

October 30, 2003

Mr. John L. Skolds, President  
and Chief Nuclear Officer  
Exelon Nuclear  
Exelon Generation Company, LLC  
4300 Winfield Road  
Warrenville, IL 60555

SUBJECT: CLINTON POWER STATION  
NRC INTEGRATED INSPECTION REPORT 05000461/2003005

Dear Mr. Skolds:

On September 30, 2003, the U.S. Nuclear Regulatory Commission (NRC) completed an integrated inspection at your Clinton Power Station. The enclosed reports documents the inspection findings which were discussed on October 9, 2003, with Mr. K. Polson and other members of your staff.

This inspection examined activities conducted under your license as they relate to safety and to 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.

This report documents one finding and associated violation of NRC requirements whose significance is to be determined. The finding relates to your staff's failure to properly evaluate a potential configuration change on a number of safety-related motor-operated valves. We have determined that this finding is greater than minor; however, the significance determination will be completed once we resolve past operability and the extent of condition concerns. This finding did not present an immediate safety concern and corrective actions including additional inspections by your staff have been implemented.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be made available electronically for public inspection in the NRC Public

J. Skolds

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Sincerely,

**/RA/**

Ann Marie Stone, Chief  
Branch 3  
Division of Reactor Projects

Docket No. 50-461  
License No. NPF-62

Enclosure: Inspection Report No. 05000461/2003005  
w/Attachment: Supplemental Information

cc w/encl: Site Vice President - Clinton Power Station  
Clinton Power Station Plant Manager  
Regulatory Assurance Manager - Clinton  
Chief Operating Officer  
Senior Vice President - Nuclear Services  
Vice President - Operations Support  
Vice President - Licensing and Regulatory Affairs  
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REGION III

Docket No: 50-461  
License No: NPF-62

Report No: 05000461/2003005

Licensee: AmerGen Energy Company, LLC

Facility: Clinton Power Station

Location: Route 54 West  
Clinton, IL 61727

Dates: July 1 through September 30, 2003

Inspectors: B. Dickson, Senior Resident Inspector  
C. Brown, Resident Inspector  
T. Tongue, Project Engineer  
D. Smith, Dresden Senior Resident Inspector  
D. McNeil, Senior Operations Engineer  
R. Walton, Operations Engineer  
D. Eskins, LaSalle Resident Inspector  
D. Zemel, Illinois Emergency Management Agency

Observers: J. Bond, NRC Intern  
D. Tharp, Reactor Engineer

Approved by: Ann Marie Stone, Chief  
Branch 3  
Division of Reactor Projects

Enclosure

## SUMMARY OF FINDINGS

IR 05000461/2003005; 07/01/2003 -09/30/2003;Clinton Power Station. Operability Evaluations and Licensed Operator Requalification.

This report covers a 3-month period of baseline resident inspection and announced baseline inspections on licensed operation requalification. The inspection was conducted by Region III inspectors and the resident inspectors. One Unresolved Item (URI) with potential safety significance greater than minor and one minor examination security violation were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be "Green" or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

### A. Inspector-Identified and Self Revealing Findings

#### **Cornerstone: Mitigation Systems**

TBD The inspectors identified a violation having safety significance greater than minor. This finding resulted from the licensee's failure to evaluate a potential configuration change in accordance with the licensee's established configuration control process following the installation of modified mounting bolts in Limitorque SMB-2 actuators. The installed mounting bolts achieved less thread engagement than required by design documentation.

This finding is considered an unresolved item (URI) pending a review of licensee's evaluation of these issues and completion of significance determination. The inspectors considered this issue greater than minor because the finding was associated with the Mitigating System crosscutting attribute of Equipment Performance and affected the Mitigating System objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. This finding was determined to have a potential safety significance greater than minor because the affected valve operators were used in both Division I and Division II low pressure emergency core cooling systems. (Section 1R15)

### B. Licensee-Identified Violations

No findings of significance were identified.

## REPORT DETAILS

### Summary of Plant Status

At the beginning of the inspection period, the plant operated at approximately 93.6 percent of rated thermal power (maintaining about 102 percent of rated electrical output). On September 7, 2003, operators reduced reactor power to approximately 60 percent to perform a control rod pattern adjustment, control rod drive scram time testing and fuel channel bow surveillance testing. On September 8, 2003, operators increased reactor power to 91 percent power (100 percent of rated electrical output). The plant remained at that power level through the end of the inspection period.

### 1. REACTOR SAFETY

#### **Cornerstone: Initiating Events, Mitigating Systems, and Barrier Integrity**

#### 1R01 Adverse Weather (711111.01)

##### a. Inspection Scope

The inspectors verified that the licensee had completed preparations for adverse weather in a timely manner before the weather actually presented a challenge. The inspectors reviewed the risk-significant equipment and ensured that the equipment was in a condition to meet the requirements of Technical Specifications (TSs), the Operational Requirements Manual (ORM), and the Updated Safety Analysis Report (USAR) with respect to protection from adverse weather. The inspectors verified that minor issues identified during the inspection were entered into the licensee's corrective action system by reviewing the associated condition reports (CRs).

On July 8, 2003, the inspectors completed one sample by verifying preparations for adverse weather and walking down selected plant areas based on their importance for availability of mitigating systems, before predicted severe thunderstorms and high winds. These areas included the Emergency Reserve Auxiliary Transformer (ERAT), the ERAT-Static VAR compensator, a construction site adjacent to the main power transformers, and the screen house.

##### b. Findings

No findings of significance were identified.

1R04 Equipment Alignments (71111.04Q)

.1 Partial Walkdowns

a. Inspection Scope

The inspectors performed five partial walkdowns of accessible portions of divisions of risk-significant mitigating systems equipment during times when the divisions were of increased importance due to the redundant divisions or other related equipment being unavailable. The inspectors utilized the valve and electric breaker checklists listed in the Attachment to verify that the components were properly positioned and that support systems were lined up as needed. The inspectors also examined the material condition of the components and observed operating parameters of equipment to verify that there were no obvious deficiencies. The inspectors reviewed outstanding work orders and condition reports (CRs) associated with the divisions to verify that those documents did not reveal issues that could affect division function. The inspectors used the information in the appropriate sections of the Updated Safety Analysis Report (USAR) to determine the functional requirements of the systems.

