U. S. NUCLEAR REGULATORY COMMISSION

REGION I

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Facility:	Salem Nuclear Generating Station, Unit 2
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EXECUTIVE SUMMARY

Salem Nuclear Generating Station
NRC Inspection Report 50-311/96-21

This inspection included aspects of licensee engineering. The report covers a 7-week period of specialist inspection of the proposed startup test program for Salem Unit 2.

Engineering

The Integrated Test Program for the startup of Salem Unit 2 was generally found to be of sufficient scope and depth to demonstrate that the facility will perform in accordance with its design. (Section E1.1)

Several examples of inadequate procedures were identified during the review of the post-modification testing for the Control Room Area Air Conditioning System (CAV). The inadequacies in the procedures were the result of not complying with the requirements for DCP Special Test procedure development. The CAV Special Test Procedures reviewed did not contain essential information needed to assure test conditions were properly established, verified, and documented. These weaknesses would have lead to the possibility that design features would not be demonstrated as operable nor would the documentation required provide a satisfactory record of the testing performed. (Section E3.1)

An unresolved item was opened regarding the Advanced Digital Feedwater Control System and Steam Generator Feed Pump Digital Governor modifications. It was not clear what controls had been placed on the software development and testing process, nor what controls were required to be placed on the process. (Section E3.3)

An inspection followup item regarding the adequacy of reviews of design bases and surveillance testing of the Reactor Control and Protection System and Solid State Protection System was closed. (Section E8.2)

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III. Engineering

E1 Conduct of Engineering

E1.1 Scope of Integrated Test Program

a. The inspector evaluated the scope of the Integrated Test Program proposed by Public Service Electric and Gas Company (PSE&G) for the restart of Salem Unit 2. The evaluation consisted of reviews of documents and discussions with personnel from Specialty Engineering and Design Engineering responsible for program reviews which were conducted during the extended outage. The discussions with the responsible engineers for the various programs was intended to determine if any matters had been identified during the reviews which could impact the startup testing, or which should have been included in the startup testing.

In addition, detailed reviews were conducted of the testing planned for eight systems. The systems were selected on the basis of accident risk (taken from the results of the Individual Plant Assessment or IPE), and three systems were selected on the basis of the magnitude of the changes being made to the system.

A listing of the documents which were reviewed is included in an attachment to this report.

The following program reviews were discussed with the responsible engineers:

- Motor Operated Valve Program
- Inservice Testing (IST) Program
- Check Valve Program
- Inservice Inspection (ISI) Program
- Erosion/Corrosion Program
- Environmental Qualification Program
- FSAR Review and Update Program
- Fire Protection Program
- Technical Specification Surveillance Improvement Program
- Hagan Solid State Logic Module Upgrade Program
- Generic Letter 96-01 Review Program

b. Observations and Findings

The controlling documents provide for procedural controls on startup testing activities, management oversight of testing activities, and review and approval processes for test selection and test procedure development. In addition, additional, more stringent controls are prescribed for activities which are outside the scope of routine operations, or which place the plant at additional risk due to unusual equipment lineups or the use of other than standard operating procedures.

With two exceptions, the program reviews did not identify issues which would affect the proposed testing. The two exceptions are the IST Program and the UFSAR Review and Update Program.

The IST program identified a number of components which needed additional testing. Approximately 52 tests were added to the IST program, primarily valve stroke tests. A list of the tests added was not available. In the absence of a listing of the tests added, a review was performed of the procedure revision requests generated by the IST program review to determine what tests should have been added to the eight targeted systems. The affected surveillance test procedures were reviewed to ensure that the appropriate revisions had been implemented. No discrepancies were identified. The procedures reviewed were included in the lists for the appropriate system.

The UFSAR Review and Update program identified several issues which will affect the proposed testing. One issue involved the time required to place the containment fan coil units (CFCUs) in operation. Technical Specifications require the CFCUs to be in operation within 45 seconds, based on the original accident analyses. The UFSAR review identified that the valves in the service water system which must reposition to establish the accident lineup have stroke times of 60 seconds. A review of the surveillance test which demonstrated the operability of the CFCUs determined that only the time for the breakers to close and the fan to start were being measured. Westinghouse performed an analysis which determined that the 60 second time to start the CFCUs would be adequate. The surveillance test procedure revision to implement this change cannot be issued, however, until such time as an amendment to the Technical Specification to use the 60 second time has been issued. At the close of the inspection, the amendment request was still under evaluation by the Office of Nuclear Reactor Regulation (NRR). The UFSAR review team performed a review of the master time response procedure to determine if any other changes were necessary, and identified one change required for the auxiliary feedwater system. An additional issue affecting the CFCUs was that if a CFCU fan were to be started with the service water side of the CFCU isolated, the tubing could be subjected to excessive pressure. A DCP was initiated to install relief valves to mitigate the effect, and will require testing prior to startup.

The other issue identified by the UFSAR review team involved ventilation system testing. They determined that ventilation systems for the fuel handling building, auxiliary building, and control room area would require additional testing. The control room area ventilation system will require response time testing to verify compliance with the design. The testing of the control room area ventilation system is discussed in more detail in section E3.1 of this report. Fuel handling building and auxiliary building ventilation system will require additional testing of the charcoal adsorbers on a regular basis.

c. Conclusions

Based on the management oversight and testing controls specified in the controlling documents, the testing selection and identification process described in the system readiness review program, and the information obtained in the discussions of the program reviews conducted during the extended outage, the inspector concluded that the scope of the Integrated Test Program proposed for the restart of Salem Unit 2 is adequate to demonstrate that the facility performs in accordance with its design.

E3 Engineering Procedures and Documentation

E3.1 Control Room Area Air Conditioning Testing Required for Restart (72400)

a. Inspection Scope

The inspector reviewed Design Change Package (DCP) 1EC-3505, Package No. 1, Control Area Air Conditioning Upgrade, to determine if the proposed post modification testing would adequately demonstrate that the system, as modified, would satisfy the system design requirements. The modification is extensive in that it implements major changes to the Control Area ductwork for the purpose of making the system common to Unit 1 and Unit 2 control room and to provide air supply through two independent air conditioning and filtration trains. The modification also removes, adds, and replaces dampers to assure proper isolation when required and to assure air intake is available when required. In addition, controls and power supply systems were upgraded to support the new design.

A listing of the documentation reviewed during the inspection is provided in an attachment to this report.

b. Observations

The inspector reviewed 1EC-3505 STP-1, Integrated Test of Control Area Air Conditioning System(CAACS)/Emergency Air Conditioning System (EACS), to determine if the procedure would provide adequate instructions for verification and documentation of proper operation in normal and emergency modes. The inspector found numerous problems with the procedure. For example, the procedure did not provide directions for establishing or documenting the initial system configuration. The procedure had neither provisions for exiting or re-entering the test in the event the test had to be stopped, nor any guidance for when or how to abort the test. In addition, there were several examples where no verification was performed to assure "Normal" position of dampers following emergency mode testing. The inspector determined that these examples were in violation of engineering procedure NC.DE-AP.ZZ-0012(Q), Test Program, Section 5.1, Test Procedure Development, which requires that the step by step instructions include a description of the expected plant response and specific guidance for when to abort the test and how to do so. The inspector also performed a brief review of 1EC-3505 STP-3, CAV Testing and Balancing. The inspector also noted that even though the test was relatively complex, test step signoffs were not used consistently. Because numerous problems were found during the inspector's review of the test procedures, the inspector terminated his review and pointed out the discrepancies to Salem staff.

PSE&G promptly initiated an Action Request in accordance with their corrective action program. The inspector found that the corrective action identified for resolution of these problems included the following:

- Perform an independent review of STP-1 by personnel with extensive startup and restart testing experience.
- Perform a review of all testing requirements associated with DCP 1EC-3505.
- Perform a review of testing required for ten DCPs required for fuel load.
- Re-evaluate the corrective actions for a previous "Action Request" which identified similar concerns.
- Evaluate the need to use step by step signoffs in conjunction with step by step procedures.

During the review of the ten DCPs, as noted in the above corrective action, Salem staff identified other test procedure discrepancies, including two more examples of inadequate initial conditions. The failure to prepare DCP test procedures in accordance with NC.DE-AP.ZZ-0012(Q), Test Program, is a violation **(VIO 50-311/96-21-01).**

c. Conclusions

The Special Test Procedures reviewed during this inspection did not contain essential information needed to assure test conditions were properly established, verified, and documented. These weaknesses would have lead to the possibility that design features would not be demonstrated as operable nor would the documentation required provide a satisfactory record of the testing performed. Salem staff promptly initiated action to resolve the problems identified by the inspector and to identify and resolve similar problems.

E3.2 Emergency Diesel Generator System Testing Required for Restart (70341)

a. Inspection Scope

The inspector reviewed the Diesel Generator System Test Plan and reviewed the test requirements for twelve Design Change Packages (DCPs) for modifications implemented during this extended outage. The objective of the review was to determine if the completed testing would adequately demonstrate that the modified equipment would meet the design requirements. The inspector also reviewed the most recent surveillance testing results for the diesel generators to determine if the acceptance criteria had been satisfied.

A listing of the documentation reviewed during the inspection is provided in an attachment to this report.

b. Observations and Findings

The inspector found that the diesel generator modifications affected the diesel generator peripherals and were relatively minor. For example, modifications included the following:

- Flexible hose, component isolation, and additional bracing measures were taken to reduce the effect of diesel generator vibration on attached components
- Fuel Oil Day Tank Pump start and stop setpoints were changed
- Check valves in the lube oil lines were replaced with an improved style check valve
- Lube Oil pump heater failure switches were replaced, the sensors replaced, and the setpoint revised
- Relocate crankcase piping to eliminate fumes from entering the HVAC system
- Replace fuel oil pressure gages

The inspector reviewed the post-modification tests as described in the DCPs and determined that they were satisfactory to demonstrate proper operation or function of the affected components.

The inspector reviewed the test results of the surveillance testing which had been performed within the last 60 days to demonstrate proper operation of the diesel generators. From this review, the inspector learned that for Diesel Generator 2A, 2B, and 2C, test results were documented for: the normal start and run-up to normal speed, load, and frequency; for endurance tests; for load rejection tests; and, for Diesel Generators 2A and 2C; the hot restart tests. The results for the completed tests were satisfactory. The hot restart test for 2C was scheduled to be performed prior to restart.

The inspector also reviewed the design basis as described in Configuration Baseline Documentation For Emergency Diesel Generator System, DE-CB.DG-0024(Q). The inspector determined that all safety features required in case of design basis accidents were being demonstrated as part of the surveillance testing.

c. Conclusions

The inspector concluded that the proposed post-modification testing, the completed surveillance testing, and the remaining surveillance testing provide an adequate basis for assuring that the Salem Unit 2 Emergency Diesel Generators will perform as designed. The issue of the connected emergency loads and their relation to exceeding the design capacity of the diesel generators is being dealt with separately.

E3.3 Feedwater and Feedwater Control System Testing Required for Restart (70348, 37828)

a. Inspection Scope

The inspector reviewed Design Change Packages (DCP) 2EC-3178, Advanced Digital Feedwater Control System, and 2EC-3306, Turbine Runback/SGFP Control Circuit Modification, to determine if the proposed post-modification testing would adequately demonstrate that the system satisfies the system design requirements.

This inspection focused on the work package testing and special test procedures, but the inspector reviewed some earlier test procedures and results to better understand the total testing program.

A listing of the documentation reviewed during the inspection is included in an attachment to this report.

b. Observations and Findings

The modifications performed under 2EC-3178 are extensive in nature and include:

- Replacement of the analog feedwater control system with a digital system
- Elimination of the feedwater flow/steam flow mismatch reactor trip
- Replacement of the Atmospheric Relief Valve (ARV) analog controllers with digital controllers. [The ARVs are also referred to as the Steam Generator Power Operated Relief Valves (S/G PORV) and MS10 valves]
- Addition of two (2) feedwater pressure loops
- Replacement of several pressure transmitters with newer technology transmitters
- Replacement of Main Feedwater regulating (BF19) and bypass (BF40) valve positioners

The modifications performed under 2EC-3306 are extensive in nature and include:

- Adds an automatic runback of the main turbine and opening of the condensate polishing by-pass and feedwater heater bypass valves upon trip of a steam generator feedwater pump (SGFP)
- Replaces the existing SGFP speed controllers with a Woodward digital system
- Installs SGFP "latching relays" to latch in all SGFP protective trips
- Modifies the Auxiliary Feedwater Pump (AFP) auto-initiation circuitry when a SGFP is expected to be out of service for more than 72 hours

The inspector found the general testing approach for these large modifications to be acceptable and comprehensive. However, there were deficiencies in test design and implementation. Additionally there were weaknesses in compliance with current site approved procedures for computer software control, and test procedure attention to detail. The SGFP Trip/Auto Turbine Runback Operational Test, 2EC-

3306 STP-2, was under licensee review and approval during the entire inspection period and was not available for NRC review. This procedure will be reviewed when it has completed the PSE&G review and approval process. **(IFI 50-311/96-21-02)**

The licensee had experience with the Woodward digital feed pump governor at their Hope Creek plant, and is very knowledgeable about its design and operation. They concluded they could take credit for this experience and limit their evaluation and testing of the system. The inspector found this reasoning acceptable, as it was consistent with site procedure ND.DE-TS.ZZ-5503(Q).

The ADFCS system is in use at a few other nuclear plants, but none of the applications correlate 100% with the Salem version. Some of the unique features used only at Salem include use of a Intel 386 processor, the distribution of ADFCS software across two processing nodes, and Salem-specific system tuning parameters. The licensee took some credit for operating experience at other nuclear plants, but a more detailed review was conducted for the ADFCS because they did not have in-house experience with it. Additionally, the licensee is using the ADFCS to eliminate an automatic reactor trip, so this digital system evaluation was much more thorough than that on the SGFP digital governors. However, the inspector was unable to determine what controls were in place for the ADFCS and SGFP digital governor software development process. Licensee engineers were unable to identify what specific controls were required. This issue remains unresolved, pending NRC review of the PSE&G determination of what controls were, and should have been, applied to the development and testing of the software. **(URI 50-311/96-21-03)**

Test Planning

Testing for these modifications is broad and has been an ongoing process for five years. These tests are identified below.

Testing performed under 2EC-3178 included:

- Hardware in Loop Testing (HWIL) which verified the control algorithm and provided acceptance criteria for the Factory Acceptance Test
- Westinghouse "in-house" system testing
- Factory Acceptance Test (FAT) which validated integrated system response to simulated inputs
- Testing on site using a hardware training platform identical to that being installed in the plant
- Testing at the plant specific training simulator where the ADFCS logics and controls were simulated
- Work package testing similar to that conducted for most plant modifications

- Site Acceptance Test (SAT) which reverified portions of the FAT after the equipment was installed in the plant. This is also called 2EC-3178 Special Test Procedure (STP) -1
- Power Ascension Testing, which is also called 2EC-3178 STP-2.

Testing performed under 2EC-3306 included:

- Work package testing similar to that conducted for most plant modifications
- Woodward Digital Governor Model 505 Configuration and Function Testing
- SGFP Turbine Speed Control System Tuning, also called 2EC-3306 STP-1
- SGFP Trip/Auto Turbine Runback Operational Test, also called 2EC-3306 STP-2.

In general the testing was well planned, and executed in appropriate segments which built upon each other to provide confidence that these changes will operate as designed.

ADFCS Test Development - Requirements Traceability Matrix

The ADFCS project used a Requirements Traceability Matrix (RTM) to track ADFCS system design requirements through the various design, development, and test stages up through the SAT. Use of an RTM is a common practice with quality software products. It is required to be used for critical digital systems installed at Salem, per site procedure ND.DE-TS.ZZ-5506(Q), "Digital System Life Cycle." The RTM was signed by the preparer, but was neither reviewed nor approved. The licensee Digital Systems Group (DSG) manager indicated this review and approval was not required until the Critical Digital System package is closed out which could be after the system is turned over to Operations. The licensee design engineer indicated that if any deficiencies were noted during the package review and close out, they would be evaluated and handled using standard site procedures. This was deemed to be not acceptable by licensing and startup personnel; the current plan is to review and approve the various digital system documents prior to system turn over to Operations. This review commenced just prior to the end of the inspection and was ongoing at that time.

The exact FAT or SAT test step associated with the specific requirement is not always provided in the RTM. Additionally, RTM entries do not follow the system requirements through to the final DCP testing. These problems result in several problems with the FAT and EC-3178 STP-2. For example, there is a requirement for the ADFCS to maintain level properly damped and stable within 15% of the reference level during both a 5% step and ramp increase. The FAT tested a 5% step change, but did not test the 5% ramp change. The associated proper response tolerance value, 15%, was used in the FAT. However, the tolerance used in 2EC-3178 STP-2 was 20%. When the inspector identified this last error to the licensee, the acceptance criterion was corrected by the licensee. However, their extent of condition review was not adequate as it did not identify the problem where the ramp test was not performed in the FAT, SAT, or 2EC-3178 STP-2. In general a step change is more challenging than a ramp change of the same magnitude, so this mitigates the significance of not testing a ramp change. The incorrect acceptance criterion is more significant as this has been a licensee problem in the past.

The inspector spot checked some of the requirements in the RTM against the FAT and SAT. A majority were adequately addressed. Several of the RTM entries such as, "Wiring to field terminal blocks shall be No. 18 to 22 AWG or larger for all individual wires of multiconductor cables," were not verified in the FAT or SAT and include the comment, "Where do you verify requirements like this?" The license indicated these were written before the DCP was finalized; they would either update the RTM entries with appropriate references to the DCP, or eliminate non-software related requirements from the RTM. The inspector found this proposal acceptable, because ND.DE-TS.ZZ-5506(Q) requires an RTM for software, not hardware.

The RTM also indicates some of the design requirements, such as controller reset wind-up prevention, and transfer to the secondary controller within 500 milliseconds of a failure in the primary controller were verified in the FAT. There was a FAT step to ensure the controller responded to step changes, but there was no verification that reset wind-up was absent. Likewise, there was a test to ensure the processors swapped, but no time criterion was clearly marked in the test procedures. The failure to verify the processor swapover occurs within 500 milliseconds is not significant from a safety standpoint but this is a case where precise acceptance criterion is established but not verified. The FAT was conducted over two years ago, but a detailed post-test review against requirements has not been conducted yet. This indicates there is still a less than fully integrated design/development/test/analysis management approach. Resolution of these issues by PSE&G will require NRC review. **(IFI 50-311/96-21-05)**

Controller reset windup on the MS10 valves was a significant problem in the past. Reset windup is a phenomenon in which the output of a controller saturates due to the monitored parameter varying from the setpoint for an extended period of time. The saturation of the controller output results in a delay in the actuation of the controlled device once the monitored parameter reaches the setpoint. The specific problem encountered with the MS10 controllers is described in greater detail in Section 5.0 of NRC Augmented Inspection Team Report Nos. 50-272/94-80 and 50-311/94-80. Proving the system "no controller reset windup" design requirement should have been included in the test program. The licensee concurred with this and during the inspection period performed a test which demonstrated controller reset windup does not occur.

ADFCS Test Content Comparison With Design Basis

The inspector spot checked the various ADFCS design basis documents against test procedures to ensure specific functional requirements were tested. This was a diverse approach to comparing the test procedures against the RTM. Most of the functional requirements selected for review were included in the various test procedures. There were some discrepancies, which are noted below:

System design transient acceptance criteria require maintaining S/G level within 15% of the reference level. The design transients include: 5% step increase in level setpoint at both 5% and 10% power, rolling the main turbine at 8% power, and synchronizing the main turbine power at any power level between 10% and 20%. Licensee Operations management requested the 5% step increase level be conducted at ≥ 7% and 15% power respectively. This is because the plant experienced divergent control problems with other interfacing systems at 5% power, and there was little to gain by running the test at 7% and again at 10% power. The licensee stated testing the system at 15% power would provide additional transient response information yet still be low enough to not challenge plant safety systems if problems were encountered.

