Hope Creek Generating Station
Facility Operating License NPF-57
Docket No. 50-354

Extended Power Uprate

Power Ascension Test Plan

DCP 80048085, SUPPLEMENT 19
HOPE CREEK EXTENDED POWER UPRATE
IMPLEMENTATION & POWER ASCENSION TEST PLAN

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1.0 INTRODUCTION

License Change Request H05-01 proposes an amendment to increase the Hope Creek Generating Station (HCGS) licensed thermal power level to an Extended Power Uprate (EPU) or Licensed Power Uprate (LPU) of 3840 megawatts thermal (MWt), approximately 15% above the Current Licensed Thermal Power (CLTP) of 3339 MWt and 16.6% above the Original Licensed Thermal Power (OLTP) of 3293 MWt.

The technical bases for this request follows the guidelines contained in the NRC-approved GE Nuclear Energy (GENE) Licensing Topical Reports (LTRs) for extended power uprate (EPU) safety analysis: NEDC-33004P-A, "Constant Pressure Power Uprate," (CPPU); NEDC-32424P-A, "Generic Guidelines for General Electric Boiling Water Reactor Extended Power Uprate," (ELTR1); and NEDC-32523P-A, "Generic Evaluations of General Electric Boiling Water Reactor Extended Power Uprate," (ELTR2). A detailed summary of the results of all significant evaluations performed justifying uprating the licensed thermal power at Hope Creek is contained in the Power Uprate Safety Analysis Report (PUSAR), NEDO-33076, Revision 2, and in the HCGS EPU Implementation Design Change Package 80048085.

The HCGS EPU Implementation and Power Ascension Test Plan (i.e., Test Plan) has been prepared fulfilling commitments contained in Section 10.4, Required Testing, of the Safety Analysis Report. Acceptance criteria contained in 10CFR50, Appendix B, Criterion XI, Test Control; Standard Review Plan 14.2.1, Guidance for EPU Test Plans; and Regulatory Guide 1.68, Initial Test Plans, are also considered in the development of this program. Design Change Package 80048085 implementation requirements as well as other EPU required testing are specified.

The Test Plan is built similar to the initial HCGS Startup Test Plan (ISTP) while utilizing experience gained since startup as currently contained in existing integrated and system operating procedures. During development of the Test Plan it was concluded that most EPU test requirements can be satisfied by completion of existing surveillance or functional tests, performance of instrumentation calibration and equipment setup, evaluation of the results of post modification testing, or through steady state data collection as part of system monitoring activities. However, in some cases new instructions or procedures were required.

The Test Plan, as defined herein, follows the approach outlined in ELTR-1, Appendix L, Section L.2, "Guidelines for Uprate Testing" and includes sufficient testing to demonstrate satisfactory performance at the requested power level. The Test Plan considers GE recommendations, BWR EPU experience, the original power ascension Test Plan, plant modifications, changes to expected operating parameters, and systems or areas where low margins are anticipated. Where appropriate, alternative approaches to testing are presented as well.

2.0 POWER ASCENSION TEST PLAN DESCRIPTION

2.1 Test Plan Scope

The HCGS Implementation & Power Ascension Test Plan is composed of phases characterized by differences in plant and test conditions. This document defines the three major phases of the program as well as activities contained in each. A fourth phase, while not directly part of the Test Plan, involving post-EPU on-going monitoring and commitment tracking, is described, but is not part of the Test Plan itself.

PHASE I PREPARATION

Activities in this phase include preparation of the HCGS Implementation and Power Ascension Test Plan (this document) and procedures; and selection of the HCGS EPU Test Organization. Examples of other activities in this phase include the following:

- Identification of the Test Director and Test Manager (HU-AA-1211, "Briefings-Pre Job, Heightened Level of Awareness, Infrequent Plant Activity and Post-Job Briefings")
- Preparation of the final Test Organization Chart & Roles and Responsibilities
- Industry Benchmarking
- Identification of the individual Test Team members & Backups for each of the Power Ascension Tests
- Preparation of the Implementation & Test Plan (ITP) as required by NC.CC-AP.ZZ-0081, "Engineering Change Implementation and Test Process," in support of Design Change Package 80048085
- Preparation of the final HCGS EPU Power Ascension Test Plan and Infrequently Performed Activity (IPA) Briefing Material
- Preparation, Review and Validation of HC.OP-FT.ZZ-0004, "Extended Power Uprate Power Ascension Testing" (hereafter referred to as the Test Procedure)
- Preparation of the EPU System Performance & Monitoring Plans
- Identification and Execution of Required Training and Pre-Test Preparation Activities (e.g., formation of walk-down teams, final instrument calibrations, acquisition of pre-outage baseline data).

Major Milestones associated with the above activities are included in Section 5.0.

PHASE II PREOPERATIONAL

This phase of the Test Plan includes implementation in the field currently scheduled for refueling outage RF14. Included within this phase are the numerous EPU related instrument scaling and set-point changes, pre-outage activities such as making TACS flow adjustments, and implementation of major modifications such as the replacement of the High Pressure Turbine and other EPU required actions. Other activities to be performed during this phase include:

- Non operational testing associated with EPU Design Change Packages
- Coordination, evaluation, and integration of component test results
- Reviews of the effectiveness of modifications made
- Power Ascension reviews by Operations, Licensing, Engineering

Refer to Appendix C for a summary of major implementation activities. Refer to Appendix B for an illustration of activities leading up to power ascension testing.

PHASE III POWER ASCENSION TESTING

The power ascension testing is comprised of two major phases; startup to current license thermal power (3339 MWth, also referred to as CLTP), and power ascension from CLTP to the final Target Uprate Power (TPU) condition of 3723 MWth (111.5% CLTP) for cycle 15. The actual testing sequence has been developed with Operations' support and is identified in the Extended Power Uprate Power Ascension Test Procedure, HC.OP-FT.ZZ-0004, developed during Phase I activities described above.

The tests themselves, plant operating conditions (Test Conditions) at which particular power ascension tests are to be performed, and testing approach are described in subsequent sections of this document. In general, the recommended testing sequence will have all tests performed at a particular Test Condition completed prior to proceeding to the next Test Condition. However, it is acknowledged that the actual testing sequence can vary from the recommended sequence due to equipment problems and other considerations. Additional information regarding the Power Ascension Testing Phase of the program is contained in DCP 80048085, GE Task Report T1005, Startup Test Specifications, Attachments 16 and 23 to LCR H05-01, and in PUSAR Section 10.4.

PHASE IV POST EPU ON-GOING MONITORING PROGRAM

While not part of the EPU Test Plan itself, additional activities will be performed periodically, mid-cycle, or following the first refueling outage after EPU implementation. Examples of such activities include periodic monitoring of moisture carryover, on-going system monitoring activities, and dryer, separator, jet-pump inspections during RF15. These activities will be tracked, planned, and scheduled via normal commitment and planning processes already in place at the station. Additional information regarding this phase is provided in Attachment 23 to LCR H05-01, Section 3.

2.2 Test Approach and Plateaus

The Power Ascension process will use an incremental approach and follow guidance outlined in ELTR-1, Appendix L, Section L.2 "Guidelines for Uprate Testing." Baseline data will be taken at 90% and at 100% of the current licensed power level. Power will then be increased with a constant rod pattern in incremental steps of 2.5% power, with significant holds at the 105%, 110%, and final 111.5% CLTP power plateaus. Present methods used to calculate core thermal power and fuel thermal limits will be utilized during the power ascension. Indicated core power will be re-scaled to the EPU power level prior to the commencement of power ascension testing. Routine measurements of operating performance parameters will be evaluated at each power level and new projected values will be provided prior to continued power ascension. The Test Plan will be continued up to the final Target Power Level (TPU) of 3723 MWth (111.5%). Once all required TPU testing is complete, power level will be reduced to 110% CLTP conditions to support the main turbine Warranty & Contract Demonstration run. Upon the return to TPU power, the power ascension testing will be considered complete.

The approach taken ensures a careful, monitored approach to maximum EPU power and maintains a consistent confirming technique for monitoring the power dependent parameters in each power increase increment. Based on the analyses performed for HCGS EPU and GE BWR experience with uprated plants, tests have been established for the initial power ascension steps of CPPU. These tests are summarized as follows:

- Testing will be performed in accordance with the Technical Specification Surveillance Requirements on instrumentation that is re-calibrated for CPPU conditions. Overlap between the IRM and APRM will be assured.
- Data will be taken at points from 90% up to 100% of CLTP, so that system performance parameters can be projected for CPPU power before the CLTP Rated Thermal Power (RTP) is exceeded.
- CPPU power increases will be made in predetermined increments of power. Operating data, including fuel thermal limits, will be taken and evaluated at each plateau. Routine measurements of reactor and system pressures, flows, and vibration will be evaluated from each measurement point, prior to the next power increment. Radiation measurements will be made at selected power levels to ensure the protection of personnel.
- Control system tests will be performed for the reactor feedwater/reactor water level controls, and pressure controls. Operational tests will be made at the appropriate plant conditions, for that test, at each of the power plateaus, to show acceptable adjustments and operational capability.
- Testing will be done to confirm the power level near the turbine first-stage pressure Reactor Protection System bypass setpoint.

In addition to the above, the Test Plan will include a detailed power ascension monitoring and analysis program to trend steam dryer and critical piping system performance. This is accomplished through the monitoring of Main Steam Line strain gauges, piping accelerometers, and moisture carryover. Details associated with this aspect of the program are incorporated into the Test Procedure, HC.OP-FT.ZZ-0004(Q), and are described in detail in Attachment 23 to LCR H05-01, Revision 1.

The Test Plan, in addition to the required testing identified by GE, will include performance monitoring plans for major EPU affected systems. All Category 1 and 2 parameters or limits currently contained in the EPU System Margin Report (Supplement

2 to DCP 80048085) will be monitored during testing activities. By definition, Category 1 and 2 parameters include:

- High Risk: Operating margin reductions with the potential for plant trips, power reductions, or LCOs, or can result in accelerated equipment degradation with potential for premature repair or replacement.

