSTEM AND TURBINE PERFORMANCE AND PLANT DYNAMIC RESPONSE VERIFICATION				x	x		x	x	
38	DELETED									
70	REACTOR WATER CLEANUP SYSTEM PERFORMANCE VERIFICATION		x							
71	RESIDUAL HEAT REMOVAL SYSTEM PERFORMANCE VERIFICATION				x (6)				x (6,8)	

LEGEND

x TEST INDEPENDENT OF FLOW CONTROLLER MODE

SD SCRAM DEFINITE

NOTES

(1) SEE FIGURE 14.2.9 TEST CONDITION REGION MAP
(2) PERFORM TEST 5, TIMING OF 4 SLOW EST CONTROL RODS IN CONJUNCTION WITH THESE SCRAMS
(3) FULL CLOSURE OF ONE VALVE ONLY
(4) MAY BE DONE DURING TEST CONDITION OPEN VESSEL
(5) SOME TESTS DONE DURING APPROACH TO TEST CONDITION
(6) MAY BE DONE DURING AN EARLIER TEST CONDITION IF CONDITIONS WARRANT
(7) DONE WITH STEAM BYPASS CAPACITY
(8) SOME TESTS DONE AFTER PLANNED TRIPS FROM POWER
(9) DETERMINE MAXIMUM POWER LEVEL TEST CAN BE PERFORMED WITHOUT CAUSING REACTOR SCRAM

(10) Test not required for Unit 2

(11) Test not required for Unit 2. No TC-3 SCRAM during STP-27. No STP-5 SCRAM timing test due to no SCRAM.

LIMERICK GENERATING STATION
UNITS 1 & 2
FINAL SAFETY ANALYSIS REPORT

STARTUP TEST SEQUENCE
(UNITS 1 & 2)

FIGURE 14.2.5

REV. 51, 02/88

LGS UNIT 2

5/31/88

STARTUP TEST 16A - SELECTED PROCESS TEMPERATURES SUBSTITUTE WITH TECHNICAL SPECIFICATION SURVEILLANCE

OBJECTIVE:

Regulatory Guide 1.68 (Revision 2; August 1978), Appendix A, does not specifically address guidelines for measurement of selected process temperatures. Startup Test 16A, Selected Process Temperatures, establishes low pump speed limits for the recirculation pumps to avoid coolant temperature stratification in the reactor pressure vessel (RPV) bottom head region and assures that idle recirculation loop temperature differentials are within Technical Specification limits prior to restarting recirculation pump(s). It is proposed that the Technical Specification Surveillance procedures associated with the determination of recirculation loop temperature differentials be substituted for this portion of the testing and that testing of the low pump speed limit be deleted.

DISCUSSION:

During initial heatup at hot standby conditions, the bottom drain line temperature and applicable reactor parameters are monitored as recirculation pump speed is slowly lowered to determine the proper setting of the low speed limiter. The coolant temperature in the bottom head region of the RPV may be colder than that in the recirculation loops or reactor pressure steam space area due to flow stagnation and the introduction of relatively cold control rod drive cooling water when the recirculation flow is at a low value. Excessive thermal stresses, temperature trasients and neutron flux scrams may occur when reactor recirculation flow is increased, sweeping this cooler water into the core. Therefore, it is necessary that the minimum MG set speed be set above the point where recirculation flow would not provide adequate mixing in the lower plenum. Testing at other previously licensed BWRs has demonstrated that the minimum pump speed limits currently established are sufficiently above the point where adequate mixing would not occur such that this testing can be deleted, see Table 1.

STARTUP TEST 16A - SELECTED PROCESS TEMPERATURES
SUBSTITUTE WITH TECHNICAL SPECIFICATION SURVEILLANCE

Following recirculation pump trips, Startup Test 16A monitors the bottom drain line temperature to determine if temperature stratification occurs in the idle loop(s). Plant Technical Specifications place limits on the temperature differential between the idle loop(s) and the reactor pressure vessel steam space coolant temperature to prevent restart of idle recirculation loops with significantly cooler water. Compliance with these Technical Specification surveillance requirements meets the objectives of Startup Test 16A following the recirculation pump trip(s). Therefore, the portion of Startup Test 16A associated with measuring the recirculation loop(s) temperature differential can be substituted with the plant Technical Specification surveillance procedure associated with idle loop(s) startup.

The NRC, in their safety evaluation report on Hope Creek Power Ascension Program Test Modifications, dated January 22, 1986, found it acceptable to substitute technical specification surveillance tests for portions of the selected process temperature tests. This allowed deletion of the test to establish the low-speed limiter for the recirculation pumps. The staff noted that testing performed at Limerick Unit 1 and Susquehanna had demonstrated ample margins for stratification.

CONCLUSION:

Testing of the minimum recirculation pump speed at other previously licensed plants to determine applicable stratification limits provides assurance that proper performance of the recirculation system occurs at the currently set low pump speed limits. Compliance with the plant Technical Specification surveillance requirements for idle recirculation loop startup, via existing surveillance procedures will satisfy the objectives of Startup Test 16A, Selected Process Temperatures, prior to restart of idle recirculation loop(s). Based on the above discussion, the proposed change will not affect any safety systems or the safe operation of the plant. Therefore, the plant Technical

STARTUP TEST 16A - SELECTED PROCESS TEMPERATURES
SUBSTITUTE WITH TECHNICAL SPECIFICATION SURVEILLANCE

Specification surveillance procedures for idle recirculation loop startup can be substituted for that portion of Startup Test 16A, Selected Process Temperatures, which measures the recirculation loop temperature differential prior to pump restart and the testing of the low pump speed limit can be deleted.