There is another variance between system design transient requirements and the startup testing sequence. Site procedure TS2.SE-SU.ZZ-0001(Q) "Startup and Power Ascension Sequencing Procedure," step 5.6.10, has plant power increased from 10% to 15% power, then commences taking main turbine expansion readings, and then synchronizes and loads the turbine generator. This indicates the ADFCS system is not tested with the main turbine being rolled at 8% power as required by the system design document. Resolution of this issue by PSE&G will require further evaluation by NRC. **(IFI 50-311/96-21-04)**

One of the reasons for implementing a digital feedwater control system is to permit feedwater control system operation in automatic at low power levels during plant startup. The ADFCS Technical Requirements document section 6.5 states, "The ADFCS shall provide completely automatic control of steam generator level and feedwater pump speed demand over the range of 2% to 100% power." From a safety standpoint, not testing the feedwater control system at its design limits at low power is not significant. Diablo Canyon, a plant very similar to Salem, implemented the ADFCS several years ago. They reported they are able to control SG level in automatic at 2% power. However, not testing the ADFCS at the design limits may not instill operator confidence that the system works as designed.

ADFCS Software Test Procedure Detail

The inspector reviewed the details of how the test procedures verified the software functionality. Questions included in the review were:

- Were appropriate outputs for the given inputs verified?
- Were multiple values for the inputs used, including limiting cases?
- Was the sequence of repetitive tests varied to determine if varying the order subprograms were called resulted in improper responses?

The results of this review identified several deficiencies. PSE&G took action to resolve some of these issues during the inspection period, and was evaluating the others at the end of the inspection. The inspector identified deficiencies are described below:

The test procedure failed to vary the sequence of inputs for repetitive tests for the median signal selector (MSS) software. It is important to note the MSS algorithm is used for SG level, and this is the basis for eliminating the feed flow/steam flow mismatch reactor trip. The MSS accepts three redundant input signals and passes the median signal through for subsequent processing. The steam generator narrow range level single failure testing sequence started with all levels approximately equal and within range, failed one off scale low, returned it to normal, failed it low but on scale, returned it to normal, failed it high but still on scale, and then returned it to normal. This exact sequence was used for all three steam generator narrow range level loops for all four steam generators. Varying the sequence for other loops or other steam generators such as fail the level low but on scale, then off scale high, and then off scale low would have been better. This would have exercised the system digital software in a more rigorous fashion, because it would test software module execution in various sequences and perhaps identify other errors. Likewise, the testing for multiple failures could have been varied.

After the FAT, PSE&G identified a MSS failure mode that was not previously identified on the Salem ADFCS or any of the other similar Westinghouse advanced digital feedwater control systems. This failure occurred when all three steam generator levels signals failed. As previously noted, the ADFCS system has been used in a few other plants, but some aspects of the Salem ADFCS configuration are Salem specific. Also, use of designs similar to Salem's can be counted in tens of plant years, not hundreds or thousands. With this one previously unidentified failure mode, the lack of thorough testing using other failure sequences and combinations increases the significance of the previous observation.

Failure of the steam pressure transmitters was not included in the original FAT procedure approved by the licensee. The licensee realized this was a deficiency and included testing in an addendum to the FAT. The addendum included a test of a failure in the average steam pressure calculation resulting in the feedwater regulating and bypass valves changing from automatic to manual in high power (>25%) mode. The addendum failed to check that the valves remain in automatic with a similar failure when in low power mode. The lack of testing steam pressure loops in the original FAT procedure but identifying this problem and taking corrective action is significant. It shows the licensee had a questioning attitude about the vendors recommendations. Checking this failure in low power mode will require additional inspector followup. **(IFI 50-311/96-21-06)**

Additionally, concurrent level signal failures in multiple steam generators was not tested. Other failure modes not tested include: not testing the turbine impulse chamber pressure algorithm for off scale high readings nor for having both instruments off scale high or low; and not testing the steam generator wide range level indications for high levels or multiple concurrent level errors. These issues are minor in nature, given that very similar software is in use on other plants using ADFCS. PSE&G indicated that they will include these items in their "lessons learned" document.

Another weakness was the lack of a functional test of the MS10 valves in 2EC-3178 STP-1, Revision 0 and 1. This was corrected by the licensee while the inspection was in progress when they reissued the procedure as Revision 2 without prompting from the inspector. Although it is a positive sign that the licensee corrected this problem on their own, it raises the question why was the lack of testing not identified prior to the initial test issue. PSE&G indicated that the earlier revision was the product of the engineering contractor who provided the DCP and it did not receive adequate review from PSE&G personnel. Additionally, there were numerous typographical errors included in this new revision, which showed some inattention to detail on the part of the preparer and the checker.

Turbine Runback/SGFP Control Circuit Testing

In 2EC-3306 STP-1, SGFP Turbine Speed Control System Tuning, there are procedural errors which may result in an inadequate test depending on how close the initial controller tuning constants are to the final values. The SGFP are stabilized at a given speed (e.g. 1100 RPM) before a step speed increase is introduced. If necessary, speed controller gain and reset are adjusted and another step increase is inserted without having the operator restabilize the SGFP at the initial speed. Taken to an extreme, the speed could be increased to an overspeed condition if numerous adjustments are required. This same problem exists for the speed decreases where the revised starting point on the high speed test run is not re-established before inserting step changes.

Another problem with this test is after meeting acceptance test criteria for a speed setpoint increase, the controller gain and reset can be adjusted to ensure the system responds to a step decrease, but does not go back and verify that the system acceptance criteria are still met on a step increase. These errors in 2EC-3306 STP-1 are additional examples of inadequate review of DCPs produced by engineering contractors. These deficiencies were corrected by PSE&G by revising the test procedure subsequent to the inspection.

The inspector reviewed the SGFP loss runback logic testing in 2EC-3306 Section 10. The testing does verify that relays which control runbacks, open the feedwater heaters bypass valve, and open the condensate polishing bypass valves operate properly. However, it does not verify the runback rates with only this runback in progress, nor when there are concurrent signals from the stator water failure, OPDT or OT/DT runback circuits. The system design requirement is that the runback should be 200%/minute when the SGFP runback is in progress with or without other runback signals. A problem arose when reviewing the runback schematics to determine if the system design is correct. One change area on drawing 218914B9781-15 is not fully legible. It appears to be referencing drawing 601216B9510-4, but there are no changes to this drawing as a result of 2EC-3306. The licensee indicated they would verify the modification is correct, and make any changes necessary including as a minimum making the drawing more legible. After the verification, the inspector will perform an additional review to determine if enhanced testing is warranted. **(IFI 50-311/96-21-07)**

Test Implementation

The inspector reviewed completed ADFCS test documents including the FAT completed in October 1994, and the SAT. Some of the standard post-modification testing was also reviewed. In general the documents were in order but there were some deficiencies. Several questions concerning abnormalities encountered during the FAT were provided to the licensee, and review of these areas are in progress. Personnel who attended the FAT are no longer employed by the licensee, but PSE&G was attempting to close these issues at the end of the inspection period.

The portion of DCP 2EC-3178 for cable and wiring installation verification was reviewed. Continuity testing was performed in accordance with DE-TS.ZZ-1900 (Q) "Instrument and Controls Electrical Installation Checkout." This site technical standard, step 4.5.1, requires:

> "Perform a point-to-point wire check for each circuit to verify conformity to the MD's (and/or any other designated drawings). One conductor of each cable shall be checked for continuity, and all terminations verified. For cables where color coding is duplicated, all conductors shall be continuity checked."

This test is inadequate for multiconductor cables used in 2EC-3178 which have uniquely colored conductors in that one or more conductors could have a break and not be tested. The licensee reported that the skill of the test engineer is such that all conductors are tested even if not required by the procedure as written. The licensee indicated this procedure, issued in 1988, will be changed in the future to make the test requirements clearer.

One section of the functional loop testing, 2EC-3178, section 10.2.3.1, was reviewed. The test step as initially written called for testing the loops "IAW DE-TS.ZZ-1900 (Q)". This procedure is the Instrument and Controls Electrical Installation Checkout procedure referenced above. The correct procedure, which should have been referenced, is DE-TS.ZZ-1902 (Q) "Instrument and Controls Circuit Functional Loop Checkout". The test procedure was corrected using appropriate plant procedures prior to the inspector identifying the problem. However, there was another typographical error in this step section which was not identified even though the item was initialed and dated as having been completed. It called for using procedure S2.IC-CC.CN-0111 (Q). The correct loop calibration procedure, S2.IC-CC.CN-0011 (Q), was used during the testing. The inspector pointed this out to the licensee and was told this would be corrected. These problems are not significant from a technical standpoint but do indicate some lack of attention to detail in test preparation and implementation.

Compliance with Site Procedures

The ADFCS is classified as a "critical digital system" by the licensee. Critical digital system requirements are described in various site approved procedures including NC.NA-AP.ZZ-0064(Q) "Software and Micro-Processor Based Systems (Digital Systems)", ND.DE-TS.ZZ-5506(Q) "Digital System Life Cycle", and ND.DE-TS.ZZ-5503(Q) "Software Requirements for Critical Digital Systems Utilizing Mature Software". ND.DE-TS.ZZ-5506(Q) has the most stringent requirements and states it is for all critical digital systems. The licensee indicated they did not use this procedure for the ADFCS, but followed the guidance for mature software in ND.DE-TS.ZZ-5503(Q). They also indicated they plan to revise the scope of ND.DE-TS.ZZ-5506(Q) so that it applies to only new software. The licensee indicated that current procedures and revisions are dated after the design effort started on these projects. The applicability of these and other computer software procedures for these modifications is unresolved, as noted previously.

Site approved procedure NC.DE-AP.ZZ-0012 (Q), "Test Program," describes how testing is specified and conducted. Special Test Procedures (STP) are developed using the format and guidance of Form NC.DE-AP.ZZ-0012-4. 2EC-3178 STP-2 was revised and issued during the course of the inspection. The inspector concluded the STP was in compliance with the format and content specified by NC.DE-AP.ZZ-0012 (Q). It includes testing of the MS10 valves which was not included in the earlier revision

c. Conclusions

The inspector concluded that, with certain exceptions, the post-modification test programs for 2EC-3178 and 2EC-3306 should adequately ensure that the modified systems satisfy the more important system design requirements.

The exceptions noted are:

- Identification of the controls which were applied, and should have been applied, to the software development process for ADFCS and the feed pump digital governors;
- Issuance of a final revision of procedure 2EC-3306, STP-2;
- Verification of no reset windup in the MS-10 controllers;
- Verification of the 500 millisecond swapover time from the primary to secondary controller for the ADFCS;
- Clarification of the required power level for rolling the main turbine for ADFCS testing;
- Verification that feedwater regulating valves' and their bypass valves' controllers remain in automatic mode of operation with a failure of the average steam pressure calculation in the low power mode of ADFCS; and
- Resolution of the apparent drawing error on drawing 218914B9781-15.

These issues are identified as either unresolved items or inspection followup items and need to be addressed by PSE&G, with subsequent NRC inspection.

E3.4 4KV System Testing Required for Startup (70341)

a. Inspection Scope

The inspector reviewed the 4KV Startup System Test Plan Unit 2 that had been reviewed and accepted by the Maintenance Department, Operations, Test Review Board (TRB), Station Operations Review Committee (SORC), and the General Manager, to determine the effectiveness/adequacy of the plan. The test plan identified two Design Change Packages (DCPs) for implementation into Salem Unit 2. The inspector reviewed the DCPs to determine the scope of the design, to identify procedural changes necessitated by the design changes, and the adequacy of testing associated with the design changes. The inspector reviewed the work orders and toured the 4KV system to determine the status of implementation of the DCPs and General Electric 4KV Magne-Blast circuit breakers. This included discussions with the 4KV System Manager and Component Engineer. The inspector also sampled related procedures to determine if the required changes had been incorporated.

b. Observations and Findings

The 4KV Startup System Test Plan Unit 2, Revision 0, approved October 2, 1996, details all 4KV system testing planned for Salem Unit 2 restart from Refueling Outage 2RO9. The plan includes testing required following implementation of restart scope, design changes, and performance of system corrective activities. The plan also includes system surveillance and tests required for restart/power ascension, and additional test requirements identified during the system readiness review process.

The scope of the two DCPs includes:

2EO-2410, Packages #1, #2, #3, and #4

> Replaces the nonguided 52 HL Switch Operator with a guided type in accordance with GE Service Advice Letter (SAL) 326.1 for the 2A, 2B, 2C, 2E, 2F, 2G, and 2H bus circuit breaker cubicles.

2EC-3338, Packages #1, #2, #3, and #4

> Adds a time delay of .3 seconds to the 2H, 2E, 2F, and 2G group bus undervoltage reactor protection scheme.

2EC-3338, Packages #5, #6, and #7

> Adds undervoltage trip function for the #21, #22, and #23 condensate pump motors.

The inspector determined that DCP 2EO-2410, Package #1, contained test procedures designed to verify that the guided type 52 HL switch operator installed in accordance with SAL 326.1, functions properly following installation into the 2A bus circuit breaker cubicle. The work order documentation indicated that plant staff completed the work for this DCP. The inspector verified the installation of the new switch operator during the walkdown of the 4KV system. The new switch operator was tested after installation by verifying it was not damaged during raising and lowering of the circuit breaker mechanism. Additionally, resistance tests were performed on all 52 HL Switch Operator contacts used for the control circuit during the circuit breaker racking procedure to verify proper operation. The inspector verified operation of the new switch operator by witnessing the racking of the Reactor Coolant Pump (RCP) #23 circuit breaker (2F4D) in accordance with the 4KV Breaker Operation Procedure, SC.OP-SO.4KV-0001(Q), Revision 11. No problems were observed. The inspector verified that packages #2, #3, #4, #5, #6, and #7 contained similar procedures for the 2B, 2C, 2E, 2F, 2G, and 2H bus circuit breaker cubicle modifications. Based on a review of the complete DCP, the inspector determined that the test procedures adequately verify the design basis of this modification.

The inspector determined that DCP 2EC-3338, Package #1, contains test procedures designed to verify the added time delay of .3 seconds to the 2H group bus undervoltage reactor protection scheme functions properly. This modification will allow the plant to operate through momentary undervoltage conditions which may occur due to transients on the 500 KV transmission system while still maintaining the required level of reactor protection. The selected time delay will allow the transient to be cleared by the 500KV circuit breakers before a reactor trip is generated. The time delay is achieved by adding a time delay relay (TD-5) in series with the output of the appropriate group bus instantaneous undervoltage relay. The inspector verified the calculated nominal .3 second time delay added to the reactor protection scheme response time would not exceed the Technical Specification requirement of 1.2 seconds. The inspector also verified that the total burden of 360 mA will be imposed on each of the two safety related batteries "A" and "B" by reviewing revised calculations ES-4.003(Q), "125 VDC System Study," ES-4.004(Q), "125 Volt DC Battery and Battery Charger Sizing Calculation," and ES-4.006(Q), "125 Volt DC Component and Voltage Drop Calculation." The inspector determined that this additional load will not cause significant battery sizing or voltage drop concerns. The work order documentation indicated that plant staff completed work for this DCP. The inspector verified the installation of the time delay relays during the walkdown of the 4KV system. This modification was tested by performing de-energized insulation and wiring checks followed by calibration and functional testing of the new TD-5 relay and associated circuitry. A time response test of the entire undervoltage scheme was conducted in accordance with the Reactor Trip System 18 Month Time Response 2H Group Bus Undervoltage and Underfrequency Procedure, S2.MD-TR.4KV-0007(Q), Revision 10, as a final test to assure proper operation. The inspector verified that packages #2, #3, and #4 contained similar procedures for the 2E, 2F, and 2G group bus undervoltage reactor protection scheme. After reviewing DCPs #1 - #4, the inspector determined that the test procedures verify the design basis of this modification adequately.

The inspector determined that DCP 2EC-3338, Package #5, contains test procedures designed to verify the addition of an undervoltage trip for the #21 condensate pump motor which is supplied electrical power from the 2H group bus. This modification will provide undervoltage protection to the condensate pump motors. This modification will also allow Unit 2 to operate the same as Unit 1. The work order documentation indicated that plant staff completed the work for this DCP. The inspector verified the installation of new wiring during the walkdown of the 4KV system. The undervoltage trip is achieved by modifying wiring and utilizing the existing bus undervoltage relay and associated auxiliary relay. This modification was tested by performing de-energized circuit tests followed by functional testing of condensate pump undervoltage protection and group bus differential trip circuit since the differential circuit wiring was disturbed by this change. The inspector verified that packages #6 and #7 contained similar procedures for the #22 and #23 condensate pumps powered from the 2E and 2F group buses respectively. After reviewing DCPs #5 - #7, the inspector determined that the test procedures verify the design basis of this modification adequately.

c. Conclusions

The inspector considered the test plan and DCP implementation for the 4KV system to be adequate to ensure the 4KV system performs its design function. The inspector concluded the 4KV test plan verifies the design basis of the modified system. The DCPs have been adequately implemented and accepted by PSE&G with documentation currently in various stages of being updated. The inspector concludes that the 4KV test plan ensures the adequacy and completes work activities associated with the 4KV system in support of startup and power ascension of Salem Unit 2.

E3.5 Reactor Control and Protection System (RCP) and Solid State protection System (SSPS) Startup Testing (70305)

a. Inspection Scope

This inspection focused on the review and examination of licensee procedural controls and test documents generated to establish that the Reactor Control and Protection (RCP) system and the Solid State Protection (SSPS) system (both considered RPS subsystems in the Configuration Baseline Documentation) would be subjected to testing that satisfactorily validates their as-modified design bases. RCP/SSPS protective features generate reactor trip signals from the following monitored plant operational parameters: Neutron Flux, Primary Coolant System, Pressurizer, Steam Generators, Main Turbine, and Safety Injection. The RCP subsystem constitutes the analog portion of the RPS and the SSPS subsystem consists of two redundant logic trains of digital circuitry.

The inspector reviewed procedures and documents related to the licensee's efforts in establishing and implementing the Startup and Power Ascension Program and its effectiveness in demonstrating that the RCP and SSPS would be subjected to testing that satisfactorily demonstrates their operability in accordance with the design bases established in the Updated Final Safety Analysis Report (UFSAR) and the facility Technical Specifications (TS).

While it was established in a previous inspection (IR 50-11/96-19) that the RCP and SSPS at Salem Unit 2 had undergone extensive design changes and modifications, the inspector concluded that the Hagan module replacement and upgrade project had been effectively managed and implemented in accordance with applicable regulations and procedures.

A listing of the documentation reviewed during the inspection is provided in an attachment to this report.

b. Observations and Findings

Hagan Refurbishment and Replacement Project

The licensee developed procedures to perform refurbishment, bench testing, and configuration control verification to re-establish the design and operational basis of each Hagan module in the RCP. Each Hagan module was upgraded to the latest version based on Westinghouse design drawings and the module board revisions to ensure that the module conforms to, and performs in accordance with, its current design. Every module has undergone bench testing, channel calibration, time response testing and configuration control verification prior to re-installation. The board was labelled accordingly after the verification process. The board revisions are controlled by station procedures. The new procedures established configuration control to the board level. In addition, the licensee verified the fuse value on all modules and documented the verification on a data base for a fuse control program.