- Medium Risk: Operating margin reductions with operation close to alarm set points or other limiting equipment parameters, or with more than minimal reduction in operational flexibility, or that may result in long-term equipment degradation with increased maintenance or monitoring required.

The above will be accomplished via EPU System Performance & Monitoring Plans developed in part from the existing trending programs already in place in Plant Engineering. While developed separate from the Power Ascension Test Procedure, they are included within the Test Plan scope and will be summarized in the final Power Ascension Report described in Section 3.5 below.

2.3 Test Acceptance Criteria

Similar to original startup testing and consistent with GE Extended Power Uprate Task Report T1005, each test's acceptance criteria is developed from several considerations such as safety analysis assumptions, engineering expectations and/or in some cases contractual commitments. The following paragraphs describe the degree of each kind of test criterion used, and the actions to be taken after an individual criterion is not satisfied.

Level 1- Termination

If a Level 1 test criterion is not satisfied, the test will be terminated and the plant must be placed in a condition that is judged to be satisfactory and safe, based upon prior testing. Plant emergency, abnormal, operating or test procedures, or the Technical Specifications, may guide the decision on the direction to be taken. Resolution of the problem must immediately be pursued by appropriate equipment adjustments or through engineering support if needed. Following resolution, the applicable test portion must be repeated to verify that the Level 1 requirement is satisfied. A description of the problem resolution must be included in the report documenting the successful test.

Other criteria that would result in test termination include:

- Any related event that causes an unexpected reactivity transient, such as that associated with reactor water level, pressure, core flow, temperature, or control rod position.
- Any event that is reportable or potentially reportable to the NRC, such as reactor scram, ECCS actuation, an uncontrolled radiation release or other condition of noteworthy concern.

Level 2- Hold

If a Level 2 test criterion is not satisfied, the test will be placed on hold and the plant stabilized. The limits stated in this category are usually associated with expectations of system transient performance, where performance can be improved by equipment adjustments. An investigation of the related parameters, as well as the measurement and analytical methods, would be performed. Following the evaluation and resolution of the Level 2 test criterion failures, the applicable test portion must be repeated or evaluated to verify that the Level 2 requirement is satisfied.

Level 1, Termination and Level 2, Hold Criteria are specifically defined in Section 2 of HC.OP-FT.ZZ-0004(Q). Section 4 of the Test Procedure explicitly discusses actions to be taken should a termination or hold occur as well as a listing of specific actions to be taken to restart or continue the test following termination. Individual Level 1 and Level 2 criteria for each test, is contained on an individual test basis, in the Attachments to the Test Procedure.

ISTP defined Level 3 test criteria associated with highly desirable performance and failure to meet such criteria did not alter test plans. However the PATP does not include a Level 3 test criteria. In lieu of Level 3 criteria, the PATP refers to and utilizes the normal corrective action program to identify and correct routine deficiencies or occurrences not directly associated with the test.

3.0 CONDUCT OF TESTING

3.1 Test Organization

This Test Plan was established to administratively and operationally control power ascension testing activities commencing with Startup and ending with operation at the target uprate power level of 3723 MWth or 111.5% CLTP, including the main turbine warranty run. To facilitate preparation for and the conduct of the Test Plan, a Test Organization was formed including members of various technical departments and senior management.

The Test Organization, which reports to the HCGS Plant Manager, is shown in Attachment A. The roles and responsibilities of each of the positions shown are similar to that established during the ISTP, with the exception of titles which are changed to be more consistent with the current plant organization. A description of each position follows.

Test Director

The Test Director is the head of the Implementation & Power Ascension Test Team and in this capacity reports to the HCGS Plant Manager. The Test Director is responsible for completion of the Test Plan. This individual works closely with the Project Manager to allocate resources and establish the Test Plan and administrative/technical procedures required to support the Power Ascension Test Plan in accordance with corporate commitments, regulatory commitments and project schedule. The Test Director coordinates and directs all parties participating in this Test Plan.

Test/Infrequently Performed Activity (IPA) Manager

The Test Manager is a member of PSEG Nuclear Management designated by the Plant Manager. The Test Manager has the authority and experience to exercise continuous responsibility for the Test Plan. The Test Manager is required to be in a management position senior to the Shift Manager (SM). The Test Manager shall provide overall line management authority for the safe conduct of this infrequently performed test or evolution. The Test Manager does not replace any individual involved in the test or evolution, nor directly supervise the evolution. The Test/IPA Manager's function is management oversight. This position will by fulfilled by a lead (dayshift) and backup (evening) individual during power ascension activities. Additional requirements of this position can be found in HU-AA-1211.

EPU Implementation & Test Team

Under the direction of the Team Leader, this team is responsible for the preparation and development of the Test Plan and all associated documentation including the test procedure(s), IPA materials, and ITP package. The team will consist of lead individuals in the areas of Operations, Implementation, and Power Ascension. During testing activities, this team will support the Test Manager in monitoring test activities and results. The Team Leader is a member of PSEG Management and is responsible for the qualifications of the Test Team. During testing activities the Team Leader will work closely with the Test Manager and IPA Coordinator to track progress and ensure successful completion of the test procedure(s).

IPA Coordinator

The IPA Coordinator will be fulfilled by the EPU Implementation & Test Team Operations Lead and is responsible for overall implementation of the test procedure(s). Specific responsibilities are defined in HU-AA-1211. This individual will maintain control of all test activities and seek assistance from support departments as necessary. The IPA Coordinator(s) or their designees will be responsible for signing off steps as completed within this procedure. The IPA Coordinator shall have the following duties and responsibilities with respect to the activities being controlled by this procedure. The SM shall not be assigned as this individual.

- Reports test status and significant issues to station management.

- Coordinates the activities requiring completion by the test procedure to assure they are completed in a safe and timely manner.
- Responsible for assuring the test procedure is updated and maintained current with work and testing activities controlled by the procedure.
- Reviews the exceptions to the test procedure and expedites the resolution if exceptions affect power ascension testing.
- Authorizes the next step in power ascension testing if the test data results meet the acceptance criteria.
- May add additional equipment performance monitoring data collection at any time during the performance of this procedure.
- Assures that shift personnel are knowledgeable of test activities being controlled and performed by the test procedure.

Test Team Members

Qualified individuals from either Engineering or support organizations, designated by the project and PSEG Management to perform a lead role in their area of expertise and to work as part of the Power Ascension Control Center. The team will include a minimum of two Test Engineers qualified to the requirements of NC.CC-AS.ZZ-0040, "Qualification/Certification of Station Modification Inspection and Test Personnel." The Test Team Members will have the following duties and responsibilities with respect to the activities being controlled by the test procedure(s). The Test Team Member may:

- Assist in the development, review and/or presentation of technical aspects of the testing evolution.
- Has technical and administrative control of applicable portions of the test procedure.
- Maintains a log during power ascension test activities and works with members of the Power Ascension Control Center (PACC).
- Supports making changes to the acceptance limits of the system and equipment, if necessary, by preparing an engineering technical evaluation that justifies the change in accordance with CC-AA-309-101, "Engineering Technical Evaluations."

Consistent with normal plant operations, the Shift Manager (SM) has the responsibility for the safe operation of the plant at all times. The SM's approval is required prior to performance of any test or power ascension activities and has the authority to stop the test at any time. The SM's approval is also required to continue testing if a test is terminated.

3.2 <u>PATP Tests and Test Procedures(s)</u>

In addition to the EPU System Performance & Monitoring plans described in Section 2.2 above, the PATP will include specific tests to demonstrate satisfactory performance at the EPU power level. These tests and instructions for their performance are contained in the

EPU Test Procedure, HC.OP-FT.ZZ-0004(Q) and are further detailed in GE Task Report T1005, Startup Test Specifications. The purpose of each test as well as the test conditions are summarized as follows:

Chemical and Radiochemical – Test #1 (Attachment 8, HC.OP-FT.ZZ-0004)

The objective of this test is to maintain control of and knowledge about the quality of the reactor coolant chemistry and radiochemistry during power ascension. Routine reactor water samples are collected and analyzed for conductivity, sulfates, chlorides and dissolved iodine-131. Condensate and feedwater samples will be analyzed for conductivity, iron and dissolved oxygen content. Acceptance criteria are based on Technical Specification limits.
Test Condition: 100% CLTP up to TPU. Depending on the parameter, readings are taken on a periodic basis (shiftly or daily) and at each of the 5% Power Plateaus.

Radiation Measurements – Test #2 (Attachment 5, HC.OP-FT.ZZ-0004)

The purpose of this test is to monitor area radiation levels during power ascension to assure that personnel exposures are maintained ALARA, that radiation survey maps are accurate, and that radiation zones are properly posted.
Test Condition: 100% CLTP up to TPU. Monitoring will occur at each 2.5% Increment; Surveys & Evaluation at the 5.0% Power Plateaus.

Intermediate Range Monitor (IRM) Performance – Test #10 (Attachment 13, HC.OP-FT.ZZ-0004)

The purpose of this test is to adjust the Intermediate Range Monitor System to obtain an optimum overlap with the Average Power Range Monitor (APRM) system. The existing plant surveillance program, which assures compliance with the TS limits, will be utilized to satisfy this requirement.
Test Condition: Overlaps will be ensured during Power Ascension by the test procedure. Adjustments, if necessary, will be made during the first controlled shutdown following APRM Calibrations for EPU (note this second activity is part of the Phase IV, Post EPU On-Going Monitoring Program, and not part of the test itself).

APRM Calibration – Test #12 (Section 5.0, HC.OP-FT.ZZ-0004)

The purpose of this test is to calibrate the APRMs to the power uprate level. The existing plant surveillance program, which assures compliance with the TS limits, will be utilized to satisfy this requirement. Additionally, calibration checks and adjustments will be made periodically during the approach to TPU.
Test Condition: Calibrate APRM system based on heat balance data consistent with Technical Specifications.

