



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION I
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February 14, 2008

Mr. Britt McKinney
Senior Vice President and
Chief Nuclear Officer
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769 Salem Boulevard – NUCSB3
Berwick, PA 18603-0467

**SUBJECT: SUSQUEHANNA STEAM ELECTRIC STATION – NRC INTEGRATED
INSPECTION REPORT 05000387/2007005 AND 05000388/2007005**

Dear Mr. McKinney:

On December 31, 2007, the U. S. Nuclear Regulatory Commission (NRC) completed an inspection at your Susquehanna Steam Electric Station Units 1 and 2. The enclosed integrated inspection report presents the inspection results, which were discussed on January 17, 2008, with you and other members of your staff.

This 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.

This report documents two NRC-identified findings of very low safety significance (Green). One of these findings was determined to involve violations of NRC requirements. Additionally, a licensee-identified violation which was determined to be of very low safety significance is listed in this report. However, because of the very low safety significance and because they are entered into your corrective action program, the NRC is treating these findings as non-cited violations (NCVs), consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest any NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington, D.C. 20555-0001; with copies to the Regional Administrator Region I; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at the Susquehanna Steam Electric Station.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any), will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of the NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

/RA/

Paul G. Krohn, Chief
Projects Branch 4
Division of Reactor Projects

Docket Nos. 50-387; 50-388
License Nos. NPF-14, NPF-22

Enclosures: Inspection Report 05000387/2007005 and 05000388/2007005
Attachment: Supplemental Information

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Sincerely,
/RA/
Paul G. Krohn, Chief
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U.S NUCLEAR REGULATORY COMMISSION

REGION I

Docket No: 50-387, 50-388

License No: NPF-14, NPF-22

Report No: 05000387/2007005 and 05000388/2007005

Licensee: PPL Susquehanna, LLC

Facility: Susquehanna Steam Electric Station, Units 1 and 2

Location: Berwick, Pennsylvania

Dates: October 1, 2007 through December 31, 2007

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SUMMARY OF FINDINGS

IR 05000387/2007005, 05000388/2007005; 10/01/2007 – 12/31/2007; Susquehanna Steam Electric Station, Units 1 and 2; Maintenance Effectiveness and ALARA Planning and Controls.

The report covered a 3-month period of inspection by resident inspectors, and announced inspections by regional reactor inspectors and a senior health physicist. Two, Green non-cited violations (NCVs) were identified. The significance of most findings is indicated by their color (Green, White, Yellow, or 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 4, dated December 2006.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Barrier Integrity

- Green. A self-revealing non-cited violation of 10CFR 50 Appendix B, Criterion III, "Design Control," was identified on December 6, 2007, when PPL maintenance personnel found broken pieces of fuel spacer grid assemblies at fuel preparation machines. The damage to fuel assembly spacer assemblies was determined to be from rechanneling activities performed on or before October 20, 2007. The cause of the damaged fuel assemblies was due to the differing exposure histories of fuel channels and fuel bundle spacers not having been adequately analyzed prior to performance of the fuel rechanneling activities. Inspectors determined that the engineering analysis which implemented the allowable applied force limit used in fuel rechanneling procedures had not verified design interfaces, and did not verify the adequacy of design limits. PPL determined that the extent of condition was limited to those rechanneled fuel assemblies re-installed in the Unit 1 or Unit 2 reactors with greater than 25 GigaWatt-Days per Metric Tonne Uranium (GWD/MTU) average exposure.

This finding was more than minor because the finding is related to the Design Control and Human Performance attributes of the barrier integrity cornerstone and negatively impacts the cornerstone objective to provide reasonable assurance that physical design barriers (fuel cladding) protect the public from radio nuclide releases caused by accidents or events. The inspectors completed a Phase 1 significance determination using IMC 0609 Appendix A, Significance Determination Process Phase 1 screening worksheet, and determined the finding to be of Very Low Safety Significance (Green) because the performance issue only degraded the Fuel Cladding Barrier and its associated cornerstone.

This finding is related to a cross-cutting component in the area of Human Performance associated with work practices H.4.(c) because PPL did not ensure supervisory and management oversight of specific work activities, specifically design reviews which supported the fuel rechanneling procedures used from October 2005 through October 2007 and the collective evaluation of 25 condition reports related to rechanneling difficulties. PPL entered this issue into the corrective action program and promptly initiated compensatory measures to

impose fuel thermal limit penalties to assure fuel barrier integrity during reactor operation. (IR12)

Cornerstone: Occupational Radiation Safety

- Green. A self-revealing finding having very low safety significance was identified due to a deficiency in the area of maintaining occupational radiation exposures as low as is reasonably achievable (ALARA). ALARA and work planning for the control room emergency outside air supply system (CREOAS) modification was less than adequate resulting in collective exposure for the work to expand from 3.37 person-rem to 11.9 person-rem.

The performance deficiency that resulted in the exposure overrun was due to significantly increased hours beyond that planned to perform the work. The root cause of the overrun was determined to be: (1) a failure to include contractor work hours in the ALARA planning process; and (2) design errors which did not properly identify bolting locations for the duct work, requiring extensive on-site rework. Susquehanna's three-year rolling average is 101 Person-rem, which is below the SDP criteria of 240 person-rem for Boiling Water Reactors (BWRs), therefore, overall ALARA performance has been effective and this finding is of very low safety significance.

A contributing cause of this finding was related to the Work Control aspect of the Human Performance cross-cutting area because the licensee did not appropriately coordinate work activities by incorporating actions to address the impact of the work on different job activities, and the need for work groups to maintain interfaces with offsite organizations, and communicate, coordinate, and cooperate with each other during activities in which interdepartmental coordination is necessary to assure plant and human performance. (H.3b) (Section 2OS2)

B. Licensee Identified Violations

Violations of very low safety significance, which were identified by PPL have been reviewed by the inspectors. Corrective actions taken or planned by PPL have been entered into PPL's corrective action program. These violations and corrective actions tracking numbers are listed in Section 4OA7 of this report.

REPORT DETAILS

Summary of Plant Status

Susquehanna Steam Electric Station (SSES) Unit 1 began the inspection period at full rated thermal power. The Unit 1 reactor was shutdown on October 12, 2007, for a maintenance and fuel assembly rechanneling outage. The unit was restarted on October 29, 2007, and reached full power operation on November 2, 2007. With the exception of brief power reductions to perform control rod pattern adjustments the unit operated at full power for the remainder of the inspection period.

Unit 2 began the inspection period with the reactor at full rated thermal power and with the exception of brief power reductions to perform control rod pattern adjustments, the reactor operated at full rated power for the remainder of the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01 – 2 Samples)

.1 Adverse Weather – Readiness for Seasonal Susceptibilitiesa. Inspection Scope

During the week of November 8, 2007, the inspectors reviewed system operations during extreme cold weather. Plant walkdowns for selected structures, systems, and components (SSCs) were performed to determine the adequacy of PPL's weather protection features. Inspectors reviewed operator actions to address failures of equipment due to freezing and compensatory actions during adverse cold weather conditions. The inspectors also reviewed and evaluated plant conditions resulting from cold weather and reviewed considerations in PPL's Maintenance Rule station risk assessment. Additional documents that were reviewed are listed in the attachment. The readiness of the following system was reviewed.

