May 3, 2001

EA 01-102

Mr. Harold W. Keiser Chief Nuclear Officer and President PSEG Nuclear LLC - X04 P. O. Box 236 Hancocks Bridge, NJ 08038

SUBJECT: NRC INSPECTION REPORT 05000272/2001-003, 05000311/2001-003

Dear Mr. Keiser:

On March 31, 2001, the NRC completed an inspection of your Salem 1 & 2 reactor facilities. The enclosed report presents the results of that inspection. The preliminary findings were presented to PSEG Nuclear management led by Mr. David Garchow in an exit meeting on April 19, 2001.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations, and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

The inspectors identified one issue of very low safety significance (Green) involving the failure to perform an adequate risk assessment for a planned maintenance activity. This issue was determined to involve a violation of NRC requirements. However, because of the very low safety significance and because the issue has been entered into your corrective action program, the NRC is treating this issue as a non-cited violation, in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny this non-cited violation, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement; and the NRC Resident Inspector at the Salem facility.

Mr. Harold W. Keiser

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Sincerely,

/RA/

Glenn W. Meyer, Chief, Projects Branch 3 Division of Reactor Projects

- Enclosure: Inspection Report 05000272/2001-003, 05000311/2001-003
- Attachment: Supplemental Information

cc w/encl:

- E. Simpson, Senior Vice President and Chief Administrative Officer
- M. Bezilla, Vice President -Technical Support
- D. Garchow, Vice President Operations
- G. Salamon, Manager Licensing
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Mr. Harold W. Keiser

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos: License Nos:	50-272, 50-311 DPR-70, DPR-75	
Report No:	05000272/2001-003, 05000311/2001-003	
Licensee:	PSEG Nuclear LLC	
Facility:	Salem Nuclear Generating Station, Units 1 & 2	
Location:	P.O. Box 236 Hancocks Bridge, NJ 08038	
Dates:	February 11 - March 31, 2001	
Inspectors:	Raymond Lorson, Senior Resident Inspector F. Jeff Laughlin, Resident Inspector Richard S. Barkley, Senior Project Engineer Kenneth Jenison, Senior Project Engineer Joseph Furia, Senior Radiation Specialist Steven Dennis, Operations Engineer Todd Fish, Operations Engineer	
Approved By:	Glenn W. Meyer, Chief Projects Branch 3 Division of Reactor Projects	

Summary of Findings

IR 05000272-01-03, IR 05000311-01-03, on 2/11-3/31/01, Public Service Electric Gas Nuclear LLC, Salem Units 1 and 2. Maintenance Risk Assessment and Emergent Work.

The inspection was conducted by resident inspectors, a regional radiation specialist, and regional project inspectors. This inspection identified one green finding, which was a non-cited violation. The significance of the finding is indicated by its color (Green, White, Yellow, or Red) using IMC 0609 "Significance Determination Process" (SDP). The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at <u>http://www.nrc.gov/NRR/OVERSIGHT/index.html.</u> Findings for which the SDP does not apply are indicated by "no color" or by the severity level of the applicable violation.

A. Inspector Identified Findings

Cornerstone: Mitigating Systems

! GREEN. PSEG Nuclear did not properly assess the risk associated with the simultaneous removal of the 1 service water bay and the 1B emergency diesel generator (EDG) from service. In this configuration only one of the six service water pumps and one of the three EDGs would have been able to respond to a loss of offsite power.

This finding was evaluated using the significance determination process and found to be of very low risk significance due to the relatively short duration (about 3 hours) that both systems were out of service. The failure to perform an adequate risk assessment prior to removal of these systems from service was a non-cited violation. (Section 1R13)

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Report Details

SUMMARY OF PLANT STATUS

Unit 1 began the period at 100% power and remained there, except for a minor power reduction to support planned maintenance, until March 27 when operators commenced an end- of-cycle coast down in preparation for refueling outage #14.

Unit 2 began the period at 100% power and remained there until February 16 when operators reduced power to 85% for planned maintenance activities. Operators restored the unit to full power on February 19. Operators reduced power to 43% on March 25 for main turbine valve testing and restored the unit to full power the same day, where it remained for the duration of the period.