Core Performance – Test #19 (Attachment 7, HC.OP-FT.ZZ-0004)

The purpose of this test is to measure and evaluate the core thermal power and fuel thermal limits to ensure a careful, monitored approach to the power uprate level. Existing calculation methods will be utilized to ensure TS compliance.

Fuel thermal margin values will be predicted for the next power level to show the expected acceptable margin to Technical Specification limits prior to the next power increase.
Test Condition: 90% CLTP; 100% CLTP; Each 5% CLTP to maximum TPU power.

Pressure Regulator – Test #22 (Attachment 12, HC.OP-FT.ZZ-0004)
The purpose of this test is to determine the response of the reactor and the turbine governor system to the operating pressure regulator. The pressure control system will be tested to verify proper dampening of induced perturbations in the system.
Test Condition: 90% CLTP; 100% CLTP; Each 5% CLTP to LPU power (+0/-5%).

Feedwater System – Test #23 (Attachment 11, HC.OP-FT.ZZ-0004)
The purpose of this test is to adjust the feedwater control system for acceptable reactor water level control and to demonstrate stable control system response to changes in reactor water level and feedwater flow changes and to verify that the maximum feedwater runout capability is compatible with licensing assumptions for EPU conditions. The pump flow characteristics will be monitored during power ascension and compared to pump performance curves.
Test Condition: 90% CLTP; 100% CLTP; Each 5% CLTP to LPU power (+0/-5%).

Main Steam/Feedwater Piping Vibration –Test #100 (Attachment 4, HC.OP-FT.ZZ-0004)
The purpose of this test is to ascertain the vibration measurements on the Main Steam and Feedwater system piping inside and outside the drywell to evaluate the vibration stress effect during power ascension. Increased steam flows and feedwater flows have the potential to increase vibration levels. Data will be collected at lower power levels to provide baseline information for comparison to the uprated values. The data collected at higher power levels will be analyzed to ensure no adverse effects are encountered.
Test Condition: 90% CLTP; 100% CLTP; Each 5% CLTP to maximum TPU power.

Steam Dryer Performance & Moisture Carrover - Test #101 (Attachments 3/9, HC.OP-FT.ZZ-0004)
The purpose of this test is to monitor the performance and integrity of the steam dryer during power ascension activities. This testing is described in detail in Attachment 23 to LCR H05-01 and is incorporated into the test procedure.
Test Condition: 90% CLTP; 100% CLTP; Each 5% CLTP to maximum TPU power.

System and Equipment Performance Data (EPU System Performance Monitoring Plans)
Steady-state data will be taken and evaluated at each power incremental step on select equipment and systems that are determined to be power dependent (refer to Attachment 14 of the Test Procedure for a discussion of systems included). Data

collection will begin at 90% of the current licensed power level and continue at each incremental power step to the maximum power level achieved. The data will be reviewed prior to exceeding the previous power level. This data includes routine measurements of reactor and system pressures, flows, levels, temperatures and vibrations as determined by engineering judgment and experience.
Test Condition: 90% CLTP; 100% CLTP; Each 5% CLTP to maximum TPU power.

GE Optional Testing

As stated in GE Task Report T1005, testing in this category which includes optimization of turbine valve testing (turbine control valve, stop, combined intermediate and bypass valves) and single MSIV closure testing is not a requirement to safely implement the test plan and as such, activities in this area will be performed via separate procedures from the Power Ascension Test Procedure. Tests in this category include the Turbine Valve Surveillance (Test #24) and single MSIV closure (Test #25). HCGS has already performed extensive testing to optimize power levels necessary for periodic surveillance testing of the main turbine control, stop and combined intermediate valves. Hope Creek does not routinely perform as part of any surveillance program full closure of a single MSIV. While not part of the Test Procedure, this testing is considered within the scope of the overall Test Plan, and will be controlled by Management.

The above PATP Tests with the exception of the GE Optional Testing are contained in HC.OP-FT.ZZ-0004(Q), "Extended Power Uprate Power Ascension Testing." The procedure was developed to meet the requirements of the PUSAR and other requirements described in Section 1.0 of this document. The procedure, which is intended as a one-time use test procedure, provides step-by-step guidance and verification for performing the Power Ascension Testing requirements for TPU conditions. The procedure supplements existing operations procedure HC.OP-IO.ZZ-0003(Q), "Startup from Cold Shutdown to Rated Power," to provide direction to maneuver the plant from startup to 3723 MWth (TPU) or approximately 97% EPU rated thermal power.

Development of the procedure involved input from numerous plant disciplines, performance of several collegial reviews involving both members from Engineering and Operations, and is subject to PORC approval. Changes to this procedure, if necessary, will be processed via normal plant processes and procedures (e.g., on-the-spot change for typographical error correction, or full procedure revision).

3.3 Review and Approval

The Plant Operations Review Committee (PORC), a permanent plant committee will be responsible for reviewing the test procedures, changes, results, deficiencies, plant terminations or holds, and test plateau escalation, and recommending approval of these items as appropriate during the Power Ascension Test.

The Test Manager with assistance from the Test Team and IPA coordinator will approve individual test results, resolutions, and subsequent actions of all result deficiencies during the actual test. The HCGS Plant Manager will approve initiation of the Test Plan, operation for the first time above 3339 MWth, and escalation in power to the next power plateaus.

Similar to EPU testing activities performed at another BWR, HCGS will provide a 96-hour hold (unless otherwise agreed upon) at each of the Power Plateaus (representing 105, 110, and 111.5% CLTP) for outside stakeholder review (NRC) prior to proceeding to the next power step.

3.4 Test Data and Deficiency Resolution

Test procedure data will be obtained primarily from plant instrumentation, Control Room Information Display System (CRIDS), the plant process computer, and the General Electric Transient Analysis Recording System (GETARS). Steady-state data will generally be obtained from all sources, whereas GETARS will be used for transient data. The GETARS high-speed digital data acquisition system can directly digitize measurements every millisecond, allowing data to be sampled and recorded in real time at 1000 samples per second per channel.

Test Results that do not satisfy an acceptance criterion will be identified as a deficiency and documented in Attachment 2 to HC.OP-FT.ZZ-0004(Q). Test deficiencies will be reviewed by PORC and approved by the Test Manager. Following resolution, the applicable test section(s) will be re-performed to verify that the acceptance criterion was satisfied, or accepted as-is, as appropriate. Deficiencies unrelated to testing activities will be dispositioned in accordance with the normal corrective action process.

3.5 EPU Power Ascension Test Report

At the completion of all power ascension activities, results will be summarized in an EPU Power Ascension Test Report, similar in format to the original HCGS Startup Report in accordance with Technical Specification Section 6.9.1.1. Information to be included in the report includes items such as the schedule summary, test performance dates, milestone summary and power ascension Test Plan chronology. The test data, evaluations, and a summary discussion will be provided for each of the power ascension tests as well as the results of performance monitoring of key systems.

4.0 COMPARISON WITH INITIAL STARTUP TEST PLAN

This section provides a Hope Creek systematic review of the PATP to be performed in RF14 (Fall 2007) and the Initial Startup Test Plan (ISTP). The ISTP was performed beginning with initial fuel loading April 1986 and completing December 1986 with a 100-hour warranty run. The comparisons will be made of the individual tests in the two programs and the significant elimination of ISTP Large Transient Testing (LTT) in the PATP. This systematic review and comparison is consistent with guidance provided in

NRC Standard Review Plan 14.2.1. The elimination of LLT while presented in summary form is addressed in detail in Attachment 16 of LCR H05-01.

4.1 UFSAR, ISTP and PATP Tests Compared – Overview

The following table shows what tests were detailed in the Hope Creek UFSAR Section 14.2.12.3, were performed during the initial startup Test Plan (ISTP per VTD 325911, "Power Ascension Test Plan Startup Report"), and are planned for the EPU Power Ascension Test Plan (PATP), per HC.OP-FT.ZZ-0004(Q), "HCGS Extended Power Uprate Power Ascension Testing." The column on the right shows either the EPU PATP Test number or that the test is not required for the EPU PATP.

UFSAR Section Number	Initial Plant Startup Test Procedure No.	Initial Startup Power Ascension Tests	Test Required for EPU
14.2.12.3.		(The Test numbers in this column are those given in the ISTP Startup Report [VTD 325911]).	PATP Test No.
1	11-19	1 Chemical and Radiochemical	1
2	21	2 Radiation Measurements	2
3	31-33	3 Fuel Loading	Not Required
4	41	4 Full Core Shutdown Margin	Not Required
5	51-56	5 Control Rod Drive System	Not Required
6	61,62 & 64	6 Source Range Monitor Performance	Not Required
7	--	7 Rod Sequence Exchange, Deleted	Not Required
8	101-103	8 Intermediate Range Monitor Performance	10
9	111 & 112	9 Local Power Range Monitor Calibration	Not Required
10	121 & 122	10 Average Power Range Monitor Calibration	12
11	131-138	11 Process Computer	Not Required
12	141-145	12 RCIC System	Not Required
13	151-154	13 High Pressure Coolant Injection System	Not Required
14	161-164	14 Selected Process & Water Level Reference Leg Temperatures	Not Required
15	170-179	15 & 39 System Expansion - NSSS	Not Required
16	191	17 Core Performance	19
17	201 & 202	18 Warranty Test (UFSAR)—Steam Production (STP)	Test Planned*
18	221-224	20 Pressure Regulator	22
--	236	21-1 Feedwater Control System – Flow Step Changes	23
19.3.a 19.3.b 19.3.c 19.3.d	231 & 235	21-1 Feedwater Control System – Level Setpoint Changes	23
	232	21-2 Feedwater System – Loss of FW Heating	LTT Not Required
	233	21-3 Feedwater Pump Trip	LTT Not Required
	234	21-4 Max Feedwater Runout Capability	23

LTT = Large Transient Test, refer to Attachment 16 to LCR H05-01 for discussion.