The following five systems were inspected:

- Control room heating ventilation and air conditioning system 'A' during maintenance on 'B' system;
- Standby liquid control system;
- Division 1 residual heat removal (RHR) system during work on Division 2 RHR;
- 125-Vdc distribution system during work in the 345 Kv switchyard; and
- Reactor core isolation cooling (RCIC) system.

b. Findings

No findings of significance were identified.

1R05 Fire Protection (71111.05Q and 05A)

.1 Quarterly Fire Zone Walkdowns

a. Inspection Scope

The inspectors conducted fire protection walkdowns which were focused on availability, accessibility, and the condition of fire fighting equipment, the control of transient combustibles and ignition sources, and on the condition and operating status of installed fire barriers. The inspectors selected fire areas for inspection based on their overall contribution to internal fire risk, as documented in the Individual Plant Examination of External Events with later additional insights, their potential to impact



equipment which could initiate a plant transient, or their impact on the plant's ability to respond to a security event. The inspectors used the documents listed in the Attachment to verify that fire hoses and extinguishers were in their designated locations and available for immediate use; that fire detectors and sprinklers were unobstructed; that transient material loading was within the analyzed limits; and that fire doors, dampers, and penetration seals appeared to be in satisfactory condition. The inspectors verified that minor issues identified during the inspection were entered into the licensee's corrective action program.

The following nine areas were inspected by walkdowns:

- Turbine building, 762-foot North including the motor-driven reactor feed pump (MDRFP) room (Fire Zone T-1h);
- Fuel building, 781-foot East and West (Fire Zone F-1p);
- Control building, 800 and 828-foot level including the main control room and control room heating, ventilation, and air conditioning system (Fire Zones CB-1i and CB-6);
- Auxiliary building, 781-level, Division-1 auxiliary power and cable-spreading room (Fire Zones A-2n, A-2o, and CB-3a);
- Diesel-generator building, 712- and 737-foot level, Division-3 oil storage tank room (Fire Zones, D-4a and -4b);
- Auxiliary building, 707 to 781 foot levels, Division-1 residual heat removal heat exchanger room (Fire Zone A-2b);
- Fuel building, 712-foot level, high pressure core spray room (Fire Zone F-1b) and control building, 762-foot level, Division-3 switchgear room (Fire Zone CB-5a and -5b);
- Auxiliary building, 781-foot level, Division-2 switch gear and cable spreading room (Fire Zones A-3f, -3g and CB-3a); and
- Control building, Division 2 and 3 cable-spreading rooms (Fire Zone CB-1g).

b. Findings

No findings of significance were identified.

.2 Annual Fire Drill Assessment

a. Inspection Scope

The inspectors assessed fire brigade performance and the drill evaluators' critique for an announced fire brigade drill for a simulated fire by the main electro-hydraulic control

system on July 15, 2003. The drill simulated a fire caused by a leak in an external filtration system. The inspectors focused on command and control of the fire brigade activities; fire fighting and communications practices; material condition and use of fire fighting equipment; and implementation of pre-fire plan strategies. The inspectors evaluated the fire brigade performance using the licensee's established fire drill performance criteria. The inspectors verified that minor issues identified during the inspection were entered into the licensee's corrective action program. The documents listed in the Attachment to this report were used by the inspectors to evaluate this area.

The inspectors completed one sample for the annual fire drill requirement by evaluating this fire drill.

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures (71111.06)

a. Inspection Scope

The inspectors verified that flooding mitigation plans and equipment were consistent with the design requirements and risk analysis assumptions. The inspectors reviewed the Updated Final Safety Analysis Report, Section 3.4.1 for internal flooding events and reviewed condition reports and work orders and completed one sample on the following:

- Flood control measures for flooding between emergency core cooling system (ECCS) rooms.

b. Findings

No findings of significance were identified.

1R07 Heat Sink Performance (71111.07A)

a. Inspection Scope

The inspectors reviewed heat exchanger performance testing activities to verify identification of potential deficiencies which could mask degraded performance, to verify potential common-cause heat sink performance problems that have the potential to increase risk, and to verify the identification and resolution of heat-sink performance problems that could result in initiating events or that could affect multiple heat exchangers in mitigating systems and thereby increase risk. The inspectors completed one sample by reviewing the results with several licensee inspections of the Division 1, Division 2 and Division 3, essential switchgear room cooler heat exchangers.

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Requalification (71111.11)

Sections 1R11.1 through 1R11.7 represent completion of one sample for the biennial licensed operator requalification program inspection.

Section 1R11.8 represents completion of one sample for the quarterly testing/training activity inspection.

.1 Facility Operating History

a. Inspection Scope

The inspectors reviewed the plant's operating history from November 2001 through October 2003, to assess whether the Licensed Operator Requalification Training (LORT) program had identified and addressed operator performance deficiencies at the plant.

b. Findings

No findings of significance were identified.

.2 Licensee Requalification Examinations

a. Inspection Scope

The inspectors performed a biennial inspection of the licensee's LORT program. The inspectors reviewed the annual requalification operating test and biennial written examination material to evaluate general quality, construction, and difficulty level. The operating examination material reviewed consisted of five operating tests, each containing two dynamic simulator scenarios and six job performance measures (JPMs). The biennial written examinations reviewed consisted of approximately 40 open reference multiple choice questions. The biennial examinations were conducted in September, October, and November 2003. The inspectors reviewed the methodology for developing the examinations, including the LORT program 2 year sample plan, probabilistic risk assessment insights, previously identified operator performance deficiencies, and plant modifications. The inspectors also reviewed the licensee's program and assessed the level of examination material duplication during the current year annual examinations as compared to the previous year's annual examinations.

b. Findings

No findings of significance were identified.