STARTUP TEST 16A - SELECTED PROCESS TEMPERATURES
SUBSTITUTE WITH TECHNICAL SPECIFICATION SURVEILLANCE

Table 1 - Select Process Temperature Startup Test Data

Plant	Recirculation Pump Speed A(%)/B(%)	Temperature Differential (deg C) Steam Dome - Bottom Head Drain
Chinshan Unit 1	20/20	8
Caorso	20/20	6
Brunswick Unit 1	20/20	8
Hatch Unit 2	20/20	7
Limerick Unit 1	18/18	10
Susquehanna Unit 2	24/25	2
Startup Test Specification Level 1 Criterion (23A1918)		81
Technical Specification 3/4.4.1.4		81 (145 deg F)

REFERENCES:

1. G. V. Kumar and H. J. Yang, "Chinshan Unit 2 Startup Test Results Final Summary Report," General Electric Company, April 1980 (MEDO-24805).

2. R. H. Torres, "Caorso Startup Test Results Final Summary Report," General Electric Company, November 1980 (NEDO-24884).

3. I. D. Poppel, "Brunswick Unit 1 Startup Test Results Final Summary Report," General Electric Company, November 1977 (NEDO-24562).

4. R. W. Turkowski and W. Yee, "Final Summary Report Edwin I. Hatch Unit 2 Startup Test Results," General Electric Company, October 1979 (NEDO-24734).

5. Philadelphia Electric Company LGS-1 Startup Test Procedure 16.1-1, January 26, 1985.

6. Susquehanna Steam Electric Station Unit II General Electric Startup Test Report ST 16.1, June 19, 1984.

the HPCI System, determine the time to reach rated flow, and adjust the flow controller in the HPCI System for proper flow rate. These tests are performed with the system in the test mode, so that discharge flow is not routed to the reactor pressure vessel. The final demonstration is made so that discharge flow is routed to the reactor pressure vessel, while the reactor is at partial power.

Acceptance Criteria - The HPCI turbine must not trip off during startup. The HPCI system must have the capability to deliver specified flow, in less than or equal to rated actuation time, against nominal rated reactor pressure.

(STP-16) Selected Process Temperatures Verification (Formerly SUT-14)

UNIT 1

Test Objectives - The test objectives are: to establish the proper setting for the low-speed limiter for the recirculation pumps, to keep the bottom head water temperature from being too low; and to demonstrate that the bottom head drain temperature corresponds to bottom head coolant temperature, during normal operation.

Prerequisites - The reactor is in a low power condition.

Test Method - With recirculation pumps at approximately 28% of maximum speed, allow the reactor to attain a steady-state condition. Data are recorded; then the speed of the pumps is slowly lowered until 20% of maximum speed or the minimum stable speed is reached, whichever is greater. Data are again recorded. The empirical data are analyzed to determine the optimum low speed limiter setting.

Acceptance Criteria - The resultant low-speed setting maintains upper and lower region coolant temperatures within the specified limits.

- INSERT "C" -

(STP-17 System Expansion (Formerly SUT-15)

Test Objectives - The test objectives are: to demonstrate that major equipment and the piping systems throughout the plant are free and unrestrained, with regard to thermal expansion; and that suspension components are functioning in the specified manner. See Section 3.9.2.1a.2 for nuclear steam supply system (NSSS) piping, and Table 3.9-7 for non-NSSS piping.

INSERT "C"

Unit 2

Test Objectives - The test objective is: To demonstrate that the bottom head drain temperature corresponds to bottom head coolant temperature, during normal operation..

Prerequisites - The reactor core flow is ≥95% of rated.

Test Method - With core flow at ≥95% of rated compare bottom drain line temperature with recirculation loop coolant temperature.

Acceptance Criteria - The bottom head drain temperature corresponds to the bottom head coolant temperature within specified limits.

TEST CONDITION (1)