* The turbine warranty run testing is controlled separate from the PATP by contractual agreements.

** Testing will be done if desired and controlled through normal surveillance procedures.

*** This data will be taken as part of Attachment 14 to HC.OP-FT.ZZ-0004, EPU System Performance & Monitoring Plans.

UFSAR Section Number 14.2.12.3.	Initial Plant Startup Test Procedure No.	Initial Startup Power Ascension Tests (Continued)	Test Required for EPU PATP Test No.
20	241-243	22 Turbine Valve Surveillance	Optional**
21.3.a 21.3.b	251	23-1 Main Steam Isolation Valves – MSIV Functional Test	Optional**
	252	23-2 MSIV Full Isolation	LTT Not Required
22	261 & 262	24 Relief Valves	LTT Not Required
23	272-274	25 Turbine Trip and Generator Load Rejection	LTT Not Required
24	281	26 Shutdown From Outside the Main Control Room	Not Required
25	291 & 292	27 Recirculation Flow Control	Not Required
26	301-305	28 Recirculation System (1 & 2 Recirc Pump Trips)	LLT Not Required
27	351 & 352	29 Recirculation System Flow Calibration	Not Required
28	311 & 313	30 Loss of Offsite Power	LTT Not Required
29	331-335,341-346	31 & 39 Piping Vibration Tests	100
30	701 & 702	32 Reactor Water Cleanup System	Not Required
31	713 & 714	33 Residual Heat Removal System	Not Required
32	721-724	34 Drywell and Steam Tunnel Cooling	Not Required
33	741	35 Gaseous Radwaste System	Not Required
34	--	Water Level Measurement (Included in 14.2.12.3.14)	Not Required
35	--	Penetration Temperature Test (N/A for HCGS)	N/A
36	751	38 Safety Auxiliaries Cooling System	Not Required
37	--	BOP Piping Vibration & Expansion (Included in 14.2.12.3.29)	Not Required
38	761 & 762	40 Confirmatory Test of Safety/Relief Valve Discharge	Not Required
None	774	41 Turbine First Stage Pressure Scram Bypass Setpoint	22
None	781-783	42 Ventilation System Performance Test	Not Required
None	715	43 LPCI & Core Spray Line Break	Data Taking***
None	771 & 772	44-1 Main Turbine & Generator Initial Startup	Not Required
None	773	44-2 Steam Seal Evaporator Initial Test	Not Required
None	791	45 Seismic Monitor	Not Required
None	792	46 Loose Parts Monitor	Not Required
None	793	47 SRV Acoustic monitoring	Not Required
--	--	Steam Dryer Monitoring Plan	101

LTT = Large Transient Test, refer to Attachment 16 to LCR H05-01 for discussion.

* The turbine warranty run testing is controlled separate from the PATP by contractual agreements.

** Testing will be done if desired and controlled through normal surveillance procedures.

*** This data will be taken as part of Attachment 14 to HC.OP-FT.ZZ-0004, EPU System Performance & Monitoring Plans.

4.2 ISTP and PATP Tests Compared – Detailed Review

The following shows what tests were performed during the initial startup Test Plan (ISTP per VTD 325911, "Power Ascension Test Plan Startup Report") and an explanation of how the test relates to the PATP, per HC.OP-FT.ZZ-0004(Q), "HCGS Extended Power Uprate Power Ascension."

Test #1 Chemical and Radiochemical: This test is being performed as PATP Test #1 to meet the EPU-affected requirements of the original ISTP test. The tests' acceptance criteria are based on current Technical Specifications, fuel warranty, and Chemistry department limits. Samples are taken in accordance with existing plant procedures and will be taken on a once per shift, daily or three times a week basis, and at each of the power plateaus. Specific sample and frequency requirements are contained in Attachment 8 to the Test Procedure. Process radiation monitoring readings will be compared with baseline data (Attachment 5) and moisture carryover will be determined using a Na-24 concentration test (Attachment 9) every 2.5% power step.

Test #2 Radiation Measurements: This test is being performed as PATP Test #2 to meet the EPU-affected requirements of the original ISTP test. The tests' acceptance criteria are based on those contained in the original test. Testing will include monitoring of Plant Area Radiation and Process Monitors at each of the 2.5% power steps and physical surveys (contact and general area dose rates) at each of the 5.0% power plateaus. Surveys will be performed using hand held instruments to measure gamma dose rates. Locations to be monitored are contained in Attachment 5 to the Test Procedure and are based on areas containing EPU affected piping and expected dose rate changes. ALARA was also considered in this determination. Note that due to noble metals introduction which changed Hydrogen Water Chemistry Injections (HWCI) required injection flow-rates from 35 to the current 9 scfm, post-EPU dose rates are anticipated to be generally less than those experienced for most of plant life to date, when HWCI was at 35 scfm. Thus, post-EPU radiation doses should be bounded by those experienced during past plant operation.

Test #3 Fuel Loading: This test is not applicable as a PATP Test. Fuel loading and sub-criticality requirements are governed by existing plant procedures and plant refueling practices (KE series and reactor engineering procedures). EPU implementation makes no changes to these procedures or practices.

Test #4 Full Core Shutdown Margin: This test is replaced by the plant post-refueling shutdown margin test, which is part of normal refueling outage operation. Thus, this test is not an applicable PATP test, since EPU implementation makes no changes to the procedure methodology.

Test #5 Control Rod Drive System: This test is replaced by the normal operating plant surveillances and procedures for the CRD system. EPU requires no significant change to CRD operating parameters, or control rod speeds.

Test #6 Source Range Monitor Performance: This test is replaced by the normal operating plant procedures for the source range monitors. Per GE Task T0500, Test #14 Selected Process & Water Level Reference Leg Temperatures: The reactor bottom head and the reactor water level instrumentation leg temperatures are unaffected by the EPU. The CPPU does not change reactor pressure (temperature) and small drywell temperature changes due to higher feed-water temperature are negligible with respect to water level measurement.

Test#15/39 System Expansion – NSSS & BOP: The piping systems' thermal expansion is unaffected by EPU (negligible changes in system temperatures due to EPU) except for feedwater piping. The effect of the rated feedwater temperature increase on pipe movement during cold to hot cycling is negligible for testing purposes.

Test #17 Core Performance: This test is being performed as PATP Test #19 to meet the requirements of the original ISTP test and to project conditions at each of the next higher power plateaus. Core thermal limits will be confirmed within Technical Specification required limits by existing surveillance procedures. Core flow was limited to 100 Mlb/hr rated flow during the ISTP test. The maximum allowable core flow has been changed via the LCR process and the PATP will limit core flow to the newer maximum value (i.e., approximately 105 Mlb/hr). Prior testing, performed in support of the EPU project confirmed the ability of the Reactor Recirculation (RR) pumps to achieve satisfactory performance near full rated maximum flow. Provided speeds remain below 1500 rpm, no additional testing is required of the RR pumps (i.e., operation above 1500 rpm requires additional vibration monitoring). This requirement is incorporated into HC.OP-FT.ZZ-0004.

Test #18 Warranty Test (UFSAR): Steam Production (STP): Plant electrical MWe output performance monitoring will be done via the High Pressure Turbine DCP (80071904) at approximately 110% CLTP with the reactor heat balance using input from the Crossflow system. Main turbine, generator and auxiliary system performance will be monitored as part of the EPU System Performance Monitoring plans within the Test Plan. Contract required testing will verify turbine cycle efficiency and MWe output. The moisture carryover performance of the reactor steam separator-dryer will be measured by Na-24 tests as part of PATP Chemical Testing, PATP Test #1 and PATP Steam Dryer Monitoring Plan, PATP Test #101 (Attachments 8 and 9 of the test procedure).

Test #20 Pressure Regulator: This test is being performed as PATP Test #22 to meet the requirements of the original ISTP test. The Digital EHC System Upgrade to GE Mark VI, which has been in operation for 2 operational cycles (~3 years) changes the nature of the takeover capability of the backup regulator during simulated pressure regulator failure high. The dynamic tuning of the pressure regulator control system will be verified similar to the ISTP Test #20. Note that similar testing performed in support of DCP 80048294 implementation was performed already at low power (approximately 23% w/simulation of a transmitter failure) and at 90% of CLTP. Thus, there are no low power PATP tests associated with the pressure regulator. Incremental regulation during power ascension will also be evaluated similar to the ISTP test.

Test #21-1 Feedwater Control System – Flow Step Changes: This test is being performed as PATP Test #23 to meet the requirements of the original ISTP test. Acceptance criteria are the same as that contained within the ISTP, with the exception of the size of the manual flow step change itself. This is due to the revised transient allowance for the condensate/feedwater system at the EPU condition from the original 10% to 5%. Refer to PUSAR Section 7.4.2 for additional information associated with this change. Startup Level Controller testing is not part of the PATP since it is not affected by the increase in power above CLTP and is identified as optional testing in HC.OP-FT.ZZ-0004.

Test #21-1 Feedwater Control System – Level Setpoint Changes: This test is being performed as PATP Test #23 to meet the requirements of the original ISTP test. Acceptance criteria is the same as that included in the original test. Per GE test specifications, the tests will be performed in both 3-element and single-element control modes.

Test #21-2 Feedwater System – Loss of FW Heating: This is a Large Transient Test (LTT), is not being performed in the PATP, and is addressed in Section 4.5 below.

Test #21-3 Feedwater Pump Trip: This is a Large Transient Test (LTT), is not being performed in the PATP, and is addressed in Section 4.5 below.

Test #21-4 Maximum Feedwater Runout Capability: This data taking and analytical projection will be performed as part of PATP #23. Unlike the original testing, each RFP will not be physically raised to its high speed clamp. The condensate models documented in H-1-AE-MDC-4004 (Fathom) and/or AE-0026 (ProtoFlo) will be utilized to aid in this projection.