1. REACTOR SAFETY (Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity)

- R04 Equipment Alignment
- a. Inspection Scope
- .1 Partial System Walkdowns

On March 2 the inspector performed a partial system walkdown of the Unit 2 motor-driven auxiliary feed water (MDAFW) pumps while the 23 auxiliary feedwater (AFW) pump was removed from service for planned maintenance. On March 5 the inspector completed a partial walkdown of the 1B and 1C emergency diesel generators (EDGs) while the 1A EDG was removed from service for planned maintenance. During these walkdowns the inspector confirmed that the redundant components were operational, properly aligned to perform their intended safety functions, and appropriately protected by administrative controls.

b. Findings

No findings of significance were identified.

.2 Unit 2 Auxiliary Feedwater System

During the week of March 5 the inspector performed a complete walkdown of the Unit 2 AFW system. The walkdown included a review of material condition, outstanding notifications and design issues, emergency and abnormal system operating procedures, Technical Specification (TS) requirements, and verification that the system was aligned correctly to support normal and emergency operations in accordance with the Updated Final Safety Analysis Report (UFSAR) and plant procedures. The following documents were reviewed as part of this walkdown:

Notification 20058796 - 22 AFW pump bearing upgrade. Notification 20058785 - Permissible leakage at #22 AFW pump. Notification 20058804 - Valve 22AF118 not properly locked. Notification 20045066 - Refurbish/Replace #22 AFW pump bearings. Notification 20056633 - Revise procedure S2.RA-ST.AF-0002(Q) Procedure S2.OP-ST.CAN-0001(Q) Rev.8 - Primary Containment Valve Monthly. Procedure S2.OP-ST.AF-0008(Q) Rev.3 - AFW Valve Verification. System Health Report - Unit 2 AFW, 3rd and 4th Quarters of 2000. Unit 2 Technical Specifications - Sections 3/4.7.1.2, 3/4.6.1.1, and 3/4.7.1.3. UFSAR Section 10.4.7.2 - AFW system. Unit 2 P&ID Drawing #205336 A 8763-48.

b. Findings

No findings of significance were identified.

.3 Emergency Diesel Generator Fuel Oil System - Unit 2

A detailed system alignment walkdown of accessible portions of the Salem Unit 2 EDG fuel oil system was performed inside the auxiliary building. Documents reviewed included: system alignment check lists and operating procedures, plant drawings, selected emergency operating procedures, applicable UFSAR sections, fuel oil transfer pump flow performance tests, fuel oil day tank level transmitter calibrations, and a fuel oil tank flooding analysis. In addition, the susceptibility of the fuel oil day tank level control system to a single level transmitter failure (low) was reviewed, including the capacity of fuel oil day tank drain line.

b. Findings

No findings of significance were identified.

R05 <u>Fire Protection</u>

a. Inspection Scope

The inspectors performed fire protection system walkdowns of the Salem Unit 1 and 2 EDG rooms, and the accessible portions of the 84' elevation of the primary auxiliary buildings (PABs). The inspector reviewed the material condition and operational status of fire detection and suppression equipment, and also the control of transient combustible materials and ignition sources. In addition, the inspector evaluated the condition of fire barriers and penetration seals.

b. <u>Findings</u>

R06 Flood Protection Measures

a. Inspection Scope

The inspector performed a review of drawings and calculations related to the containment, turbine and switchgear buildings, the service water intake area, and the condensate, service water, and fire protection systems to verify that the equipment was not subject to damage resulting from internal or extreme external flooding events. The inspector reviewed selected flooding analysis elevation and clearance calculations that had been performed to demonstrate that selected safety-related equipment was not vulnerable to internal flooding and reviewed the design basis for the plant site to verify that the intake, service water, and auxiliary building structures were constructed to be resistant to design basis external flooding events. In addition to numerous plant drawings and calculations, the Salem Plant Specific Analysis for External Events (IPEEE), the UFSAR, and selected abnormal operating procedures, including SC.OP-PT.ZZ-0002, Station Preparations for Winter Conditions and S1.OP-AB.ZZ-0002, Flooding, were evaluated. A detailed evaluation of the corrective actions for a postulated flooding scenario was performed. A sample of flood-related notifications (including 20024003, 20019727, and 20024002 and 3) was reviewed to ensure that the corrective actions documented to protect safety-related equipment from flooding events were appropriate. In addition, a sample of seal penetration modifications to correct a potential single mode flooding path to the vital switch gear rooms was reviewed (including E-25403-022, 062, 064, and 100, EC3277).

b. Findings

No findings of significance were identified.