In the review of the module failure data, Nuclear Engineering Design (NED) determined that the failure rates for electrolytic capacitors are typically 3 to 4 times higher than those of other module components. Failure of electrolytic capacitors resulted in an increase in the alternating current (AC) noise levels within the modules. High AC noise levels can cause loss of accuracy and ultimately lead to misoperation or failure of the 4 to 20 mA (1-5 VDC) Hagan instrument loops. The licensee initiated a replacement program, a preventive maintenance work activity, to replace the electrolytic capacitors to ensure that no installed capacitors are over 10 years old. The inspector concluded that the licensee actions in this area were prudent and enhanced safety.

The licensee hosted the first Hagan User's Group meeting in June 1996 to share industry experience and received feedback from other participating utilities.

The inspector found the above procedures acceptable and adequate. In addition, the inspector walked down the Unit 1 and Unit 2 RCP areas to observe the difference in the equipment before and after the refurbishment efforts. The licensee's efforts exhibited excellent controls on Unit 2 RCP equipment. The inspector was also given a brief tour of the Hagan project facilities where the licensee performed the refurbishment, calibration and burn-in of the RCP modules.

While on-site, the inspector observed the pre-job briefing and the performance of Salem System Engineering TS2.SE-SU.RCP-0001(Q) Rev.3, "VCT Level and Makeup Flow Test." The performance of the loop tuning was adequate. The inspector did not observe any safety concerns.

Temperature Effects on NUS Modules

The inspector reviewed Engineering Evaluation EE# S-C-RCP-CEE-1037, "Evaluation of NUS 7100/Hagan Replacement Module Performance," Revision 1. The licensee's evaluation was to determine if the performance and accuracy of the NUS replacement comparator, summator, RTD low level amplifier, and isolator modules were equivalent to the existing Westinghouse supplied 7100/Hagan modules.

NUS specified the performance and accuracy on a module basis, and Westinghouse specified the performance and accuracy of the 7100/Hagan modules on a loop/rack basis. In Revision 0, the maximum rack temperature rise was assumed to be 15°F. In Revision 1, this number was revised to be 20°F to furnish a safety margin for the modules. The NUS modules generated less heat than the Hagan modules, thus providing a larger safety margin. The worst-case (Station Blackout) Control Equipment Room temperature is 114.8°F, and the modules were designed to operate in an ambient room temperature of 120°F for up to 11 hours and 20 minutes. The modules are capable of performing their safety functions at elevated temperatures. The modules are operated well within their designed maximum temperature.

The quarterly instrument channel checks during plant operation provides ongoing instrument channel performance data to ensure the instrument's are operating within their allowable value. Salem Maintenance Department as part of the project's bench testing performed a 50-hour burn-in phases on all modules.

The engineering evaluation confirmed the performance and accuracy specifications of the NUS modules to be equal to or better than those of the Hagan counterparts. Based on this evaluation, the inspector concluded that the NUS modules will meet the performance specifications with the stated monitoring of performance. The evaluation recommended that the channel check and calibration data for the NUS modules installed in Westinghouse 7100/Hagan instrument loops be reviewed for a period of two years to verify the assumptions in the analysis.

c. Conclusions

Based on the above, and except for issues identified in NRC Integrated Inspection Report 50-272/96-06, 50-311/96-06, dated June 18, 1996, the inspector found the Hagan Module testing for the RCP and SSPS to be acceptable.

E3.6 RPS Channel Time Response Testing (70305)

a. Inspection Scope

Since the licensee had concluded that surveillance test procedures would be necessary and sufficient to demonstrate RPS operational readiness, the inspector selected a sample of these procedures for review (additional detail is provided in Section E8.2, below).

The list of documentation reviewed during the inspection is included with that for the RCP and SSPS in the attachment to this report.

b. Observations and Findings

While reviewing S2.IC-TR.RCP-0001(Q), "2TE-411A-B #21 RX Coolant Loop Delta T-Tavg Protection Channel I (Channel Time Response Test)", Revision 4, and S2.IC-TR.NIS-0001(Q), "Power Range Channel 2N41 (Channel Time Response Test), Revision 3, the inspector found that neither procedure included acceptance criteria for the channel time response.

Upon further review and after a conversation with the System Manager, the inspector learned that Attachment 3, "Completion Summary" in both S2.IC-TR.RCP-0001(Q) and S2.IC-TR.NIS-0001(Q) require that the Controls Supervisor forward a copy of Attachment 2, "Data Sheet" to the Lead Controls Supervisor or transcribe Response Time Data to S2.IC-TR.ZZ-0002(Q), "Unit 2 Master Time Response" after "data and tolerance values have been obtained." However, it was not clear from the information in either S2.IC-TR.RCP-0001(Q) or S2.IC-TR.NIS-0001(Q): (1) how the Controls Supervisor could determine that "data and tolerance values have been obtained" before executing S2.IC-TR.ZZ-0002(Q) and (2) when in the work sequence (i.e., from the procedure portion of either S2.IC-TR.RCP-0001(Q) or S2.IC-TR.NIS-0001(Q) through execution of S2.IC-TR.ZZ-0002(Q)) would the logic channel time response be declared acceptable and the channel operational. The issue of when/how the channel calibration and time response are determined to be acceptable and the channel returned to "operable" status will require additional inspection followup. **(IFI 50-311/96-21-08)**

c. Conclusions

From the information obtained during the inspection, it was unclear what process was used to determine that instrument channels met established requirements to be called "operable." It appeared that the instruments were declared "operable" and returned to service prior to the response time of the channel being determined to be acceptable. As noted above, additional inspection effort will be required to resolve this concern.

E3.7 Safety Injection (SI) and Associated Systems Testing (70304)

a. Inspection Scope

The inspector reviewed the following documents associated with the SI system to determine whether components which have been modified or worked on have been included for post-work testing; the extent and appropriateness of testing; and whether important functions have been adequately demonstrated by testing. The inspector's evaluation extended beyond the boundaries of the SI system to include a review of the ability of the ECCS (Emergency Core Cooling System) subsystems to realign properly upon receipt of an engineered safety features actuation signal. In addition, the inspector reviewed in detail the documentary record and interviewed licensee personnel to determine the adequacy of the testing procedures for ECCS Flow Balance (High and Intermediate Head). (Note: the SI system is referred to as SJ in the licensee's nomenclature.)

The list of documentation reviewed during the inspection is included in an attachment to this report.

b. Observations and Findings

System Technical Background

There are three phases of ECCS operation: injection, cold leg recirculation, and hot leg recirculation. In the injection phase, water is taken from the refueling water storage tank (RWST) and injected into the Reactor Coolant System (RCS) through the cold legs. When the RWST is low and the containment sumps have enough water to supply the required net positive suction head to the ECCS pumps, suction is switched to the containment sump for cold leg recirculation. After approximately 24 hours the ECCS flow is shifted to the hot leg recirculation phase to provide a backflush.

The active ECCS consists of three separate subsystems: centrifugal charging (high head), safety injection (intermediate head), and residual heat removal (RHR) (low head). Each of the three subsystems consists of two 100% capacity trains that are interconnected and redundant such that either train is capable of supplying 100% of the flow required to mitigate the accident consequences. During the injection phase of LOCA recovery, a suction header supplies water from the RWST to the ECCS pumps. Control valves are set to balance the flow to the RCS. This balance ensures sufficient flow to the core to meet the analysis assumptions following a LOCA in one of the RCS cold legs. During the recirculation phase of LOCA recovery, RHR pump suction is transferred to the containment sump. The RHR pumps then supply the other ECCS pumps. Initially, recirculation is through the same paths as the injection phase. Subsequently, recirculation alternates injection between the hot and cold legs. The ECCS subsystems are actuated upon receipt of an SI signal.

The active ECCS components, along with the passive accumulators and the RWST, provide the cooling water necessary to meet General Design Criteria 35. Each ECCS subsystem is taken credit for in a large break LOCA event at full power. This event establishes the requirement for runout flow for the ECCS pumps, as well as the maximum response time for their actuation. The centrifugal charging pumps and SI pumps are credited in a small break LOCA event. This event establishes the flow and discharge head at the design point for the centrifugal charging pumps.

Licensee Work Performed:

The inspector reviewed the licensee's test plan for the SI system and determined the following significant maintenance and modification work, and associated required testing was performed during the extended outage :

- Electrical modifications were performed using Design Change Package (DCP) 2EC-3396 that affected the parallel RWST supply valves to the charging pumps (2SJ1, 2SJ2), the parallel valves on the discharge from the BIT tank (2SJ12 and 2SJ13) and the parallel RHR supply valves from the emergency containment sump (21SJ44 and 22SJ44).

- DCP 2EC-3461, "Cavitation Mitigation on Safety Injection Cold Legs & Hot Legs," was implemented to remove the potential for SI pump runout damage by installing flow resistance orifices to drop pressure upstream of the SI system cold leg injection line throttle valves (Valves 21SJ143 through 24SJ143) and the hot leg injection line throttle valves (Valves 21SJ138 through 24SJ138).

- Weep holes were drilled in the valve disc on the pump discharge side of the RWST supply valves to the charging pumps (2SJ1 and 2SJ2) to provide an internal relief path to preclude potential pressure locking of the actuator (due to entrapped fluid expansion in the valve bonnet cavity and the space between the valve disc) using DCP 2EC-3467. Weep holes were also drilled in the parallel valves connecting the suction headers of the safety injection and charging pumps (21SJ13 and 22SJ13) using DCP 2EC-3467.

- DCP 2EC-3549 made changes to piping that increased the reliability of the charging pumps to deliver water to the cold leg injection lines and eliminate the potential for plugging the charging pumps cold leg injection line valves (21SJ16 through 24SJ16) with debris from the containment sump when in the recirculation mode.

Evaluation Of Work Performed:

For the DCPs discussed above, the inspector determined that the post-modification testing was appropriate and sufficient to determine the proper functioning of the component involved.

Regarding DCP 2EC-3461, the inspector noted that the cavitation calculations described in the DCP were part of NRC Restart Issue T.35, - Verify Adequate Protection for Safety Injection Pump Runout, and were addressed in NRC Inspection Report 50-272&311/96-15. The following is a synopsis of those inspection findings regarding the calculations, further detail may be found in the referenced report:

- Three calculations were prepared to establish the size and quantity of orifices required for Unit 2, Nos. S-2-SJ-MDC-1576 (SI Hot Leg Orifice Design), S-2-SJ-MDC-1577 (SI Cold Leg Orifice Design), and S-2-SJ-MDC-1604 (Charging/SI Cold Leg injection Line Flow Resistance Orifice Sizing). The inspector found that the methodology used was correct, the assumptions reasonable and the approach appropriate.

- The inspector concluded that PSE&G had properly addressed the SI runout protection concern and had taken acceptable actions to resolve it.

Also, DCP 2EC-3461 described a Unit 2 condition which could potentially lead to post-LOCA runout damage of the SI pumps. The inspector inquired if Unit 1 had been evaluated for the condition. The licensee's reply stated that this had also been an issue for Unit 1. Further, DCP 1EC-3530 was originally developed for Unit 1 to install orifice sets to mitigate cavitation on the Unit 1 SJ143 Cold Leg Injection Valves. At that time the SJ138 Hot Leg Injection Valves were under review for potential modifications. Unit 1 was put on hold and work proceeded on Unit 2. The completion of work on Unit 1 will require additional inspection followup **(IFI 50-272/96-21-09)**

Licensee Rationale For Not Using RHR Suction Boost

The inspector noted that the Startup System Test Plan for the SJ system stated that it did not contain a test which operates the SJ and SJ/CVC pumps with the RHR pump discharge as the suction source and requested information that would support the decision not to test in this mode.

The licensee responded that an evaluation was presented and accepted by the Test Review Board (TRB). The evaluation had been prepared in response to a previous TRB comment on the test plan. The inspector noted that the following points were made in the evaluation:

- The initial RHR suction boost test was performed successfully during initial startup.

- The system design engineer researched Westinghouse requirements to determine if a suction boost test was required to be performed. No requirement was found.

- The system manager researched UFSAR requirements to determine if a suction boost test was required to be performed. No requirement was found

- Westinghouse had supplied calculation and correction factors to allow for the difference in SI pump output between RWST suction and suction boost and the new numbers were used in the ECCS throttle valve setting surveillance procedure.

ECCS Throttle Valve Measurement Inadequacy

The inspector noted during a review of procedures for ECCS injection leg throttle valve flow balancing, an inconsistency in the methodology for determining valve position. The inspector questioned why in one instance procedures required that settings be measured by valve "turns" and in other cases by measurements using a machinist rule. Additionally, the inspector queried why, if one method was considered to give more accurate results, that method wasn't consistently used in all cases?

The licensee replied that prior to the ongoing outage all ECCS throttle valve positions were recorded using the machinist rule to measure stem height. During the outage an engineer preparing a design change had determined that counting the valve turns would be more accurate. Accordingly, a Condition Report (CR 961003224) had been initiated also questioning the accuracy of the methods used. The CR stated that the evaluation was ongoing and it was expected that a depth gauge method of measuring valve stem height would be utilized and that, once developed, the same process would be used for all twelve ECCS throttle valves for consistency. The CR also discussed the possibility that, while there was not a current operability concern, if throttle valves were positioned during previous operating cycles and returned to positions 1/16 inch from original position, ECCS flows may not have met Technical Specification requirements. That would be potentially reportable. The PSE&G conclusions, when completed, regarding reportability of this issue will require additional inspection followup. **(IFI 50-311/96-21-10)**

Testing of SI and Portions of ECCS system

The inspector reviewed a range of licensee documentation to ensure that important system performance functions were adequately reflected in the test procedures. Proper component and system actuation of the Safety Injection system were the focus of the inspector's test reviews. Portions of the Emergency Core Cooling System realignments were also included. As a basis for reviewing the licensee's activities, the inspector noted that the licensee's UFSAR Table 14.2-1, "Tests Performed Prior to Initial Reactor Fueling," stated that the test objectives for the SI system were to verify that system components and operation are in accordance with requirements as specified in the FSAR and appropriate manufacturer's technical manuals. More specifically that:

- SI pumps perform their design functions satisfactorily and reliably.

- Level and pressure instruments are operable and reset as required.

- Flow distribution between injection flow paths are balanced and meet design requirements.

- Each pair of valves installed for redundancy operate as designed.

The inspector discussed the extent and scope of the component and system testing with the licensee and reviewed testing documents to determine if certain design basis functions are met. The first three items listed above were satisfied as a result of the post-modification testing following the installation of the flow resistance orifices in the ECCS injection lines

In light of the licensee's electrical and mechanical work on safety-related components of the Safety Injection system and portions of the ECCS system, the inspector conducted reviews to determine that testing had been conducted to ensure component-level operability as well as an ability to respond to system-level emergency actuation signals.

The inspector noted that the licensee's procedure for manual safety injection, TS2.OP-PT.SSP-0001(Q), conducted during November 1996, provided necessary instructions to actuate both trains of safety injection signals. The procedure also verified, in addition to other actuation, that the following realignments would occur:

- Each automatic valve in the boron injection flowpath actuates and goes to its correct position.

- Each automatic valve in the ECCS flowpath actuates to its correct position.

- Upon receipt of a containment isolation phase A signal (this is generated by the SI signal) each phase A containment isolation valve actuates and goes to its isolation position.

The licensee's procedure S2.OP-ST.SSP-0002(Q), Rev.14, Engineered Safety Features Manual Safety Injection 2A Vital Bus, provided instructions to verify that the SI and RHR pumps started automatically upon receipt of a SI test signal.

The licensee's procedure S2.OP-ST.SSP-0007(Q), Rev.2, Engineered Safety Features Manual Safety Injection 2A Vital Bus, provided instructions to demonstrate that the CVCS letdown valves (2CV3, 2CV4, 2CV5) repositioned in response to a phase A containment signal, thereby verifying the ability to isolate the CVCS from the RCS. The containment isolation signal is normally generated upon receipt of an engineered safeguards feature actuation signal.

c. <u>Conclusions</u>

The inspector concluded that collectively the testing of the SI system was adequate to demonstrate the system's capability to properly realign to the emergency configuration and perform its emergency function in response to a safety injection signal.

E3.8 Component Cooling Water Testing Required for Restart (72400)

a. Scope of Inspection

The inspector reviewed the System Test Plan for the Component Cooling Water (CCW) System, Rev. 0, dated June 13, 1996, and those sections of DCPs listed which describe the change being made and the post-modification testing to be performed. The inspector also reviewed a listing of the work orders to be performed on the system prior to the restart to determine what maintenance and associated retests had been scheduled. The DCPs and the procedures which were referenced for performing the testing are listed in an attachment to this report. In addition, the inspector followed the activities of the NRC team conducting the Safety System Functional Inspection (SSFI) of the CCW system.

b. Observations and Findings

Very few modifications were made to the CCW system during the outage. Several valves had their wedge shoes replaced to improve corrosion resistance and several valves were replaced due to plugging or seat leakage.

Testing specified included pressure boundary inservice leak rate tests, valve operation and test evaluation system (VOTES) testing of the MOVs with internals replaced, and stroke time testing for the MOVs. In addition, those valves which act as containment boundaries received Type C local leak rate tests. Additional testing of the system, called out in work order printouts and the test plan include all the surveillance tests for the system.

A system flow balance test was conducted to validate the computer model of the system which had been developed. The test was reviewed by the SSFI team, and is described in their report (NRC Inspection Report 50-311/96-81).

c. Conclusions

Based on the review of the surveillance procedures for the CCW system, a review of the maintenance procedures for MOVs, and the acceptance criteria procedures for CCW system, the inspector concluded that the testing planned for restart will verify that the system operates in conformance with its design.

E3.9 Service Water Testing Required for Restart (72400)

a. Scope of Inspection

The inspector reviewed the Startup System Test Plan for the Service Water System, Rev. 1, dated July 12, 1996. The inspector reviewed the portions of DCPs listed which described modifications being made to the system, and the testing to be performed. In addition, the inspector reviewed a printout of the work orders which were scheduled to be performed prior to restart to determine what maintenance, and associated retesting was scheduled. The DCPs and the procedures which were referenced for the testing which the inspector reviewed are listed in an attachment to this report.

b. Observations and Findings

Due to emergent issues, the scope of service water system work for startup was changing throughout the inspection period. A new revision of the Startup System Test Plan, also marked Revision 1, was issued December 3, 1996. This revision also eliminated the system flow balance test. The basis for elimination of the test was that the flows in the major flow paths had been verified during the pump and piping testing following replacement. The flows in the small loops (primarily room coolers and small heat exchangers) will be verified prior to startup and periodically thereafter as part of the ongoing service water system performance monitoring program. This argument was presented to the SORC, and was accepted as a justification for deleting the test.

The majority of the work in the DCPs originally listed was a continuation of the Service Water Upgrade Project which has been ongoing for several years. The piping and valves have been, for the most part, replaced with molybdenum bearing austenitic stainless steel which has much better service life in brackish water conditions. In addition, all of the Unit 2 service water pumps have been replaced with a new design pump which is better suited to the silt-laden brackish water which is their normal operating environment. The emergent work is aimed at resolving issues related to containment fan cooler unit overpressurization, water hammer, response time, service water strainer performance improvements, and service water strainer backwash valve failure resolution.

The testing proposed for the service water system consists of a combination of surveillance test procedures and special test procedures for performing the functional checkout of the new components. The special test procedures for the pump replacements implement the routine surveillance test procedures for the pumps, with two additional flow measurement points to develop pump curves for IST baselines. The pressure boundary post-modification testing was performed as inservice leak rate tests.