- Units 1 and 2, cold weather preparation, ultimate heat sink systems.

b. Findings

No findings of significance were identified.

.2 Adverse Weather – Impending Adverse Weather Conditionsa. Inspection Scope

On December 15, 2007, during the onset of a snow and ice storm with high winds, the inspectors reviewed PPL's preparations/protection for selected risk significant SSCs exposed to the adverse outdoor conditions. The inspection focused on verifying the design features and implementation of PPL's procedures to protect the mitigating systems from adverse weather effects such that the SSCs remained operable. This

included review of open work items on heat trace and other freeze protection measures, plant walkdowns of the selected SSCs, and reviews of the Final Safety Analysis Report (FSAR), Technical Specifications (TS), and plant documents for the selected SSCs. The following outdoor systems were reviewed: condensate storage tanks, fire system valves, emergency safeguards, 4KV transformers, station blackout, diesel and offsite power transformers T-10 and T-20.

b. Findings

No findings of significance were identified.

1R04 Equipment Alignment (71111.04 – 4 Samples)

.1 Partial Walkdown

a. Inspection Scope

The inspectors performed partial walkdowns to verify system and component alignment and to identify any discrepancies that would impact system operability. The inspectors verified that selected portions of redundant or backup systems or trains were available while certain system components were out of service. The inspectors reviewed selected valve positions, electrical power availability, and the general condition of major system components. The walkdowns included the following systems:

- Unit 1, RHR Division I during a Division II scheduled outage window;
- Unit 2, control rod drive system during hydraulic control unit maintenance; and
- Units 1 and 2, high pressure coolant injection (HPCI) heat tracing during testing.

.2 Complete Walkdown

a. Inspection Scope

The inspectors conducted a detailed review of the alignment and condition of the Unit 1 Reactor Core Isolation Cooling System (RCIC). The inspectors reviewed operator rounds, check-off lists, system operating procedures, and system piping and instrumentation diagrams. The inspectors evaluated ongoing maintenance and outstanding condition reports associated with the RCIC system to determine the effect on system health and reliability. The walkdown included the following system:

- Unit 1, reactor core isolation cooling.

b. Findings

No findings of significance were identified.

1R05 Fire Protection (71111.05 – 9 Samples)

.1 Fire Protection – Tours

a. Inspection Scope

The inspectors reviewed PPL's fire protection program to evaluate the required fire protection design features, fire area boundaries, and combustible loading requirements for selected areas. The inspectors walked down those areas to assess PPL's control of transient combustible material and ignition sources, fire detection and suppression capabilities, fire barriers, and any related compensatory measures to assess PPL's fire protection program in those areas. The inspected areas included:

- Unit 1, upper relay room, elevation 754', fire zone 0-27E (C-501) area 12, during halon impairment;
- Unit 1, main condenser bay, elevation 656', fire zone 1-31D;
- Unit 1, reactor core isolation cooling room, elevation 645', fire zone 1-D;
- Unit 1, high pressure coolant injection room, elevation 645', fire zone 1-1C;
- Unit 2, lower relay room, elevation 698', fire zone 0-24G, elevation 698'0" (C-201) area 21;
- Unit 2, equipment and battery rooms, control structure, elevation 771', fire zones 0-28A-1, 0-28 F, D, T, G, E, C, 0-28 A-1;
- Unit 2, upper relay room, fire zone 0-27A, elevation 754'0" (C-502) area 21;
- Unit 2, upper cable spreading room, fire zone 27B, elevation 754'0" (C-507), area 21; and
- Unit 2, lower cable spreading room, fire zone 0-25A, elevation 714'0" (C-301), area 21.

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures (71111.06 – 1 Sample)

.1 Internal Flooding

a. Inspection Scope

The inspectors reviewed documents, interviewed plant personnel, and walked down SSCs to evaluate the adequacy of PPL's internal flood protection measures. The inspection focused on verifying that PPL's flooding mitigation plans and equipment were consistent with the design requirements and risk analysis assumptions. The material condition of credited components such as watertight plugs, floor drains, flood detection equipment and alarms were also assessed to determine whether the components were capable of performing their intended function. The inspectors also verified that adequate procedures were in place to identify and respond to floods. The following risk significant area was reviewed:

- Unit 2, high pressure coolant injection (HPCI) room

b. Findings

No findings of significance were identified.

1R07 Heat Sink Performance (71111.07A – 1 Sample)

a. Inspection Scope

The inspectors reviewed PPL's programs for maintenance, testing, and monitoring of risk significant heat exchangers (HXs) to determine whether potential HX deficiencies could mask degraded performance, and to assess the capability of the HXs to perform their design functions. The inspectors assessed whether Susquehanna's HX programs conformed to PPL's commitments to NRC Generic Letter 89-13, "Service Water (SW) System Problems Affecting Safety-Related Equipment." In addition, the inspectors evaluated whether any potential common cause heat sink performance problems could affect multiple HXs in mitigating systems or result in an initiating event. Based on risk significance and prior inspection history, the following HXs were selected:

- Unit 1, reactor core isolation cooling (RCIC) system lube oil cooler, IE21.

The inspectors assessed the external condition of the HXs in the field; reviewed the most recent eddy current data results; inspection and cleaning work results; and reviewed the applicable system health reports to confirm that results were acceptable and that design basis assumptions for flow rate, plugged tube percentage, and heat transfer capability had been met.

Inspectors reviewed the chemical treatment programs for the spray pond (emergency service water (ESW) ultimate heat sink) and the cooling tower basin (SW heat sink) to verify that potential bio-fouling mechanisms were being addressed, including on-going treatment and monitoring as specified in the chemistry manual. The review included discussions with chemistry personnel and the ESW and SW system engineer.