R11 Licensed Operator Regualification

a. Inspection Scope

The inspector observed a March 6, 2001, simulator training session for two crews during licensed operator training. The crews were performing the newly developed steam generator tube leak procedure, S.2.OP-AB.SG-0001(Q), which detailed how to properly respond to significant steam generator tube leaks that are within the makeup capacity of the charging system. The inspector assessed the adequacy of the training scenario, operator performance in mitigating the consequences of the simulated event, operator command and control as well as operator communications prior to and during the event, and PSEG Nuclear's use of operating experience in the training. The inspector discussed the observations of the crew performance with the training staff and the Salem operations manager. The inspector was later informed of the satisfactory remedial training of one of the crews as well as plans for periodic operator refresher training on this abnormal operating procedure.

The inspector observed a March 27, 2001, licensed operator re-qualification simulator training session for one operating crew. The session was conducted per Examination Scenario Guide (ESG) 101, *Abnormal Operations and Reactor Trip Response*. The

purpose of the observation was to assess the adequacy of: the training scenario, the operators' response to the events, and the training staff's post-scenario critique.

b. <u>Findings</u>

No findings of significance were identified.

R12 Maintenance Rule Implementation

a. Inspection Scope

The inspector reviewed the maintenance rule classifications, performance criteria and system health reports for the Unit 1 and 2 chilled water systems as well as the Unit 1 chemical and volume control system. Recent equipment performance problems on these systems were reviewed to ensure they were recorded and tracked by the maintenance rule program. The inspector discussed planned and ongoing corrective actions to improve the reliability and availability of these systems with the responsible system engineers.

b. Findings

No findings of significance were identified.

- R13 Maintenance Risk Assessments and Emergent Work Control
- .1 <u>1B Emergency Diesel Generator Out of Service While Performing 13 Service Water Pump</u> In-service Test
- a. Inspection Scope

The inspector reviewed the risk assessment for maintenance activities performed on February 13, 2001, that simultaneously removed the 1 service water (SW) bay pumps (11, 12, and 13 pumps) from service for about 3 hours (2:13 p.m. to 5:23 p.m.) while the 1B EDG was out of service for a planned maintenance outage. The inspector also reviewed the Unit 1 control room narrative and TS logs, and the Unit 1 probabilistic safety assessment (PSA) risk evaluation for work week 6 (2/11-2/17/2001) to confirm that PSEG Nuclear properly assessed and managed the risk associated with the remaining work week 6 maintenance activities in accordance with operations procedure, SH.OP-AP.ZZ-0027(Q), Revision 1, *On-Line Risk Assessment*.

The inspector also reviewed notification 20056519 which documented a PSEG Nuclear identified issue that the Unit 1 operators unknowingly entered Technical Specification Action Statement (TSAS) 3.0.5 during the simultaneous 1 SW bay and 1B EDG outage.

b. Findings

PSEG Nuclear did not properly assess the risk associated with the simultaneous removal of the 1 SW bay and 1B EDG from service. In this configuration only one of the six service water pumps and one of the three EDGs would have been able to respond to a loss of offsite program. This finding was evaluated using the significance determination process and found to be of very low risk significance due to the relatively short duration (about 3 hours) that both systems were out of service. The failure to perform an adequate risk assessment prior to removal of these systems from service was a non-cited violation.

The risk assessment for work week 6 had permitted the removal of the 13 SW pump from service while the 1B EDG was out of service, but did not take into account that the 13 SW pump test configuration also rendered the 11 and 12 SW pumps inoperable. Subsequently, PSEG Nuclear performed a risk analysis and determined that the core damage frequency (CDF) increase was 3.2E-4/yr over the 3 hours this configuration existed for an overall change of 1.1E-7. The on-line risk assessment procedure (SH.OP-AP.ZZ-0027(Q)) stated that planned activities should be rescheduled, if possible, to avoid this level of risk.