Test #22 Turbine Valve Surveillance: As stated in GE Task Report T1005, this testing is not a requirement to safely implement EPU and is considered optional testing. Test procedure HC.OP-FT.AC-0005 has been prepared to perform this testing and was performed as part of the DEHC modifications in support of EPU. While not part of the Test Procedure, this testing is considered within the scope of the overall Test Plan, and will be controlled by Management.

Test #23-1 Main Steam Isolation Valves – MSIV Functional Test: As stated in GE Task Report T1005, this testing is not a requirement to safely implement EPU and is considered optional testing. As stated in this document, it is suggested to take advantage of the testing program to optimize the power level at which an MSIV can be fully closed, thereby increasing plant capacity during such evolutions. While during the ISTP, individual valves were stroked closed at 16% power;

single MSIV closures are not performed at power at the station. For HCGS, only a partial stroke test per HC.OP-IS.AB-0101 is performed to verify proper RPS inputs. Fast closure full-stroke time testing of the MSIVs occurs during cold shutdown via HC.OP-IS.AB-0102. Thus, this testing recommendation is not applicable at HCGS.

Test #23-2 MSIV Full Isolation: This is a Large Transient Test (LTT), is not being performed in the PATP, and is addressed in Section 4.5 below.

Test #24 Relief Valves: This is a Large Transient Test (LTT), is not being performed in the PATP, and is addressed in Section 4.5 below.

Test #25 Turbine Trip and Generator Load Rejection: This is a Large Transient Test (LTT), is not being performed in the PATP, and is addressed in Section 4.5 below.

Test #26 Shutdown From Outside the Main Control Room: EPU Implementation has made no physical or significant parameter changes involving operations at the remote shutdown panel (with the exception of extending the cooldown time to cold shutdown). The ability to safely scram the reactor and maintain it in hot standby and commence a cooldown remains unaffected by EPU. Thus, the test results are still valid, and such testing is not being performed in the PATP.

Test #27 Recirculation Flow Control - Flow Step Changes: EPU does not change the maximum rated recirculation flow for the reactor recirculation pumps. Previous testing has confirmed the ability of these pumps to supply their maximum rated flows. While slightly higher RR pump speeds are required to produce the same flow (slight increase in core plate DP), they are considered negligible and would not invalidate previous test results. Should operation above 1500 rpm for either pump occur, vibration data will be taken. However, the step changes originally performed as part of the ISTP are valid, and such testing is not being performed in the PATP.

Test #28 Recirculation System (1 and 2 RR Pump Trips): This is a Large Transient Test (LTT), is not being performed in the PATP, and is addressed in Section 4.5 below.

Test #29 Recirculation System Flow Calibration: For the same reasons discussed above in response to ISTP Test 27, calibration of the RR pumps is not required during the PATP. Setting of the high speed electrical and mechanical stops to fulfill Technical Specification requirements is performed via independent procedures as an infrequently performed activity.

Test #30 Loss of Offsite Power: This is considered a Large Transient Test (LTT), is not being performed in the PATP, and is addressed in Section 4.5 below.

Test #40 Confirmatory Test of Safety/Relief Valve Discharge: This is a Large Transient Test (LTT), is not being performed in the PATP, and is addressed in Section 4.5 below.

Test #41 Turbine First Stage Pressure Scram Bypass Setpoint: This test is being performed as part of PATP Test #22 to meet the requirements of the original ISTP test.

Test #42 Ventilation System Performance Test: This test is replaced by the normal operating plant procedures, which contain limits for operation. Per H-1-GT-MEE-1943, Drywell and Reactor Building HVAC Calculations, the EPU impact to ventilation systems (including the turbine building as documented in GE-0004), is small or negligible. The ISTP test results are still valid and no specific ventilation tests will be included within the Test Procedure. Please note that some original design deficiencies seen in the SJAE and No. 6 feedwater heater rooms still exist today but are being pursued via the corrective action program and are limited to non safety related areas of the plant. Ventilation system performance will be monitored as part of the EPU System Performance & Monitoring plans.

Test #43 LPCI & Core Spray Line Break: Given the margins seen during the ISTP and the fact that under constant pressure power uprate conditions, EPU implementation is not expected to change original test results. Thus, this test is not specifically included in the PATP. System Performance will be monitored as part of the EPU System Performance & Monitoring Plans.

Test #44-1 Main Turbine & Generator Initial Startup: This test is replaced by normal operating and integrated operating plant procedures revised for EPU and the new HP turbine. No new startup requirements are associated with the new turbine.

Test #44-2 Steam Seal Evaporator Initial Test: This test is replaced by the normal operating plant procedures revised for EPU conditions, thus, is not part of the PATP.

Test #45 Seismic Monitor: This test is replaced by the normal operating plant procedures. EPU implementation has no effect on this system.

Test #46 Loose Parts Monitor: This monitor has been abandoned in place, thus, is not part of the PATP.

Test #47 SRV Acoustic monitoring: This test involved large transient testing and is further discussed in Section 4.5. Nonetheless, a slight change in initial noise level due to EPU conditions (main steam) is not expected to invalidate test results since the SRV Open response is numerous orders of magnitude higher.

EPU Related Modifications Made During RFO13, RFO12, or Earlier	Post Modification Testing	Further Testing by PATP
Cooling Modification	Thermograph evaluations	
DCP 80072785, Steam Jet Air Ejector A Modification	Parameter measurements at rated flow No chugging at rated flow	No*
DCP 80086589, Resin Strainers for Cond Demins (1 in RF13, 6 in RF14)	Pressure drop measurements at full flow	No*
DCP 80062466, EPU Piping Vibration Monitoring (MS, FW, Ext, Recirc)	Functional checks & Vibration Measurements at EPU conditions	No*
DCP 80084814, Additional EPU Piping Vibration Monitoring (Recirc, RHR, MS)	Functional performance checks Vibration Measurements at EPU conditions	No*

* Post Modification Testing involves additional data gathering not already incorporated into the PATP and will be performed as part of the EPU System Performance & Monitoring plans. This monitoring does not require a specific PATP test or large transient test.

In addition to the above, the following modifications in support of EPU will be implemented during RF014. The testing of these modifications (as necessary) will be part of the EPU implementation in accordance with station procedures. The column on the right documents that none of these modifications require a specific power ascension test or large transient testing of the plant to address the required post-modification testing.

EPU Related Modifications to be Made During RFO14	Post Modification Testing	Further Testing by PATP
DCP 80071904, HP Turbine Replacement & new SSE Relief Valves & Setpoints	120% rotor speed factory test Transient/steady state data recording Over-speed trip testing. ASME Perform Test PTC 12.4-1992	No*
DCP 80048085, EPU I&C Upgrades and process setpoint changes	Equipment calibrations Component performance measurements	No
DCP 80086589, Resin Strainer Cond Demin (1 in RF13, 6 in RF14)	Pressure drop measurements at full flow	No*
Reactor Coolant and BOP Piping Structural Upgrades (minor hanger upgrades)	Physical inspections NDE	No
DCP 80043099, Cooling Tower Flow Distribution, continued	Performance measurements	No*
DCP 80045795, Cooling Tower Fill & Fill Support, continued	Performance measurements	No*
DCP 80090587, Mn Stm DW Vibration Monitoring (on SRVs & MS risers)	Functional checks & Vibration Measurements at EPU conditions	No*
DCP 80090588, Mn Stm Small Bore Piping Weld Upgrades	NDE Only	No
DCP 80061468, Structural Calculations	NDE Only	No
DCP 80048085, Op 306 Final Transient Analysis Recommendations Cond/FW low suction trip setpoints	Controls calibrations Functional performance checks	No*
DCP 80048085, Op 606 RCIC Exhaust	Controls calibrations	No

EPU Related Modifications to be Made During RFO14	Post Modification Testing	Further Testing by PATP
Pressure Setpoint Change	Functional performance checks	

* Post Modification Testing involves additional data gathering not already incorporated into the PATP and will be performed as part of the EPU System Performance & Monitoring plans. This monitoring does not require a specific PATP test or large transient test.

4.4 Other Comparisons

All ISTP Power-Ascension LTTs Performed at ≥ 80% of OLTP

The following transient tests were performed during initial plant startup, as detailed in the Hope Creek UFSAR. The initial condition of these tests during initial plant startup was ≥80% power.

Initial Transient Test	Power Level	UFSAR Paragraph 14.2	Attachment 2 to SRP 14.2.1
Feedwater Pump Trip	97.4%	12.3.19.3b	Yes
Loss of Feedwater Heating	83.8%	12.3.19.3c	Yes
Closure of All MSIVs	99.6%	12.3.21.3b	Yes
Turbine Trip/Generator Load Rejection	97%	12.3.23.3	Yes
Recirculation Pump Trip	99%	12.3.26.3	Yes

Each is addressed in Attachment 16 to LCR H05-01, Hope Creek Generating Station EPU Large Transient Testing and is not planned as part of the EPU PATP.

Attachments 1 and 2 of the SRP 14.2.1

The following steady-state tests, included in Attachment 1 of SRP 14.2.1, were not performed during Hope Creek startup as a formal stand-alone test.

SRP Attachment 1, Steady-State Tests Not Performed During HCGS ISTP	Reason for Not being Included in the HCGS ISTP	Test Required for EPU PATP?
Control Rod Pattern Exchange	This was deleted from the GE Test Spec. [It is a rod movement activity at low power (~60%) controlled by Reactor Engineering]	Not Required
Control Rod Misalignment Testing	Not part of the GE Test Spec & controlled by the RWM (& RSCS before 1997) at low power & Reactor Engineering	Not Required
Failed Fuel Detection System	Not part of the GE Test Spec & is controlled and monitored by plant procedures	Not Required
Shield & Penetration Cooling System	N/A to Hope Creek	N/A
ESF Auxiliary & Environmental Systems	Not part of the GE Test Spec & controlled by normal plant processes	Not Required

The following tests, included in Attachment 2 of SRP 14.2.1, were not performed during Hope Creek startup at power levels greater than 80%. The power level at which the initial startup test was conducted is compatible with the Attachment 2 stated power level/plant condition below.