The inspectors reviewed a sample of condition reports (CRs) related to the selected HXs and SW system, to verify that PPL was appropriately identifying, characterizing, and correcting problems related to these systems and components. Documents reviewed during the inspection are listed in the Attachment.

b. Findings

No findings of significance were identified

1R11 Licensed Operator Requalification Program (71111.11 – 1 Sample)

a. Inspection Scope

On December 21, 2007, the inspectors observed licensed operator simulator training during routine operator requalification training. The inspectors compared their observations to TSs, emergency plan implementation, and the use of system operating procedures. The inspectors also evaluated PPL's critique of the operators' performance to identify discrepancies and deficiencies in operator training. The following training was observed:

- An operating crew simulator scenario that included a simulated failure of the reactor to scram, trip of both control rod drive pumps, trip of the "A" standby liquid control pump, and the inadvertent closure of the main steam isolation valves. The scenario included the proper emergency plan Site Area Emergency event classification.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness (71111.12 – 1 Sample)

a. Inspection Scope

The inspectors evaluated PPL's work practices and follow-up corrective actions for selected SSC issues to assess the effectiveness of PPL's maintenance activities. The inspectors reviewed the performance history of those SSCs and assessed PPL's extent of condition determinations for these issues with potential common cause or generic implications to evaluate the adequacy of PPL's corrective actions. The inspectors reviewed PPL's problem identification and resolution actions for these issues to evaluate whether PPL had appropriately monitored, evaluated, and dispositioned the issues in accordance with PPL procedures and the requirements of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance." In addition, the inspectors reviewed selected SSC classification, performance criteria and goals, and PPL's corrective actions that were taken or planned, to verify whether the actions were reasonable and appropriate. This review included the associated system design basis, including the Final Safety Analysis Report (FSAR), the Core Operating Limits Report, and previous documented issues with fuel rechanneling activities. In addition, the inspectors performed field walkdowns and interviewed PPL staff to verify whether the identified actions were appropriate to correct the extent of condition for identified performance issues. The following issue was reviewed:

- Units 1 and 2, rechanneling of fuel assemblies; maintenance procedures and effectiveness of quality controls.

b. Findings

Introduction: A Green self-revealing NCV of 10 CFR Appendix B, Criterion III, "Design Control," was identified on December 6, 2007, when PPL maintenance personnel working on the refuel floor identified foreign material at a fuel preparation machine. The foreign material was visually identified to be the outer portions of fuel spacer grid assemblies. As part of the extent of condition investigation, additional spacer grid pieces were found at two other fuel preparation machines within the spent fuel pool (SFP). This failure of plant equipment was promptly entered into the PPL corrective action program and determined to be a Significant Condition Adverse to Quality.

Description: On December 6, 2007, PPL retrieved the identified fuel spacer pieces from three fuel preparation machines and placed them in a container within the SFP. As part of the investigation into this failure of plant equipment, fuel assembly F21-694 was inspected on December 8, 2007. When de-channeling fuel assembly F21-694 similar debris was observed falling from the fuel assembly after the channel was raised above the lowest spacer position. PPL visually verified that the debris was not from the lowest spacer and, therefore, concluded that the spacer pieces came from a higher axial location on this fuel bundle. Due to lack of foreign material exclusion (FME) controls to capture additional debris, the channel was re-seated on the fuel assembly and inspection of this assembly was suspended. PPL selected a set of 10 additional fuel assemblies that were expected to provide information regarding extent of condition.

PPL could not de-channel two of these fuel assemblies and the additional inspections of eight of these fuel assemblies found no additional spacer debris and found no damaged spacer locations to correspond with the broken spacer pieces retrieved from the fuel preparation machines.

The PPL root cause team identified that the fuel spacer material was most likely from rechanneling activities performed during the Unit 1 October 2007 fuel rechanneling outage. Since no fuel spacer damage sites were located, PPL was unable to visually confirm the identity or the number of fuel assemblies with spacer damage. The rechanneling activities which damaged fuel spacers occurred on or before October 20, 2007, and the fuel spacer pieces were discovered on December 6, 2007, which was greater than or equal to 47 days after the fuel spacers were damaged during a maintenance activity.

Following a review of procedure controls and interviews with PPL staff, inspectors concluded that the engineering analysis which supported the implemented design control measures in the fuel rechanneling procedures (Procedure OP-ORF-007) had not verified design interfaces, and did not verify the adequacy of design limits. This characterization of the performance issue aligns with PPL's identified root cause of an analysis deficiency (calculations: stress, hydraulic, thermal, electrical, other). PPL determined that a design deficiency allowed a rechanneling force limit of 250 pounds, even though applying that amount of force could damage a fuel spacer when there is interference with a fuel channel. The PPL root cause stated that "prior to installing new channels on exposed fuel bundles, the effect of differing exposure histories of the channels and fuel bundle spacers had not been adequately analyzed."

Based on the rate of spacer growth as a function of fuel burn-up, PPL determined that the extent of condition was limited to those fuel assemblies rechanneled and reinstalled in Unit 1 and Unit 2 reactors with greater than 25 GWD/MWT average exposure. As such, the missing or damaged spacer plates, which assure turbulent flow between the outer fuel pins and the inner wall of the fuel channel, were evaluated with regard to the impact on linear heat generation rate (LHGR) and critical power performance of the fuel which is installed in both the Unit 1 and Unit 2 reactors. Since a fuel assembly is required to not fail during normal operation and anticipated operational occurrences, the damaged fuel spacer plates caused the core thermal operating limits to be in question.

Based on all the information available, PPL implemented the following three compensatory measures to assure fuel barrier integrity:

- a fuel thermal limit penalty was applied which reduced the maximum fraction of limiting critical power ratio (MFLCPR) to less than or equal to 0.84 for rechanneled fuel;
- a fuel thermal limit penalty was applied which reduced the ratio of the maximum linear heat generation rate (fraction design limit ratio – FDLRX) to less than or equal to 0.92 for re-channeled fuel; and
- the function of the reactor recirculation pump high flow electrical and mechanical stops (non-safety related) were credited in the analysis.

The inspectors determined that the inadequate design control over fuel rechanneling efforts which resulted in fuel spacer damage at Susquehanna constituted a performance deficiency and a finding.

Analysis: This finding was more than more in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, because the finding is related to the Design Control and Human Performance attributes of the barrier integrity cornerstone and negatively impacts the cornerstone objective to provide reasonable assurance that physical design barriers (fuel cladding) protect the public from radio nuclide releases caused by accidents or events.

The inspectors completed a Phase 1 significance determination using IMC 0609, "Significance Determination Process," using IMC 0609 Appendix A, SDP Phase 1 screening worksheet. The inspectors determined the finding to be of very low safety significance (Green) because the performance issue only degraded the fuel cladding barrier and its associated cornerstone.

Regarding design reviews, PPL was aware of the potential for fuel bundle spacer interferences with fuel channels and implemented procedure changes to address rechanneling difficulties and provide controls on the amount of force applied during rechanneling activities. Inspectors found that the original vendor engineering source document for the 250 pound force limit utilized during rechanneling was based on an design limit of 500 pounds for a spacer side plate (no design reference provided) and this value was divided by 2 to address possible embrittlement and loss of strength due to irradiation (fuel burnup or exposure) without a detailed evaluation of the suitability of this factor for the specific conditions at Susquehanna. The design margin between the maintenance limit and the actual design limit was not determined during the design review process. PPL's acceptance of the fuel vendor's force limit without a site specific evaluation as the engineering basis was a missed opportunity to verify that design reviews and design control measures were adequate for the rechanneling of fuel at Susquehanna.