This failure to properly assess the risk associated with the removal of the safety systems from service had a credible impact on safety since the maintenance configuration resulted in three SW pumps being out of service and no emergency power source available for a fourth (14 SW pump). Therefore, the condition affected the availability of both SW bays. A regional senior reactor analyst performed a Phase 3 assessment since the Phase 1 screen had indicated that the likelihood of a loss of service water initiating event was increased and that station blackout mitigation capability was decreased. The dominant postulated accident sequence involved a loss of off-site power (LOOP) event, resulting in only one SW pump being available from the A bus (i.e. the 11-13 SW pumps were out of service, the 14 SW pump would be lost in the event of a LOOP, and the 1A EDG would start only one SW pump). The Phase 3 analysis used the NRC's Standardized Plant Analysis Risk model for the Salem plant. This probabilistic assessment found a CDF increase of 3.4E-4/yr over the 3 hours approximately the same as PSEG Nuclear's conclusion. When the risk during this short time period was averaged over a one year period, the increase in the annual CDF was approximately 1E-7. Findings with an annual averaged increase in CDF of less than 1E-6/yr are considered to be of very low significance (GREEN).

10 CFR 50.65(a)(4) requires that licensees assess and manage the increase in risk before performing planned maintenance activities. Contrary to the above, PSEG failed to properly assess the risk associated with the simultaneous removal of the 1 SW bay and the 1B EDG from service. This is a violation of 10 CFR 50.65 (a) (4). This violation is being treated as a non-cited violation (NCV) in accordance with Section VI.A.1 of the NRC Enforcement Policy since the finding was of very low risk significance and was entered into the PSEG corrective action program (notifications 20056519 and 20056723). (NCV-05000272/2001-003-01).

R15 Operability Evaluations

.1 <u>22 Auxiliary Feedwater Pump</u>

a. <u>Inspection Scope</u>

The inspectors performed a detailed review of the February 12, 2001 failure of the 22 AFW pump during its quarterly surveillance test (ST), which extended the Unit 2 72-hour TS shutdown action statement already in effect for the ST. The failure was due to high vibration on the pump outboard bearing. The inspectors interviewed cognizant operations, maintenance, and engineering personnel; reviewed pump test documentation (procedure S2.OP-ST.AF-0002(Q), *Inservice Testing 22 Auxiliary Feedwater Pump*) including vibration data; and observed the Station Operations Review Committee meeting which discussed the failure and retest activities following pump bearing replacement, to verify pump operability.

b. Findings

No findings of significance were identified.

.2 <u>11 Component Cooling Water Pump</u>

a. Inspection Scope

The inspector reviewed operability determination (OD) 01-004 which evaluated the operability of the 11 component cooling water (CCW) pump room cooler following replacement of the 11 CCW pump impeller. The 11 CCW pump brake horsepower (BHP) and projected heat output increased following the impeller replacement. A PSEG Nuclear design engineer performed a calculation and determined that the CCW pump room cooler would have sufficient capacity to remove the projected room heat load provided the river supply temperature remained below 70°F.

The inspector also reviewed notification 20058401 and interviewed a design engineer regarding the impact of the increased 11 CCW pump BHP requirements on the 1A EDG. The inspector reviewed the 11 CCW pump post-modification test data, and the projected 1A EDG loading profile documented in engineering calculation ES-9.002, revision 3, to determine whether any 1A EDG capacity limits would be exceeded.

b. Findings

R19 Post Maintenance Testing

a. Inspection Scope

The inspector observed post-maintenance testing (PMT) activities and reviewed work order 60015802, 22 AFW Pump Has High Vibrations on Outboard Pump Bearing, and PMT data in procedure S2.OP-ST.AF-0002(Q), Inservice Testing 22 Auxiliary Feedwater Pump, following emergent work on the 22 auxiliary feedwater pump. The inspector verified that test activities were adequately controlled, were adequate to assure system operability, and met the appropriate acceptance criteria.