TEST NO	PROCEDURE DESCRIPTION	OPEN VESSEL	HEAT UP	1	2	3	4	5	6	WAR RANT
1	CHEMICAL AND RADIOCHEMICAL	x	.	x	x	x		x(6)	x	
2	RADIATION MEASUREMENTS	x	x		x	x			x	
3	FUEL LOADING	x								
4	FULL CORE SHUTDOWN MARGIN		x(4)							
5	CONTROL ROD DRIVE SYSTEM	x	x		x	x(11)			x	
6	SRM PERFORMANCE AND CONTROL ROD SEQUENCE		x(4)							
9	WATER LEVEL REFERENCE LEG TEMPERATURE		x	x	x	x	x	x	x	
10	IRM PERFORMANCE		x(4)	x						
11	LPRM CALIBRATION		x	x		x			x	
12	APRM CALIBRATION		x	x	x	x		x	x	x
13	PROCESS COMPUTER PERFORMANCE VERIFICATION	x	x	x	x	x			x(5)	
14	RCIC SYSTEM PERFORMANCE VERIFICATION		x	x	x(5,6)					
14.1	RCIC SYSTEM STARTUP AFTER LOSS OF AC POWER TO THE SYSTEM			x(6)						
14.2	RCIC SYSTEM OPERATION WITH A SUSTAINED LOSS OF AC POWER TO THE SYSTEM			x(6)						
15	HPCI SYSTEM PERFORMANCE VERIFICATION		x			x				
16	SELECTED PROCESS TEMPERATURES VERIFICATION		x(10)			x	x(10)		x(10)	
17	SYSTEM EXPANSION	x	x		x(6)				x(6,8)	
18	TIP UNCERTAINTY					x			x	
19	CORE PERFORMANCE			x	x	x	x	x	x	x
20	STEAM PRODUCTION									x
21	DELETED									
22	PRESSURE REGULATOR RESPONSE			x	x	x	x(10)	x	x	
23	FEEDWATER CONTROL SYSTEM DEMONSTRATION			x	x	x	x	x	x(5)	
24	MAIN TURBINE VALVES SURVEILLANCE TEST					x			x(5,9)	
25	MAIN STEAM ISOLATION VALVES PERFORMANCE VERIFICATION		x	x		x(3)		x(3)	x, SD(2,5,9)	
26	MAIN STEAM RELIEF VALVES PERFORMANCE		x		x					
27	TURBINE TRIP AND GENERATOR LOAD REJECTION DEMONSTRATION				x(7)	x, SD(2,5), 11			x, SD(2)	
28	SHUTDOWN FROM OUTSIDE THE MAIN CONTROL ROOM DEMONSTRATION				x, SD(2)					
29	RECIRCULATION FLOW CONTROL DEMONSTRATION					x(5)			x(5)	
30	RECIRCULATION SYSTEM				x	x	x		x	
31	LOSS OF TURBINE - GENERATOR AND OFFSITE POWER				x SD					
32	ESSENTIAL HVAC SYSTEM OPERATION AND CONTAINMENT HOT PENETRATION TEMPERATURE VERIFICATION		x			x			x	
33	PIPING STEADY STATE VIBRATION		x		x	x(5)		x	x (5,6,8)	
34	OFFGAS SYSTEM PERFORMANCE VERIFICATION		x	x		x			x(5)	
35	RECIRCULATION FLOW CALIBRATION					x(5)			x	
36	PIPING DYNAMIC TRANSIENT		x		x	x			x	
37	MAIN STEAM SYSTEM AND TURBINE PERFORMANCE AND PLANT DYNAMIC RESPONSE VERFICATION				x	x		x	x	
38	DELETED									
70	REACTOR WATER CLEANUP SYSTEM PERFORMANCE VERIFICATION		x							
71	RESIDUAL HEAT REMOVAL SYSTEM PERFORMANCE VERIFICATION				x(6)				x (6,8)	

LEGEND

x TEST INDEPENDENT OF FLOW CONTROLLER MODE

SD SCRAM DEFINITE

NOTES

(1) SEE FIGURE 14.2-9 TEST CONDITION REGION MAP
(2) PERFORM TEST 5, TIMING OF 4 SLOW-EST CONTROL RODS IN CONJUNCTION WITH THESE SCRAMS
(3) FULL CLOSURE OF ONE VALVE ONLY
(4) MAY BE DONE DURING TEST CONDITION OPEN VESSEL
(5) SOME TESTS DONE DURING APPROACH TO TEST CONDITION
(6) MAY BE DONE DURING AN EARLIER TEST CONDITION IF CONDITIONS WARRANT
(7) DONE WITH STEAM BYPASS CAPACITY
(8) SOME TESTS DONE AFTER PLANNED TRIPS FROM POWER
(9) DETERMINE MAXIMUM POWER LEVEL TEST CAN BE PERFORMED WITHOUT CAUSING REACTOR SCRAM
(10) Test not required for Unit 2
(11) Test not required for Unit 2. No TC-3 SCRAM during STP-27. No STP-5 SCRAM timing test due to no SCRAM.

LIMERICK GENERATING STATION
UNITS 1 & 2
FINAL SAFETY ANALYSIS REPORT

STARTUP TEST SEQUENCE
(UNITS 1 & 2)

FIGURE 14.2-5

REV. 51, 02/85

STARTUP TEST 22 - PRESSURE REGULATOR
TEST SIMPLIFICATION - REDUCED NUMBER OF TESTS

OBJECTIVE:

Regulatory Guide 1.68 (Revision 2; August 1978), Appendix A, paragraphs 4.u and 5.s establish guidelines for demonstration of the operability during low power testing and calibration and performance verification during power ascension testing of the Pressure Regulator system. Startup Test 22, Pressure Regulator, determines the response of the system to rapid pressure setpoint changes and at specified test conditions the load limit setpoint will be set so that the transient is handled by control and/or bypass valves. Backup pressure regulator takeover will be tested by simulating a failure of the selected pressure regulator. Performance of this test is planned for Test Conditions 1-6. It is proposed to delete the Pressure Regulator tests at Test Condition 4 and the backup pressure regulator takeover testing at Test Condition 5.

DISCUSSION:

The pressure regulator system is primarily sensitive to vessel steam flow (and hence, power level) since the reactor is basically operated as a constant pressure device for varying steam flows. Therefore, testing of the pressure regulator response should cover the range of expected core power levels and is not significantly dependent on core flow since the steam flow at a fixed power level is insensitive to the core flow rate. Testing of the pressure regulator system during Test Condition 1, 2, 3, 5, and 6 adequately covers the range of expected power levels during plant operation. Therefore, testing of the pressure regulator system at Test Condition 4 is not required for verification of the controller performance, and testing at Test Conditions 1, 2, 3, 5, and 6 will provide adequate confirmation of the system performance over the entire operating range.

STARTUP TEST 22 - PRESSURE REGULATOR
TEST SIMPLIFICATION - REDUCED NUMBER OF TESTS

Pressure regulator testing (specifically the pressure setpoint changes) at Test Condition 4 also provides information on the stability of the system. However, information on the stability of the reactor at Test Condition 4 can also be obtained by monitoring the neutron flux (both local and core average) as required by Technical Specification section 3/4.4.1.1. These surveillance requirements provide for monitoring of the APRM and LPRM detectors when operating at natural circulation conditions and provide sufficient information on the stabi y of the reactor at Test Condition 4 in addition providing operator training for the monitoring procedures. Pressure regulator testing (pressure setpoint changes) will be performed at Test Condition 5, minimum pump speed which bounds the least stable portion of the normal operating region, and will provide additional information on the stability of the reactor. Therefore, pressure regulator testing at Test Condition 4 can be deleted.