The emergent work was not reviewed during this inspection due to time constraints. The review of the emergent work will be performed in a future inspection, when all the work is finalized and the DCPs have been approved and issued.

c. Conclusions

The inspector determined, based on the procedure reviews, work order and DCP descriptions, that the testing proposed was appropriate to verify that the modified system will meet is design requirements. The emergent work will be reviewed during a future inspection.

E8 Miscellaneous Engineering Issues

E8.1 (Open) Inspector Follow-up Item 50-272 & 311/96-07-03:

Salem has experienced problems with GE Magne-Blast 4KV circuit breakers in safety related applications failing to latch closed. The problem has been identified in NRC Information Notice (IN) 94-54, "Failures of General Electric Magne-Blast Circuit Breakers Failing to Latch Closed," August 1, 1994. Subsequent NRC inspections (NRC Inspection Reports 50-272; 311/96-07 and 50-272; 311/96-05) have also identified this problem. Inspection Report 50-272; 311/96-15, Inspector Follow-up Item (IFI) 50-272; 311/96-07-03, details testing and analysis of two modified circuit breakers, to ensure reliable operation. As of October 22, 1996, the two circuit breakers operated more than 5,000 cycles without a failure, demonstrating that the modifications made to the circuit breakers provided reliable operation. The inspector determined that the 4KV and 13KV Magna-Blast Circuit Breakers Inspection & Test Procedure, SC.MD-IS.4KV-0001(Q), Revision 13, contain test procedures design to verify proper operation of the GE Magne-Blast 4KV Circuit Breaker. The inspector verified the test procedure was modified as a result of the corrective actions and root cause analysis (4KV Magna-Blast Circuit Breaker Failure Root Cause Analysis, Condition Report PR 960315194) to ensure proper circuit breaker operation. The procedure requires the use of a high speed video camera to verify and accept proper circuit breaker operation (latching). If the circuit breaker passes the high speed video review, it is considered "Root Cause Qualified." To date (1/20/97), 51 of 60 circuit breakers installed in the 4KV system for Unit 2 have been root cause qualified. The inspector verified the ability of the high speed video camera to capture and verify circuit breaker latching mechanism (prop and pin) operation by viewing video test samples taken during testing.

The inspector concluded the root cause analysis, corrective actions taken, and testing of the GE Magne-Blast 4KV circuit breakers (failure to latch) performed by PSE&G to be adequate for restart of the facility. This item will remain open pending final resolution of Magne-Blast breaker problems.

E8.2 (Closed) Inspector Follow-up Item 50-311/96-19-01): RCP/SSPS System Readiness Review Report and Startup System Test Plan issues. Five issues had been identified: (1) unclear that the affected systems were evaluated to identify known significant or recurring maintenance and operations problems; (2) unclear that affected surveillance test procedures were evaluated to identify what, if any, additional testing will be required to assure that the modified systems will perform their design basis functions; (3) unclear that testing requirements necessary to verify the adequacy of new design modifications were adequately identified; (4) it appeared that the Startup Test Plans for both RCP and the SSPS would not subject either system to Integrated Functional Testing (Startup System Test Plan, Section 5.1.3, Phase III) or to Power Ascension Testing (Startup System Test Plan, Section 5.1.4, Phase IV); and (5) unclear how the Salem Startup Group determined that existing Surveillance Test procedures would adequately verify the functionality of new or modified RCP and SSPS equipment.

RCP and SSPS Readiness and Design Basis Review (Issues 1, and 2)

The inspector confirmed that a detailed review of the RCP and SSPS design bases was performed by the licensee during the Initial System Readiness Review. This review was conducted under Salem/System Engineering procedures (1) SC.SE-DD.ZZ-0001(Z), "System Readiness Review Program," and (2) SC.SE-DD.ZZ-0002(Z), "Support Systems Review Program." Results of this review were documented in "System Readiness Review Report - Reactor Control and Protection System (RCP) & Solid State Protection System (SSPS)," Final Report.

The inspector interviewed the RCP/SSP System Manager who provided a detailed overview of the readiness review process, including walkdowns. As part of this review, a comparison was made between UFSAR commitments, Salem Unit 2 TS requirements, and NRC Safety Evaluation Reports (SERs) to expose any inconsistencies. The UFSAR commitments were verified to be implemented by a review of such records as drawings, operations procedures, surveillance test procedures, design change packages, configuration baseline documents, and license change requests. No discrepancies between the UFSAR, TS and SERs were identified.

Any RCP/SSP design or licensing bases changes resulting from the Hagan Refurbishment and Replacement Project were addressed during the Design Change Package (DCP) process, as described above.

RCP and SSPS Startup and Power Ascension Testing (Issue 3)

The Salem Startup Test Group and the Test Review Board reviewed all testing requirements in DCPs listed against the RCP and SSP. Although in some instances additional testing was specified in the RCP and SSP Startup Test Plans, most DCP testing was being addressed through the performance of surveillance testing. Existing Channel Calibrations, Time Response (when applicable), and Sensor Calibration portions were performed to ensure adequate post-modification testing. Additionally, as part of the DCP review process, the Hagan Refurbishment and Replacement Project team reviewed the adequacy of the Surveillance procedures (Functional, Channel Calibration, Time Response, Sensor Calibration, and Operation) in establishing the operational readiness of all protection channels (I, II, III and IV).

RCP Startup System Test Plan, dated 8/30/96

The inspector reviewed portions of DCP No. 2EC-3450, "Channel I Pressurizer Protection & Control Instrumentation Isolator & Summator Replacement," Package No. 1, to ascertain the extent of testing performed during its implementation. The DCP required that each module affected be bench calibrated, and that Calibration Procedures S2.IC-CC.RC-0082(Q) and S2.IC-CC.RCP-0017(Q), and Time Response Procedure S2.IC-TR.RCP-0017(Q) be performed satisfactorily on all affected channels.

In addition to testing specified by each DCP, additional testing focused on the RCP Process Control Loops will be performed to demonstrate the effectiveness of the Hagan refurbishment effort and to substantiate the operability of the system. This additional testing will consist of dynamic testing of the following control loops: (1) Pressurizer Level Control Loop, (2) Pressurizer Pressure Control Loop, (3) Steam Dump Control, (4) Boric Acid Makeup Flow Control, (5) Primary Water Flow Control, (6) CVC Volume Control Tank Level, (7) RCS Letdown Heat Exchanger Temperature Control, (8) RCS Letdown Pressure Control, and (9) Rod Speed & Direction Control.

SSPS Startup System Test Plan, dated 10/17/96

In addition to testing activities associated with each DCP, the SSPS will be subjected to additional testing associated with the following: (1) Modifications performed on the SSPS due the implementation of the Advanced Digital Feedwater Control System DCP (DCP No. 2EC-03178), and (2) Complete surveillance testing, including Manual Safety Injection (Phase A & Phase B) testing. The Test Plan concluded that no additional testing is required on the SSPS. Upon final review of the DCPs and successful completion of all Test Plan testing requirements, the SSPS will be considered ready to be returned to service.

Evaluation of RPS Restart Testing at Salem Unit 2 (Issues 4 and 5)

The licensee does not intend to subject the RCP or SSPS to any "transient testing" during restart. Although a transient test associated with turbine runback & SGFP trip/runback will be performed, it is not expected that the RCP and/or SSPS be challenged (i.e., no reactor trip or ESFAS signals are expected or anticipated).

In order to establish a "benchmark" for the adequacy of the approach adopted by the Salem Startup Test Group for RCP and SSPS testing, the inspector reviewed copies of the original procedures used during preoperational and startup testing of the facility. Procedures reviewed include:

- Salem Unit 1 - Startup Procedure (SUP) No. 20.1, "Reactor Trip System & Engineered Safety Feature System Response Time Test," Revision 1 (Dated September 9, 1976)
- Salem Unit 1 - Startup Procedure (SUP) No. 20.2, "Reactor Protection System Operational Test," Revision 7 (Dated August 9, 1976)

- Salem Unit 1 - Startup Procedure (SUP) No. 20.3, "Safeguards System Operational Test," Revision 15 (Dated July 26, 1976)

- Salem Unit 2 - Startup Procedure (SUP) No. 20.5, "Reactor Plant System Set Point Verification," Revision 3 (Dated May 21, 1980), and

- Salem Unit 1 - Startup Procedure (SUP) No. 51, "Integrated Test of Engineered Safeguards and Emergency Power System"

During the initial Salem startup test program, the execution of SUP 51 demonstrated the following:

- Operation of the Engineered Safeguards System during its postulated accident modes (Blackout, LOCA with offsite power available, and LOCA coincident with a Blackout).

- Timely sequencing of safeguard loads onto vital buses during Blackout and LOCA coincident with Blackout accident modes.

- Each Diesel Generator's (EDG) capability of attaining rated speed and voltage as well as its readiness to accept loads within specified time periods. The capability of each DG in maintaining voltage and frequency above minimally acceptable values was also demonstrated.

- Proper response of containment isolation valves to Containment Isolation Phase A and Phase B actuation signals.

- Compliance with Regulatory Guide (RG) 1.41, "Preoperational Testing of Redundant On-site Electric Power Systems to Verify Proper Load Group Assignments."

While the Salem Restart Test Program testing scope for the RPS and for the Engineered Safety Features Actuation System (ESFAS) is not identical to the scope of SUP 51, the Restart Test Program encompasses surveillance (S2.OP-ST.SSP-0002(Q), 0003(Q), 0004(Q), 0006(Q), AND 0007(Q)) and functional testing (S2.MD.FT.SEC-0001(Q), 0002(Q), AND 0003(Q)) to an extent commensurate with the maintenance and equipment modifications performed in the facility during the outage. Restart Testing of the RPS and ESFAS will encompass the following:

- EDG Accident Load Test (Safeguards Mode 1) - Verification of proper ESFAS component response to an SI test signal, including EDG start and voltage/frequency response.

- EDG Blackout Load Test (Safeguards Mode 2) - Verification of proper ESFAS component response to an undervoltage test signal, including Vital Bus load shedding, Vital Bus re-energization and shutdown load sequencing by the EDG while maintaining proper bus voltage/frequency.

- EDG Blackout Accident Load Test (Safeguards Mode 3) - Verification of proper ESFAS component response to an SI test signal in conjunction with an undervoltage test signal, including Vital Bus load shedding, Vital Bus re-energization and accident load sequencing by the EDG while maintaining proper bus voltage/frequency.

- Demonstration of proper EDG voltage/frequency response to rejection of the largest single load.

- Verification of EDG capability to carry auto-connected loads without exceeding 2-hour load rating.

- Demonstration of SI test signal override of EDG "test mode" by returning EDG to standby operation and energizing emergency loads from offsite power.

- Verification of EDG capability to accept the largest auto-connected load while EDG is carrying blackout accident loads.

- Demonstration of operability and accuracy of all Safeguard Equipment Control Cabinet equipment logic and timing functions during Blackout and Accident Mode, including proper loading sequence time delays .

- Containment Isolation Phase "A" and Phase "B" Manual Actuation.

- Verification of proper ESFAS component response to Containment Isolation Phase "A" and Phase "B", Containment Ventilation Isolation, Containment Spray Actuation, and Main Steam Line Isolation .

Absent major electrical system modifications, re-testing to demonstrate compliance with RG 1.41 during restart was deemed unnecessary by the licensee.

The inspector compared the comprehensiveness, purpose, scope and acceptance criteria of the original procedures with those of the RCP and SSPS, as described above. For this comparison, a sample of applicable Surveillance Test procedures were also selected for review. The Surveillance Test Procedures which were examined are listed in an attachment to this report.

Additionally, the inspector review the following documents:

- DE-CB.RCP/SEC/SSP/SPL-0032(Q), "Configuration Baseline Documentation for Reactor Protection Systems," Revision 2.

- Salem - Unit 2 TS (a) Section 2.2, "Limiting Safety System Settings," (b) Section 3/4.3.1, "Reactor Trip System Instrumentation," and (c) Section 3/4.3.2, "Engineered Safety Features Instrumentation."
- Salem Units 1 and 2 UFSAR (a) Section 7.2, "Reactor Trip System," and (b) Section 7.3, "Engineered Safety Features Instrumentation."

The inspector confirmed that the surveillance test procedures described above adhered to applicable TS calibration and surveillance requirements as well as UFSAR design bases criteria.

Based on the review of Salem Unit 2 surveillance and functional test procedures in conjunction with DE-CB.RCP/SEC/SSP/SPL-0032(Q), the facility's UFSAR and TS, as well as other documents described above, the inspector concluded that the licensee's restart testing approach for RCP and SSPS is sufficiently comprehensive and appropriate to demonstrate operational readiness of the RCP and SSPS.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on January 24 , 1997. The licensee acknowledged the findings presented.

During the inspection, several documents under review were identified as being proprietary information. These documents were returned to PSE&G at the end of the inspection.

During the inspection, some questions were presented to PSE&G in written form to ensure correct understanding of detailed technical issues. A list of all the questions provided during the inspection, and PSE&G's answers, is provided as an attachment to this report. All the technical issues have been/are being addressed as part of our routine inspection process. NRC will review each question and answer for potential enforcement action. **(URI 50-311/96-21-11)**

PARTIAL LIST OF PERSONNEL CONTACTED

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INSPECTION PROCEDURES USED

IP 70300, Preoperational Test Procedure Review
IP 70304, Engineered Safety Features Test Preoperational Test Procedure Review
IP 72400, Overall Startup Test Program
IP 70348, Main Turbine Runback Tests
IP 70341, Emergency-Standby Power System Test
IP 70305, Reactor Protection System Test
IP 37828, Installation and Testing of Modifications

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-311/96-21-01	VIO	DCP Special Test Procedures were not prepared in accordance with NC.DE-AP.ZZ-0012(Q), Test Program
50-311/96-21-02	IFI	Review 2EC-3306 STP-2, SGFP Trip/Turbine Runback Operational Test after revision is issued
50-311/96-21-03	URI	Controls for development and testing of SGFP digital Governor and ADFCS software not defined
50-311/96-21-04	IFI	ADFCS is not being tested in accordance with system design documentation
50-311/96-21-05	IFI	The Requirements Traceability Matrix requirements were not carried through to Factory Acceptance test for ADFCS (MS-10)
50-311/96-21-06	IFI	ADFCS Factory Acceptance Test did not test failure of steam pressure calculation in low power mode
50-311/96-21-07	IFI	Change area on schematic 218914B9781 is not fully legible. Referenced drawing shows no change for 2EC-3306.
50-311/96-21-08	IFI	How and when are channel calibration and time response determined to be acceptable
50-272/96-21-09	IFI	Complete evaluation and work on Unit 1 SJ hot and cold leg injection valves to prevent post LOCA pump runout
50-311/96-21-10	IFI	Review PSE&G reportability evaluation of throttle valve position measurement inadequacy (CR 961003224)

Closed

50-311/96-19-01	IFI	Adequacy of reviews of RCP and SSPS testing

Discussed

50-272/96-07-03 50-311/96-07-03	IFI	Magne-Blast Circuit Breaker failures

LIST OF ACRONYMS USED

AC	Alternating Current
ADFCS	Advanced Digital Feedwater Control System
AFP	Auxiliary Feedwater Pump
AR	Action Request
ARV	Atmospheric Relief Valve
BIT	Boron Injection Tank
CAACS	Control Room Area Air Conditioning System
CAV	Control Room Area Ventilation
CBD	Configuration Baseline Document
CFR	Code of Federal Regulations
CR	Condition Report

CVCS	Chemical and Volume Control System
DCP	Design Change Package
DSG	Digital Systems Group
EACS	Emergency Air Conditioning System
ECA	Engineering Change Authorization
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
EEB	Electrical Engineering Branch
ESFAS	Engineered Safety Features Actuation System
FAT	Factory Acceptance Test
GE	General Electric
HWIL	Hardware in Loop Testing
IN	Information Notice
LOCA	Loss of Coolant Accident
mA	milli-ampere
NED	Nuclear Engineering Design
NSS	Nuclear Shift Supervisor
NRC	Nuclear Regulatory Commission
P&ID	Piping and Instrumentation Drawing
PMT	Post Modification Testing
PORV	Power Operated Relief Valve
PSE&G	Public Service Electric and Gas Company
RCP	Reactor Control and Protection System
RCS	Reactor Coolant System
Rev	Revision
R.G.	Regulatory Guide
RHR	Residual Heat Removal
RPS	Reactor Protection System
RTD	Resistance Temperature Detector
RWST	Refueling Water Storage Tank
RTM	Requirements Traceability Matrix
SAT	Site Acceptance Test
SEB	Systems Engineering Branch
SER	Safety Evaluation Report
S/G	Steam Generator
SGFP	Steam Generator Feed Pump
SI	Safety Injection
SNSS	Senior Nuclear Shift Supervisor
SORC	Station Operations Review Committee
SRO	Senior Reactor Operator
SSPS	Solid State Protection System
STP	Special Test Procedure
SUP	Startup Procedure
SW	Service Water
TRB	Test Review Board
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
VCT	Volume Control Tank

VDC	Volts Direct Current
WO	Work Order

LIST OF DOCUMENTS REVIEWED

Section E1

Scope of Integrated Test Program

Salem Restart Plan, dated October 13, 1995
SC.TE-TI.ZZ-0001(Q), Rev. 3, Startup and Power Ascension Program
SC.SE-AP.ZZ-0002(Q), Rev. 0, Conduct of Testing
TS2.SE-SU.ZZ-0001(Q), Rev. 0, Startup and Power Ascension Sequencing Procedure
SC.SE-DD.ZZ-0001(Z), Rev. 5, System Readiness Review Program
SC.SE-DD.ZZ-0002(Z), Rev. 3, Support Systems Review Program
SC.SA-AP.ZZ-0034(Q), Rev. 1, Self Assessment Program
SC.SA-AP.ZZ-0035(Q), Rev. 1, Operational Readiness Self Assessment Program
NC.NA-AP.ZZ-0001(Q), Rev. 10, Nuclear Procedures System
NC.NA-AP.ZZ-0004(Q), Rev. 6, Station Operations Review Committee
NC.NA-AP.ZZ-0005(Q), Rev. 6, Station Operating Practices
NC.NA-AP.ZZ-0006(Q), Rev. 14, Corrective Action Program
NC.NA-AP.ZZ-0008(Q), Rev. 10, Control of Design and Configuration Change, Tests and Experiments
NC.NA-AP.ZZ-0009(Q), Rev. 10, Work Control Process
NC.NA-AP.ZZ-0014(Q), Rev. 4, Training, Qualification and Certification
NC.DE-AP.ZZ-0012(Q), Rev. 6, Test Program

Section E3

4kV System

Salem Generating Station Updated Final Safety Analysis Report, Section 8.3, Onsite Power System
S2.IC-TR.ZZ-0002(Q), Revision 5, 8/1/96, Unit 2 Master Time Response
SC.OP-SO.4KV-0001(Q), Revision 11, 11/15/96, 4KV Breaker Operation
SC.MD-IS.4KV-0001(Q), Revision 13, 11/26/96, 4KV and 13KV Magna-Blast Circuit Breakers Inspection & Test
S2.MD-TR.4KV-0004(Q), Revision 10, 5/22/96, Reactor Trip System 18 Month Time Response 2E Group Bus Undervoltage and Underfrequency
S2.MD-TR.4KV-0005(Q), Revision 9, 5/22/96, Reactor Trip System 18 Month Time Response 2F Group Bus Undervoltage and Underfrequency
S2.MD-TR.4KV-0006(Q), Revision 9, 5/22/96, Reactor Trip System 18 Month Time Response 2G Group Bus Undervoltage and Underfrequency
S2.MD-TR.4KV-0007(Q), Revision 10, 5/22/96, Reactor Trip System 18 Month Time Response 2H Group Bus Undervoltage and Underfrequency
ES-4.003(Q), Revision 1, 125 VDC System Study
ES-4.004(Q), Revision 3, 125 Volt DC Battery and Battery Charger Sizing Calculation
ES-4.006(Q), Revision 0, 125 Volt DC Component and Voltage Drop Calculation