.3 Licensee Administration of Requalification Examinations

a. Inspection Scope

The inspectors observed the administration of the requalification operating test to assess the licensee's effectiveness in conducting the test and to assess the facility evaluators' ability to determine adequate performance using objective, measurable performance standards. The inspectors evaluated the performance of one shift crew in parallel with the facility evaluators during four dynamic simulator scenarios. In addition, the inspectors observed licensee evaluators administer several JPMs to various licensed crew members. The inspectors observed the training staff personnel administer the operating test, including pre-examination briefings, observations of operator performance, individual and crew evaluations after dynamic scenarios, and the post operating test crew de-brief by the training department evaluators. The inspectors evaluated the ability of the simulator to support the examinations. A specific evaluation of simulator performance was conducted and documented under Section 1R11.7, "Conformance With Simulator Requirements Specified in 10 CFR 55.46," of this report. The inspectors also reviewed the licensee's overall examination security program.

b. Findings

No findings of significance were identified. However, one minor violation was identified by the inspectors during the validation of the dynamic simulator scenarios. The digital recorders used in the simulator had an internal memory that was not completely erased at the end of each validation session. Since personnel not signed on the requalification examination security agreement had access to the simulator, they could have viewed examination material, giving them an unfair advantage on a subsequent dynamic simulator scenario examination. The inspectors believed it highly unlikely that an actual compromise of examination material occurred due to the difficulty of retrieving the information. However, because of the potential for compromise, this was considered a violation of 10 CFR 55.49, "Integrity of examinations and tests." Because the violation is minor it normally would be not documented. However, all violations of examination security are required to be documented. This violation was discovered by station personnel and entered in the station's corrective action program (CR177191, Paperless Recorders Not Being Erased During Simulator Validation). An acceptable method of clearing the memory has been incorporated into the station's examination security procedures.

.4 Licensee Training Feedback System

a. Inspection Scope

The inspectors assessed the methods and effectiveness of the licensee's processes for revising and maintaining its LORT program up to date, including the use of feedback from plant events and industry experience information. The inspectors reviewed the licensee's quality assurance oversight activities, including licensee training department self-assessment reports. The inspectors evaluated the licensee's

ability to assess the effectiveness of its LORT program and their ability to implement appropriate corrective actions.

b. Findings

No findings of significance were identified.

.5 Licensee Remedial Training Program

a. Inspection Scope

The inspectors assessed the adequacy and effectiveness of the remedial training conducted since the previous annual requalification examinations and the training planned for the current examination cycle to ensure that they addressed weaknesses in licensed operator or crew performance identified during training and plant operations. The inspectors reviewed remedial training procedures and individual remedial training plans.

b. Findings

No findings of significance were identified.

.6 Conformance With Operator License Conditions

a. Inspection Scope

The inspectors reviewed the facility and individual operator licensees' conformance with the requirements of 10 CFR Part 55. The inspectors reviewed the facility licensee's program for maintaining active operator licenses and to assess compliance with 10 CFR 55.53 (e) and (f). The inspectors reviewed the procedural guidance and the process for tracking on-shift hours for licensed operators and which control room positions were granted credit for maintaining active operator licenses. In addition, the inspectors reviewed the facility licensee's LORT program to assess compliance with the requalification program requirements as described by 10 CFR 55.59 (c).

b. Findings

No findings of significance were identified.

.7 Conformance With Simulator Requirements Specified in 10 CFR 55.46

a. Inspection Scope

The inspectors assessed the adequacy of the licensee's simulation facility (simulator) for use in operator licensing examinations and for satisfying experience requirements as prescribed in 10 CFR 55.46, "Simulation Facilities." The inspectors also reviewed a sample of simulator performance test records (i.e., transient tests, scenario test and discrepancy resolution validation test), simulator discrepancy and modification records,

and the process for ensuring continued assurance of simulator fidelity in accordance with 10 CFR 55.46. The inspectors reviewed and evaluated the discrepancy process to ensure that simulator fidelity was maintained. Open simulator discrepancies were reviewed for importance relative to the impact on 10 CFR 55.45 and 55.59 operator actions as well as on nuclear and thermal hydraulic operating characteristics. The inspectors conducted interviews with members of the licensee's simulator staff about the configuration control process and completed the IP 71111.11, Appendix C, checklist to evaluate whether or not the licensee's plant-referenced simulator was operating adequately as required by 10 CFR 55.46 (c) and (d).

b. Findings

No findings of significance were identified.

.8 Quarterly Testing/Training Activity

a. Inspection Scope

On September 18, 2003, the inspectors observed a licensed operator annual requalification dynamic examination on the simulator. The inspectors observed scenario ESG-LOR-06-00. This scenario involved a loss of the 'A' unit auxiliary transformer, with a subsequent loss of all condensate, condensate booster, and feedwater pumps, coincident with a stuck open power-operated relief valve. This observation constituted one quarterly sample.

The inspectors reviewed licensed operator requalification training to evaluate operator performance in mitigating the consequences of a simulated event, particularly in the areas of human performance. The inspectors also evaluated crew performance in the areas of:

- communication clarity and formality;
- timely performance of appropriate operator actions including following emergency operating procedures;
- appropriate alarm response;
- proper procedure use and adherence; and
- senior reactor operator oversight, allocation of resources and command and control.

Crew performance in these areas was compared to licensee management expectations and guidelines as presented in the following documents:

- OP-AA-101-111, "Roles and Responsibilities of On-Shift Personnel," Revision 0;
- OP-AA-103-102, "Watchstanding Practices," Revision 2;

- OP-AA-104-101, "Communications," Revision 1; and
- OP-AA-106-101, "Significant Event Reporting," Revision 2

The inspectors also assessed the performance of the training staff evaluators involved in the requalification process. For any weaknesses identified, the inspectors observed the licensee evaluators to verify that they also noted the issues and discussed them in the critique at the end of the session. The inspectors verified all issues were captured in the training program and licensee corrective action process.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness (71111.12Q)

a. Inspection Scope

The inspectors reviewed the effectiveness of the licensee's maintenance efforts in implementing the maintenance rule (MR) requirements, including a review of scoping, goal-setting, performance monitoring, short and long-term corrective actions, and current equipment performance problems. These systems were selected based on their designation as risk significant under the MR, or their being in the increased monitoring (MR category (a) (1)) group. In addition, the inspectors interviewed the system engineers and maintenance rule coordinator. The inspectors also reviewed condition reports and associated documents for appropriate identification of problems, entry into the corrective action system, and appropriateness of planned or completed actions. The documents reviewed are listed at the end of the report. The inspectors completed two samples by reviewing the following:

- Rod control and information system; and
- Drywell cooling (VP) system (system in (a)(1) status and criteria to be considered prior to transfer to (a)(2) status, January 1, 2002 to August 2003).