In addition, there were ten corrective action items initiated during the rechanneling activities in 2005 and 2006 related to difficulties in removing or installing fuel channels from fuel and an additional fifteen condition reports written during the Unit 1 October 2007 outage that documented fuel bundles that could not be rechanneled. This corrective action history provided an opportunity for management to revisit actual design margins and initiate some additional measures to assure significant conditions adverse to quality, associated with the rechanneling effort would be promptly identified.

Enforcement: Appendix B of 10 CFR 50, Criterion III, "Design Control," states, in part, that: "Measures shall be established for the selection and review for the suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions of systems, structures and components. Design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design." Contrary to these requirements, on or before October 20, 2007, PPL installed new fuel channels on exposed fuel bundles, without the effects of differing operating and irradiation exposure histories of the bundle spacers and channels being properly addressed as part of a detailed design review. Because this violation is of very low safety significance and entered into the Corrective Action system (CR 935833), it is being treated as a non-cited violation consistent with section

VI.A. of the NRC enforcement policy. (NCV 050000387, 388/2007005-01, "Inadequate Design Control to Support Fuel Rechanneling Activities")

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 6 Samples)

a. Inspection Scope

The inspectors reviewed the assessment and management of selected maintenance activities to evaluate the effectiveness of PPL's risk management for planned and emergent work. The inspectors compared the risk assessments and risk management actions to the requirements of 10 CFR Part 50.65(a)(4) and the recommendations of NUMARC 93-01, Section 11, "Assessment of Risk Resulting from Performance of Maintenance Activities." The inspectors evaluated the selected activities to determine whether risk assessments were performed when required and appropriate risk management actions were identified.

The inspectors reviewed scheduled and emergent work activities with licensed operators and work-coordination personnel to evaluate whether risk management action threshold levels were correctly identified. In addition, the inspectors compared the assessed risk configuration to the actual plant conditions and any in-progress evolutions or external events to evaluate whether the assessment was accurate, complete, and appropriate for the emergent work activities. The inspectors performed control room and field walkdowns to verify whether the compensatory measures identified by the risk assessments were appropriately performed. The selected maintenance activities included:

- Unit 1, source range monitor upscale/inoperable and rod block alarm did not prevent rod motion during mode 5 (core alterations), CR 914006;
- Unit 1, equipment-out-of-service risk calculation for "C" RHR pump, "B" soluble liquid boron control injection valve and "E" EDG unavailable;
- Unit 1 standby liquid control (SLC) heat trace turned off on the "A" SLC pump suction pipe;
- Unit 1, fuel spacer finger springs found on the fuel prep machines, AR 935833;
- Unit 1, power range neutron monitoring system implementation, bypass mode selector switch on October 16, 2007; and
- Common, plant risk during station blackout (SBO) maintenance.

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations (71111.15 – 4 Samples)

a. Inspection Scope

The inspectors reviewed operability determinations that were selected based on risk insights, to assess the adequacy of the evaluations, the use and control of compensatory measures, and compliance with the TSs. In addition, the inspectors reviewed the selected operability determinations to verify whether the determinations were performed in accordance with NDAP-QA-0703, "Operability Assessments." The inspectors used the TSs, Technical Requirements Manual, Final Safety Analysis Report

(FSAR), and associated Design Basis Documents as references during these reviews. The issues reviewed included:

- Units 1 and 2, error in critical power correlations, Part 21 – error in power prediction for partial length fuel rods, CR 900301;
- Unit 1, reactor water cleanup (RWCU) isolation on differential flow during cool down, AR 910150 and 911162;
- Unit 1, chemistry technician de-energized the Unit 1 containment radiation monitor (CRM) instead of the Unit 2 CRM, CR 918927; and
- Unit 1 reactor fuel spacer sections found on the fuel prep machines, AR 935833, Revision 0.

b. Findings

No findings of significance were identified.

1R19 Post-Maintenance Testing (71111.19 – 5 Samples)

a. Inspection Scope

The inspectors observed portions of post-maintenance testing activities in the field to determine whether the tests were performed in accordance with the approved procedures. The inspectors assessed the test adequacy by comparing the test methodology to the scope of maintenance work performed. In addition, the inspectors evaluated acceptance criteria to determine whether the test demonstrated that components satisfied the applicable design and licensing bases and TS requirements. The inspectors reviewed the recorded test data to determine whether the acceptance criteria were satisfied. The post-maintenance testing activities reviewed included:

- Unit 1, core spray valve F015A dynamic motor-operated valve (MOV) testing following stem nut replacement, CR 907518;
- Unit 1, HV15768 loss-of-coolant-accident isolation testing following relay replacement, AR 906719;
- Unit 1, HPCI quarterly flow verification after maintenance, SO-152-002;
- Unit 1, CRD stroke timing adjustments, TP-055-015; and
- Unit 2, (2D673) testing of battery charger following failure and loaded 24V battery for >6 hours.

b. Findings

No findings of significance were identified.

1R20 Refueling and Other Outage Activities

a. Inspection Scope

The inspectors reviewed the outage risk management plan for the Unit 1 outage for fuel assembly rechanneling, conducted from October 12, 2007 to October 29, 2007, to confirm that PPL had appropriately considered risk, industry experience, and previous site-specific problems in developing and implementing a plan that assured defense-in-depth barriers. Inspectors observed the reactor shutdown including the control rods

which were slow to settle and the associated control rod inoperabilities as described in Event Notification 43722 and Condition Report 918927. During the rechanneling outage, the inspector observed or reviewed the outage activities listed below.

- Establishment of a reactor vessel cool down rate;
- Establishment of shutdown cooling using the 'A' residual heat removal system;
- Outage configuration controls including:
 - 1) availability and accuracy of reactor coolant system instrumentation;
 - 2) availability of nuclear instrumentation;
 - 3) electrical power alignments;
 - 4) decay heat removal system operation;
 - 5) availability of reactor inventory makeup water systems; and
 - 6) secondary containment controls and integrity.
- Drywell walkdown after shutdown and prior to final closeout;
- Fuel bundle rechanneling work on the refueling floor; and
- Core verification, and reactor startup, control rod scram time tests, and reactor power increases before and after placing the turbine generator online.

In addition to the above, inspectors performed an inspection sample as recommended by Operating Experience Smart Sample (OpESS) FY2007-03, "Crane and Heavy Lift Inspection, Supplemental Guidance for IP-71111.20." Inspectors verified the applicable requirements related to heavy load lifts and crane inspections. Inspectors witnessed heavy load lifts and verified the procedures enforced safety and were in agreement with PPL's prior commitments.

During the conduct of the maintenance outage activities, the inspectors reviewed the associated documentation to ensure that the tasks were performed in accordance with plant TS requirements and operating procedures. Documents reviewed are listed in the attachment to this report.