Condition Report PR960315194, 4KV Magne-Blast Circuit Breaker Failure Root Cause Analysis, 5/30/96
DCP 2EO-2410-1, 2A Switchgear HL Limit Switch Operator Replacement
DCP 2EO-2410-2, 2B Switchgear HL Limit Switch Operator Replacement
DCP 2EO-2410-2, 2C Switchgear HL Limit Switch Operator Replacement
DCP 2EC-3338-1, Add Time Delay Relay for Group Bus 2H Undervoltage Protection
DCP 2EC-3338-2, Add Time Delay Relay for Group Bus 2E Undervoltage Protection
DCP 2EC-3338-3, Addition of Time Delay Relay for 2F Group Bus Undervoltage
DCP 2EC-3338-4, Add Time Delay Relay for Group Bus 2G Undervoltage Protection
DCP 2EC-3338-5, 4kV Group Bus 2H Undervoltage Trip for Condensate Pump No. 21
DCP 2EC-3338-6, 4kV Group Bus 2E Undervoltage Trip for Condensate Pump No. 22
DCP 2EC-3338-7, 4kV Group Bus 2F Undervoltage Trip for Condensate Pump No. 23

Control Room Area Ventilation System

NC.DE-AP.ZZ-0012(Q), Rev. 6, Test Program
DCP 1EC-3505-1, Control Area Air Conditioning Upgrade

Safety injection System

Regulatory Guide 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants," Rev. 2, August 1978.
SGS-UFSAR Chapter 14, "Initial Tests and Operation," Rev.6, February 1987.
SGS-UFSAR Chapter 6.3, "Emergency Core Cooling System"
UFSAR Table 6.3-6, "Sequence of Changeover Operation Injection To Recirculation"
Technical Specifications 4.5.2.a, 4.5.2.f, 4.5.2.h
Configuration Baseline Documentation for Safety Injection System, DE-CB.SJ-0040(Q)
Startup System Test Plan-Safety Injection System (SJ), Rev.1, October 17, 1996.
Procedure S2.OP-ST.SJ-0014(Q), Rev.8, Intermediate Head Cold Leg Throttling Valve Flow Balance Verification
Procedure S2.OP-ST.SJ-0015(Q), Rev.10, Intermediate Head Hot Leg Throttling Valve Flow Balance Verification
Procedure S2.OP-ST.SJ-0016(Q), Rev.11, High Head Cold Leg Throttling Valve Flow Balance Verification
Procedure TS2.OP-PT.SSP-0001(Q), Rev.0, Manual Safety Injection-Equipment Verification
Procedure S2.OP-ST.SSP-0002(Q), Rev. 13, 14 & 15., Engineered Safety Features Manual Safety Injection 2A Vital Bus
Procedure S2.OP-ST.SSP-0003(Q), Rev. 17, Engineered Safety Features Manual Safety Injection 2B Vital Bus
Procedure S2.OP-ST.SSP-0004(Q), Rev. 17, Engineered Safety Features Manual Safety Injection 2C Vital Bus
DCP 2EC-3396-1, 10CFR50 Appendix R Alternate Shutdown Methodology Installation of Transfer Switches
DCP 2EC-3461-1, Cavitation Mitigation on Safety injection Cold Legs and Hot Legs
DCP 2EC-3467-1, SI Refuel WST to Charg Pump MOVs (2SJ1 & 2SJ2) Disc Weep Holes
DCP 2EC-3467-2, SI RHR to Charging Pump MOVs (21SJ113 & 22SJ113) Disc Weep Holes
DCP 2EC-3467-3, Boron Inj. Outlet to Cold Leg MOVs (2SJ12 & 2SJ13) Disc Weep Holes

DCP 2EC-3549-1, Debris Mitigation on Charging/Safety Injection Cold Leg
Calculation S-2-SJ-MDC-1576 (SI Hot Leg Orifice Design)
Calculation S-2-SJ-MDC-1577 (SI Cold Leg Orifice Design)
Calculation S-2-SJ-MDC-1604 (Charging/SI Cold Leg injection Line Flow Resistance Orifice Sizing)
P&ID 205334 A 8763-52 Sht 1, Safety Injection, Unit 2
P&ID 205334 A 8763-52 Sht 2, Safety Injection, Unit 2
P&ID 205334 A 8763-52 Sht 3, Safety Injection, Unit 2
P&ID 205334 A 8763-52 Sht 4, Safety Injection, Unit 2
P&ID 221057 B 9545-16 Sht 8, Reactor Protection System, Safeguards Actuation
Condition Report CR-961003224, "ECCS throttle Valve Measurement Inadequate," dated 10/07/96.

Emergency Diesel Generators

DCP 2EC-3404-1, EDG 2A Air Start Vibration Reduction
DCP 2EC-3404-2, EDG 2B Air Start Vibration Reduction
DCP 2EC-3404-3, EDG 2C Air Start Vibration Reduction
DCP 2EC-3349-1, 2A EDG Starting Air & Turbo Boost System Upgrade
DCP 2EC-3349-2, 2B EDG Starting Air & Turbo Boost System Upgrade
DCP 2EC-3349-3, 2C EDG Starting Air & Turbo Boost System Upgrade
DCP 2EC-3456-1, Emergency Diesel Generator 2A Starting Air Compressor and Turbo Boost Air Compressor Start-Stop Pressure Switches
DCP 2EC-3456-2, Emergency Diesel Generator 2B Starting Air Compressor and Turbo Boost Air Compressor Start-Stop Pressure Switches
DCP 2EC-3456-3, Emergency Diesel Generator 2C Starting Air Compressor and Turbo Boost Air Compressor Start-Stop Pressure Switches
DCP 2EC-3506-1, EDG 2A/2B/2C Turbo Boost Air Receiver Low Pressure Alarm
ECA 2EE-0107-1, Diesel Generator 2A, 2B, 2C Diesel Generator Fuel Oil Header Pressure Gage Replacement

Feedwater and Feedwater Control System

UFSAR Section 7.3.2.5, Secondary Systems Control
UFSAR Section 7.3.3.5, Turbine Generator Trip with Reactor Trip
UFSAR Section 7.5.2.5, Feedwater Isolation
DE-CB.CN-0015(Q), Rev. 4, Configuration Baseline Documentation for Steam Generator Feedwater & Condensate System
Condensate and Feedwater System Readiness Review Report, dated 27 September, 1995
DCP 2EC-3178, Advanced Digital Feedwater Control System
Advanced Digital Feedwater Control System Technical Requirements, Rev. 5, dated 25 October, 1994
Digital Feedwater Control System (DFWCS) Functional Requirements - Salem Units 1 and 2, Revision 2.0, dated December, 1992
Steam Generator Atmospheric Relief Valve Control System Functional Requirements - Salem Units 1 and 2, Revision 0, dated February 1993
Verification and Validation Plan for Public Service Electric and Gas Salem Generating Station Advanced Digital Feedwater Control System Revision 1, dated 22

September, 1994
Advanced Digital Feedwater Control System Verification and Validation Report (Draft as of 4 December, 1996)
Advanced Digital Feedwater Control System Requirements Traceability Matrix, prepared 30 August, 1995
Factory Acceptance Test (FAT) for ADFCS Revision 1, dated 1 September, 1994
Factory Acceptance Test (FAT) ADFCS Addendum 1, dated 1 November, 1994
DCP 2EC-3306, Turbine Runback / SGFP Control Circuit Modification
TS2.SE-SU.ZZ-0001(Q), Rev. 0, Startup and power Ascension Sequencing Procedure
DE-TS.ZZ-1900(Q), Rev. 0, Instrument and Controls Electrical Installation Checkout
DE-TS.ZZ-1901(Q), Rev. 0, Instrument and Controls Mechanical Installation Checkout
DE-TS.ZZ-1902(Q), Rev. 0, Instrument and Controls Circuit Functional Loop Checkout
S2.IC-CC.CBV-0168(Q), Rev. 3, Containment Fan Coil Units Leak Detection
S2.IC-CC.CVC-0026(Q), Rev. 0, 2PT-142 Charging System Seal Pressure
S2.IC-CC.RC-0051(Q), Rev. 5, 2QM-412A Tavg High Reactor Control System
S2.IC-CC.RC-0053(Q), Rev. 6, 2TM-412S Tavg Auctioneered
S2.IC-CC.RCP-0025(Q), Rev. 4, 2PT-506 Turbine First Stage Impulse Pressure Protection Channel II
S2.IC-CC.MS-0102(Q), Rev. 3, 2TM-500A Steam Dump Turbine Trip and Load Rejection
S2.IC-CC.MS-0109(Q), Rev. 5, 2PT-507 Steam Generator Header Steam Dump to Condenser Control
S2.IC-CC.CN-0011(Q), Rev. 3, 2TL-8885 Steam Generator Inlet Feedwater Temperature
S2.RA-ST.MS-0002(Q), Rev. 0, Inservice Testing Main Steam and Main Feedwater Valves Acceptance Criteria
NC.NA-AP.ZZ-0064(Q), Rev. 1, Software and Micro-Processor Based Systems (Digital Systems)
ND.DE-AP.ZZ-0052(Q), Rev. 1, Software Control
ND.DE-TS.ZZ-5503(Q), Rev. 0, Software Requirements for Critical Digital Systems Utilizing Mature Software
ND.DE-TS.ZZ-5506(Q), Rev. 0, Digital Systems Life Cycle
NC.DE-AP.ZZ-0012(Q), Rev. 6 , Test Program
Westinghouse Letter PSE-ADFCS-93-043, dated July 17, 1993 "WDPF Electromagnetic Interference"
P&ID 205302
Schematic 203312
Schematic 203315
Schematic 203322
Schematic 218914
Schematic 247404
Schematic 247405

Component Cooling Water System

DE-CB.CC-0023(Q), Rev. 2, Configuration Baseline Documentation for Component Cooling Water
SD-PSE/PNJ-200/C/3. Rev 0, Component Cooling Water System
Westinghouse Letter PSE-89-744, Salem CCW Calculation Summaries
Westinghouse Letter PSE-85-592, Salem Component Cooling Water Flow

Westinghouse Letter BURL-3018, Salem Nuclear Generating Station Units Number 1 and 2, Auxiliary Pumps Cooling Requirements
S-C-CC-MDC-0860, Component Cooling System Design Temperature
S-C-SW-MSE-0859, Rev. 0, SW & CCW EOP Alignment Issues
S-C-SW-MDC-1390, Rev. 0, CCW Temp Setpoint for CCHX During LOCA
S-C-CC-MDC-0957 Rev. 1, CCW System Pressure Drop
S-C-N210-MSE-0421, Rev. 1, Requirements for CCW Operability with Regard to Moderate Energy Line Breaks
S-C-ZZ-MEE-1006, Rev. 0, Engineering Evaluation to Justify Post Restart Status for Stress Analysis Identified Deficiencies
S-1-N210-MSE-0171, Rev. 0, CCW Non-Availability in Mode 5 Operation
SC-CC003-01, Rev. 1, Salem Unit 1&2 Component Cooling Surge Tank Level
SC-CC002-01, Rev. 1, 1/2 CCW RHR Outlet Flow Indication & Alarms
TS2.SE-SU.CC-0001(Q), Rev. 1, CCW Flow Balance
SC.MD-GP.ZZ-0019(Q), Rev. 5, Valve Repacking
SC.MD-CM.ZZ-0014(Q), Rev. 2, Disassembly/Repair of Type SMB-00 Limitorque Actuators
SC.MD-EU.ZZ-0012(Q), Rev. 9, VOTES Data Acquisition, Motor Operated Valve
S2.OP-ST.CC-0001(Q), Rev. 9, Inservice Testing - 21 Component Cooling Pump
S2.OP-ST.CC-0002(Q), Rev. 8, Inservice Testing - 22 Component Cooling Pump
S2.OP-ST.CC-0003(Q), Rev. 8, Inservice Testing - 23 Component Cooling Pump
S2.OP-ST.CC-0004(Q), Rev. 5, Inservice Testing Component Cooling Valves, Modes 5-6
S2.OP-ST.CC-0005(Q), Rev. 5, Inservice Testing Component Cooling Valves, Modes 5-6
S2.OP-ST.CC-0006(Q), Rev. 0, Component Cooling Valve Verification, Modes 1-4
S2.IC-CC.CC-0156(Q), Rev. 2, Residual Heat Exchanger Component Cooling Water Outlet Flow
S2.IC-CC.CC-0158(Q), Rev. 1, 2TE-602A #21 Component Cooling Heat Exchanger Discharge Temperature
S2.IC-CC.CC-0159(Q), Rev. 1, 2TE-602B #22 Component Cooling Heat Exchanger Discharge Temperature
S2.IC-CC.CC-0160(Q), Rev. 3, #21 Component Cooling Water Surge Tank Level
S2.IC-SC.CC-0160(Q), Rev. 2, 2LT-628A #21 Component Cooling Water Surge Tank Level
S2.IC-SC.CC-0156(Q), Rev. 2, Residual Heat Exchanger Component Cooling Water outlet Flow
S2.IC-SC.CC-0161(Q), Rev. 2, 2LT-628B #22 Component Cooling Water Surge Tank Level
S2.OP-PM.CC-0021(Q), Rev. 7, 21CCHX Service Water Side 10,000 GPM Flush
S2.OP-PM.CC-0022(Q), Rev. 6, 22CCHX Service Water Side 10,000 GPM Flush
S2.OP-PT.CC-0103(Q), Rev. 1, Differential Pressure Test of Component Cooling Containment Isolation Valves 2CC117, 2CC118, 2CC136, and 2CC187
S2.OP-PT.CC-0104(Q), Rev. 3, Differential Pressure Test of 21-22CC Header X-over Valves (21CC3/22CC3) & 21-22 RHRHX CC Outlet Valves (21CC16/22CC16)
S2.OP-PT.CC-0114(Q), Rev. 0, Differential Pressure Test of 21-22 CCHX Out to Aux Hdr Valves 2CC30 and 2CC31
Drawing 220402, No. 11, 21, 12 & 22 CC Surge Tank - Units 1&2 Aux Cooling System

Reactor Control and Protection System and Solid State Protection System

Salem Unit 1 - Startup Procedure (SUP) No. 20.1, "Reactor Trip System & Engineered Safety Feature System Response Time Test," Revision 1 (Dated 9/9/76)
Salem Unit 1 - Startup Procedure (SUP) No. 20.2, "Reactor Protection System Operational Test," Revision 7 (Dated 8/9/76)
Salem Unit 1 - Startup Procedure (SUP) No. 20.3, "Safeguards System Operational Test," Revision 15 (Dated 7/26/76)
Salem Unit 2 - Startup Procedure (SUP) No. 20.5, "Reactor Plant System Set Point Verification," Revision 3 (Dated 5/21/80), and
Salem Unit 1 - Startup Procedure (SUP) No. 51, "Integrated Test of Engineered Safeguards and Emergency Power System"
SC.IC-TI.ZZ-0102(Q), Rev. 10, "Westinghouse - Hagan 7100 Control System Configuration Control For Comparators"
SC.IC-GP.ZZ-0127(Q), Rev. 11, "Bench Test and Calibration Hagan Model 118 Signal Comparator"
SC.IC-GP.ZZ-0124(Z), Rev. 5, "Bench Test and Calibration Hagan Model 125-124 Controller"
SC.IC-TI.ZZ-0113(Q), Rev. 4, "Westinghouse - Hagan 7100 Control System Configuration Control For Controllers"
S2.OP-ST.SSP-0002(Q), Rev. 15, Engineered Safety Features Manual Safety Injection 2A Vital Bus
S2.OP-ST.SSP-0003(Q), Rev. 17, Engineered Safety Features Manual Safety Injection 2B Vital Bus
S2.OP-ST.SSP-0004(Q), Rev. 18, Engineered Safety Features Manual Safety Injection 2C Vital Bus
S2.OP-ST.SSP-0006(Q), Rev. 7, Engineered Safety Features Containment Isolation Phase "A"
S2.OP-ST.SSP-0007(Q), Rev. 2, Engineered Safety Features Containment Isolation Phase "B"
S2.MD.FT.SEC-0001(Q), Rev. 12, 2A Safeguards Equipment Control (SEC) 18 Month Time Response Surveillance Procedure
S2.MD-FT.SEC-0002(Q), Rev. 12, 2B Safeguards Equipment Control (SEC) 18 Month Time Response Surveillance Procedure
S2.MD-FT.SEC-0003(Q), Rev. 13, 2C Safeguards Equipment Control (SEC) 18 Month Time Response Surveillance Procedure
S2.IC-TR.RCP-0001(Q), Rev. 4, 2TE-411A-B #21 Rx Coolant Loop Delta T Avg Protection Channel 1 (Channel Time Response Test)
S2.IC-TR.NIS-0001(Q), Rev. 3, Power Range Channel 2N41 (Channel Time Response Test
S2.IC-TR.ZZ-0002(Q), Rev. 5, Unit 2 Master Time Response

Service Water System

DE-CB.SW-0047(Q), Rev. 6, Configuration Baseline Documentation for Service Water System
DCP 2EC-3359-1, No. 22 Service Water Pump Replacement
DCP 2EC-3360-1, No. 24 Service Water Pump Replacement
ECA 2EE-0089-1, No. 26 Service Water pump Replacement

ECA 2EE-0109-1, Tubing Tray T-043A Replacement
ECA 2EE-0134-1, CFCU Water Box Coating
ECA 2EE-0213-1, Pipe Support MSWG-97 Modification
ECA 2EE-0225-1, CFCU Pipe and Tube Insulation
ECA 2EO-2320-2, 22 Service Water Pump Amp Transducer Replacement
ECA 2EO-2377-1, 2SV632 Replacement
ECA 2EO-2379-1, 21SW47 Replacement
ECA 2EO-2379-2, 22SW47 Replacement
ECA 2EO-2379-3, 21SW34, 22SW34, and 21SW44 Replacement
ECA 2EO-2379-4, 21SW36, 22SW36, and 22SW44 Replacement
ECA 2EO-2379-5, 21SW38, 22SW38, and 23SW44 Replacement
ECA 2EO-2379-6, 21SW2 Replacement
ECA 2EO-2379-7, 22SW2 Replacement
ECA 2EO-2379-8, 23SW2 Replacement
ECA 2EO-2398-1, 2SW308 Mounting Upgrade
DCP 2EC-3287-1, Service Water Piping Replacement
DCP 2EC-3287-2, Service Water Large Bore Pipe Replacement
DCP 2EC-3288-1, Piping Replacement for Service Water Intake Bay #2
DCP 2EC-3288-2, Piping Replacement for Service Water Intake Bays #3 and #4
DCP 2EC-3356-1, No. 25 Service Water Pump Replacement
DCP 2EC-3357-1, No. 21 Service Water Pump Replacement
DCP 2EC-3358-1, No. 23 Service Water Pump Replacement
DCP 2EC-3468-1, Resolving Service Water Control Valves 2SW308/2SW311 Issues
DCP 2EC-3289-1, Salem Unit 2 CFCU Setpoint Regulator Replacement
DCP 2EC-3294-1, CFCU Flow Transmitter Circuit Board Replacement