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessment and Emergent Work Evaluation (71111.13)

a. Inspection Scope

The inspectors observed the licensee's risk assessment processes and considerations used to plan and schedule maintenance activities on safety-related structures, systems, and components particularly to ensure that maintenance risk and emergent work

contingencies had been identified and resolved. The inspectors completed six samples by assessing the effectiveness of risk management activities for the following work activities or work weeks:

- Verification of licensee's action for protecting Division-2 emergency diesel generator (EDG) and ECCS equipment during Division-1 shutdown service water (SX) system 24-hour operability surveillance test;
- Installing Astromed recording monitor following unexpected turbine driven reactor feed pump trouble alarm in main control room;
- Review of troubleshooting and operation contingency plan in response to increased air in-leakage to main condenser;
- Review replacing 345kV-switchyard breaker 4518;
- Review of the risk evaluation for trouble-shooting and attempted repair for main condenser air in-leakage; and
- Risk evaluation for Division-3 EDG and SX outage week including major diesel overhaul.

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations (71111.15)

a. Inspection Scope

The inspectors reviewed the following operability determinations and evaluations affecting mitigating systems to determine whether operability was properly justified and the component or system remained available such that no unrecognized risk increase had occurred.

The inspectors completed eight samples of operability determinations and evaluations as follows:

- Supporting operability documentation (SOD) for CR 157529, "Diesel generator temperature and pressure switches do not have the required procurement qualifications for safety-related applications;"
- SOD for CR 170723, "Oil leak on generator outboard bearing;"
- SOD for CR 170350, "Diesel generator lube oil/filter bypass relief valves do not have the required procurement qualifications for safety-related applications;"
- SOD for CR 146142, "Diesel generator lube oil switches do not have procurement qualifications for safety related applications;"



- SOD for CR 134566, “Shutdown Service Water Pump Room cooling system providing excess cooling;”
- An evaluation of Reactor Core Isolation Cooling system test return valve to reactor core isolation cooling system ST valve over torqued;
- An evaluation of CR 176490 “Chunk of rust found in Diesel Generator Air Start system check valve;” and
- An evaluation of information supporting operability of safety-related motor operated valves actuator mounting bolts with less thread engagement than procedurally required CR 177160.

b. Findings

Introduction: The inspectors identified a violation having potential safety significance greater than minor. This finding resulted from the licensee’s failure to evaluate a potential configuration change in accordance with the licensee’s established configuration control process following the installation of modified mounting bolts in Limatorque SMB-2 actuators. The installed mounting bolts achieved less thread engagement than required by design documentation. This finding is considered an unresolved item (URI) pending a review of licensee’s evaluation of these issues.

Description: On September 23, 2003, while performing preventive maintenance activities on the residual heat removal heat exchanger bypass valve (1E12-F048B), the licensee observed that the motor-operated valve actuator wobbled as maintenance workers manually stroked the valve. The actuator used in this application was a Limatorque SMB-2.

The licensee’s immediate investigation of this issue revealed that the operator mounting bolts were not in contact with the valve body flange, thus allowing the actuator to wobble. Upon further investigation of this issue, the licensee discovered that the operator mounting bolts were bottomed out in the pre-tapped actuator casing bolt holes. The licensee indicated that a search of maintenance records showed that the operator mounting bolts were changed out during a previous two-year preventive maintenance window. This occurred when maintenance personnel noted that the bolts installed then did not meet the minimum requirements of the station’s valve maintenance procedure CPS 8451.05, “Limatorque Operator Removal/Installation.” Appendix I of CPS 8451.04 required those mounting bolts for the Limatorque SMB-2 valve actuator have a minimum thread engagement length of one-inch. The maintenance personnel changed the bolts out to meet the one inch thread engagement criteria; however, during replacement did not recognize that the bolts had bottomed out. Following the identification that 1E12-F048 was wobbly the licensee installed a bolting configuration that securely fastened the actuator to the valve.

The licensee documented that 1E12-F048B was wobbly in condition report 177160. Additionally in this condition report, the licensee documented that a similar incident occurred on the residual heat removal heat exchanger outlet valve (1E12-F003B).

Specifically, during installation of the operator mounting bolts, the bolts bottomed out. However, here the licensee recognized that the bolts had bottomed out and hence modified the bolts such that less than one inch thread engagement was achieved. The condition report also documented that per discussions with the station's engineering staff, 3/4 inch thread engagement for the operator mounting bolts was acceptable. This was based on a review of calculation IP-CL-018, Revision 0, that documents the stresses in the casing threads were only 52 percent of the allowable. As for addressing the operability of this valve in this condition report, the shift manager documented that the valve was operable because engineers had performed an evaluation that showed that 3/4 inch thread engagement was adequate.

The inspectors reviewed calculation IP-CL-018 and noted that the calculation was for a minimum thread engagement of one inch, not 3/4 inch. The licensee stated that based on the margin shown in IP-CL-018, engineering judgement was used to approve 3/4 inch thread engagement. The inspectors noted that Exelon procedure CC-AA-10 "Configuration Control Process Description" stated that a "design input" comprises the criteria, parameters, bases, assumptions and other design requirements upon which detailed final design is based. Exelon Procedure CC-AA-10 also stated that a change to configuration information represented a configuration change. The inspectors concluded that installation of operator mounting bolts that achieved less than the minimum vendor recommended thread engagement and less than the minimum as specified in the licensee's design documentation could represent a change to a critical design input and therefore needed to be evaluated as a potential configuration change. The licensee agreed with the inspectors' conclusion and initiated condition report (CR 178682) documenting this issue. The inspectors considered this issue a performance deficiency.