Attachment 2, ISTP Transient Tests Performed at <80% Power	Power Level per SRP	Power Level during HCGS ISTP	Test Required for EPU PATP?
Relief Valve Testing	~25%	Various, ≥20%	Not Required—See Section 4.5
RCIC Functional Testing	Rated Temp & Press, ~25% Power	≥150 psig and rated Press	Not Required—See Section 4.3
Loss of Offsite Power	>10%	Final Test at 20%	Not Required—See Section 4.5

4.5 Large Transient Testing

Hope Creek does not intend to perform large transient testing involving an automatic scram from a high power level. Transient experience at high power levels and for a wide range of operating power levels at operating BWR plants has shown an acceptable correlation of the plant transient data to the predicted response. The operating history of Hope Creek demonstrates that previous transient events from full power are within expected peak limiting values. The transient analysis performed for the Hope Creek CPPU demonstrates that all safety criteria are met and that the uprate does not cause any previous non-limiting events to become limiting. Based on the similarity of plants, past transient testing, past analyses, and the evaluation of test results, the effects of the CPPU RTP level can be analytically determined. Detailed technical information on this can be found in the Large Transient Testing Supplement, Attachment 16 of LCR H05-01. This is presented in summary form below.

Dynamic Response to Plant Load Swings

Plant response to recirculation flow changes at CPPU conditions is expected to be similar to the documented response during initial start up testing. The existing MELLLA load line will be unchanged at ≤100% CLTP for EPU and will have been in place for one operating cycle before EPU operation.

The need for re-performing this test at EPU conditions is not required since plant dynamic response is not expected to significantly change from the previously documented response during initial start up testing. The recirculation flow control system tuning was adjusted during plant start up to provide a slow plant response to meet all safety criteria. EPU does not cause any previous tuning to become limiting. The reactor recirculation system remains unchanged since the maximum allowable flow of 105 Mlbm/hr remains unchanged for EPU. Thus, the need for re-performing this test at EPU conditions is not required since plant response is not expected to significantly change from that previously documented response during initial start up testing.

Feedwater Pump Trip

During the ISTP, 'A' Feed-water Pump was tripped from 97.4% core thermal power on December 2, 1986. Reactor water level dropped from 34.8 inches to 29.8 inches, and stabilized at 34.5 inches. The capacity and response of the two remaining feedwater pumps nearly prevented a recirculation runback during this test, as the Level 4 signal (30 inches) was just reached. The feedwater pump trip provided a margin to scram of 16.9 inches, which far exceeded the required margin of three inches from the low water level scram setpoint of +12.5 inches. In addition, plant parameters were recorded by GETARS during a Hope Creek event in May 1993, when two feedwater pumps were lost with the plant operating at full power. During the event, reactor vessel level did not reach the low-level trip setpoint of 12.5" (Level 3), and power level stabilized slightly below 50%. The May 1993 event was initiated by an electrical (13.8KV) failure that caused a momentary loss of 2 vital 1E buses and 3 non-1E buses. In addition to 2 feed pumps, the electrical transient also tripped a primary and secondary condensate pump, a feedwater heater string, and a recirculation pump. The tripped recirculation pump, along with the full runback of the other recirculation pump, helped to stabilize reactor vessel level and precluded a low-level SCRAM.

A comparison was made of reactor power and vessel level from the 1993 data with the analysis of the Single Feedwater Pump Trip of the EPU transient analyses. The 1993 event, which included loss of two reactor feed pumps, bounds the EPU evaluation of a single feed pump trip. The 1993 event is bounding both from power level change and reactor vessel level change. While the 1993 event was more than a simple trip of two feedwater pumps, when combined with the margins demonstrated during startup testing, it further demonstrates the robust nature of the Hope Creek systems in responding to a loss of feedwater event.

The feedwater pump trip event was analyzed at a reactor power level of 3952 MWt. The results of this analysis show a similar drop and recovery in level. Therefore, based on plant historical data and EPU analytical results, the capability of the recirculation system to prevent a low water level scram following the trip of a feedwater pump while operating at EPU power has been established and additional plant testing of feedwater pump trips is not necessary.

Loss of Feedwater Heating

The purpose of this test was to demonstrate adequate plant response to a reduction in feedwater temperature caused by a single failure that would result in the largest loss in feedwater heating. A loss of feedwater heating test was conducted on December 3, 1986. The largest loss of feedwater heating by a single failure was initiated by opening the bypass line around the third, fourth, and fifth stage feedwater heaters at 83.8% reactor power and 96.5% core flow. The predicted drop in feedwater temperature at 100% reactor power was approximately 40°F. The actual drop in feedwater temperature was measured to be 21°F, with a resultant increase in reactor thermal power to 86.2% (an increase of 2.4%). The feedwater temperature decrease was well within the predicted, and significantly less than the acceptance criteria of <100°F. The observed 2.7% heat flux increase was less than the allowable Level 2 value of 2.88% (83.8% to 86.68% power). Fuel Thermal limit margins were maintained throughout the transient.

As presented in Attachment 16 to LCR H05-01, there have been a number of loss of feedwater heating events during plant operation. The transients were relatively minor in magnitude. Based on plant historical data and the EPU analytical results, loss of feed-water heating testing will not be conducted as part of EPU power ascension.

Simultaneous Closure of All MSIVs

The MSIV full closure test was performed at a reactor thermal power of 99.6% rated (3280 MWt) with the main turbine-generator producing 1105 MWe. Initial reactor steam dome pressure was 998 psig, with RPV level at +35 inches. The reactor scram occurred at 0.6 seconds after the second channel of MSIV logic tripped on "MSIVs-not-full-open". MSIVs closed with an average stroke time of 3.56 seconds. Steam dome pressure peaked at 1049 psig at approximately 5 seconds into the transient, with the low-low set "H" SRV opening at 1047 psig. This is as expected since there are two low-low set SRVs at Hope Creek (SRV "H" and "P"). Under the low-low set logic, both valves are armed and initially open at 1047 psig. Once armed, SRV "H" reopens at 1017 psig and SRV "P" reopens at 1047 psig, until the logic is reset.

Reactor water level reached its minimum value of -46.3 inches at approximately 5 seconds into the transient. Both HPCI and RCIC systems received a low reactor water level auto-initiation signal but only HPCI properly performed its function of injecting water to the vessel. RCIC performance is discussed below.

All Level 1 and Level 2 acceptance criteria were met for this test, except that RCIC failed to develop sufficient head to inject into the core. This was caused by the failure of the turbine steam admission valve to fully open due to faulty relay contacts. The contacts were subsequently cleaned and adjusted, and RCIC was successfully retested with the reactor at power and pressure.

No MSIV full-closure events, intentional or unintentional, have been recorded since the plant startup test. Consequently, initial start up testing at 3280 MWt is the highest reactor power level at which a full MSIV closure has occurred at Hope Creek.

The MSIV full closure event was analyzed at a reactor power level of 102% of 3840 MWt. The results are shown in Figure 3-13 of GE Task Report T0900, VTD

430060-002, as well as Section 9.1.1 of the PUSAR. The transient analysis performed for the Hope Creek EPU demonstrates that all safety criteria are met and that CPPU does not cause any previous non-limiting events to become limiting.

As fully discussed in Attachment 16 to LCR H05-01, the objective of determining reactor transient behavior resulting from the simultaneous full closure of all Main Steam Isolation Valves can be satisfied for EPU without LTT. This can be demonstrated through a combination of post-modification testing, Technical Specification required surveillances and engineering analysis. In addition, limiting transient analyses are included as part of the reload licensing analysis. The need for re-performing this test at EPU conditions is not required since plant response is not expected to significantly change from that previously documented at OLTP conditions. Plant experience and analysis demonstrate adequate margin is available in vessel pressure and level limits. These demonstrate acceptable reactor transient behavior. Deliberately closing all MSIVs from 100% power will result in an undesirable transient cycle on the primary system that can reduce equipment service life. MSIV full-closure testing at 100% core power during EPU power ascension testing is not required at Hope Creek because the plant response at CPPU conditions is expected to be similar to the documented response during initial start up testing. The transient analysis performed for the Hope Creek EPU demonstrates that all safety criteria are met and that CPPU does not cause any previous non-limiting events to become limiting.

Turbine Trip/Generator Load Rejection

Turbine trips and generator load rejections are different events with respect to the manner in which they are initiated and in the protective devices that must respond, however the overall affect on plant response is basically the same. That is, the turbine control valves fast close in ~0.1 second in a generator load rejection and the turbine stop valves trip closed in ~0.1 second in a turbine trip. Hence they are treated herein as a single event, including load-rejections that are initiated by a loss of off-site power (LOOP) and turbine trips that are initiated by one of the 18 sensed parameters that feed the turbine trip logic.

On December 6, 1986, a main turbine-generator load rejection was initiated by simultaneously opening the main-generator output breakers with the plant operating at 97% rated thermal power (3194 MWt). Spurious Level-8 trip signals at the start of the transient tripped the feed-water turbines, resulting in starting HPCI and RCIC to maintain reactor vessel level. A subsequent evaluation determined the feed-water control system at Hope Creek to be adequate to maintain RPV water level between Level-2 and Level-8. The recirculation pump drive flow coast-down was found to be slightly above the 4.5 second inertia time constant and was evaluated in a subsequent test. All other acceptance criteria were satisfied.

Since initial startup, a number of turbine trip or generator load reject events have been recorded. In addition, a generator load-rejection event was analyzed at a reactor power level of 3840 MWt. The results are shown in transient analysis Figure 3-7 of the LCR Attachment 16 as well as Section 9.1.1 of LCR H05-01.