Section E8

Inspector Followup Item 50-311/96-19-01

S2.IC-FT.RCP-0001(Q), "2TE-411A-B #21 RX Coolant Loop Delta T-Tavg Protection Channel I", Revision 8
S2.IC-FT.RCP-0009(Q), "2TE-431A-B #23 RX Coolant Loop Delta T-Tavg Protection Channel III", Revision 8
S2.IC-CC.RCP-0029(Q), "2FT-513 #21 Steam Generator Steam Flow Protection Channel II", Revision 11
S2.IC-CC.RCP-0032(Q), "2PT-516 #21 Steam Generator Pressure Protection Channel IV", Revision 6
S2.IC-CC.RCP-0059(Q), "2FT-543 #24 Steam Generator Steam Flow Protection Channel II", Revision 10
S2.IC-CC.RCP-0061(Q), "2PT-545 #24 Steam Generator Pressure Protection Channel II", Revision 6

S2.IC-CC.RCP-0001(Q), "2TE-411A-B #21 RX Coolant Loop Delta T-Tavg Protection Channel I", Revision 14
S2.IC-CC.RCP-0009(Q), "2TE-431A-B #23 RX Coolant Loop Delta T-Tavg Protection Channel III", Revision 10
S2.IC-CC.RCP-0013(Q), "2TE-441A-B #24 RX Coolant Loop Delta T-Tavg Protection

Channel IV", Revision 11
S2.IC-CC.RCP-0019(Q), "2PT-457 Pressurizer Pressure Protection Channel III," Revision 11
S2.IC-CC.RCP-0033(Q), "2LT-517 #21 Steam Generator Level Protection Channel IV," Revision 6
S2.IC-CC.RCP-0064(Q), "2LT-548 #24 Steam Generator Level Protection Channel III" Revision 6

LIST OF NRC QUESTIONS AND PSE&G RESPONSES

Item	NRC Question	PSE&G Response
1	NRC requested approved startup system test plans for 4kV, CN, and EDG. In addition, associated DCP test sections were requested.	All test plans and DCP test sections provided.
2	Requested additional information on the Salem control room ventilation modification. Specifically: copies of control room ventilation P&IDs and control schematics showing previous and new design, system air flows, and design basis describing the basis of the modification (new) being implemented	Provided copies of previous and new design drawings on control room ventilation P&IDs, P&IDs and pictogram with system air flows, electrical control schematics on major changes, logic diagrams, design analysis, simplified P&ID pictogram of new system layout, and safety evaluation from DCP 1EC-3505 Pkg 1 latest revisions
3	Need to review testing from DCP 2EC-3178 ADFCS, and DCP 2EC-3306, Turbine runback/Woodward governor	Discussed Rev. 0 testing write-ups. For example, 2EC-3178 Section 9, 2EC-3178 STP-2, 2EC-3306 Section 9, 2EC-3306 STP-1 and STP-2. Provided copies of same. Emphasized that testing is in revision and that new revision will be issued in about one week.
4	NRC requested copy of list of NAP-5 special tests approved by D. Garchow for the startup.	List was provided 4 December, 1996.
5	DCP 1EC-3505 STP-1 Control Room ventilation testing. Item 1/14: Section 5.0 - No initial conditions set up for testing. Step 5.2.2 is a checklist, however, lineup for pretest conditions not clear	Although not specifically located in the initial condition section, the OFF NORMAL list review step 5.2.3, performed by the Test Engineer with operations provides identification of components that may impact the start of testing. Per step 5.4.10, any discrepancies will be documented in the remarks section in the back of the STP by the Test Engineer and reasons for testing to proceed. In addition, testing in section 10 (step 5.2.1) verifies component level readiness of electrical and pneumatic loops for dampers, fans, indicators, etc. and section 5.5.1 and 5.5.5 "Normal-Operation" initially aligns the system which would also verify system readiness for testing. Based on the "OFF-NORMAL" list review, performance of component level testing in step 5.2.1 and initial verification of 5.5.1 and 5.5.5, these items are adequate in assuring that initial conditions are satisfied prior to testing. However, the procedure will be enhanced so that it will be clear in future reviews that the initial conditions were satisfied. An MCR will be generated to revise Section 5.2. The "Prior to Test Checklist" is a standard checklist used prior to the start of testing. It is not intended to provide initial conditions, but rather serve as a guide to the Test Engineer to verify readiness of the system prior to the start of the testing. There are no recommended changes to the "Prior to Checklist" based on this response.
6	DCP 1EC-3505 STP-1 Testing of control room ventilation. Item 2/14: Step 5.3.1 gets shift supervisor permission to start testing. Not clear as to what that permission is.	Sign-off for this section is required per NC.DE-AP.ZZ-0012(Q). Although NC.DE-AP.ZZ-0012(Q) does not specify who is required to sign-off, it is the Test Engineer and the DCP Teams discretion as to who should be required as a sign-off. It is a typical requirement for SNSS sign-off.
7	DCP 1EC-3505 STP-1 Control Room ventilation testing. Item 3/14: Section 5.2.3 Off normal review - no documentation of what was off normal	The Test Engineer upon completing the review of the "Off Normal" list with the shift on duty will annotate any discrepancies per step 5.4.10 or problems in the test record remarks section at the end of the procedure. There are no recommended changes based on this response.

Item	NRC Question	PSE&G Response
8	DCP 1EC-3505 STP-1 Control Room ventilation testing. Item 4/14: Section 5.4.4 One EACS fan leads and one in standby (prerequisite) - during testing you violate your precaution	The intent of this statement is to inform the Test Engineer and operators that only one of the two EACS fans is to operate throughout testing. Step 5.4.4 identifies normal fan switch alignment which will ensure that this occurs. Step 5.4.6 also provides notification that only one EACS fan shall be allowed to run at any time. During testing, the fan control switch for the fan that is not running is positioned in the OFF position rather than the Standby position per section 5.4 This is specifically done during section 5.5.3 in order to test the auto start function of the Standby fan if the lead fan fails to start. However, throughout the remainder of the test procedure, the EACS fan control switches are positioned such that one fan is in lead and the other fan is in standby. The statement in step 5.4.4 is not required since step 5.4.6 clearly states the caution on fan operation, however since it may cause a discrepancy to instructions in the body of the test procedure this step will be removed from the STP via MCR #229.
9	DCP 1EC-3505 STP-1 Control Room ventilation testing. Item 5/14: Section 5.5.1.14 If ____ then ____ - shouldn't you already know?	Step 5.5.1.14 and 5.5.5.12 are provided as an additional reminder to the operator to record the time that the emergency charcoal filters were in service. However, this step may not have to be performed at all. These steps only appear when the unit 1 and 2 is initially placed in the Normal mode alignment and its configuration verified for the first time. The reason that this step was added was in case the system was operating in the emergency mode prior to placing the system in Normal. In this case, this step adds an additional check so that the operator records the filter service time. There are no recommended changes based on these response.
10	DCP 1EC-3505 STP-1 Control Room ventilation testing. Item 6/14: Section 5.5.1.2 record status of fans then hit normal - never verify all combinations.	Section 5.5.1 "Normal Operation - Unit 1" is not testing the CAACS fan combinations. The intent of this test section is to only verify that the system aligns to the Normal configuration. Section 10.23.1, 10.23.2, and 10.23.3 perform the circuit testing on the control switches for these fans. The Normal mode selection does not start or align any of the CAACS fans, whatever fan is running previously remains running in the Normal mode. Fan in service during normal modes is controlled by operation actions. Steps in this section is to only which CAACS fan is/are running during testing. There are no recommended changes based on this response.
11	DCP 1EC-3505 STP-1 Control Room ventilation testing. Item 7/14: Section 5.5.2.14 press normal (after testing) then never verify everything went back to normal.	At the end of every test section there is a step that restores the system to Normal, but no specific instructions to verify Normal alignment. The system has been verified to operate initially in Normal in steps 5.5.1, 5.5.5 and at the end of the STP testing in section 5.7. Since the Normal mode alignment was verified initially and at the end of testing, the verification after each test section was not performed and credit was taken in sections 5.5.1, 5.5.5, and section 5.7. In addition, the component actuated by the Normal mode are verified to operate by testing of the operating modes. The operation of the switches (relay) which actuate these components used to place the system in the operating modes are checked out in Section 10. This testing provides overlap testing and reasonable assurance that when the system is placed in Normal, that the system properly aligns. In discussion with the Test Engineer, it was noted that it was his intent to verify Normal alignment even though no specific instructions were given. However, to enhance the procedure and add further assurance of verifying Normal alignment during the testing, the STP will be revised via MCR #229.

Item	NRC Question	PSE&G Response
12	DCP 1EC-3505 STP-1 Control Room ventilation testing. Item 6/14: General - there are no provisions for exit testing and re-entering tests (STP-3 had steps for that concern)	There are no provisions in the STP and therefore, will be provided via MCR.
13	DCP 1EC-3505 STP-1 Control Room ventilation testing. Item 9/14: Section 5.5.3 (Fire outside) Section 5.5.3.11 after returning to normal, didn't verify swapped back to normal before checking next fan for "fire"	At the end of every test section there is a step that restores the system to Normal, but no specific instructions to verify Normal alignment. The system has been verified to operate initially in Normal in steps 5.5.1, 5.5.5 and at the end of the STP testing in section 5.7. Since the Normal mode alignment was verified initially and at the end of testing, the verification after each test section was not performed and credit was taken in sections 5.5.1, 5.5.5, and section 5.7. In addition, the component actuated by the Normal mode are verified to operate by testing of the operating modes. The operation of the switches (relay) which actuate these components used to place the system in the operating modes are checked out in Section 10. This testing provides overlap testing and reasonable assurance that when the system is placed in Normal, that the system properly aligns. In discussion with the Test Engineer, it was noted that it was his intent to verify Normal alignment even though no specific instructions were given. However, to enhance the procedure and add further assurance of verifying Normal alignment during the testing, the STP will be revised via MCR #229.
14	DCP 1EC-3505 STP-1 Control Room ventilation testing. Item 10/14: Section 5.5.3.23 30 seconds - no tolerance (approximately)	The approximately 30 second statement in these steps were provided as additional information to the operators that there will be a time delay before the start of the standby fan. This procedure is not verifying the 30 second setpoint of the time delay relay. Section 10.13.1b, 10.13.2a, and 10.13.2b perform the calibration of these time delay relays. There are no recommended changes based on this response.
15	DCP 1EC-3505 STP-1 Control Room ventilation testing. Item 11/14: Section 5.5.3.29 30 seconds - no tolerance (approximately)	The approximately 30 second statement in these steps were provided as additional information to the operators that there will be a time delay before the start of the standby fan. This procedure is not verifying the 30 second setpoint of the time delay relay. Section 10.13.1b, 10.13.2a, and 10.13.2b perform the calibration of these time delay relays. There are no recommended changes based on this response.
16	DCP 1EC-3505 STP-1 Control Room ventilation testing. Item 12/14: Section 5.5.3.30 (Fire Outside) after returning to normal, didn't verify swapped back to normal before checking next fan for "fire"	At the end of every test section there is a step that restores the system to Normal, but no specific instructions to verify Normal alignment. The system has been verified to operate initially in Normal in steps 5.5.1, 5.5.5 and at the end of the STP testing in section 5.7. Since the Normal mode alignment was verified initially and at the end of testing, the verification after each test section was not performed and credit was taken in sections 5.5.1, 5.5.5, and section 5.7. In addition, the component actuated by the Normal mode are verified to operate by testing of the operating modes. The operation of the switches (relay) which actuate these components used to place the system in the operating modes are checked out in Section 10. This testing provides overlap testing and reasonable assurance that when the system is placed in Normal, that the system properly aligns. In discussion with the Test Engineer, it was noted that it was his intent to verify Normal alignment even though no specific instructions were given. However, to enhance the procedure and add further assurance of verifying Normal alignment during the testing, the STP will be revised via MCR #229.

Item	NRC Question	PSE&G Response
17	DCP 1EC-3505 STP-1 Control Room Ventilation Testing. Item 13/14: Looks rough for a test that should be the equivalent of a preop test. Stopped review at end of step 5.5.3.	No response required.
18	DCP 1EC-3505 STP-3 Rev. 2 Control Room ventilation testing. Item 14/14: No sign-offs in steps.	In accordance with Form NC.DE-AP.ZZ-0012-4 of NC.DE-AP.ZZ-0012(Q), Test Engineer sign-offs on the appropriate steps of the data sheets of the procedure upon completion of each step to ensure that the step was completed is a requirement. Sign-offs or hold points after every step within the body of the STP are determined by the Test Engineer and Senior Nuclear Shift Supervisor. To enhance the procedure, appropriate sign-offs will be incorporated via an MCR. The Phase 3 testing of the procedure has already been revised via MCR #205 which includes appropriate sign-offs.
19	Reactor Control and Protection: How do we control configuration of boards, modules and new NUS modules.	Station procedures were developed and approved to perform refurbishment, bench testing and configuration control verification on the Hagan and NUS (SSLM) modules of the Reactor Control and Protection System. These procedures were developed by station personnel. Attached are a sample of procedures. These procedures include steps that verify the correct fuses are installed in each module prior to placing the module in the plant. Since every module in the system underwent a configuration control verification, which is documented via work orders, there are no fuse control issues. Each hagan module was upgraded to the latest revision based on Westinghouse drawings and the module's board revisions are controlled by its associated procedure. The following is a list of the procedures that were developed during the Hagan R&R Project (see 12/4/96 letter for list) (letter and procedures to be provided 12/5//96)
20	Reactor Control and Protection: How are fuses controlled	Same as Item 19 response above
21	Reactor Control and Protection: Was a design basis review of the system conducted?	Yes a detailed review of the Reactor Control & Protection design basis was performed during the Initial System Readiness Review. The design basis review was performed under Salem/System Engineering procedures SC.SE-DD.ZZ-0001(Z) "System Readiness Review Program" and SC.SE-DD.ZZ-0002(Z) "Support Systems Readiness Review Program." Attached are the following documents: UFSAR Macro review for Reactor Control and Protection (RCP) and Solid State Protection System (SSP); Sections I & II from the initial system readiness review report for RCP & SSP; RCP System Walkdown Hagan Racks; MCR FSSR Presentation Report Owner: RCP pages 45 through 191 of the SIDS report provide a brief summary of the PIRs issued against the RCP system and scoped as restart required.
22	Reactor Control and Protection: Are there any additional, if any, testing required to assure that the system will perform their design basis functions?	The DCPs implemented on the RCP system provide a testing section which delineates what testing requirements are required to be performed to declare the modified channel operable. All protection channels are required to undergo Tech Spec surveillance testing, e.g. channel calibrations, time response and functional tests. Therefore existing station procedures were primary tool for verifying loop operability. Process control loops are typically required to perform in a closed loop functions. Therefore, additional tests were developed to verify optimal control. A list of loops undergoing special startup testing are listed in Table 4 of the RCP Startup Test Plan.

Item	NRC Question	PSE&G Response
23	Reactor Control and Protection: How did the Salem Startup Group establish that existing Surveillance Test procedures adequately verify the functionality of new or modified RCP and SSPS equipment - written response required.	The Salem Startup Test Group required that all DCPs be listed in Table 1 of the Startup Test Plan. The actual testing sections from the DCPs were provided to the Test Review Board (TRB) for their review. Under table 1 "Design Changes," a summary of the purpose/description of the DCP is provided and the required testing. If additional testing is required it is listed in Table 4 of the Startup Test Plan. The existing channel calibrations, time response (when applicable), and the parts of the sensor calibration were performed to ensure that adequate post modification testing was performed. As part of the DCP review process the adequacy of the Surveillance procedures were reviewed for impact, this review included the functional, channel calibration, time response, sensor calibration, and operation procedures. This review was performed by various members of the Refurbishment and Replacement (R&R) project team. In addition, the applicable maintenance procedures for the system were revised as required, e.g. bench calibration and configuration control procedures. Operations and maintenance procedures required to be updated to support/maintain the system after turnover to Operations (Part "A") are classified as Cat I. These procedures are verified revised prior to Part "A" closure.
24	Reactor Control and Protection: How did the Salem Startup Group establish that existing Surveillance Test Procedures adequately verify the functionality of new or modified RCP and SSPS equipment - Written response required.	The Salem Startup Test Group required that all DCPs be listed in Table 1 of the Startup Test Plan. The actual testing sections from the DCPs were provided to the Test Review Board for their review. Under Table 1, "Design Changes," a summary of the purpose/description of the DCP is provided and the required testing. If additional testing is required it is listed in Table 4 of the Startup Test Plan. The existing Channel Calibrations, Time Response (when applicable), and the parts of the Sensor Calibration were performed to ensure that adequate post modification testing was performed. As part of the DCP review process the adequacy of the surveillance procedures were reviewed for impact. This review included the Functional, Channel Calibration, Time Response, Sensor Calibration, and Operation procedures. This review was performed by various members of the Refurbishment & Replacement (R&R) project team. In addition, the applicable maintenance procedures for the system were revised as required, e.g. Bench Calibration and Configuration Control procedures. Operations and Maintenance procedures required to be updated to support/maintain the system after turnover to Operations (Part "A") are classified as Category 1. These procedures are revised prior to Part "A" closure.
25	Reactor Control and Protection: Please provide a list and copies of Integrated Functional testing procedures that will be conducted to demonstrate proper operation of the RCP and SSPS prior to power ascension testing	A copy of the following procedures were provided to Mr. Gee: S2.OP-ST.SSP-0007(Q) "Engineered Safety Feature Containment Isolation Phase "A""; S2.OP-ST.SSP-0006(Q) "Engineered Safety Feature Containment Isolation Phase "B""; TS2.OP-PT.SSP-0001(Q) Rev. 1 "Manual Safety Injection - Equipment Verification"
26	Reactor Control and Protection: Will any "plant transient testing" be performed on the RCP and the SSPS	No. No RCP SSPS transient testing will be performed. There is transient testing that will be performed, however it should not challenge the RCP and/or SSPS systems (i.e. no reactor trip or ESFAS signal is expected). The transient testing which will be performed is associated with turbine runback and SGFP trip/runback testing (see the CN system test plan).

Item	NRC Question	PSE&G Response
27	Reactor Control and Protection: What were the effects of this DCP [assumed 3450] on the Surveillance Testing procedures listed in Section VI of the "change package executive summary"	Most of the changes to the procedures listed in Section VI of the change package executive summary of DCP 2EC-3450 required a change to the procedure to change the PSBP reference for the new NUS modules. There were also technical changes required for some of the procedures which were listed in Section VI. The packages and the effects of the change are listed below (see attached list)
28	Reactor Control and Protection: Which revision of the Surveillance Testing procedures "captured" the DCP changes, if any	There were many changes of procedures for the new NUS PSBP reference. A sample for package 1 is S2.IC-CC.RC-0082(Q) Rev. 4 and S2.IC-CC.RCP-0017(Q) Rev. 9. The procedure revisions that captured the technical changes of the procedures listed in Section VI of the change package executive summary are listed below (see attached list)
29	Reactor Control and Protection: For those instrumentation channels which contain SSLMs (NUS modules), how the temperature induced drift of the SSLM has been incorporated into the calibration process for the loop	Engineering Evaluation S-C-RCP-CEE-1037 was issued to confirm NUS modules have equal to or better than performance/accuracy specifications than Hagan counterparts. This calculation addresses module temperature effects and drift and ensures our calibration practices are consistent with the methodology and assumptions used in S-C-RCP-CEE-1037. Copy of Rev. 1 of same provided.
30	Was any work done in or around the ECCS sump	Work is done in accordance with administrative procedure NAP-9 and Foreign Material Exclusion (FME) program. Additionally, a tech spec surveillance is performed prior to heat-up which verifies the ECCS sump is free of debris.
31	Was any work done on or near electrical supplies/cabling for ECCS MOVs	All safety related MOVs are included in the 89-10 program and for Unit 2 attached is a list of when test was performed. additionally most of the MOVs would be tested IAW 4.0.5-V requirements for each system.