The inspectors also noted the following issues:

- The licensee's review of the extent of condition was limited to the two identified cases. The inspectors noted that Appendix I of CPS 8451.04 contains instructions regarding all Limatorque actuators used by the licensee in safety-related applications and questioned the licensee regarding the extent of condition scope. The licensee agreed and later identified seven additional valves which could be impacted by this issue. After further discussions, the licensee generated CR 179001 to document the need for a more extensive look at all safety related Limatorque operator mounting bolts.
- By the end of the inspection period, the licensee completed inspection of five of the seven SMB-2 Limatorque actuators used in safety-related systems. These valves were located both divisions of the residual heat removal system. The licensee noted that each of the five actuators had operator mounting bolts which did not meet the previously established minimal thread engagement. The shortest thread engagement length was on the residual heat removal heat exchanger outlet valve (5/8 inch thread engagement). At the end of the inspection period, the licensee was performing an evaluation to assess the

adequacy of 5/8 thread engagement for these types of Limitorque actuators. The completed evaluation is needed to fully assess the significance of the previously discussed performance deficiency.

- The inspectors questioned engineering assumptions made by the licensee in calculation IP-CL-018. For example, the licensee assumed that the bolts effective grip length was equal to the length of the bolts thread engagement. The inspectors concluded that this assumption resulted in a higher than actual joint stiffness factor. This higher than actual joint stiffness factor would result in non-conservative outcome when calculating the remaining joint force as thread engagement is decreased from the one inch minimum requirement. Additionally, in IP-CL-018, the licensee referenced an equation for calculating the grip member's stiffness constant. This equation differed from the equation noted by the inspectors in several references during the inspectors initial evaluation. The difference in the equations represented an approximate 50 percent reduction in the grip member's stiffness constant. This reduction would affect the calculated induced load in the mounting bolt and consequently the shear stress seen on the internal thread of the actuator casing. An assessment of the accuracy of the calculation needs to be completed in order to assess the significance of the previously discussed performance deficiency.
- The inspectors questioned the licensee regarding the past operability of residual heat removal heat exchanger bypass valve (1E12-F048B). For approximately two years, the actuator remained in a condition such that, under design basis seismic loading, the valve's functionality may be questionable. This information is needed to assess the safety significance of the performance deficiency described above.

Analysis: The inspectors considered the licensee failure to properly evaluate a potential configuration change a performance deficiency. The inspectors used IMC 0612, Appendix B, to disposition this issue and determined that it was more than minor because the finding was associated with the Mitigating System crosscutting attribute of Equipment Performance and affected the Mitigating System objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, failure to properly analysis configuration change could lead to degradation in the valve ability to perform appropriately during a design basis accident. This finding was determined to have a potential safety significance greater than minor because that affected valve operators were used in both Division I and Division II low pressure emergency core cooling systems. However, the inspectors were unable to assess the finding in accordance with IMC 0609,"Significance Determination Process" due to the open issues noted above. the complete the significance determination. Therefore, no color is assigned to this finding at this time.

Enforcement: Appendix B, 10 CFR Part 50, Criteria III, stated that design changes, including field changes, shall be subjected to design control measures commensurate with those applied to the original design. Exelon procedure CC-AA-10 "Configuration Control Process Description" stated that a "design input" comprises the criteria,

parameters, bases, assumptions and other design requirements upon which detailed final design is based. Appendix I of CPS 8451.04 required a minimum thread engagement length of one-inch mounting bolts for the Limatorque SMB-2 valve actuator in question. Contrary to the above, about two years ago, following the licensee identification that the operator mounting bolts for several Limatorque SMB-2 did not fit properly, the licensee installed bolts with thread engagement less than the required minimum. This was completed without performing the appropriate level design control review. At the end of the inspection period, the licensee was addressing a number of inspector-identified issues. This issue is considered an unresolved item **(URI 05000461/2003005-01)** pending additional review of the licensee's evaluations and a completed significance determination review.

1R16 Operator Work-Arounds (71111.16)

a. Inspection Scope

The inspectors reviewed an operations work-around with particular focus on the method by which instructions and contingency actions were communicated and reviewed to on-shift licensed operators.

The inspectors completed one sample by reviewing the following:

- operator work around (OWA) -1CP-RCV, "Condensate recycle valve - 3 broken hangers upstream of valve found during polisher operations," WO#489984.

b. Findings

No findings of significance were identified.

1R19 Post Maintenance Testing (71111.19)

a. Inspection Scope

The inspectors reviewed the post maintenance testing activities associated with maintenance or modification of important mitigating, barrier integrity, and support systems that were identified as risk significant in the licensee's risk analysis. The inspectors reviewed these activities to verify that the post maintenance testing was performed adequately, demonstrated that the maintenance was successful, and that operability was restored. During this inspection activity, the inspectors interviewed maintenance and engineering department personnel and reviewed the completed post maintenance testing documentation. The inspectors used the appropriate sections of the TS and USAR, as well as the documents listed in the Attachment, to evaluate this area.

The inspectors completed six samples by observing and evaluating the post-maintenance testing subsequent to the following activities:

- Hydrogen ignitors after ignitor maintenance;

- Division-3 4160 Vac breaker after breaker replacement;
- Control room HVAC (VC) “B” after system outage week;
- Control rod drive hydraulic control unit testing after scram solenoid valve replacement;
- Condensate-booster pump testing after shaft-seal replacement; and
- Control room HVAC testing after VC “A” modulating damper repairs.

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors witnessed selected surveillance testing and/or reviewed test data to verify that the equipment tested using the surveillance procedures met the TS, the ORM, the USAR, and licensee procedural requirements, and demonstrated that the equipment was capable of performing its intended safety functions. The activities were selected based on their importance in verifying mitigating systems capability and barrier integrity. The inspectors used the documents listed in the Attachment to verify that the testing met the frequency requirements; that the tests were conducted in accordance with the procedures, including establishing the proper plant conditions and prerequisites; that the test acceptance criteria were met; and that the results of the tests were properly reviewed and recorded. In addition, the inspectors interviewed operations, maintenance and engineering department personnel regarding the tests and test results.