These documents conclude that the objective of determining reactor transient behavior resulting from a turbine-trip/generator load-rejection testing at 100% core power during EPU power ascension testing is not required at Hope Creek. The plant response at EPU conditions is expected to be similar to the documented response seen during initial start up testing and historical events tabulated above between 1988 and 1994. The transient analysis performed for the Hope Creek EPU demonstrates that all safety criteria are met and that CPPU does not cause any previous non-limiting events to become limiting. Deliberately causing a load reject and subsequent scram from 100% power results in an unnecessary transient cycle on the primary system that can cause undesirable effects on equipment and grid stability. The transient load rejection provides no benefit to safety equipment. Therefore, additional load reject / turbine trip testing causing a scram from high power levels is not expected to result in plant response that has not been previously seen.

Recirculation Pump Trip

During startup testing, recirculation pump "A" was tripped on December 2, 1986 from 99% reactor power and 98% core flow. Pump "B" was tripped on November 1, 1986 from 75% power and 95% core flow. The pumps were tripped by opening the MG set drive motor breakers from the control room. The reactor vessel margins to scram measured during the pump trips and pump restart satisfied all testing acceptance criteria. Six events were recorded between 1987 and the present in which one or both recirculation pumps tripped.

The results from startup testing and events that have occurred during plant operations indicate recirculation pump trip testing is not considered necessary. Figure 3.6-1 of LCR Attachment 16, shows GETARS information recorded in June 1988 when Recirculation Pump B tripped during plant operation. As shown in Figure 3.6-1, the impact on the reactor coolant system was minor and well within operating parameters. This is consistent with the original startup testing. Recirculation pumps were tripped from full reactor power, where reactor parameters were analyzed with adequate margins to RPS setpoints along with the capability of the feedwater system to prevent high water level trips. Therefore, based on plant historical data and GETARS results, acceptable recirculation system and feedwater control have been established; additional plant testing of recirculation pump trips is not necessary.

Relief Valve Testing

During startup testing, safety relief valves (SRVs) were tested with reactor power at 20%, steam dome pressure at 927 psig, and the main turbine secured with steam being routed to the main condenser via the turbine bypass valves. The relief valves were manually opened one at a time to verify proper operation and were maintained open for approximately ten seconds to allow plant variables to stabilize and to be recorded for acceptance. Relief valves are inspected and tested in accordance with Technical Specification requirements. In addition, SRVs have operated satisfactorily during various unplanned events since startup, some of which are discussed in the previous sections on simultaneous closure of all MSIVs and Turbine Trip / Generator Load Rejection.

Relief valves will continue to be tested in accordance with Technical Specifications. Since relief valve set-points are not changed and relief valve operations are not impacted by EPU, there is no need for any additional testing beyond the testing already required by Technical Specifications.

Loss of Offsite Power

During startup testing, 4 Loss of Power (LOP) tests were run during the startup program. The initial LOP test uncovered design problems in the control logics of the RACS swap to replace chilled water for drywell cooling. The first LOP Test was done at Test Condition-2 (20-30%) and the second and third tests were done at cold shutdown to completely evaluate 1E or uninterruptible power for components and required instrumentation displays. The NRC issued a Confirmatory Action Letter (CAL) and dispatched an Augmented Inspection Team (AIT) to assess the anomalies identified during the first two LOP tests. Power to various components and Bailey 862 solid state logic modules were verified. All discrepancies were resolved. The final performance of the test at 20% power met the objectives of the test and all acceptance criteria were satisfied. No full LOP operational events have occurred since startup.

Evaluation has concluded that LOP during EPU power ascension testing is not required because the EPU changes do not have an impact on plant emergency power supply or electrical systems. The electrical changes in the Isolated Phase Bus Modification, the Main Power Transformer upgrade, and the added 500 kV switchyard breaker do not affect plant response in a LOP, but rather make the plant more reliable. Therefore, LOP testing would not provide any new data, particularly with regard to reactor transient response or overall plant response.

The technical bases for the above conclusions are presented in Attachment 16 to LCR H05-01. Refer to this document for detailed discussion of plant operating experience regarding the above and other large transient tests and their applicability to EPU.

5.0 Major Milestones and Schedule

Phase 1 - Preparation:		*Date*
Test Organization		
Selection of the Test Director & Test Manager		2/16/07
Test Team Member Selection		2/23/07
Development Roles/Responsibilities, Expectations		2/23/07
Final Test Organization Chart		2/30/07
Commence Bi-Weekly Team Status Meetings	Begin	3/02/07
Commence Weekly Management Meetings	Begin	3/02/07
Benchmarking		
Review Available BWR EPU Experience		2/09/07
Lessons learned trip to Vermont Yankee		2/16/07
Prepare & Distribute Benchmarking Meeting Notes		3/15/07
HCGS Extended Power Uprate Test Procedure, HC.OP-FT.ZZ-0004(Q)		
Prepare Procedure and Attachments		4/11/07
Conduct Collegial Review		4/12/07
Complete Review Process		4/27/07
Presentation to PORC for Approval		5/12/07
DCP Implementation & Test Plan (CCAP-81)		
RFO14 Work Orders Planned		4/12/07
Final ITP Prepared and Reviewed		5/12/07
HCGS Power Ascension Test Plan (DCP, Supplement 19)		
Prepared and Reviewed		4/30/07
Owner's Acceptance Review & Final Approval		5/12/07
Development of the EPU PATP Communication Plan		5/31/07
Commencement of Project Publications		6/15/07
EPU System Performance & Monitoring Plans		
Development of the Individual Plans		8/15/07
Approval of all Plans		9/12/07
Turbine Valve Testing Strategy (GE Optional Testing)		6/30/07
Walkdown Team Formation & 100% Power Baselining		8/30/07
Development of Test Contingencies		8/30/07
PATP Required Instrument Calibrations		9/15/07

All PATP Training Complete	9/01/07
Department Readiness Reviews Complete	9/15/07
Test Performance (w/Team) in HC Simulator	9/30/07

Phase 2 – Preoperational/Implementation	*Date*
Various – Outage Schedule	RFO14

Phase 3 – Power Ascension Testing	*Date*
IPTE Briefing	RFO14
Startup & Power Ascension	RFO14

6.0 Signatures

Prepared: ______________________ **Date:** **4/26/07**
P. Lindsay, MLEA

Reviewed: ______________________ **Date:** **4/26/07**
B. Barkley, MLEA

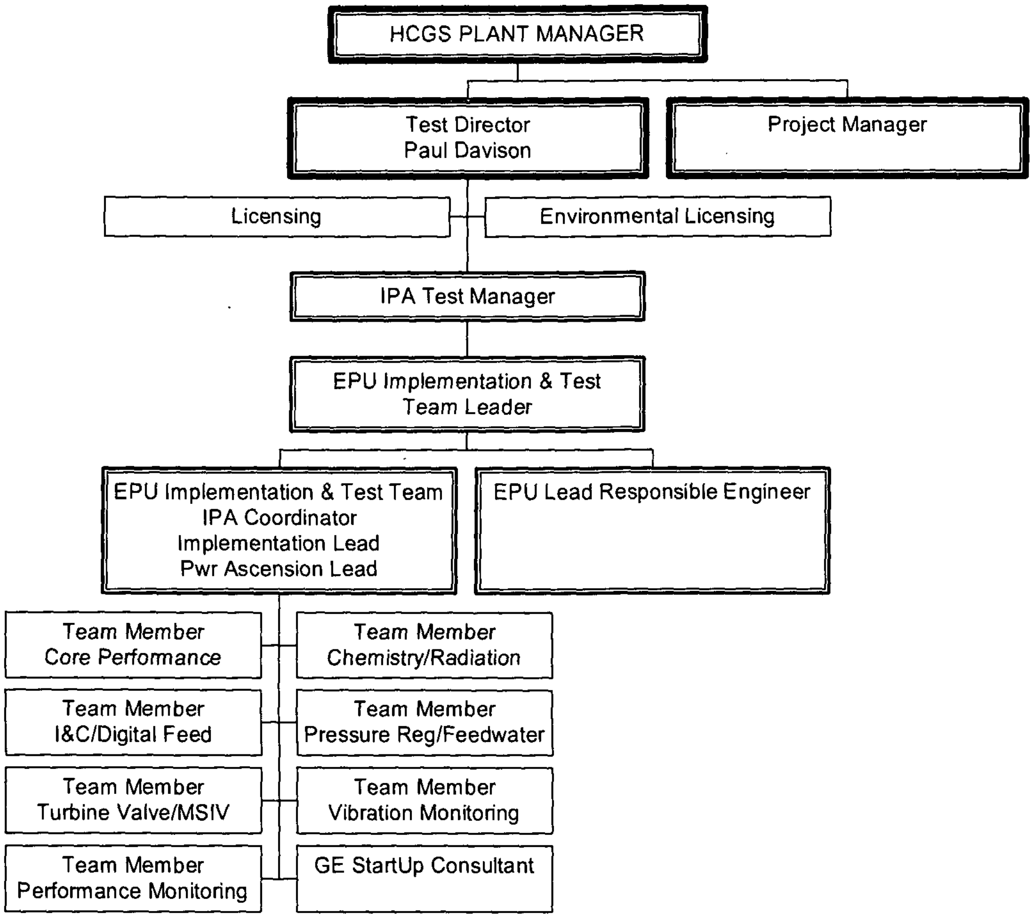
Reviewed: ______________________ **Date:** 4/30/07
S. Kugler, Test Team Lead