The inspector also reviewed the PMT data documented in work order 60009873 and interviewed a maintenance engineering supervisor following replacement of the 11 CCW pump impeller. The inspector compared the PMT data to the vendor supplied pump characteristic curve and also reviewed PSEG Nuclear's evaluation of the increased pump BHP requirements (discussed in Section R15).

b. Findings

No findings of significance were identified.

2. RADIATION SAFETY

Occupation Radiation Safety [OS]

- 2OS1 Access Control (7112101)
- a. Inspection Scope

The inspector reviewed the access control program (as required under Plant TSs and 10 CFR 20.1601) by examining the controls established for exposure significant areas, including postings, markings, control of access, dosimetry, surveys and alarm set points. Controls reviewed included: key control for locked high radiation areas; use of radiation work permits to control access to radiologically significant areas; and, pre-job radiological briefings.

The inspector also made direct observations of diving activities taking place in the Unit 1 spent fuel pool. These activities involved underwater inspections of the fuel upender/transfer cart in preparation for the upcoming refueling outage (1R14).

b. Findings

2OS2 ALARA Planning and Controls (7112102)

a. Inspection Scope

The inspector reviewed work performance in accordance with 10 CFR 20.1101(b). Areas reviewed included an evaluation of the use of engineering controls to achieve dose reductions; review of the use of low dose waiting areas; review of on-job supervision provided to workers; and a review of individual exposures from selected work groups.

The inspector also reviewed work packages, radiation work permits (RWPs) and as low as reasonably achievable (ALARA) reviews written to support refueling activities and steam generator inspections scheduled for 1R14. Viability of work and exposure estimates, utilization of engineering controls to reduce dose rates, and coordination with affected work groups for these tasks were examined. The exposure goal for the outage has been established at 125 person-rem.

b. Findings

No findings of significance were identified.

2OS3 Radiation Monitoring Instrumentation

a. Inspection Scope

The inspector reviewed field instrumentation utilized by health physics technicians and plant workers to measure radioactivity, including portable field survey instruments, friskers, portal monitors and small article monitors. The inspector reviewed instruments observed in the auxiliary and fuel handling buildings, specifically verification of proper function and certification of appropriate source checks for these instruments which are utilized to ensure that occupational exposures are maintained in accordance with 10 CFR 20.1201.

The inspector reviewed PSEG Nuclear's self-contained breathing apparatus (SCBA) equipment, including: surveillance records; capabilities for filling and transportation of bottles; and training and qualification of users.

b. Findings

4. OTHER ACTIVITIES [OA]

OA1 Performance Indicator Verification

a. Inspection Scope

The inspector reviewed the Unit 1 safety system unavailability data for the last three quarters of 2000 and interviewed PSEG Nuclear personnel responsible for collecting and reporting the data. The inspectors used NEI 99-02, Revision 0, *Regulatory Assessment Performance Indicator Guideline*, to assess the performance indicator data.

The inspector reviewed a listing of all PSEG Nuclear radiological problem reports for the period April 2, 2000 through March 18, 2001 for issues related to the occupational radiation safety performance indicator, which measured non-conformances with high radiation areas greater than 1R/hr and unplanned personnel exposures greater than 100 mrem TEDE, 5 rem SDE, 1.5 rem LDE, or 100 mrem to the unborn child.

b. Findings

- OA3 <u>Event Follow-up</u>
- .1 (Closed) LER 05000272/2000-04-00: Invalid engineering assumptions used in computing the non-essential heat loads that needed to be removed from the chilled water system to meet the intent of TS 3.7.10. The inspector reviewed the LER and the revised system operating procedure (S2.OP.SO.CH-0001(Q)) that implemented the requirements of TS 3.7.10 in the event that a chiller was removed from service and/or an elevated chilled water temperature was experienced. The corrective actions, as detailed in the LER, have been completed. The non-conservative engineering assumption errors previously used to develop the system operating procedure were minor and there were no potential safety consequences to this event since the non-essential chilled water system loads would have been automatically isolated during a design basis event. LER 05000272/00-004-00 is closed.
- .2 (Closed) LER 05000311/2000-001-00: Historical non-compliance with requirements of Technical Specification 3.3.3.9 Action 36. This LER discussed a September 30, 2000, event where continuous effluent samples had not been collected following the failure of the normal effluent monitoring stations as required by TS 3.3.3.9 Action 36. The TS requirement was subsequently relocated to the Off-site Dose Calculation Manual (ODCM). The licensee's planned corrective actions included: pre-staging of two alternate sampling skids to minimize the time necessary to establish the alternate effluent monitoring station. The inspector concluded that this LER involved a violation of minor significance and that the corrective actions appeared reasonable and complete. LER 05000311/2000-001-00 is closed.