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing (71111.22 – 5 Samples)

a. Inspection Scope

The inspectors observed portions of selected surveillance test activities in the control room and in the field and reviewed test data results. The inspectors compared the test results to the established acceptance criteria and the applicable TS or Technical Requirements Manual operability and surveillance requirements to evaluate whether the systems were capable of performing their intended safety functions. The observed or reviewed surveillance tests included:

- Unit 1, scram time measurement of control rods, SR-155-004;
- Unit 1, RCIC flow surveillance following rechannel outage at 955 pounds RCS pressure;
- Unit 2, compliance with SR 3.6.2.1.1 suppression pool temperature, SO-200-001;
- Unit 2, Containment Radiation Monitor monthly functional test, SC-273-102; and
- Station portable diesel generator unloaded run, OP-002-001.

b. Findings

No findings of significance were identified.

1R23 Temporary Plant Modifications (71111.23 – 2 Samples)

a. Inspection Scope

The inspectors reviewed a temporary plant modification to determine whether the temporary change adversely affected system or support system availability, or adversely affected a function important to plant safety. The inspectors reviewed the associated system design bases, including the FSAR, TSs, and assessed the adequacy of the safety determination screenings and evaluations. The inspectors also assessed configuration control of the temporary changes by reviewing selected drawings and procedures to verify that appropriate revisions had been made. The inspectors compared the actual installations to the temporary modification documents to determine whether the implemented changes were consistent with the approved documents. The inspectors reviewed selected post-installation test results to determine whether the actual impact of the temporary changes had been adequately demonstrated by the test. The following temporary modifications were reviewed:

- Station control structure chiller OK112B hi bearing temperature trip elimination; and
- Station ESW pump house gagged Division 2 dampers and temporary space heater.

b. Findings

No findings of significance were identified.

1EP6 Drill Evaluation (71114.06 - 1 Sample)

a. Inspection Scope

The inspectors reviewed the combined functional drill scenario (2007 Blue Team HP Drill) that was conducted on November 13, 2007, and observed selected portions of the drill at the simulator control room and technical support center. The inspection focused on PPL's ability to properly conduct EAL classification, notification, and protective action recommendation activities and on the evaluators' ability to identify observed weaknesses and/or deficiencies within these areas. Eight performance indicator (PI) opportunities were included in the scenario. The inspectors attended the evaluators' post-drill critique and compared identified weaknesses and deficiencies against those identified by PPL to determine whether PPL was properly identifying failures in these areas.

b. Findings

No findings of significance were identified.

2. RADIATION SAFETY

Cornerstone: Occupational Radiation Safety

2OS1 Access Control to Radiologically Significant Areas (71121.01 – 6 Samples)

a. Inspection Scope

The inspectors reviewed licensee activities during the Unit 1 mid-cycle fuel channel replacement outage. Particular attention was focused on the licensee's use and control of contractor personnel to perform work around irradiated components in locked high and very high radiation areas. Activities observed included fuel channel removal and valve work and repair.

The inspectors reviewed the licensee's self-assessments, audits, Licensee Event Reports, and Special Reports related to the access control program since the last inspection. The inspectors determined whether identified problems were entered into the corrective action program for resolution.

The inspectors reviewed radiological problem reports since the last inspection which found that the cause of the event was due to radiation worker errors. The inspectors determined if there was an observable pattern traceable to a similar cause. The inspectors determined if this perspective matched the corrective action approach taken by the licensee to resolve the reported problems. The inspector discussed with the radiation protection manager any problems with the correction actions planned or taken. The inspectors verified adequate posting and locking of entrances to high dose rate - high radiation areas, and very high radiation areas.

The inspectors reviewed radiological problem reports since the last inspection that found the cause of the event was radiation protection technician error. The inspectors determined if there was an observable pattern traceable to a similar cause. The inspector determined if this perspective matched the corrective action approach taken by the licensee to resolve the reported problems.

b. Findings

No findings of significance were identified.

2OS2 ALARA Planning and Controls (71121.02 – 3 Samples)

a. Inspection Scope

The inspectors reviewed the assumptions and basis for the current annual collective exposure estimate. The inspectors reviewed applicable procedures to determine the methodology for estimating work activity-specific exposures and the intended dose outcome.

The inspectors determined if there had been any declared pregnant workers during the current assessment period. The inspectors reviewed the exposure results and monitoring controls employed by the licensee with respect to requirements of 10 CFR 20.

The inspectors observed and reviewed outage work activities associated with the Unit 1 fuel rechanneling, radwaste filter work, drywell activities, turbine/condenser valve work and the Control Room Emergency Outside Air Supply System (CREOAS) activities.

b. Findings

Introduction: A self-revealing finding having very low safety significance (Green) was identified due to a deficiency in the area of maintaining occupational radiation exposures as low as is reasonably achievable (ALARA). ALARA and work planning for the CREOAS modification was less than adequate resulting in collective exposure for the work to expand from 3.37 person-rem to 11.9 person-rem.

Description: Collective exposure during the CREOAS work during the summer of 2007 significantly exceeded its initial estimate. The performance deficiency that resulted in the exposure overrun was due to significantly increased hours beyond that planned to perform the work. The root cause of the overrun was determined to be: (1) a failure to include contractor work hours in the ALARA planning process; and (2) design errors which did not properly identify bolting locations for the duct work, requiring extensive on-site rework. Susquehanna's three-year rolling average is 101 Person-rem, which is below the SDP criteria of 240 person-rem for Boiling Water Reactors (BWRs), therefore, overall ALARA performance has been effective and this finding is of very low safety significance (Green). The licensee has documented this issue in condition report 886817.

Analysis: The occupational radiation safety significance determination defines a performance deficiency as one in which the licensee fails to meet a standard and the cause was reasonably within the licensee's ability to foresee or correct. The person-hours required for this work would have been significantly lower had the installation plan for the modification correctly identified mounting locations. Further, the ALARA planning for this work should have identified the significant number of hours being worked by contractor personnel. The finding is associated with the ALARA planning attribute of the radiation safety cornerstone, and affects the objective of providing adequate protection of the worker from exposure to radiation. Susquehanna's three-year-rolling-average is 101 person-rem, which is below the SDP criteria of 240 person-rem for BWRs, therefore, this finding is of very low safety significance.

Enforcement: Traditional enforcement is not applicable since these matters did not have an actual safety consequence, or the potential for impacting the NRC's ability to perform its regulatory function. As aggregated, these matters are considered more than minor since each issue is comparable to a more than minor ALARA example described in IMC 0612, Appendix E. While no significant exposure was received by any one of the affected workers, the Significance Determination Process applies because the occurrence involved collective dose that resulted from the licensee's inability to properly plan and control work during a refueling outage (ALARA planning example of the Program and Process attribute). The finding was determined to be of low safety significance (Green) because it did not involve issues involving access to radiologically significant areas; did not result in, nor was there a substantial potential for, an overexposure; and the licensee's ability to assess dose was not compromised. The finding was entered into the licensee's corrective action program. The finding is

associated with the ALARA planning attribute of the radiation safety cornerstone, and affects the objective of providing adequate protection of the worker from exposure to radiation.