Approved: ______________________ **Date:** 4/30/07
B. Booth, Test Manager

Approved: ______________________ **Date:** 4/30/07
P. Davison, Test Director

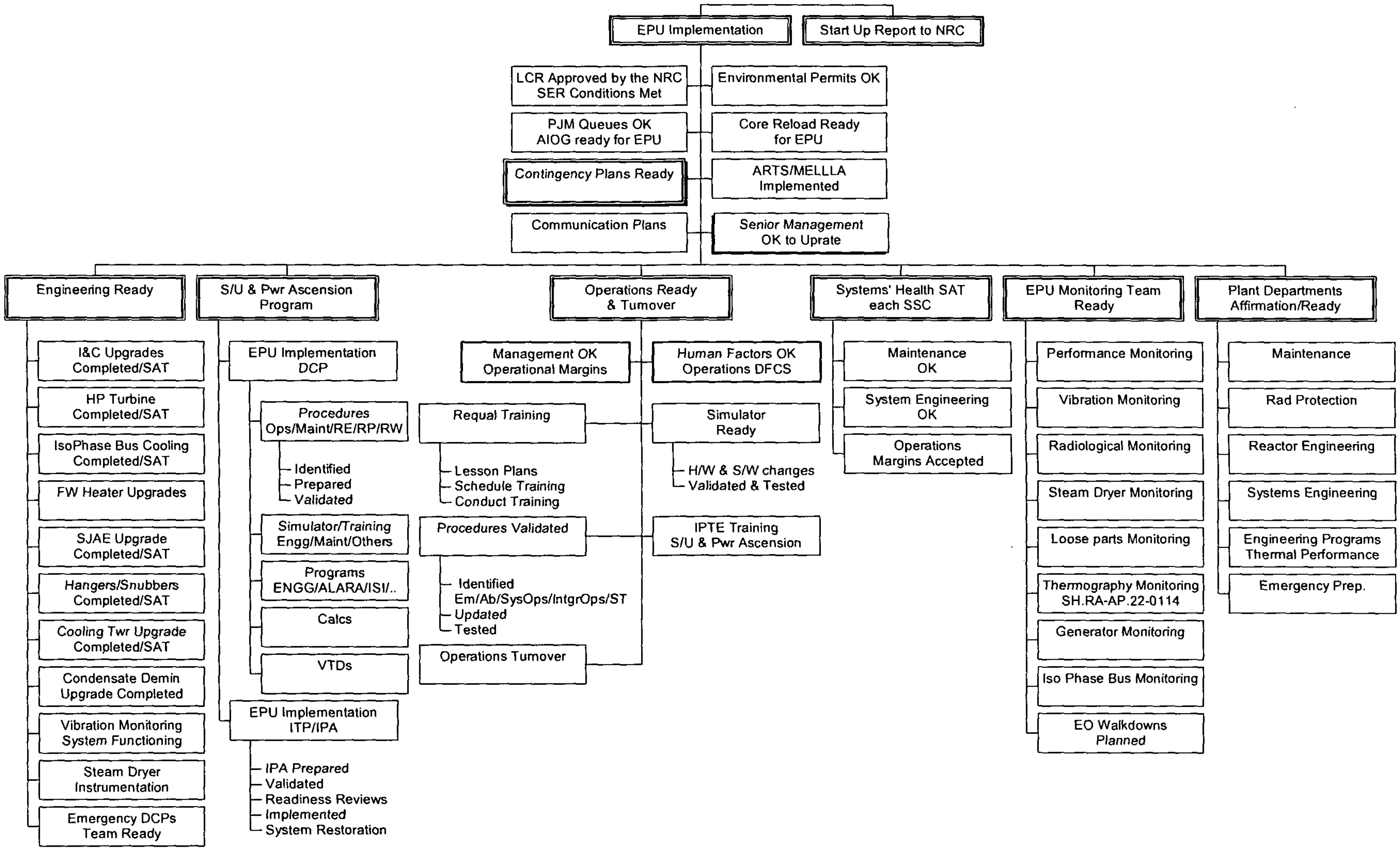
APPENDIX A – TEST ORGANIZATION CHART

HOPE CREEK EPU IMPLEMENTATION & POWER ASCENSION TEST TEAM ORGANIZATION



APPENDIX B – EPU IMPLEMENTATION PROCESS FLOW CHART

Hope Creek EPU Implementation scheduled for RF14



APPENDIX C
SUMMARY OF MAJOR IMPLEMENTATION REQUIREMENTS
REFUELING OUTAGE 14

PREREQUISITES

- EPU License Change Request (LCR) H05-001 (and PUSAR) is approved as submitted by the NRC.
- The EOPs and calculations are updated and Operator Training completed.
- All necessary State air/discharge permits obtained.
- TACS flow balancing has been completed.
- The following EPU-related DCPs have been completed:
  a. DCP 80086589, Resin Strainer.
  b. DCP 80071904, HP Turbine and Replacement of SSE Relief Valves
  c. DCP 80090588, Main Steam Small Bore Piping Weld Upgrades
  d. DCP 80090587, DW Vibration Monitoring (Strain gauges)
  e. DCP 80061468, Structural Calculations
- Other Prerequisites required by DCP 80048085 have been completed.

DCP 80048085 IMPLEMENTATION

- Instrumentation Scaling Changes for components listed in Table 1-2 have been completed.
- Instrumentation Set-point Changes for components listed in Table 1-3 have been completed.
- Instrumentation Replacements for components listed in Table 1-4 have been completed.
- DFCS work for components listed in Table 1-5 has been completed.
- Other Systems changes listed in Table 1-6 have been completed.

DCP 80048085 TESTING/OTHER

- Offline DFCS testing has been completed. Offline testing for the new hardware and modified software is conducted at the Factory Acceptance Test.
- The HP Turbine DCP is installed prior to commencing the IPA for EPU Startup and Power Ascension.
- Turnover of systems and components changed under this DCP is completed prior to commencing the IPA for EPU Startup and Power Ascension.
- Testing for EPU related modifications implemented in conjunction with this DCP is coordinated with testing required by this DCP.
- Appendix J required testing has been completed with satisfactory results at 50.6 psig.

ATTACHMENT D - HOPE CREEK POWER ASCENSION TEST TIMELINE																							
(Commencing at 90% Current Licensed Thermal Power, CLTP)																							
Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Startup to 3005 MWth (90% CLTP)																							
4-Hour Stabilization Period																							
Dryer/FIV/Moisture Carryover/System Baseline Data Gathering																							
Level/Pressure/RFP step change testing (12 hour estimate)																							
3005 MWth (90% CLTP) to 3339 MWth (100% CLTP)																							
Raise Power to 3339 MWth																							
Contingency Rod Adjustment to Compensate for Xenon (24 hrs)																							
Re-establish 3339 MWth																							
4-Hour Stabilization Period																							
Dryer/FIV Moisture Carrover/System Baseline Data Gathering																							
Cross-Flow System Calibration Data Acquisition (12-16 hours)																							
Level/Pressure/RFP step change testing (12 hour estimate)																							
Final Authorization above 3339 MWth																							
3339 MWth (100% CLTP) to 3422 MWth (102.5%) - 1st Power Step																							
Power Acension Rate 1% per Hour - Achieve 3422 MWth																							
4-Hour Stabilization Period																							
Dryer/FIV/MS and Rad Pro Readings/System Monitoring																							
3422 MWth (102.5%) to 3506 MWth (105%) - 1st Power Plateau																							
Power Ascension Rate 1% per Hour - Achieve 3506 MWth																							
Acquisition/PORC Approval of Dryer/FIV Data																							
Moisture Carrover/System Monitoring/Rad Surveys/Chem Tests/Walkdowns																							
Cross-Flow System Calibration Data Acquisition (12-16 hours)																							
Level/Pressure/RFP step change testing (12 hour estimate)																							
Data Review of Dryer/FIV Data by NRC (96 hours)																							
PORC/Plant Manager Approval to Raise Power																							
3506 MWth (105% CLTP) to 3589 MWth (107.5%) - 2nd Power Step																							
Power Acension Rate 1% per Hour - Achieve 3589 MWth																							
4-Hour Stabilization Period																							
Dryer/FIV/MS and Rad Pro Readings/System Monitoring																							
3589 MWth (107.5%) to 3673 MWth (110%) - 2nd Power Plateau																							
Power Ascension Rate 1% per Hour - Achieve 3673 MWth																							
Acquisition/PORC Approval of Dryer/FIV Data																							
Moisture Carrover/System Monitoring/Rad Surveys/Chem Tests/Walkdowns																							
Cross-Flow System Calibration Data Acquisition (12-16 hours)																							
Level/Pressure/RFP step change testing (12 hour estimate)																							
Data Review of Dryer/FIV Data by NRC (96 hours)																							
PORC/Plant Manager Approval to Raise Power																							

ATTACHMENT D - HOPE CREEK POWER ASCENSION TEST TIMELINE																							
(Commencing at 90% Current Licensed Thermal Power, CLTP)																							
Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
3673 MWth (110%) to 3723 MWth (111.5%) - 3rd Power Step																							
Power Acension Rate 1% per Hour - Achieve 3723 MWth w/o Crossflow																							
4-Hour Stabilization Period																							
Dryer/FIV/MS and Rad Pro Readings/System Monitoring																							
Final Cross-Flow System Calibration Data Acquisition (12-16 hours)																							
Evaluation & Determination of the Cross Flow Correction Factor																							
3723 MWth With Crossflow In-Service - 3rd & Final Power Plateau																							
Adjust Power to 3723 MWth in Two Steps (12-16 hours data taking)																							
Acquisition/PORC Approval of Dryer/FIV Data																							
Moisture Carrover/System Monitoring/Rad Surveys/Chem Tests/Walkdowns																							
Data Review of Dryer/FIV Data by NRC (96 hours)																							
PORC/Plant Manager Approval of Operation at 3723 MWth																							
Main Turbine Contract/Warranty Testing																							
Reduce Reactor Power to 3673 MWth (110% CLTP)																							
Perform Required Warranty Testing																							
Raise Reactor Power to 3723 MWth																							
PATP Final Review & Approval and Post-Evolution Critique																							