- .3 (Closed) LER 05000311/2000-003-00: Engineered safety feature feedwater isolation due to high steam generator level. This LER described an event that occurred on November 7, 2000, involving an unexpected feedwater isolation due to a high 21 steam generator (SG) level condition. The event was attributed to human error involving the failure to anticipate the impact of a 21 main feedwater regulating valve corrective maintenance activity on the 21 SG water level. The plant was in Mode 4 at the time of the event and there were no adverse safety consequences. The inspector reviewed this report and did not identify any findings of significance. LER 05000311/2000-003-00 is closed.
- .4 (Closed) LER 05000311/2001-002-00: Failure to comply with the requirements of the Salem Fire Protection program during testing. Salem operators performed a discharge test on all Appendix R battery powered emergency light units (ELUs), which rendered the ELUs inoperable during the post-test time that the batteries were recharging. The operators, however, did not implement the compensatory actions for the inoperable ELUs as required by the fire protection program. The inspector reviewed this report and did not identify any findings of significance. LER 05000311/01-002-00 is closed.
- OA6 Management Meetings
- a. Exit Meeting Summary

On April 19, 2001, the inspectors presented their overall findings to members of PSEG Nuclear management led by Mr. David Garchow. PSEG Nuclear management acknowledged the findings presented and did not contest any of the inspectors' conclusions. Additionally, they stated that none of the information reviewed by the inspectors was considered proprietary.

ATTACHMENT 1

SUPPLEMENTAL INFORMATION

a. <u>Key Points of Contact</u>

- T. Cellmeer, Radiation Protection Manager
- K. Davidson, Operations Manager Salem
- D. Garchow, Vice President Operations
- M. Hassler, Radiation Operations Protection Superintendent Salem
- G. Salamon, Licensing Manager

b. List of Items Opened and Closed

Opened/Closed

05000272&311/2001-003-001NCV	Failure to perform an adequate risk assessment prior to removing the 1 service water bay and 1B emergency diesel generator from service for maintenance. (Section 1R13)		
05000272/2000-004-00	LER	Invalid engineering assumptions used to determine non-essential chilled water system heat loads. (Section OA3)	
05000311/2000-001-00	LER	Historical non-compliance with the requirements of Technical Specification 3.3.3.9, Action 36. (Section OA3)	
05000311/2000-003-00	LER	Engineered safeguards feature actuation due to personnel error. (Section OA3)	
05000311/2001-002-00	LER	Failure to comply with the fire protection program requirements. (Section OA3)	

c. <u>List of Acronyms</u>

AFW	Auxiliary Feedwater	
ALARA As Low as Reasonably Achievable		
BHP	Brake Horsepower	
CCW	Component Cooling Water	
CDF	Core Damage Frequency	
EDG	Emergency Diesel Generator	
ELU	Emergency Lighting Unit	
ESG	Examination Scenario Guide	
IPEEE	Individual Plant Examination	

Attachment 1

LER	Licensee Event Report
LOOP	Loss of Off-Site Power
MDAFW	Motor-driven Auxiliary Feedwater Pump
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
OD	Operability Determination
ODCM	Off-site Dose Calculation Manual
PAB	Primary Auxiliary Building
PARS	Publicly Available Records
PMT	Post Maintenance Testing
PSA	Probabilistic Safety Assessment
PSEG	Public Service Electric Gas
RWP	Radiation Work Permit
SCBA	Self-contained Breathing Apparatus
SDP	Significance Determination Process
SG	Steam Generator
ST	Surveillance Test
SW	Service Water
TS	Technical Specification
TSAS	Technical Specification Action Statement
UFSAR	Updated Final Safety Analysis Report