The inspectors completed eight samples by evaluating the following surveillance tests:

- High pressure core spray operability test;
- Reactor core isolation cooling system valve operability and pump flow quarterly surveillance test;
- Diesel fire pump (DFP) “B” capacity test and operability test;
- Average power range monitor (APRM) channel functional tests;
- Division-2 shutdown service water (SX) quarterly operability test;
- Standby liquid control system, quarterly surveillance test;
- Control room heating, ventilation, and air conditioning (HVAC); and

- Evaluation of the Division-3 EDG monthly for oil leak on generator bearing during monthly operability test.

b. Findings

No findings of significance were identified.

1R23 Temporary Plant Modifications (71111.23)

a. Inspection Scope

The inspectors reviewed the three following temporary modifications to determine whether the safety functions of important safety systems were affected and if the licensee followed their established procedure for temporary modifications CC-AA-112 "Temporary Configuration Changes," Revision 5. The inspectors utilized selected sections of TSs and the USAR and 10CFR50.50 Screening and Review, and Evaluation. The inspectors also interviewed the system engineers.

- EC 341096 - Temporary Modification (TMOD) to eliminate the run back signal to the "B" Reactor Recirculation Flow Control Valve during a loss of feedwater concurrent with a low water level;
- EC 341953 and EC 341754, "Reroute wiring to the A and B Reactor Recirculation Flow Control Valves, Rotary Variable Differential Transformers (RVDT) to compensate for damaged wiring;" and
- Temporary Modification #337100, Raised alarm and trip setpoint for main generator bearing vibrations.

b. Findings

No findings of significance were identified.

4 **OTHER ACTIVITIES (OA)**

4OA1 Performance Indicator Verification (71151)

The inspectors reviewed the licensee's assessment of the performance indicators (PIs) discussed below to determine the accuracy and completeness of the PI data.

**Cornerstone: Mitigating Systems**

a. Inspection Scope

The inspectors sampled the licensee's submittals for performance indicators (Pis) for the periods listed below. The inspectors used PI definitions and guidance contained in Revision 2 of Nuclear Energy Institute Document 99-02, "Regulatory Assessment

Performance Indicator Guideline” to verify the accuracy of the PI data. The following two PIs were reviewed:

- safety system unavailability (SSU) - emergency AC power
- safety system functional failures

The inspectors reviewed selected applicable conditions and data from logs, licensee event reports, and CRs from July 2002 through June 2003 for each PI area specified above. The inspectors independently re-performed calculations where applicable. The inspectors compared that information to the information required per each performance indicator definition in the guideline to ensure that the licensee reported the data accurately.

b. Findings

No findings of significance were identified.

4OA2 Identification and Resolution of Problems (71152)

.1 Routine Review of Identification and Resolution of Problems

a. Inspection Scope

As discussed in previous sections of this report, the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify that they were being entered into the licensee’s corrective action system at an appropriate threshold, that adequate attention was being given to timely corrective actions, and that adverse trends were identified and addressed. Minor issues entered into the licensee’s corrective action system as a result of inspectors’ observations are generally denoted in the report.

The inspectors also reviewed a licensee training department self-assessment report. The licensee’s self-assessment reviewed the licensed operator training program 2 months prior to this inspection activity. The self-assessment was reviewed to ensure that any issues identified during the self-assessment were appropriately evaluated, prioritized, and controlled.

b. Findings

No findings of significance were identified.

.2 Third Quarter-2003 Prompt Investigations and Apparent Cause Evaluations Trend Review (Annual Sample)

a. Inspection Scope

The inspectors reviewed the CRs listed in the Attachment to determine if there was a discernible trend in either the causes or the corrective actions for the CRs. This area was selected as a sample because insights gained would assist in assessing the cross-cutting area of human performance. The review included 11 licensee prompt investigations and apparent cause evaluations initiated from July through September 2003. The reports were reviewed for trends in either the causes or the corrective actions for the CR as well ensuring that the full extent of the issues were identified, an appropriate evaluation was performed, and appropriate corrective actions were specified and prioritized.

b. Findings and Observations

There were no findings identified associated with the 11 reviewed CRs. The inspectors noted that human performance was a contributing factor on 2 of the CRs involving work orders which required a scope change before being implemented. In the first case, the workers had not checked both the E02 and the E03 electrical prints to ensure agreement on wiring details before starting work and had not checked the wiring on a second component for energization before lifting a lead -- causing drop in condensate-booster pump discharge pressure. In the second case, the clearance order had been revised to prevent hanging a clearance tag on a component to be worked on. (The tag would have precluded working on the component.) The personnel that changed the scope of the clearance order did not follow the same rigor as specified for the initial clearance order preparation with the result that some electrical contacts for the computer system would have remained energized. The mistake was caught before anyone signed on to the clearance order. The changes in work scope had created conditions where personnel did not use the same amount of rigor in checks and balances to ensure proper conduct of work. The errors were by different work groups and were attributed to weak human performance attributes in self-checking as contributing causes.

4OA3 Event Follow-up (71153)

On August 14, 2003, following the loss of power grid on East coast, the inspectors responded to the main control room. The inspectors verified that there were no immediate consequences to the facility.

4OA6 Meetings

.1 Exit Meeting

The inspectors presented the inspection results to Mr. K. Polson and other members of licensee management at the conclusion of the inspection on October 9, 2003. The



inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

.2 Interim Exit Meetings

An interim exit meeting was conducted for:

- Biennial Operator Requalification Program Inspection with Mr. K. Polson on October 3, 2003.

**ATTACHMENT: SUPPLEMENTAL INFORMATION**

**SUPPLEMENTAL INFORMATION**

**KEY POINTS OF CONTACT**

Licensee

R. Bement, Site Vice President  
K. Polson, Plant Manager  
M. Baetz, Operations Support/Services Manger  
J. Cunningham, Work Management Director  
R. Davis, Radiation Protection Director  
R. Frantz, Regulatory Assurance Representative  
M. Hiter, Access Control Supervisor  
W. Iliff, Regulatory Assurance Manager  
J. Madden, Nuclear Oversight Manager  
D. Schavey, Operations Director  
R. Schmidt, Maintenance Manager  
J. Sears, Chemistry Manager  
T. Shortell, Training Director  
J. Williams, Site Engineering Director  
C. Williamson, Security Manager  
R. Zacholski, Shift Operations Superintendent