Testing of the backup pressure regulator is performed by simulating the failure of a selected pressure regulator. This test is currently planned to be performed at Test Conditions 1, 2, 3, 5, and 6. Testing at Test Conditions 1, 2, 3, and 6 provides adequate demonstration of the capability of the backup pressure regulatory to control pressure in the event of a failure of the controlling pressure regulator since these test conditions bound the power level of Test Condition 5.

The NRC safety evaluation for the Clinton Power Station, Proposed Changes to the Power Ascension Program, issued in April of 1986, found the change to Startup Test 22, Pressure Regulator, Test Simplification to be acceptable. The change proposed for Limerick is identical to that approved for Clinton.

CONCLUSION:

Testing of the Pressure Regulator system at Test Condition 4 is not required since the pressure regulator will be tested at other Test Conditions that bound the power level of Test Condition 4 and stability data during Test Condition 4 will be obtained by monitoring of the APRM and LPRM detectors as required by Technical Specifications. Therefore, deletion of Test Condition 4 testing does not adversely affect any safety related systems or the safe operation of the plant. Testing of the backup pressure regulator at Test Conditions 2, 3, and 6 demonstrates the performance of the backup system. Deleting testing of the backup pressure regulator at Test Condition 5 does not adversely affect any safety systems or the safe operation of the plant. Startup Test 22, Pressure Regulator, can therefore be simplified by deleting the backup pressure regulator testing at Test Condition 5 and the testing at Test Condition 4.

TEST NO.	PROCEDURE DESCRIPTION	TEST CONDITION (1): OPEN VESSEL	HEAT UP	1	2	3	4	5	6	WARRANT
1	CHEMICAL AND RADIOCHEMICAL	x	x	x	x	x		x(6)	x	
2	RADIATION MEASUREMENTS	x	x		x	x			x	
3	FUEL LOADING	x								
4	FULL CORE SHUTDOWN MARGIN		x (4)							
5	CONTROL ROD DRIVE SYSTEM	x	x		x	x(11)			x	
6	SRM PERFORMANCE AND CONTROL ROD SEQUENCE		x (4)							
9	WATER LEVEL REFERENCE LEG TEMPERATURE		x	x	x	x	x	x	x	
10	IRM PERFORMANCE		x (4)	x						
11	LPRM CALIBRATION		x	x		x			x	
12	APRM CALIBRATION		x	x	x	x		x	x	x
13	PROCESS COMPUTER PERFORMANCE VERIFICATION	x	x	x	x	x			x(5)	
14	RCIC SYSTEM PERFORMANCE VERIFICATION		x	x	x(5,6)					
14.1	RCIC SYSTEM STARTUP AFTER LOSS OF AC POWER TO THE SYSTEM			x (6)						
14.2	RCIC SYSTEM OPERATION WITH A SUSTAINED LOSS OF AC POWER TO THE SYSTEM			x (6)						
15	HPCI SYSTEM PERFORMANCE VERIFICATION		x			x				
16	SELECTED PROCESS TEMPERATURES VERIFICATION		x(10)			x	x(10)		x(10)	
17	SYSTEM EXPANSION	x	x		x(6)				x (6,8)	
18	TIP UNCERTAINTY					x			x	
19	CORE PERFORMANCE			x	x	x	x	x	x	x
20	STEAM PRODUCTION									x
21	DELETED									
22	PRESSURE REGULATOR RESPONSE			x	x	x	x(10)	x	x	
23	FEEDWATER CONTROL SYSTEM DEMONSTRATION			x	x	x	x	x	x (5)	
24	MAIN TURBINE VALVES SURVEILLANCE TEST					x			x (5,9)	
25	MAIN STEAM ISOLATION VALVES PERFORMANCE VERIFICATION		x	x		x (3)		x (3)	x,SD (2,5,9)	
26	MAIN STEAM RELIEF VALVES PERFORMANCE		x		x					
27	TURBINE TRIP AND GENERATOR LOAD REJECTION DEMONSTRATION				x (7)	x,SD(2,5),11)			x,SD(2)	
28	SHUTDOWN FROM OUTSIDE THE MAIN CONTROL ROOM DEMONSTRATION				x,SD(2)					
29	RECIRCULATION FLOW CONTROL DEMONSTRATION					x(5)			x(5)	
30	RECIRCULATION SYSTEM				x	x	x		x	
31	LOSS OF TURBINE-GENERATOR AND OFFSITE POWER				x,SD					
32	ESSENTIAL HVAC SYSTEM OPERATION AND CONTAINMENT HOT PENETRATION TEMPERATURE VERIFICATION		x			x			x	
33	PIPING STEADY STATE VIBRATION		x		x	x(5)		x	x (5,6,8)	
34	OFFGAS SYSTEM PERFORMANCE VERIFICATION		x	x		x			x(5)	
35	RECIRCULATION FLOW CALIBRATION					x(5)			x	
36	PIPING DYNAMIC TRANSIENT		x		x	x			x	
37	MAIN STEAM SYSTEM AND TURBINE PERFORMANCE AND PLANT DYNAMIC RESPONSE VERFICATION				x	x		x	x	
38	DELETED									
70	REACTOR WATER CLEANUP SYSTEM PERFORMANCE VERIFICATION		x							
71	RESIDUAL HEAT REMOVAL SYSTEM PERFORMANCE VERIFICATION				x(6)				x (6,8)	