Item	NRC Question	PSE&G Response
32	The startup teat plan for SJ system states that it does not contain a test which operates the SJ and SJ/CVC pumps with the RHR pump discharge as the suction source. Please provide the (documented) evaluation that found this to be unnecessary	The evaluation which was presented and accepted by the TRB is located on pages 13 and 14 of the startup system test plan. This evaluation was prepared in response to a previous TRB comment on the test plan. No additional documentation was prepared to respond to this comment. The individual points made in the evaluation were obtained in the following manner: A) The initial RHR suction boost test was performed successfully during initial startup. B) The lack of a Westinghouse requirement to perform a suction boost test was researched by the design engineer and no requirement was found. C) The lack of an UFSAR requirement to perform a suction boost test was researched by the system manager and no requirement was found. D) The Westinghouse calculation and correction factors to allow for the difference in SI pump output between RWST suction and suction boost has been supplied from Westinghouse and the new numbers used in the ECCS throttle valve setting surveillance. E) The dynamic VOTES testing waiver for SJ45s and SJ113s was obtained from an interview with the MOV component engineer who is responsible for compliance with NRC GL 89-10. F) The evaluation into obstructed piping was performed in a CR is response to an OEF from a Spanish nuclear plant which found construction debris in the line between the containment sump and their equivalent to our SJ44s. The system manager performed an evaluation of Salem's applicability to this event and found Salem to not be susceptible. The piping arrangements were evaluated for any low flow regions and each of these regions is periodically flushed through other means or has only been breached a limited number of times and there is no expectation of debris entering the system which would need to be flushed out by a suction boost test. G) The industry experience came from conversations with other utilities (Diablo Canyon, Indian Point 3, Beaver Valley). In each case, they either did perform a suction boost test or they performed it as part of a VOTES test or a check valve test neither of which is applicable to Salem.
33	The SJ system test plan states, with respect to the RHR suction boost test "Westinghouse has supplied Salem with calculations and correction factors to allow for the differences in suction pressure between the RWST and the RHR discharge." Please provide these calculations (if the documentation retrieval is not an excessive burden)	A copy of the requested calculation was provided.
34	Provide a copy of surveillance test procedures: ECCS flow balance, containment spray automatic testing	Provided copy of completed test for CS. For ECCS flow balance, RHR completed test provided 12/10/96, safety injection and charging are yet to go.
35	Inspector requested a walkthrough of the UFSAR change process, and copies of the digital feedwater and feed pump runback UFSAR change notices and safety evaluations.	Provided walkthrough of process and copies of DCP 2EC-3178, Rev. 4 50.59 and related UFSAR change notice 96-84; DCP 2EC-3306 Rev. 0 50.59 and related UFSAR change notice 96-68.
36	In conducting the FSAR project earlier this year, were any items identified which should be reconfirmed by testing prior to restart.	FSAR Project items which will require testing were discussed in detail with inspector. In general primary issues were 1) CFCUs response time testing and post mod testing for volume boosters for the 223 valves and thermal overpressure protection, 2) ABV and FHV (charcoal filter testing; 3) CAV post mod time response testing.
37	DCP 1EC-3505 (control room modification) Item 1/3: High rad monitor start or swap over for control room vent: where is it tested	DCP 1EC-3505, Pkg. 03 STP provides the instructions for functionally testing the high radiation signal. There are no recommended changes based on this response.

Item	NRC Question	PSE&G Response
38	DCP 1EC-3505 (control room modification) Item 2/3: Temperature switches added into the control room are interlocks with the chilled water valve: where is it tested	This is tested in Section 10.8.3a and 10.8.3b. There are no recommended changes based on this response.
39	DCP 1EC-3505 (control room modification) Item 3/3: There does not seem to be any dynamic test for temperature control in the control room, i.e. change temperature setpoint and observe temperature change	The temperature control loop for the emergency mode of operation was modified. Specifically, the temperature loop has been modified to provide 1) modulation of the chilled water valve, and 2) backup control scheme to open the chilled water control valve if high air temperature is detected in the discharge of the emergency supply fans. This design provides for a fail safe operation if the temperature controller fails to control room temperature below 85 F. Testing of the modification consisted of the temperature control loop being calibrated and functionally loop checked by procedure SC.IC-GP.ZZ-0003(Q) in section 10.9.3a and 10.9.3b. In addition, STP-02 "CAACS and EACS Coil Performance Test" of DCP 1EC-3505 provides an additional qualitative assurance that the temperature controller responds appropriately given a change in temperature and STP-01 visual checks on operation of chilled water control valve in accordance with attachments 7.2, 7.3, 7.4, and 7.5. The testing performed in the DCP provides reasonable assurance that the temperature controller would function as designed. There are no recommended changes based on this response.
40	Various questions on special tests required for operability and Unit 2 startup. These are items required to be put in startup test plan. Requested list of 52 tests added after IST program review, when will these tests be performed.	There were no special tests required for IST. All IST equipment is in Tech Spec. Some tests needed to be performed to get a baseline. Jeff Neyhard has list of 52 items and will provide to NRC. 12/5/96: Inspector indicate he is working with Jeff Neyhard and the list does not exist. He is working from a different angle of creating the list for surveillance tests from procedure revision requests.
41	DCP 2EC-3461 "Cavitation mitigation on safety injection cold legs and hot legs" describes a condition which could potentially lead to post LOCA runout damage to the SI pumps. Why isn't this a problem/concern for Unit 1 also?	This is an issue for Unit 1. DCP 1EC-3530 was originally developed for Unit 1 to install orifice sets to mitigate cavitation on the Unit 1 SJ143 Cold Leg Injection Valves. At the same time the SJ 138 valves were under review for potential modifications. Unit 1 was put on hold and work proceeded on Unit 2. A request for bid has been under development since mid-November 1996 to add the SJ 138 Hot Leg Injection Valves and revise the original package to include lessons learned on the Unit 2 effort. The SJ16 debris plugging issue is being addressed for Unit 1 under DCP 1EE-0311.

Item	NRC Question	PSE&G Response
42	DCP 2EC-3461 states that Design Point 2, Recirculation Mode, involves delivering SI flow through both SI pumps operating in parallel and receiving suction boost from the RHR pump discharge. The Test Plan says suction boost won't be used. Please reconcile.	The DCP design analysis section page 5 discusses design point 2 and describes this as "delivering SI flow through both SI pumps operating in parallel and receiving suction boost from the RHR pump discharge." The previous sentence states that design point 2 "will be imposed on the orifice arrangement specified by Design Point 1..." This is further discussed in Section 9.1 page 1 last paragraph. "Cold Leg flow rates, pressure drops, and throttle valve positions will be measured at two design flow conditions to simulate the injection and recirculation modes." Section 10 STP-001 steps 5.5.3 - 5.5.13 set up the conditions using one SI pump without boost. This method was chosen during DCP development to minimize in plant test time and to take maximum advantage of the pre-existing surveillance test methodology as much as possible. Testing for cavitation at design point 2 was never considered to be a critical evolution because the primary parameter used to determine the potential for cavitation is determining the ratio of upstream pressure to downstream pressure. The only item that affects this ratio between design points 1 and 2 is the vapor pressure of the water based on an injection temperature of 120 degrees (13 psia) and a recirculation temperature of 200 degrees (3 psia). The change in upstream vs. downstream pressure ratio caused by the 10 psia difference is very small. This was originally reflected in calculation S-2-SJ-MDC-1577 which shows a ratio for the SJ143 valves of .193 for Design Point 1 vs. .198 for Design Point 2 (typical of the change for each line). In addition the test effort required to set up boost conditions with supply water at 200 degrees would be significant and would represent an insignificant change from the readily available test conditions used.
43	Need a copy of DCP 2EC-3306 and 2EC-3178 to either review and then request specific questions, or a complete copy. In particular the post mod testing (section 9 and 10 of DCP) and affected I&C/logic change drawings (not cable pulls) being modified are needed now	A copy of the DCPs have been provided in the ADFCS trailer. NRC inspector has been reviewing the DCPs and drawings.
44	During a meeting with inspector, it was stated that TRB had written an AR/CR against DCP testing. The CR identified potential administrative and technical deficiencies. Inspector asked for a copy of the PIR (960508172)	Provided copy of the PIR and Level 1 root cause.
45	Provide the justification of why the Salem configurations not affected by the Westinghouse generic concern about S/G level transmitter tap being shared with another process tap for a safety related transmitter (Nuclear Safety Advisory Letter 96-04)	CR 961030147 was provided.
46	How does Salem control configuration for a system between the time a test begins and when it is completed? This is more important for extended tests when initial conditions are established at low power and/or shutdown conditions and testing is started, then stopped, then resumed later at higher power levels.	This is accomplished by a review of the plant/system status and a pre-job briefing before the test is resumed. Any time changes are made to a system, retest requirements are identified and performed. During the test requirements identification, the effect on subsequent testing would immediately be identified (if retest requirement identification is performed by members of the ADFCS or feedwater DCP teams) or made known to the DCP teams via an AR. As the tests in question are special tests, NC.DE-AP.ZZ-0012(Q), "Test Program," applies. This procedure discusses among other items, the establishment of a Testing Supervisor, Test Manager, and Test Engineer. The procedure discusses special test requirements and how special tests are to be performed and controlled.

Item	NRC Question	PSE&G Response
47	Reference DCP 2EO-2410 Pkg 1,2,3 - In paragraph 4.7.4.3 a reference is made to attachment 4.10.3 which was not included in the copy of the DCP provided. An explanation of attachment 4.10.3 is needed.	Attachment 4.10.3 was provided.
48	DCP 2EC-3178 STP-2 Data Sheet 5.5.4.3.2 Step 5 and 6 - are we changing all 4 S/Gs with a 5% level change concurrently, or 1 S/G at a time?	
49	The 50.59 evaluation for 2EC-3178 Rev 3 (page 26 of 40) calls for electromagnetic interference (EMI) noise measurements. The STP-001 for the package also calls for repeating step 5.5.4.1 (THD) when greater than or equal to 5% power. Are these tests currently scheduled and tracked as activities in the restart test schedule?	Work orders are in place with different activities to measure the "noise" in Mode 5 (activity 2), Mode 3 (activity 3), and at 100% power (activity 4). The work orders are presently "work in progress."
50	ADFCS Median Signal Selector Testing: did the FAT or site testing test the condition where two signals were out of range high, or out of range low?	The Median Signal Selector is designed to switch the ADFCS to manual control upon the failure of two out of three input channels. The testing of the MSS logic performed in the FAT and the SAT was to check the functionality of the MSS, the ADFCS system switches to manual on the loss of two out of three input channels. The direction the channels fail in is of no concern because of the way the algorithm is designed. Referring to Westinghouse drawing #5D92081, Sh 15, the MSS algorithm has three delta checks and three quality checks which monitor the input channels for signal quality and deviation between channels. If a channel fails high or low it will be flagged by the quality check if it is out of range and the delta checks will be pick up deviations between channels. Therefore any two failures high or low will cause a switch to manual on either quality or signal deviation. Note however, the two channels are failed low in step 5.3.2 of STP-001 of 2EC-3178.
51	Ref. DCP 2EC-3338 Packages 1,2,3,4 - what is the basis of selecting a 0.30 second time delay to add to the group bus undervoltage 1 out of 2 taken twice reactor protection scheme?	The design analysis section of DCP 2EC-3338 was provided.
52	Ref. DCP 2EC-3338 Pkg 1,2,3,4 and startup test plan Rev. 0 dated 4/23/96 - The startup plan states a time delay of .3 seconds will be added to the group bus undervoltage 1 out of 2 taken twice reactor protection scheme which provides protection for loss of reactor flow. DCP section 9.5.1 states "time response testing of the group bus NGV undervoltage relay circuit results in less than .5 seconds." What is the rationale for the difference between these times? According to the section 10.2.1 (note) of DCP 2EC-3338 Pkg 1 "time response limit is 0.50 seconds (ref. design analysis, DCP Section 3, attachment 1 calculation)." Please provide a copy of the design analysis DCP Section 3 attachment 1 calculation.	Provided design analysis section of DCP 2EC-3338
53	Digital Feedwater - Provide documentation for the ADFCS design requirements (e.g. what is the maximum transient which it should handle in auto, and what the expected level transient will be, what the requirements are for loss or invalid input signals, when should the system be able to go into auto) - please provide document "PSE&G Salem Station Analog Feedwater Control System Replacement Project, Advanced Digital Feedwater Control System Technical Requirements, 10/28/92, Rev. 1"	Provided copy of Unit 2 Technical Standards Rev. 5, dated 10/25/94.

Item	NRC Question	PSE&G Response
54	What is the required tolerance for the ADFCS S/G level control? Technical Requirements Rev. 1, Section 6.5 states "within 15% of the reference level during normal operating transients." STP-001 section 5.7, criterion 7 has it at 20% of reference level during normal operating plant transients. Provide justification for the relaxed tolerance.	This appears to be an error. MCR 249 has ben written to correct it.
55	2EC-3178 STP-2: What are acceptance criteria 1 and 2 (step 5.7.1 and 5.7.2) from page 26 (appear to have been deleted with MCR 147. Was there an Ar written on this issue?	Per STP-2 issued 2/7/96: Section 5.7.1 - During the steam generator closed loop level setpoint perturbation test the S/G level overshoot (undershoot) should be less than +/- 5% of span following a level setpoint increase (decrease). Section 5.7.2 - During the steam generator closed loop level setpoint perturbation test the S/G level should return to and remain within +/- 2% of the level setpoint within 3 reset time constants periods following a level setpoint change.
56	Provide a justification for not testing the ADFCS for a 5% step increase in level setpoint at 5% and 10% power (see Technical Requirements 6.5.a and 6.5.b). Currently 2EC-3178 STP-2 tests single S/Gs at 5% and 15% for loop tuning purposes but does not test an increase in all 4 S/Gs concurrently at 5% and 10% power.	1) In order to verify the proper closed loop response of the ADFCS following any adjustments made as a result of the open loop test, a simple level setpoint perturbation will be performed. Currently this is performed in DCP 2EC-3178, Pkg 1, STP-2, Section 5.5.7.3 (Testing performed at 7% RTP), Closed Loop Level Setpoint Perturbation. ADFCS Project Technical Requirements, Section 6.5 (Control System Mode Transfer Requirements), subsection (a) states that a 5% STEP increase in level at 5% RTP. The Assistant Operations Manager requested to raise this 5% RTP transient to 7% RTP due to previously divergent control problems experienced from other interfacing systems. The ADFCS project team along with the Test Manager reviewed the above technical requirements and changed the previous 5% RTP transient to 7% RTP in the test program. ADFCS Project Technical Requirements, Section 6.5 (Control System Mode Transfer Requirements), subsection (b) states that a 5% STEP increase in level at 10% RTP. The verification of the 5% STEP increase at 10% RTP was increased to 15% RTP due to the just discussed change to 7% RTP. The project team considered the approximate 3% RTP difference not large enough to obtain beneficial data. The ADFCS project team along with the Test Manager reviewed the above Technical Requirement and changed the previous 10% RTP transient to 15% RTP. The transient at 15% RTP will provide transient values to validate the 10% information and still low enough, if something is not quite right, will not challenge plant safety. 2) Due to the autonomy of the algorithm of each Steam Generator Level Control (no master level control), it is not possible to initiate a pure step change of level that would affect all steam generators at one time.
57	Testing during turbine roll and synchronization: provide justification for doing this testing at "approximately 15% power." Technical Requirements section 6.5.d has rolling the main turbine at 8% power and synchronizing at any power between 10% and 20% (Ref. DCP 2EC-3178 STP-2, Step 5.5.5 and 5.5.5.4.1)	

Item	NRC Question	PSE&G Response
58	DCP 2EC-3178 Rev. 2 section 5.5.2 added tests for the SGPORV (ARVs). The opening time is checked to ensure it is less than or equal to 20 seconds. What is the spec for closing time? Provide the basis for this: the CBD makes no distinction between the opening and closing times.	The baseline document is Westinghouse letter BURL-429, dated 10/16/68. As discussed in problem report 960518123, Westinghouse has called this a "good practice." As this is a pressure relief valve, it makes sense that the criteria applies only to the opening of the valve. The DCP is testing the MS-10s to verify the open full stroke is greater than or equal to 20 seconds.
59	Please provide completed startup and preoperational test procedures from initial startup (1981 timeframe for Unit 2) for RPS and SSPS systems.	Provided copies of executed startup procedures 20.1, 20.2, 20.3, 20.4, 20.5, and 51 from original startup, all Unit 1 except 20.5 which is Unit 2.
60	CCW SSFI Carryover - Provide post-test calibration of ultrasonic flow measurement equipment from CCW flow balance test	The ultrasonic flow instruments used to support the CCW flow balance test were Panametrics PT 868 Ultrasonic Flowmeters. The specific units used have serial numbers 157 and 158. Stated accuracies are 2% of total flow for pipe sizes greater than six inches. These values were obtained from the Panametrics User's Manual 910-142A-2, "Two Channel Transport Model 2PT868 Portable Flowmeter." To support the stated accuracy, the manufacturer provided a "Certificate of Conformance" for both of the units (copy provided). Periodic calibrations to maintain the specified accuracy are not required per the manufacturer, and this is specifically stated in a facsimile transmitted to Maplewood Labs by Panametrics. "The ultrasonic flowmeters do not require periodic calibrations to maintain the specified accuracy. There are no moving parts, therefore nothing to wear out or break from normal operation. In addition, the meters have built in diagnostics to help troubleshoot application, programming, or electrical problems. An error message will be displayed on the PT868 display. Each error message is defined in the PT868 manual."
61	CCW SSFI Carryover - Provide AR resolution of test log statement where test procedure was revised to Rev. 1 during test, control room had Rev. 1 but some field copies had Rev. 1 with some Rev. 0 copies in book. Also, field copies of exhibits for data conversion were Rev. 0 vs. Rev. 1	PIRS 961025145 was written at the time of discovery to document inadequate document control during CCW flow balance test. Immediate corrective actions were to replace Rev. 0 sheets with Rev. 1 and verify there was no impact to the test from the Rev. 0 sheets found in the field. This was completed sat, and the flow balance test was resumed and completed. The procedure revision process per NAP-1 is to upgrade the entire procedure to Rev. 1 and not just the affected pages. Therefore, although the exhibits for data conversion were Rev. 1, there was no change to them from Rev. 0. The followup root cause determination is still in progress.
62	CCW SSFI Carryover - Provide calculation for test acceptance criteria for IST test (4.0.5P).	
63	CCW SSFI Carryover - Provide calculation for test acceptance criteria in CCW flow balance test.	