The ALARA rule contained in 10 CFR 20.1101(b) Statements of Consideration indicates that compliance with the ALARA requirement will be judged on whether the licensee has incorporated measures to track and, if necessary, to reduce exposures and not whether exposures and doses represent an absolute minimum or whether the licensee has used all possible methods to reduce exposures. The overall exposure performance of the nuclear power plant is used to determine compliance with the ALARA rule. Since Susquehanna is below the three-year-rolling-average of 240 person-rem, no violation of regulatory requirements [10CFR20.1101(b)] has occurred. **(FIN 05000387/2007005-02, 05000388/2007005-02, Failure to Maintain Occupational Radiation Exposure As Low As Reasonably Achievable During CREOAS Work)**

2OS3 Radiation Monitoring Instrumentation and Protective Equipment (71121.03 – 4 Samples)

a. Inspection Scope

The inspectors verified the calibration, operability, and alarm setpoints of several types of instruments and equipment. Verification methods included review of calibration documentation, and observation of licensee source check or calibrator exposed readings. The inspectors determined what actions were taken when, during calibration or source checks, an instrument is found significantly out of calibration (>50%). The inspectors determined possible consequences of instrument use since last successful calibration or source check. The inspectors determined if out of calibration results were entered into the corrective action program.

For repetitive deficiencies or significant individual deficiencies in problem identification and resolution identified above, the inspectors determined if the licensee's self-assessment activities were also identifying and addressing these deficiencies. No issues of this type were identified by the inspectors.

Based on FSAR, TSs and Emergency Operating Procedures requirements, the inspectors reviewed the status and surveillance records of self-contained breathing apparatus (SCBAs) staged and ready for use in the plant. The inspectors reviewed the licensee's capability for refilling and transporting SCBA air bottles to and from the control room and operations support center during emergency conditions. The inspectors determined if control room operators and other emergency response and radiation protection personnel were trained and qualified in the use of SCBA (including personal bottle change-out). The inspectors determined if personnel assigned to refill bottles were trained and qualified for that task.

The inspectors reviewed the qualification documentation for onsite personnel designated to perform maintenance on the vendor-designated vital components, and the vital component maintenance records for three SCBA units currently designated as "ready for service." For the same three units, the inspectors ensured that the required, periodic air cylinder hydrostatic testing was documented and up to date, and the Department of Transportation required retest air cylinder markings were in place.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (71151 – 19 Samples)

a. Inspection Scope

The inspectors reviewed PPL's performance indicator (PI) data, for the period of December 2006 through November 2007, to verify whether the PI data was accurate and complete. The inspectors examined selected samples of PI data, PI data summary reports, and plant records. The inspectors compared the PI data against the guidance contained in Nuclear Energy Institute (NEI) 99-02, "Regulatory Assessment Performance Indicator Guideline." The following performance indicators were included in this review:

Initiating Event Performance Indicators

- Units 1 and 2 scrams with complications.

Mitigating Systems Performance Indicators (MSPI)

- Units 1 and 2 safety system functional failures;
- Units 1 and 2 MSPI index – emergency AC power systems;
- Units 1 and 2 MSPI index – high pressure injection systems;
- Units 1 and 2 MSPI index – heat removal systems;
- Units 1 and 2 MSPI index – residual heat removal systems; and
- Units 1 and 2 MSPI index – cooling water systems.

b. Findings

No findings of significance were identified.

Cornerstone: Physical Protection

a. Inspection Scope

The inspector performed a review of PI data submitted by the licensee for the Physical Protection Cornerstone. The review was conducted of the licensee's programs for gathering, processing, evaluating, and submitting data for the Fitness-for-Duty, Personnel Screening, and Protected Area Security Equipment PIs. The inspector verified that the PIs had been properly reported as specified in Nuclear Energy Institute (NEI) 99-02, Regulatory Assessment Performance Indicator Guideline, Revision 5. The review included the licensee's tracking and trending reports, personnel interviews and security event reports for the PI data collected since the last security baseline inspection. The inspector noted from the licensee's submittal that there were no reported failures to properly implement the requirements of 10 CFR 73 and 10 CFR 26 during the reporting period. This inspection activity represents the completion of three

(3) samples relative to this inspection area; completing the annual inspection requirement.

b. Findings

No findings of significance were identified.

Cornerstone: Occupational Radiation Safety (1 Sample)

a. Inspection Scope

The inspectors reviewed all licensee PIs for the Occupational Exposure Cornerstone for follow-up. The inspectors reviewed a listing of licensee action reports for the period January 1, 2007 through November 26, 2007, for issues related to the occupational radiation safety performance indicator, which measures non-conformances with high radiation areas greater than 1R/hr and unplanned personnel exposures greater than 100 mrem total effective dose equivalent (TEDE), 5 rem skin dose equivalent (SDE), 1.5 rem lens dose equivalent (LDE), or 100 mrem to the unborn child.

The inspectors determined if any of these PI events involved dose rates >25 R/hr at 30 centimeters or >500 R/hr at 1 meter. If so, the inspectors determined what barriers had failed and if there were any barriers left to prevent personnel access. For unintended exposures >100 mrem TEDE (or >5 rem SDE or >1.5 rem LDE), the inspector determined if there were any overexposures or substantial potential for overexposure.

b. Findings

No findings of significance were identified.

Cornerstone: Public Radiation Safety (1 Sample)

a. Inspection Scope

The inspectors reviewed a listing of licensee action reports for the period January 1, 2007 through November 26, 2007, for issues related to the public radiation safety performance indicator, which measures radiological effluent release occurrences per site that exceed 1.5 mrem/qtr whole body or 5 mrem/qtr organ dose for liquid effluents; or 5 mrad/qtr gamma air dose, 10 mrad/qtr beta air dose; or 7.5 mrems/qtr organ doses from I-131, I-133, H-3 and particulates for gaseous effluents.

b. Findings

No findings of significance were identified.

40A2 Identification and Resolution of Problems (71152 – 1 Semi-Annual Sample and 2 Annual Samples)

.1 Review of Items Entered into the Corrective Action Program

a. Inspection Scope

As required by Inspection Procedure (IP) 71152, Identification and Resolution of Problems, and in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed screening of all items entered into PPL's corrective action program. This was accomplished by reviewing the description of each new action request/condition report and attending daily management meetings.

b. Findings

No findings of significance were identified.

.2 Semi-Annual Review to Identify Trends

a. Inspection Scope

As required by IP71152, Identification and Resolution of Problems, the inspectors performed a semi-annual review of PPL's corrective action program and associated documents to identify trends that could indicate the existence of a more significant safety issue. This trend review considered the results of daily inspector corrective action program item screenings discussed in Section 4OA2.1. The review also included issues described in system health reports, corrective maintenance work orders, PPL management meetings, regional inspector exit meetings, and maintenance rule assessments. This review concentrated on the six-month period of July 2007 through December 2007, although some examples were prior to this time period to confirm potential trends. The inspectors compared and contrasted their results with the results in PPL's internal assessment reports and trending. Corrective actions that were initiated in response to inspector observations and the issues identified in PPL trend reports were also reviewed.

b. Findings and Observations

No findings of significance were identified.