LEGEND

x TEST INDEPENDENT OF FLOW CONTROLLER MODE

SD SCRAM DEFINITE

NOTES

(1) SEE FIGURE 14.2-9 TEST CONDITION REGION MAP
(2) PERFORM TEST 5, TIMING OF 4 SLOWEST CONTROL RODS IN CONJUNCTION WITH THESE SCRAMS
(3) FULL CLOSURE OF ONE VALVE ONLY
(4) MAY BE DONE DURING TEST CONDITION OPEN VESSEL
(5) SOME TESTS DONE DURING APPROACH TO TEST CONDITION
(6) MAY BE DONE DURING AN EARLIER TEST CONDITION IF CONDITIONS WARRANT
(7) DONE WITH STEAM BYPASS CAPACITY
(8) SOME TESTS DONE AFTER PLANNED TRIPS FROM POWER
(9) DETERMINE MAXIMUM POWER LEVEL TEST CAN BE PERFORMED WITHOUT CAUSING REACTOR SCRAM
(10) Test not required for Unit 2
(11) Test not required for Unit 2. No TC-3 SCRAM during STP-27. No STP-5 SCRAM timing test due to no SCRAM.

LIMERICK GENERATING STATION
UNITS 1 & 2
FINAL SAFETY ANALYSIS REPORT

STARTUP TEST SEQUENCE
(UNITS 1 & 2)

FIGURE 14.2-5 REV. 51, 02/88

STARTUP TEST 27 - TURBINE TRIP AND GENERATOR LOAD REJECTION
TEST SIMPLIFICATION - REDUCED NUMBER OF TESTS

OBJECTIVE:

Regulatory Guide 1.68 (Revision 2, August 1978), Appendix A, paragraphs 5.1.1 and 5.n.n recommend that a Turbine T.ip and Generator Load Rejection be performed at 100% power to demonstrate that the dynamic response of the plant is in accordance with design requirements for turbine trip and full load rejection. These tests may be combined if a turbine trip is initiated directly during the generator load rejection instead of tripping from secondary effects such as a turbine overspeed trip. Startup Test 27, Turbine Trip and Generator Load Rejection, is currently planned to be performed at three conditions during the power ascension test program; (1) a turbine trip during Test Condition 1 or 2 (within the bypass capacity of the plant); (2) a turbine trip during Test Condition 3 (approximately 75% power); and (3) a turbine trip at Test Condition 6 (approximately 100% power). It is proposed to delete the Turbine Trip test at Test Condition 3. This proposed testing will demonstrate that Regulatory Guide 1.68 objectives are met.

DISCUSSION:

Acceptable response of the system during a turbine trip is determined by analyzing test data and comparing it to acceptance criteria, Level 1 and Level 2, which define the required system performance. Level 1 criteria require: proper operation of the turbine control and stop valve closure times with respect to the bypass valve opening time; adequate bypass valve response times; proper feedwater control system response to prevent flooding of the steam lines; that recirculation flow coastdown following protective trips from near rated flow is within design values; and acceptable vessel dome pressure and simulated heat flux response. Level 2 criteria require: that no MSIV closure occurs during the first three minutes of the event; that vessel dome pressure and simulated heat flux changes do not exceed predicted values; for the turbine trip within bypass capacity (Test Condition 1 or 2) the reactor does not scram; that the bypass capacity calculated is greater than or equal to the assumed value in FSAR analysis; that low water level recirculation pump trip, HPCI and RCIC are not initiated; that feedwater level control avoids loss of feedwater because of high level trips; and require that safety/relief valve discharge temperatures return to within acceptable limits, if opened.

The turbine trip (Test Condition 6) and the turbine trip (Test Condition 1 or 2) provide data to demonstrate that the Level 1 and 2 criteria are met during a turbine trip and bound the turbine trip (Test Condition 3) identified for deletion. The turbine bypass system performance will be verified at a lower power level (Test Condition 1 or 2).

Control systems which regulate the long term operation following the transients are separately tested during the power ascension test program. Feedwater and level control system tuning in Startup Test 23 (Feedwater System Response) will ensure proper water level control. High and low water level trip avoidance will be verified in the turbine trip test at Test Condition 6. Pressure control tuning during Startup Test 22 (Pressure Regulator testing) will ensure that the MSIV closure trip on low turbine inlet pressure is avoided during the transient.

The NRC safety evaluation for the Hope Creek Generating Station, Power Ascension Test Program Acceleration, issued in February of 1986, found the deletion of the turbine trip at Test Condition 3 from Startup Test 27 Turbine Trip and Generator Load Rejection, to be acceptable.

STARTUP TEST 27 - TURBINE TRIP AND GENERATOR LOAD REJECTION
TEST SIMPLIFICATION - REDUCED NUMBER OF TESTS

CONCLUSION:

The turbine trip test has been previously demonstrated to be a mild transient event and poses no serious threat to the core and reactor integrity (FSAR Section 15.2.4, etc.). In addition, the transient results from a turbine trip at full power are more limiting than the results from a turbine trip at Test Condition 3. Based on the above discussions, the proposed change will not affect the safety related systems or safe operation of the plant. Current testing of the turbine trip at 100% power, satisfies the intent of Regulatory Guide 1.68 (Revision 2), Appendix A, paragraphs 5.1.1 and 5.n.n. In addition, the proposed Turbine Trip test within bypass valve capacity (Test Condition 1 or 2) provides additional verification of the response of the protective systems and also provides demonstration of the bypass system's capability to avoid scram at low power levels. Therefore, the turbine trip at Test Condition 3 can be deleted since a turbine trip test will be performed at Test Condition 1 or 2.