**LIST OF ITEMS OPENED, CLOSED AND DISCUSSED**

Opened

05000461/2003005-01	URI	Thread Engagement of Limitorque Actuator Mounting Bolts less than vendor recommendations.
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Closed

None

Discussed

None

## LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety but rather that selected portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

### 1R01 Adverse Weather

CPS 4302.01 Tornado/High Winds, Revision 17b  
CR 00170491 Tornado Missile Exclusion Area

### 1R04 Equipment Alignments

CPS 3314.01V00;	"Standby Liquid Control Valve Lineup" Procedure; Rev.10
CPS Drawing MO5-1077	"P&ID Standby Liquid Control"; Rev. Z
CPS 3503.01	"Battery and DC Distribution"
CPS 3503.01 E001	"Battery and DC Distribution Electric Lineup"
CPS 3314.01 V001)	"Standby Liquid Control Valve Lineup," Rev. 10
Plant Drawing MO5-1077	"Standby Liquid Control," Rev. Z
Plant Drawing OS-1075	"Residual Heat Removal System," Revision AG
Plant Drawing OS-1078	"Reactor Core Isolation Cooling System," Revision AG
Plant Drawing OS-1102	"Control Room HVAC," Revision 2
CR 00167555	RCIC Interlock Doors Not Working Properly
CR 00176565	NRC Identified Issue - EHC PEPS Skid Gage Over ranged
CR 00177806	Enhancement to ID the RCIC Lube Oil Cooler as "No Step"
CR 00177868	Small Oil Accumulation at RCIC Governor

### 1R05 Fire Protection

Updated Safety Analysis Report (USAR) 9.5.1, "Fire Protection"  
Fire Protection Evaluation Report,  
Fire Protection Safe Shutdown Analysis.

### 1R06 Flood Protection

CPS 4302.01	Tornado/High Winds, Revision 17b
CPS 4303.01	Loss of the Ultimate Heat Sink - Response Strategies, Revision 0a
CPS 4303.02	Abnormal Lake Level, Revision 7
CPS 4304.01	Flooding, Revision 4a

1R07 Heat Sink

GL-8913 Service Water System Problems Affecting Safety-Related Equipment; July 18, 1989  
Illinois Power; Update to Illinois Power Response to GL 89-13 "Service Water System Problems Affecting Safety-Related Equipment"; February 4, 1999  
WO# 00019585 MM Inspect/Clean Chiller Condenser A; April 20, 2001  
WO# 0044733 Inspect/Clean Condenser, Hydrolance Tubes, EDDY; September 17, 2003  
Heat Exchanger Data Acquisition Requirements for GL 89-13 Testing; September 10, 2001  
Heat Exchanger Data Acquisition Requirements for GL 89-13 Testing; June 10, 2003  
Heat Exchanger Data Acquisition Requirements for GL 89-13 Testing; August 25, 2003  
Heat Exchanger Data Acquisition Requirements for GL 89-13 Testing; January 29, 2002  
CR 00173165 Pitting on 1VX06CC Condenser Tubesheet and End Bell

1R11 Licensed Operator Requalification

TQ-AA-105-101 Administrative Process for NRC Licensee and Medical Requirements; Revision 4  
OP-AA-105-102 NRC Active License Maintenance; Revision 3  
TQ-AA-106 Licensed Operator Requalification Training Program Description; Revision 2  
TQ-AA-106-0114 Simulator Demonstration Examination Crew Competency Evaluation Form; Revision 0 (for evaluated crew)  
TQ-AA-106-0113 Simulator Individual Competency Evaluation Form; Revision 0 (for individuals evaluated during the inspection week)  
TQ-AA-106-305 LORT - Examination Development Job Aid; Revision 0  
TQ-AA-201 Examination Security and Administration; Revision 4  
TQ-AA-210-4101 Remedial Training Notification and Action on Failure; Revision 0 (multiple sheets, various operators)  
TQ-AA-210-4102 Performance Review Committee Data Sheet; Revision 0 (multiple sheets, various Committee meetings)  
TQ-AA-210-5102 Trainee Reaction; Revision 0 (multiple sheets, various operators)  
TQ-AA-301 Simulator Configuration Management; Revision 3  
TQ-AA-302 Simulator Testing & Documentation; Revision 3

TQ-AA-303 Controlling Simulator Updates & Thermo-hydraulic Model Updates; Revision 2

Clinton 2003 LORT Self-Assessment Report; dated September 21, 2003

Clinton Power Station 2003 Main Control Room Simulator Certification Report

CR 172126 Incomplete Documentation of JPM Summary Sheets

CR 172132 Opportunities for Improvement

CR 177191 Paperless Recorder Not Being Erased During Simulator Validation

1R12 Maintenance Effectiveness

ER-AA-310 Implementation of maintenance rule, Rev. 2  
ER-AA-310-1005 Maintenance rule - dispositioning between (a) (1) and (a) (2)  
CPS-01 System Health Report - Drywell Cooling HVAC 01; June 03  
Expert Panel Meeting Minutes - March 20, 2002, November 2002, February 20, 2003, and May 22, 2003  
System/Structures Scoping and Performance Criteria, Clinton Power Station (VP)  
Drywell cooling as of August 25, 2003  
CR 153679 Drywell Area Temperatures Exceeded Limits; April 13, 2003  
CR 150288 Unexpected Trip of VP Chiller A; March 22, 2003  
CR 147673 VP A Left In A Non-Operable Condition After Troubleshooting; March 5, 2003  
CR 142536 Unexpected Trip of DW Chiller; February 2, 2003  
CR 139875 VP "A" Failed to Start Due to SX020A Shut; January 17, 2003  
CR 139151 Pre-rotations Vanes Are Frozen Up, Chiller Won't Load; January 13, 2003  
CR 138700 VP "A" Unexpected Trip; January 9, 2003  
CR 130870 Drywell Chiller A Tripped to Off; November 9, 2002  
CR 128559 VP A Chiller Tripped - No Cause Indicated, October 23, 2002  
CR 119608 VP A Chiller Did Not Start; August 16, 2002  
CR 98515 VP Chiller A Tripped On High Compressor Oil Temperature  
CR 99299 VP A Chiller trip during 2700.12 Div. 1 SX flow balance; February 14, 2002  
CR 103665 VP A Pump & Chiller Tripped during 9080.22 sect 8.2; February 11, 2002  
CR 94143 VP A Chiller Trip On Low Refrigerant Temperature; February 7, 2002  
CR 94141 1VP03PB, VP B Chill Water Pump Tripped During Start Up; February 7, 2002  
CR 92565 Trip of VP Chiller on startup; January 27, 2002  
CR 91832 VP A chiller shutdowns during VP B chiller maintenance; January 23, 2002  
CR 91647 Trip of Drywell Cooling Chiller 'A' - 1VP04CA; January 21, 2002  
CR 95425 Failure of the Electrical Demand Controller; January 4, 2002