Procedure Use and Compliance

The inspectors identified an adverse trend in the area of procedure use and compliance. Specifically, inspectors found an increase in the number of minor procedure violations and inspection items with procedure use and compliance contributors during baseline inspection activities. Procedure use issues were observed and documented in the corrective action system for multiple work groups. This identified potential trend was communicated to PPL.

PPL also identified this potential trend during internal functional group assessments, entered the issue into the corrective action program, and performed a common cause analysis for some of the more recent examples during the last quarter of 2007.

As previously documented in Inspection Report 2007-003, PPL issued an internal communication (Hot Box 07-07) on June 29, 2007, to increase worker awareness of the observed trend in human performance issues related to procedural compliance and usage. One of these examples was from inspectors witnessing non-licensed operators

aligning the "E" EDG without utilizing one of the established step-by-step operating procedures. (NCV 2007003-01, PIM #78972)

Inspectors identified other instances of procedure use issues in the electrical maintenance, chemistry, operations and engineering departments during the second half of 2007. For example:

- In July 2007 after PPL identified reactor building scaffolding that was not built to specifications, inspectors identified additional reactor building scaffolds that were not built according to procedures and standards.
- During a December 2007 post-maintenance testing inspection, the inspectors questioned whether equipment operators were observing stabilizer valve flow indications as described by the control rod drive testing procedure. The Control Rod Drive (CRD) system engineer responded that there was an open Action Request to provide clarification to this procedure. The inspectors found that an action request was previously written to document a previous NRC inspector's question on this same issue.
- During a NRC Performance Indicator (PI) inspection, the inspectors identified that PI records were not retained or readily retrievable as required by PPL procedures. Although a performance issue, the inspectors determined that the required information was sufficient to support the inspection

PPL also identified human performance procedure related issues through the 3rd quarter 2007 Operations department functional unit excellence plan (AR 908670). The inspectors also determined that some of the procedure use and adherence issues observed during the 4th quarter were administrative or documentation related, and none of the individual issues were found to be of more than minor significance.

Increase in Control Room Alarm Panel Condition Reports and Emergent Work

Inspectors identified a potential adverse trend in control room alarm panel performance. The adverse trend challenges the operations staff by making it more difficult to assess plant parameters and system performance. When alarm system power supplies failed, operators were increasing their monitoring of local field panels to compensate for the associated control room alarms for that system or train being inoperable. The number of plant annunciator system condition reports is considered to be on an increasing trend. Inspectors categorized this observation as a potential adverse trend because there is no system health report, there were no system engineering journal entries for this system, and condition reports related to the plant annunciator systems were not typically coded to the system number which made relevant condition report retrieval and trending difficult.

This PI&R trend review documents the identified adverse trend in procedure use and adherence as well as a potential adverse trend in control room annunciator system performance at Susquehanna. These observations were not more-than-minor performance deficiencies that affected any safety cornerstone during the inspection period. Inspector observations were communicated to PPL at weekly management meetings and the quarterly exit meeting.

.3 Human Performance – Work Control, Work Package Quality and Supervisory Oversight (1 Annual Sample)

a. Inspection Scope

The inspectors reviewed PPL's corrective actions to resolve a station-wide trend of human performance deficiencies, focused in the areas of work control, work package quality, and supervisory oversight. The inspectors reviewed several CRs, internal assessments and evaluations, conducted several interviews, observed various shift turnover meetings and pre-job briefs, and observed a sample of work activities in the field. Specifically, CR 886646 documents a common issue analysis with respect to human performance, and assigns several corrective actions as well as evaluations of the actions taken. CR 886871 documents an in-progress effectiveness review of actions taken to resolve the human performance issues. The inspectors also reviewed a recent station assessment of human performance tools, as well as actions taken to improve station use of such tools. Finally, CR 891288 documents actions taken to correct the causes of two NRC Green Findings and two NRC Green NCVs in the area of Radiation Safety, as discussed in NRC Integrated Inspection Report 05000387/2007003 and 05000388/2007003. All four Radiation Safety issues were determined to be caused by breakdowns in human performance.

The inspectors assessed PPL's problem identification threshold, cause analysis, extent of condition reviews, effectiveness reviews, internal assessments, and prioritization and timeliness of corrective actions to determine whether PPL was appropriately identifying, characterizing, and correcting problems associated with this issue. Additionally, inspectors assessed whether the planned or completed corrective actions were appropriate.

b. Findings and Observations

No findings of significance were identified.

Assessment - Control of Station Work, Work Package Quality, & Supervisory Oversight

The inspectors determined that PPL is engaging significant effort across the station with respect to control of work, work package quality, and supervisory oversight. Many corrective actions have been taken to address the deficiencies, and several corrective actions are currently ongoing. The Maintenance Department has led the corrective action effort, through the hiring of an independent contractor to perform coaching and training in human performance, focusing their effort on supervisory oversight. Inspectors observed that maintenance supervisors are being trained on the importance of implementing several standards, including in-field walkdowns and observations, procedural use and adherence, work package review, and coaching to change behavior. The independent contractor training and coaching was also implemented within the Work Planning Department. Additional corrective actions in the area of work package quality include actions to improve procedure quality and assigning additional personnel to support procedure writing.

PPL has implemented a plan to capture the lessons learned from the contractor training and coaching efforts, and implemented these efforts across other departments at the station. CRA 919156 addresses implementation of the contractor training within the

Radiation Protection Department, one of several actions to correct the NRC Green Findings and NCVs in the area of Radiation Protection (RP). Additional actions include a focus on improving occupational radiation dose estimates for work activities required to be performed, supervisory reinforcement of radiation work permit (RWP) reviews, and establishing plans to include RP supervision in outage control center (OCC) reviews.

Inspectors have observed improving trends with respect to station work package quality, and supervisory oversight. In contrast, however, inspectors have also observed a recent increase in the number of issues where there is a failure to follow procedures. This trend was confirmed after inspectors performed the semi-annual PI&R trend review in November 2007. PPL has also identified the negative trend in procedure use and adherence, and recently performed a station assessment on the use of human performance tools - including procedure use and adherence.

Since procedure use and adherence is a specific human error barrier, inspectors performed an additional PI&R annual sample on Procedure Use and Adherence during the last quarter of 2007. Inspector review of this assessment found that PPL identified similar results and trends when compared to results of previously performed assessments in the areas of work control and supervisory oversight, as mentioned above. The inspectors observed no current plan in place for PPL to integrate the results and planned corrective actions from the recent station assessment on use of human performance tools with assessments performed in the areas of work control, work package quality, and supervisory oversight.