TEST CONDITION (1)

TEST NO.	PROCEDURE DESCRIPTION	OPEN VESSEL	HEAT UP	1	2	3	4	5	6	WAR RANT
1	CHEMICAL AND RADIOCHEMICAL	x	x	x	x	x		x(6)	x	
2	RADIATION MEASUREMENTS	x	x		x	x			x	
3	FUEL LOADING	x								
4	FULL CORE SHUTDOWN MARGIN		x (4)							
5	CONTROL ROD DRIVE SYSTEM	x	x		x	x(11)			x	
6	SRM PERFORMANCE AND CONTROL ROD SEQUENCE		x (4)							
7	WATER LEVEL REFERENCE LEG TEMPERATURE		x	x	x	x	x	x	x	
10	IRM PERFORMANCE		x (4)	x						
11	LPRM CALIBRATION		x	x		x			x	
12	APRM CALIBRATION		x	x	x	x		x	x	x
13	PROCESS COMPUTER PERFORMANCE VERIFICATION	x	x	x	x	x			x (5)	
14	RCIC SYSTEM PERFORMANCE VERIFICATION		x	x	x (5,6)					
14.1	RCIC SYSTEM STARTUP AFTER LOSS OF AC POWER TO THE SYSTEM			x (6)						
14.2	RCIC SYSTEM OPERATION WITH A SUSTAINED LOSS OF AC POWER TO THE SYSTEM			x (6)						
15	HPCI SYSTEM PERFORMANCE VERIFICATION		x			x				
16	SELECTED PROCESS TEMPERATURES VERIFICATION		x(13)			x	x(10)		x(10)	
17	SYSTEM EXPANSION	x	x		x (6)				x (6,8)	
18	TIP UNCERTAINTY					x			x	
19	CORE PERFORMANCE			x	x	x	x	x	x	x
20	STEAM PRODUCTION									x
21	DELETED									
22	PRESSURE REGULATOR RESPONSE			x	x	x	x(10)	x	x	
23	FEEDWATER CONTROL SYSTEM DEMONSTRATION			x	x	x	x	x	x (5)	
24	MAIN TURBINE VALVES SURVEILLANCE TEST					x			x (5,9)	
25	MAIN STEAM ISOLATION VALVES PERFORMANCE VERIFICATION		x	x		x (3)		x (3)	x, SD (2,5,9)	
26	MAIN STEAM RELIEF VALVES PERFORMANCE		x		x					
27	TURBINE TRIP AND GENERATOR LOAD REJECTION DEMONSTRATION				x (7)	x, SD (2,5), 11)			x, SD (2)	
28	SHUTDOWN FROM OUTSIDE THE MAIN CONTROL ROOM DEMONSTRATION				x, SD (2)					
29	RECIRCULATION FLOW CONTROL DEMONSTRATION					x (5)			x (5)	
30	RECIRCULATION SYSTEM				x	x	x		x	
31	LOSS OF TURBINE - GENERATOR AND OFFSITE POWER				x SD					
32	ESSENTIAL HVAC SYSTEM OPERATION AND CONTAINMENT HOT PENETRATION TEMPERATURE VERIFICATION		x			x			x	
33	PIPING STEADY STATE VIBRATION		x		x	x (5)		x	x (5,6,8)	
34	OFFGAS SYSTEM PERFORMANCE VERIFICATION		x	x		x			x (5)	
35	RECIRCULATION FLOW CALIBRATION					x (5)			x	
36	PIPING DYNAMIC TRANSIENT		x		x	x			x	
37	MAIN STEAM SYSTEM AND TURBINE PERFORMANCE AND PLANT DYNAMIC RESPONSE VERIFICATION				x	x		x	x	
38	DELETED									
70	REACTOR WATER CLEANUP SYSTEM PERFORMANCE VERIFICATION		x							
71	RESIDUAL HEAT REMOVAL SYSTEM PERFORMANCE VERIFICATION				x (6)				x (6,8)	

LEGEND

x TEST INDEPENDENT OF FLOW CONTROLLER MODE

SD SCRAM DEFINITE

NOTES

(1) SEE FIGURE 14.2-9 TEST CONDITION REGION MAP
(2) PERFORM TEST 5, TIMING OF 4 SLOWEST CONTROL RODS IN CONJUNCTION WITH THESE SCRAMS
(3) FULL CLOSURE OF ONE VALVE ONLY
(4) MAY BE DONE DURING TEST CONDITION OPEN VESSEL
(5) SOME TESTS DONE DURING APPROACH TO TEST CONDITION
(6) MAY BE DONE DURING AN EARLIER TEST CONDITION IF CONDITIONS WARRANT
(7) DONE WITH STEAM BYPASS CAPACITY
(8) SOME TESTS DONE AFTER PLANNED TRIPS FROM POWER
(9) DETERMINE MAXIMUM POWER LEVEL TEST CAN BE PERFORMED WITHOUT CAUSING REACTOR SCRAM

(10) Test not required for Unit 2

(11) Test not required for Unit 2. No TC-3 SCRAM during STP-27. No STP-5 SCRAM timing test due to no SCRAM.