Item	NRC Question	PSE&G Response
64	CCW SSFI Carryover - NRC felt there should be a procedure for connecting ultrasonic flow devices vs. "skill of craft" coupled with vendor manual.	Maplewood Testing Services (MTS) personnel who connect ultrasonic flow devices and other test equipment are test engineers and senior test engineers who are certified in accordance with American National Standards Institute ANSI N45.2.6-1978, Qualifications of Inspection, Examination, and Testing Personnel for Nuclear Power Plants. Accepted MTS practice permits certified test engineers and senior test engineers to connect and disconnect ultrasonic flow devices and other test equipment as warranted per approved work orders which may be accompanied by specific test procedures. Procedures exclusively for test equipment hook-up, set up or verification are not required as it is within the skill of the craft to accomplish that portion of the job because test equipment is set up and used in accordance with vendor/manufacturer recommendations.
65	Retention of transient data: The ADFCS transient test data (100% - 60% load reduction, loss of SGFP, transition from AFW to MFW etc.) is a good means to collect data for baseline comparison after future events. The current test procedures do not address collecting plant computer data after these tests. Does PSE&G plan to collect from P250 for baseline and archive the data?	A Westrac recorder will be connected to record pertinent information. This information will be given to Nuclear Fuels and the training simulator to update/compare the actual plant response the Fuel's and simulators's runs. In addition, all inputs to the plant computer are automatically "sent" to a historian which maintains the data at least for one cycle. Presently, discussions are underway as to how fast to sample the data. The plant computer's default is one second.
66	Re: ADFCS Software tests: The software was tested in accordance with the approved Factory Acceptance Test (FAT) procedure. Subsequent to the FAT it was determined a failure mode existed which was not uncovered by the FAT (i.e. failure of all 3 signals to the Median Signal Selector). Changes to the software were made and tested under Site Acceptance Test (SAT) procedure. What was the extent of software or system review to ensure no other problems exist?	The software error in the Median Signal Selector algorithm was uncovered by the post FAT testing performed by the I&C department. It was corrected by Westinghouse and reviewed and regression tested by the Digital Systems group. The nature of the error was an incorrect option set in the final XLOSEL algorithm of the Median Signal Selector. The option that was set incorrectly was the QUAL PROP. This option can be set to on or off. If it is set to off, the quality of the output signal is not passed to the output, if it is set to on, the quality of the output tracks the quality of the input. (Ref. Westinghouse drawing # 5D92081 sh. 15 and manual # U0-0106 pg 3-51). This error did not affect the main function of the MSS algorithm, to cause a switch to manual on the loss of two channels, but it did prohibit the passing of bad quality to the output on the loss of all three channels. The review performed by the Digital Systems Group saw this as a minor software error outside the bounds of the functional design of the MSS algorithm because once a switch to manual is initiated on the loss of two input channels, the output of the QAM cards are held at the last good value and manual control is given to the operators. This functionally was inline with the system requirements.
67	Technical Requirements for the ADFCS (Doc. 0970-015.002-TR-01) section 6.4.1.5 addresses reset windup prevention when the process variable deviates from the setpoint for long periods of time. Where is this tested?	Reset Windup in the ADFCS system is prevented by the use of tracking logic. This tracking logic minimizes the impact of error signals over time to the control algorithms. The reset windup is explained in detail in the ADFCS Functional Requirements, sect 13.17 (Westinghouse doc. WPF1651D:1D/121192). The testing of this logic is covered by the closed loop testing that will be performed in the FAT and the closed and open loop testing that will be performed during power ascension. There are no specific test for anti windup since this function is an integral part of the control algorithms which we feel are fully tested by the open and closed loop testing.

Item	NRC Question	PSE&G Response
68	Please provide copies of any integrated testing done on the SI system as part of the original pre-op testing. Discuss/Explain the differences between original and current testing and the rationale for current not being as exhaustive.	Copies of test documentation for the Safety Injection System which was performed during the Initial Startup Test Program was provided to the inspector. This item was discussed in detail at a followup meeting with the Startup Testing Manager, including the relationship and interface between Safety Injection System Testing and Integrated Plant Testing. The inspector indicated satisfaction with the information provided.
69	For the SI system: 1) Did you perform a design basis review of the system? 2) Please provide a copy of that review. 3) Please provide copy of the design basis document.	Inspector has accessed many of the documents on his own through DMS. At this point he wants the safety injection vertical slice executive summary, and a copy of S2.IC-SP.SJ-0056(Q) as referenced by S2.OP-ST.SJ-0015(Q) (provided 12/19/96)
70	Please provide copies of testing procedures for Containment Isolation (both phases). The purpose of this request is to determine if integrated testing exists for the SI (and the rest of ECCS) systems.	Question was withdrawn after discussion of testing with Startup Manager.
71	Please describe the differences between test procedures (scope and content) that will be used during restart of RPS versus those originally used.	The Reactor Protection System (RPS) underwent channel calibrations and time response testing to verify system operability during initial startup. These tests verified the analog portion of the system. The Solid State Protection (SSP) System, which is considered a subsystem of RPS, also underwent logic testing and integrated functional testing. The SSP system consists of two redundant logic trains of digital circuitry. Based on all the restart work performed on the RPS all protection channels (I, II, III, IV) are undergoing channel calibration and time response testing. The SSP system is being tested via normal station procedures: Logic Functional, Interface, Multiplexing and the Slave Output surveillances. Additionally, integrated surveillance tests are performed, such as Manual Safety injection, Phase "A" and Phase "B". Changes in the SSP logic due to the elimination of the Steam Flow/Feedwater Flow mismatch were tested under the Advanced Feedwater Control System (ADFCS, DCP 2EC-3178). Special tests are being developed to verify control functions of various process loops, see table 4 of the Startup Test Report for details. These are comprehensive procedures which meet or exceed testing performed on the system during initial startup.
72	Please provide copies of surveillance test procedures that will be used during restart to verify: 1) Bistable signals to both trains of SSPS coincident logic for (a) low S/G level and steam flow/feed flow mismatch reactor trip, and (b) an overtemperature delta - T reactor trip.	(a) Changes were made in SSP logic due to the elimination of the Steam Flow/ Feedwater Flow Mismatch with Low S/G Level Reactor Trip. These changes were made based on the implementation of ADFCS, DCP 2EC-3178. (b) The following procedures were provided for the overtemperature delta-T loop channel calibration, time response, and functional procedures: S2.IC-CC.RCP-0001, 0005, 0009, & 0013 S2.IC-TR.RCP-0001 S2.IC-FT.RCP-0001, 0005, 0009, & 0013 S2.IC-TR.NIS-0001 S2.IC-ST.SSP-0002, 0008, 0009 S2.OP.ST.SSP-0001, 0002, 0006, 0007, 0009, 0010, 0011

Item	NRC Question	PSE&G Response
73	Please provide copies of surveillance test procedures that will be used during restart of RPS to verify: 1) Bistable signals for both trains of SSPS coincidence logic for (a) Low-low S/G level DFW system actuation, and (b) high steamline flow and low steamline pressure for low-low T avg. SI and SLI	(a) S/G level loop calibration procedures provided: #21 S/G: S2.IC-CC.RCP-0033, 0034, 0035 #22 S/G: S2.IC-CC.RCP-0043, 0044, 0045 #23 S/G: S2.IC-CC.RCP-0053, 0054, 0055 #24 S/G: S2.IC-CC.RCP-0063, 0064, 0065 (b) Steam flow and low steamline pressure procedures for 21 and 22 S/Gs provided: S/G #21 Steam Generator Steam Flow: S2.IC-CC.RCP-0028, 0029 S/G #21 Steam Generator Pressure Protection: S2.IC-CC.RCP-0030, 0031, 0032 S/G #22 Steam Generator Steam Flow: S2.IC-CC.RCP-0058, 0059 S/G #22 Steam Generator Pressure Protection: S2.IC-CC.RCP-0060, 0061, 0062
74	Please provide copies of surveillance test procedures that will be used during restart of RPS to verify: Bistable signals to both trains of SSP coincidence logic for (a) Pressurizer Pressure P-11; and (b) High S/G level turbine trip and feedwater isolation P-14	(a) Pressurizer Pressure channel calibrations provided: 2PT-455 Pressurizer Pressure Protection Channel I S2.IC-CC.RCP-0017 2PT-456 Pressurizer Pressure Protection Channel I S2.IC-CC.RCP-0018 2PT-457 Pressurizer Pressure Protection Channel I S2.IC-CC.RCP-0019 (b) Steam Generator Level Loop procedures are the same as those listed for question 73.
75	Requested installation status for DCP 2EO-2410 Pkg 1 through 7 and DCP 2EC-3338 Pkg 1 through 7	All 14 packages are installed, accepted by the station, and in various stages of document update.
76	References to "Open Item 15" keep occurring in the text of the CBD for the safety injection system, DE-CB.SJ-0040(Q). Please explain what Open Item 15 is and its current status.	Open Item 15 was assigned to DEF Number DES-92-00125. The description of the DEF is "The SI System pump performance assumed during accidents is being revised and an LCR has been submitted to NRC. These revisions also affect the PCT values calculated to occur during accidents." The actions required to resolve the DEF were "to ensure the accident analysis (sections) are consistent with LCR 91-03 when approved." The NRC approved the LCR for Unit 1 and Unit 2 via Tech Spec amendments 143 and 118 respectively. There is a CBD change request outstanding, CBDCN SJ-1410, to update the CBD text, including Chapter 7 and the Appendices. This is to be incorporated into Revision 3 of the CBD.
77	Provide a copy of Commitment C0560. How did procedure S2.OP-ST.SJ-0016(Q) Rev. 11 satisfy the requirements of C0565?	Copy provided. This commitment concerns Safety Injection Pumps and the requirements of this commitment are met in the surveillance's to set the SI pump (intermediate head) throttle valves SJ138s and SJ143s (S2.OP-ST.SJ-0014/0015). Procedure lower capacity that the SI pumps are not part of commitment C0565.
78	Why were throttle valves 21-24SJ16 settings measured by "turns" whereas valves 21-24SJ143 were set using a machinist's rule? If one method is considered to give more accurate results why wasn't that method used in all cases?	Prior to the outage, all ECCS throttle valve positions were recorded using the machinist rule measuring the stem height. During this outage, a DCP changed the identity of 21-24SJ16s with the 21-24SJ388s. The engineer preparing the DCP determined that counting the valve turns would be more accurate. The system manager was then in the process of evaluating this method for all of the ECCS throttle valves which a Condition Report (951003224) was initiated questioning the accuracy of measuring the stem heights. This evaluation is currently in progress and is expected to utilize a depth gage method of measuring the stem height. Once developed the same process will be used for all 12 ECCS throttle valves for consistency. A copy of CR 961003224 is provided.

Item	NRC Question	PSE&G Response
79	Page 4-14 paragraph C of the CBD for the Safety Injection system states that relief valve 1SJ167 (on cold leg injection line) et al relieves to the PRT. Drawing 205234-A-8763-47, Sh 2, SI system, shows relief valve 2SJ167 relieving to Containment Spray system (drawing 205335-A-8763 Sh 1). Please reconcile.	Both 1SJ167 and 2SJ167 relieve to the PRT. The relief line from 2SJ167 goes onto the Containment Spray print where it enters the relief line from 21CS5 and into the PRT from there (prints supplied). 2SJ167 relieves to the PRT by way of the relief line for a Containment Spray relief valve which is why its relief line goes over to the Containment Spray print.
80	Please provide logic diagrams for ESF actuation of SI/ECCS system.	Drawing 221057 was provided.
81	Component Cooling Water procedures (S2.OP-ST.CC-0001, 0002, 0003 for pump IST and TS2.SE-SU.CC-0001 for flow balance) use 10 gpm as the cooling water flow to the safety injection pump seal coolers. Calculation S-C-CC-MDC-0860, Westinghouse letter PSE-89-744, and Westinghouse system description SD-PSE/PNJ-200/C/S all use 20 gpm for cooling water flow to the SJ pumps from the CCW system. When and why did the requirement change?	
82	Will the Startup and Power Ascension Program verify and demonstrate proper operation (per design bases) of all design features (especially those tested under section 10.4, 10.5, and 10.6 of SUP 51) originally within the scope of SUP 51, "Integrated Test of Engineered Safeguards and Emergency Power System?" If not all design features will be tested, please provide basis for exclusion from Startup and Power Ascension Program.	A Reactor Protection & Engineered Safety Feature Actuation System Test Comparison Matrix was developed for the purpose of comparing testing performed during the Initial Salem Startup Test Program to testing performed during the Salem Restart Test Program. This matrix is a part of the Startup System Test Plan for the Reactor Control and Protection System (RCP). In this matrix, all testing performed by SUP 51 was evaluated. The review performed to develop the matrix concluded that RCP testing performed for Salem Restart meets or exceeds the preoperational testing performed during the Initial Salem Startup Test Program, with the following exception: Testing to demonstrate electrical independence IAW Regulatory Guide 1.41, Preoperational Testing of Redundant On-Site Electric Power Systems to Verify Proper Load Group Assignments, is not performed for Salem Restart. This testing is generally performed only one time, during the initial preoperational test program. Additionally, testing IAW Reg. Guide 1.41 would be required following major plant modifications which would affect electrical independence (i.e., major electric plant design changes). This testing is not required for Salem Restart, however, since only minor electric plant modifications have been implemented during this refueling outage.

Item	NRC Question	PSE&G Response
83	Problems were encountered with the ADFCS during the FAT as noted in the System History records provided by the Digital Systems Group: At 1635 on 10/11/94 after installing a card there was a problem where MS-10 swapped from manual to auto and demand went to 100%. The problem was repeatable. The solution was to ensure the card edge connector was properly aligned. Was there a design change to ensure the connector was properly aligned? If not, was a cautionary note added to the vendor manual and/or maintenance procedure? 2) On 10/11/94 there was a problem where variable F500MAL was found to be in a "forced open" condition. The solution was to unforce it, and the system worked. a) Why was it in a condition different from that anticipated? b) Could this have invalidated any previous testing? If so, was any retesting completed?	1) A cautionary note has been provided foe inclusion in the ADFCS troubleshooting procedures. This note defines the problem and the plant impact resulting from improper alignment. 2) The variable was not found in a forced condition in the original FAT run in October 1993. The October 1994 testing had just started on a system which had been on the Westinghouse factory floor since the October 1993 testing. Various engineers had performed several software upgrades in the interim. The performed testing to that time had not failed. The test did uncover the forced value when the system did not perform as expected. It is important to realize that the FAT was run again in February 1995 to assure PSE&G that the system would still pass the FAT after any changes made since the October 1993 testing. Any testing which might have been invalidated would have been re-run when the test failed, based on the experience and knowledge of the Westinghouse and PSE&G engineers present for the testing. It is impossible to determine what retesting was performed on 10/11/94 from the written records.
84	Problems were encountered during the FAT as noted in the System History records provided by the Digital Systems Group: 1) On 10/12/94 a fuse was pulled, no alarms were generated, the M/A station indicated it was in AUTO, but the pushbutton station was inoperable and the Dixon indicator showed 76%. The resolution is addressed in a letter "to be issued 12/15/94" - please provide a copy of this letter and explain why the resolution is acceptable. 2) On 10/13/94 there was a problem with delta check alarms and switch to manual on dual failure. How was this resolved? What were the retests to ensure the problems are resolved?	
85	Problems were encountered during the FAT as noted in the System History records provided by the Digital Systems Group: 1) On 11/19/94 there were problems when recovering from a "Catastrophic Highway Failure" - was the solution to the problem addressed with a change to the design or procedure revision? If not, why not? 2) What is the resolution to the issue raised on 11/3/94 where turbine first stage pressure is in PSIA on the EMMI, the transmitter is scaled for 0-672 PSIG for 0-120% which implies 100%=560 psig, but 558 psig was apparently used during the test.	
86	Answer to previous question #49 regarding EMI measurements addresses testing in mode 5, mode 3, and at 100% power. Are these tests required to be addressed in TS2.SE-SU.ZZ-0001(Q)? The T4 book page 12 indicates readings will be taken in mode 5, and at 50% and 100% power. What are the plans, and which documents need to be corrected?	These tests are not required to be addressed in TS2.SE-SU.ZZ-0001(Q) as the tests are controlled by the ADFCS DCP. TS2.SE-SU.ZZ-0001(Q) provides overall guidance and coordination of significant tests. This procedure establishes Hold Points to ensure required activities are completed before proceeding. Noise monitoring, the connection of a recorder for a period of time to ADFCS channel input signals, does not fall into this realm. The T4 book is in error and will be corrected.

Item	NRC Question	PSE&G Response
87	Answer to previous question #50: The system is designed to swap to manual on two signals failing. Testing was performed for two signals failing low. Why was testing not performed for two signals failing high? Why was the order of testing not varied between channels? (Good software test practices will vary the test order for similar loops to ensure that the system does not act inappropriately when the sequence of "parallel" inputs is altered. This is how PSE&G found the problem with three signals failing; this problem was not detected on the previous seven DFCS provided by Westinghouse.) Was the problem with three signals failing reported on the INPO Nuclear Network by PSE&G?	
88	1) The 50.59 Safety Evaluation for 2EC-3178, Section 4.2a states the SSPS modifications are done under the control of a temporary modification. Please explain further. 2) The 50.59 states that the modification does not add instrumentation with accuracies or response characteristics different from existing instrumentation. Provide references where this is supported for the replacement of old equipment with new Rosemount transmitters.	
89	Are the following features tested in the Hardware-in-Loop Testing as they do not appear to have been tested in the FAT, SAT, PMT or STP. If they are not being tested, provide the justification for not testing these system requirements. If they are only testing in the HWIL, provide a justification for not validating functions performed at Westinghouse using their simulation equipment. 1) S/G level setpoint as a function of turbine impulse pressure, 2) FW valve "linearization" curves - what is the valve design curve and the linearization function? 3) Feedwater temperature dependent gain curves.	

Item	NRC Question	PSE&G Response
90	Are the following features tested in the Hardware-in-Loop Testing as they do not appear to have been tested in the FAT, SAT, PMT or STP. If they are not being tested, provide the justification for not testing these system requirements. If they are only testing in the HWIL, provide a justification for not validating functions performed at Westinghouse using their simulation equipment. 1) Time responses - provide either test data or show where an analysis was done proving these times can be met. a) Primary controller shall self diagnose a problem, initiate a failover to the secondary controller during the next scan cycle (500 millisecond maximum), - Advanced Digital Feedwater Control System requirements, Rev. 5 dated 10/25/94, Section 6.3.3 b) The overall delay between the acquisition of new inputs, and the generation of the corresponding control output shall be no longer than 1.3 seconds (Westinghouse Proprietary Digital Feedwater Control System (DFWCS) Functional Requirements Revision 2.0 dated December 1992, Section 13.11.2) c) The time step (time between sequential control loop calculations) for the feedwater valve controllers (main and bypass) and the turbine driven feedwater pump speed controller shall be no longer than 0.8 seconds (Westinghouse Proprietary Digital Feedwater Control System (DFWCS) Functional Requirements Revision 2.0 dated December 1992, Section 13.11.1) d) All manual inputs must take effect within 1 second after initiation. (Westinghouse Proprietary Digital Feedwater Control System (DFWCS) Functional Requirements Revision 2.0 dated December 1992, Section 13.11.2)	
91	Can any ADFCS operational or support software fail due to the Year 2000 problem? What evaluation has been done to support this calculation?	
92	Is the ADFCS considered important to safety? Is it covered by the Maintenance Rule? Is the associated software considered critical software in accordance with NC.NA-AP.ZZ-0054(Q)? Answer the same questions for the MFP digital governor installed under 2EC-3306. Is the turbine runback equipment installed under 2EC-3306 considered important to safety? Is it covered by the Maintenance Rule? Are the SGFP latching relays installed under 2EC-3306 considered important to safety? Is it covered by the Maintenance Rule?	ADFCS is not considered important to safety using the definition in NC.NA-AP.ZZ-0059(Q). ADFCS is covered by the Maintenance Rule. ADFCS's software is considered critical software as defined in NC.NA-AP.ZZ-0064(Q). The MFP digital governor is not considered important to safety using the definition in NC.NA-AP.ZZ-0059(Q). The MFP digital governor is covered by the Maintenance Rule. The MFP digital governor is considered critical software as defined in NC.NA-AP.ZZ-0064(Q). The turbine runback circuitry is not considered important to safety using the definition in NC.NA-AP.ZZ-0059(Q). The turbine runback circuitry is covered by the Maintenance Rule. The SGFP latching relays (2CNE23-5X, 2CNE24-5X) are safety related. The relays are covered by the Maintenance Rule.