1R15 Operability Evaluations

FSAR 9.4.5.4 "Shutdown Service Water Pump Room Cooling System"  
MS-01.00 "Equipment Lubrication Standard"  
CR 00174498 Incomplete Response to Operability Evaluation Question 2.1

1R16 Operator work-Arounds

Collective Assessment of the Operations Department Workarounds and Challenges Database

1R19 Post Maintenance Testing

CPS 9367.04 "Hydrogen Ignitor Current/Voltage Test," Revision 26,  
CPS 3515.01 "Operation of 6900/4160/480 V Circuit Breakers," Revision 2c,  
CPS 9070.01 "Control Room HVAC Air Filter Package Operability Test Run,"  
Revision 25c,  
CPS 8523.01 "Scram Pilot Valve Maintenance," Revision 7b,  
CPS 8249.02 "Condensate Booster Pump Maintenance," Revision 11,  
CPS 9070.01 Control Room HVAC Air Filter Package Operability Test Run,"  
Revision 25c,

1R22 Surveillance Testing

CPS 9501.01 "HPCS Pump & HPCS Waterleg Pump Operability, Revision 40d.  
CPS 9054.01 "RCIC High Pressure Operability Check," Revision 42a.  
CPS 9071.01 Diesel Driven Fire Pumps Operability Test," Revision 35d  
CPS 9017.02 Diesel Fire Pump Capacity Checks/Sequential Starting,"  
Revision 34a.  
CPS 9031.02 "APRM Channel Functional (On-Line)," Revision 0c  
CPS 9069.01 "Shutdown Service Water Operability Test," Revision 42c  
CPS 9015.01 "Standby Liquid Control System Operability," Revision 39a  
CPS 9070.01 "Control Room HVAC Air Filter Package Operability Test Run,"  
Revision 25c  
CPS 9080.03 "Diesel Generator 1C Operability -- Manual and Quick Start  
Operability," Revision 26b,  
CR 00166547 LPCS Pump Run for greater than 5 seconds at Shut off Head.  
CR 00169811 NRC Observation-- Air Bubbles in RHR Discharge to  
Suppression Pool.  
CR 00169434 Log Entries when HPCS/RCIC Inoperable.  
CR 00173327 NRC Inspector Questions Concerning Division 3 Diesel  
Generator.  
CR 00173409 Possible Cavitation of Division 3 Diesel Generator Heat  
Exchanger Outlet Valve 1SX006C.  
CR 00174319 Enhancement CR - NRC Comments- MCR Light Appear Dim  
CR 00174792 Operator Training on Channel Bow Impacts  
CR 00169513 Limitation in Surveillance Procedure is Unclear or Incorrect  
CR 00166508 Minimum Flow Valve Failure to Respond

1R23 Temporary Plant Modifications

CC-AA-112 "Temporary Configuration Changes," Revision 5  
CR 00176047 Temporary Fan Inappropriately Stored in Plant  
CR 00175379 Apparent Missing Washer

4OA1 Performance Indicator Verification

Emergency Diesel Run Logs

LS-AA-2040 Attachment 1, Monthly PI Data Elements for Safety System  
Unavailability

Emergency AC Power, July 2002 - June 2003.

CR 00172676 Residual Heat Removal System Unavailability in Action Region  
CR 00178705 RHR C Unavailability Not Identified in MCR Logs

4OA2 Identification and Resolution of Problems

CR 153547 Pipe insulation damage found in 737 heater bay

CR 120180 OVC31YA - VC "A" backdraft damper failed to shut

CR 162300 Determination of why the Operability Evaluation for CR 160302  
did not include the use of ASME Code Case N-513

CR 162505 Scheduled 'HFA Relay' Work Already Performed. Missed  
Opportunities to Credit PM's

CR 154499 Turbine First Stage Pressure Spike

CR 166547 Low Pressure Core Spray (LPCS) operated > 5 seconds at  
shutoff head

CR 159765 Investigation into potential contractor work performance issue  
regarding installation of insulation on the 'B' Reactor  
Recirculation (RR) Flow Control Valve (FCV)

CR 167687 Problems Identified with Spare RR Motor

CR 166068 Nuclear Oversight (NOS) audit of Fire Protection

CR 172006 Inadequate Clearance for 1IA13B Clean and Inspect

CR 168629 Abnormal RPV Level/Loss of Feedwater at Power

## LIST OF ACRONYMS USED

ADAMS	Agency wide Documents Access and Management System
ANSI/ANS	American National Standard Institute/American Nuclear Society
APRM	Average Power Range Monitor
CFR	Code of Federal Regulations
DRS	Division of Reactor Safety
ERAT	Emergency Reserve Auxiliary Transformer
FPER	Fire Protection Evaluation Report
HPCS	High Pressure Core Spray
IMC	Inspection Manual Chapter
IP	Inspection Procedure
JPM	Job Performance Measure
LER	Licensee Event Report
LORT	Licensed Operator Requalification Training
LPCS	Low Pressure Core Spray
MPT	Main Power Transformer
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
OPC	Operational Support Center
PARS	Publicly Available Records
PI	Performance Indicator
PMT	Post Maintenance Testing
RCIC	Reactor Core Isolation Cooling
RCS	Reactor Coolant System
RHR	Residual Heat Removal
RO	Reactor Operator
RT	Reactor Water Cleanup
SDP	Significant Determination Process
SRO	Senior Reactor Operator
SVC	Static VAR Compensator
USAR	Updated Safety Analysis Report
VP	Drywell cooling