LIMERICK GENERATING STATION
UNITS 1 & 2
FINAL SAFETY ANALYSIS REPORT

STARTUP TEST SEQUENCE
(UNITS 1 & 2)

FIGURE 14.2-5 REV. 51, 02/88

LGS UNIT 2 PAGE 27-1 5/31/88

STARTUP TEST 30E - RECIRCULATION SYSTEM CAVITATION TEST DELETION

OBJECTIVE:

Regulatory Guide 1.68 (Revision 2, August 1978), Appendix A, paragraph 5.s recommends that the recirculation flow control system be calibrated as necessary and its performance verified. At conditions of high flow and low power, both the jet pumps and the recirculation pumps may cavitate. The analytically determined cavitation region of the power-flow map is protected by a cavitation interlock which will run back recirculation flows at low power if the cavitation limit is exceeded. Startup Test 30E, Recirculation System Cavitation, verifies that no recirculation system cavitation will occur in the operable region of the power-flow map. Currently, this test is planned to be performed at Test Condition 3, where power will be lowered at high recirculation flow until a recirculation pump runback occurs, or the plant is at approximately 20% power and no runback has occurred or there is indication of cavitation. It is proposed that the testing be deleted based upon Limerick Generating Station Unit 1 test data and experience at previous BWR startups.

DISCUSSION:

Acceptable response of the system near the cavitation region is determined by analyzing test data and comparing to acceptance criteria which define the required system performance. The recirculation system cavitation test for Limerick Generating Station Unit 1 was performed in Test Condition 3. The test was to verify that the recirculation cavitation runback logic settings were adequate to prevent operation in possible cavitation areas. This was accomplished without taking a runback by defeating the runback circuitry, establishing core flow at ≥95%, and inserting control rods to reduce reactor power and therefore reactor feed flow. When the runback circuitry was activated at approximately 2[illegible] feed flow, no recirculation system cavitation was noted. The applicable acceptance criterion was satisfied.

STARTUP TEST 30E - RECIRCULATION SYSTEM CAVITATION TEST DELETION

During the recirculation pump cavitation searches performed at previous BWR startups (including Limerick Unit 1) no pump cavitation has been experienced prior to reaching the analytical setpoints of the cavitation interlocks.

The predicted cavitation curve for the jet pumps is based on empirical data determined from the Moss Landing test program. The recirculation pump cavitation curve is based on the pump vendor supplied data. Based on this information the interlock is set at 20% feedwater flow. At normal operation, rated core flow, there is about a 10% power margin between the interlock setpoint and predicted cavitation. The margin increases as flow is reduced as shown on the attached figure.

The verification of the cavitation runback logic will be performed during phase one of the initial test program.

CONCLUSION:

Cavitation interlock setpoints are designed to allow maximum operation in the power/flow map but are conservatively set to assure that no recirculation system cavitation occurs. Tests at LGS Unit 1 and previous BWR startups have demonstrated that cavitation interlock setpoints have been conservative, and therefore since no cavitation has been observed prior to reaching the interlock setpoints, the deletion of this test is justified. This proposed testing deletion will not adversely affect any safety related systems or safe operation of the plant. Therefore, Startup Test 30E, Recirculation System Cavitation, can be deleted as stated above.

REFERENCE:

1. Philadelphia Electric Company Limerick Generating Station Unit No. 1, Startup Report, Rev. 2, G. M. Leitch, March 1986.

GENERAL ELECTRIC

NUCLEAR ENERGY DIVISION

ENGINEERING

LIMERICK 1 & 2

TITLE REACTOR OPERATING MAP

AUGUST 02, 1973

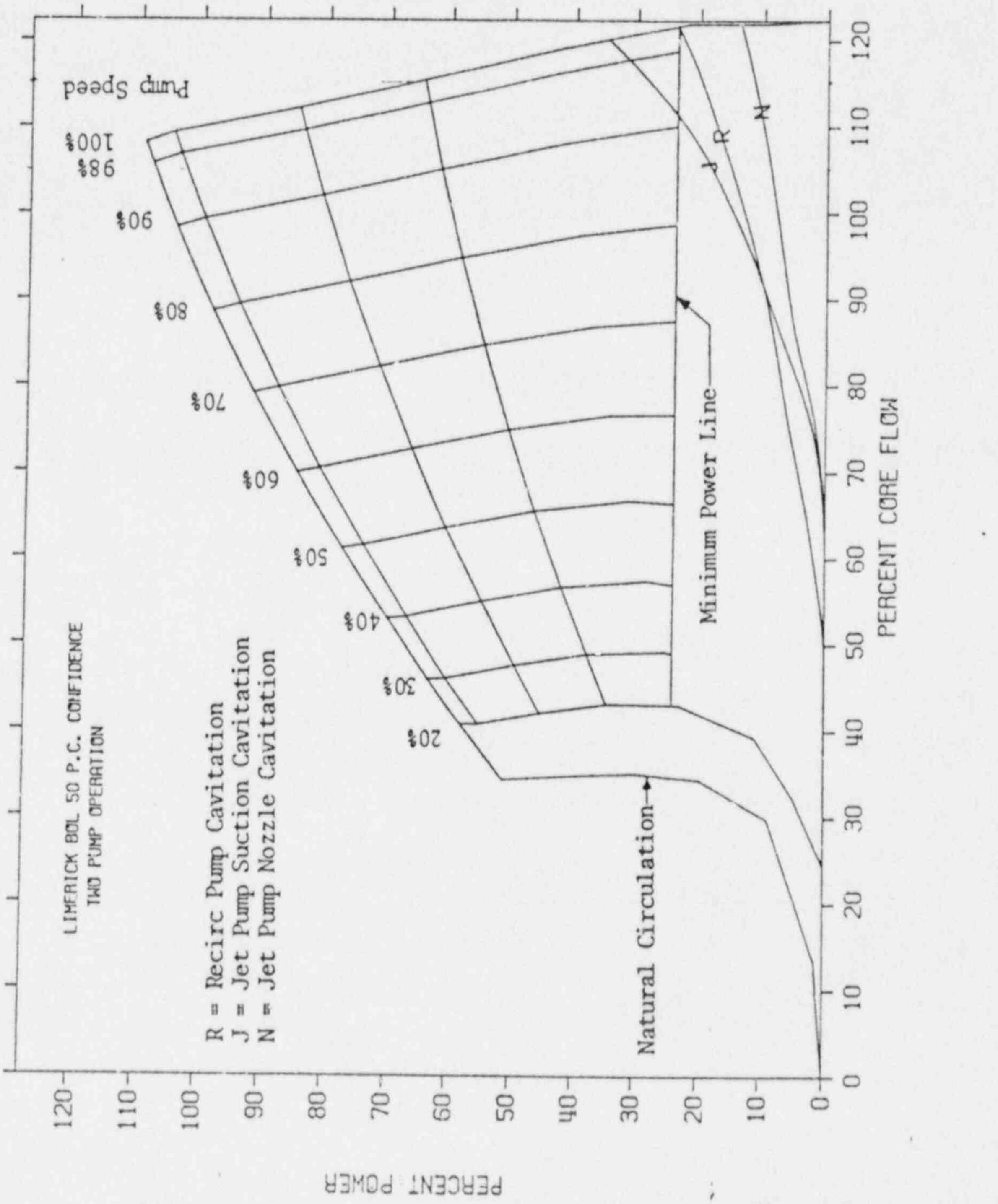


Figure 7

BY E. Morgan 12-7-73	APPROVALS B.W. Fitzsimmons 12/19/73	REV NO. 1
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NED-749 (12/72)

c. Reactor coolant temperature and pressure can be lowered sufficiently to place the RHR system in operation.

d. A heat transfer path to the spray pond can be established.

e. Cooldown with the RHR system can be controlled to a rate that would not exceed technical specification limits.

(STP-29) Recirculation Flow Control Demonstration (Formerly SUT-26)

Test Objective - The test objective is to determine the plant response to a change in recirculation flow, to optimize the setting of the master flow controller, and to demonstrate the plant loading capability in master manual flow control mode.

Prerequisites - The reactor is in a steady-state condition and the feedwater system is operating in three-element control.

Test Method - Data are recorded during the step and ramp changes. The final controller settings for both the master flow controller and the individual loop speed controllers are determined.

Acceptance Criteria - The decay ratio for each process variable that exhibits oscillatory response to flow control changes is acceptable. The plant response to a change in recirculation flow is acceptable. The plant loading capability in the master manual flow control mode is acceptable (Vendor Test Specification).

• (STP-30) Recirculation System (Formerly SUT-27)

Unit 1

Test Objectives - The test objectives are: to determine transient responses and steady-state conditions following recirculation pump trips at selected power levels; to obtain jet pump performance data; and to demonstrate that no recirculation system cavitation occurs in the operation region of the power flow map.

Prerequisites - The recirculation system preoperational test is completed; the process computer is available; and power testing is in progress.

Test Method - Single-pump and two-pump trips are performed from different power levels. The single-pump trips are initiated by opening the generator field breaker on the applicable motor generator or by opening the M-G set drive motor breaker. The two-pump trip is initiated by tripping the recirculation pump trip (RPT) breakers. Reactor pressure, reactor level, steam and feedwater flow, and neutron flux are recorded during the transient and steady-state conditions. The data recorded during rated power operation verify the noncavitation performance of the recirculation pumps and the jet pumps.

Acceptance Criteria - All responses to the pump trip test transients are within limits. Pump performance testing under operating conditions verifies the noncavitation within the operating range. Plant stability is within specified limits.

- INSERT "D" -

(STP-31) Loss of Turbine-Generator and Offsite Power (Formerly SUT-28)

Test Objective - The test objective is to demonstrate the performance of the reactor and plant electrical equipment and systems, during the loss of auxiliary power transient.

Prerequisites - The diesel-generators are in the auto-start mode, and the plant is operating at power.

Test Method - The loss of auxiliary power test is performed at nominal 25% 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.

Acceptance Criteria - All safety systems function as required, without manual assistance. Reactor steam dome pressure is maintained below acceptable limits. Normal reactor cooling systems are capable of maintaining adequate suppression pool water temperature, adequate drywell cooling, and of preventing actuation of the automatic depressurization system (ADS).

(STP-32) Essential HVAC System Operation and Containment Hot Penetration Temperature Verification (Formerly SUT-34)

Test Objective - The test objective is to demonstrate, under actual operating conditions, satisfactory performance of the drywell, control enclosure, control room, reactor enclosure, and radwaste enclosure HVAC systems and to verify that concrete temperature surrounding hot penetrations remain within specified limits.

INSERT "D"

Unit 2

Test Objectives - The test objectives are: to determine transient responses and steady-state conditions following recirculation pump trips at selected power levels; and to obtain jet pump performance data.

Prerequisites - The recirculation system preoperational test is completed; the process computer is available, and power testing is in progress.

Test Method - Single-pump and two-pump trips are performed from specified power levels. The single-pump trips are initiated by opening the generator field breaker or the applicable motor generator or by opening the M-G set drive motor breaker. The two-pump trip is initiated by tripping the recirculation pump trip (RPT) breakers. Reactor pressure, reactor level, steam and feedwater flow, and neutron flux are recorded during the transient and steady-state conditions.

Acceptance Criteria - All responses to the pump trip test transients are within limits. Plant stability is within specified limits.