.4 Human Performance - Procedural Use and Adherence (1 Annual Sample)

a. Inspection Scope

The inspectors reviewed PPL's corrective actions to address issues which are related to the station-wide trend of procedure use and adherence as identified during both Semi-annual PI&R trend reviews in 2007 and also indicated during the preparation for the PI&R annual sample inspection on Work Package Quality, and Supervisory Oversight performed in December of 2007. The inspectors reviewed several CRs, internal assessments and evaluations, conducted several interviews, observed the December 2007 Management Briefing on Worker Usage of Human performance Tools (QA Assessment) and observed ongoing work activities in the field.

Inspectors identified numerous examples of procedure and work instruction non-compliance during the semi-annual PI&R trend review completed in late November 2007. In addition to the examples of procedure use and adherence issues documented under that baseline inspection effort, inspectors found additional procedure use performance issues. Inspectors used these additional examples to assess PPL's problem identification threshold, cause analysis, extent of condition reviews, effectiveness reviews, internal assessments, and prioritization and timeliness of corrective actions to determine whether PPL was appropriately identifying, characterizing, and correcting problems associated with procedure usage and adherence. Additionally, inspectors assessed whether the planned or completed corrective actions were appropriate.

b. Findings

No findings of significance were identified.

Assessment - Human Performance - Procedural Use and Adherence

One issue identified on November 26, 2007, was an open jumper test switch found in Upper Relay Room Panel 1C621 which was not removed following previous RCIC system and logic functional testing performed in October 2007. Inspectors reviewed PPL's corrective actions including cause analysis, extent of condition, and timeliness of corrective actions. Inspectors found that PPL utilized a Level 2 Cause evaluation in the corrective action system and that PPL conducted Event and Accountability Review Boards in early December. Inspectors observed a detailed review of extent of condition and apparent causes associated with the issue. This human performance issue and corrective actions will also be reviewed by the PPL Corrective Action Review Board. Although no effectiveness review was conducted for this specific issue, PPL initiated a common cause evaluation for engineering testing errors that have occurred in 2007. The issue is documented and tracked under CR #927706.

Inspectors also reviewed a self-revealing issue from November 12, 2007, involving a Chemistry technician securing the containment radiation monitor on the incorrect unit. Although the human performance issues for this event and condition report are broader than procedure compliance, inspectors determined that improved use of procedures regarding filed actions and pre-job briefings and better communication practices could have prevented this event. Inspectors found that PPL performed a detailed review and evaluation of the extent of condition and apparent cause of the event. This human performance issue and corrective actions were reviewed by the PPL Corrective Action Review Board. The issue is documented and tracked under CR # 918927.

Inspectors found that PPL was using the Corrective Action Program to identify, evaluate, and correct conditions adverse to quality. Inspectors found an appropriate level of effort and priority for issues that involved procedure compliance as a contributing or apparent cause.

Although each case of a procedure non-compliance mentioned in this PI&R assessment was determined to be a performance issue, the inspectors determined that the issues were licensee-identified, had been placed in the corrective action program, and were not of more-than-minor significance. One exception, however, was a licensee-identified procedure violation that did negatively affect safety cornerstone objectives regarding unqualified seismic material left in the Unit 1 residual heat removal pump room.

Overall Assessment for PI&R Annual Samples

The inspectors determined that PPL is appropriately identifying problems in the areas of human performance - specifically, work control, work package quality, supervisory oversight, as well as, procedure use and adherence. Characterization and evaluation of the problems is generally appropriate, though inspectors observed no current plan for PPL to integrate the results and planned corrective actions from the recent station assessment on use of human performance tools with the independent assessments performed in the areas of work control, work package quality, and supervisory oversight. Procedure use and adherence appears to be on a negative trend as compared to the

other human performance barriers and tools which do not show the same adverse or negative trend. Inspectors have determined corrective actions taken to address the issues thus far have been appropriate, however, several corrective actions are currently ongoing and the inspectors will continue to monitor station performance.

4OA6 Meetings, Including Exit

On January 17, 2007, the inspectors presented their findings to Mr. C. Gannon, Vice President - Nuclear Operations, and other members of his staff, who acknowledged the findings.

4OA7 Licensee-Identified Violations

The following violation of very low safety significance (Green) was identified by PPL and is a violation of NRC requirements which meets the criteria of Section VI of the NRC Enforcement Policy, NUREG-1600, for being dispositioned as a Non-Cited Violation.

On October 30, 2007, PPL identified a 4-foot long I-beam in the overhead of the Unit 1 "A" Residual Heat Removal (RHR) pump room which was determined to be an unapproved field change, a violation of Technical Specifications 5.4.1, and a violation of those procedures that must be implemented for performing maintenance as delineated in Regulatory Guide 1.33. PPL procedure NDAP-QA-0502, "Work Order Process," requires that equipment shall be returned to the original design configuration following work completion unless a change mechanism has been issued. Contrary to the above, a 4-foot I beam of approximately 80 pounds which was bridging across permanent structural steel in the Unit 1 "A" RHR room overhead was not removed following its use for maintenance activities. The I-beam (located 15 feet above safety related equipment) reduced the reliability of mitigating equipment regarding RHR design basis functions required following a seismic event. PPL evaluated the condition of the structural steel member and two C-clamp restraints and determined that the beam was unlikely to become dislodged during a seismic event. The beam was promptly removed and PPL entered this issue into the corrective action process (CR # 915409). The finding was determined to be very low safety significance (Green) because the probability of a dynamic event (earthquake) is very low, the as-found configuration of the structural steel member provided some resistance to falling during a dynamic event including a design basis earthquake, and although the identified deficiency reduced design margin, there was no actual loss of safety related functions.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION**KEY POINTS OF CONTACT****Licensee Personnel**

R. Bogar, EDG System Engineer
 D. Brophy, Acting Regulatory Affairs Supervisor
 P. Capotosto, Supervising Engineer, Electrical Engineering
 D. D'Angelo, Manager Station Engineering
 S. Davis, Senior Engineer, Programs and Components
 J. Helsel, Manager Nuclear Operations
 C. Hoffman, Manager, Nuclear Fuels
 J. Jeanguenat, ESW System Engineer
 W. Kahler, Senior Engineer, Nuclear Fuels
 R. Kessler, Senior Health Physicist – ALARA
 G. Machalick, Senior Engineer, Programs and Components
 F. Negvesky, Senior Engineer
 J. Paciotti, Security Operations Coordinator
 M. Rose, QA Manager
 V. Schuman, Radiological Protection Manager
 M. Sleigh, Security Manager

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

None.

Opened/Closed

05000387, 388/2007005-01	NCV	Inadequate Design Control to Support Fuel Rechanneling Activities (Section IR12)
05000387, 388/2007005-02	FIN	Failure to Maintain Occupational Radiation Exposure As Low As Reasonably Achievable During CREOAS Work (Section 2OS2)

Closed**BASELINE INSPECTION PROCEDURE PERFORMED**

7112101	Access Control	2OS1
7112102	ALARA Planning and Controls	2OS2
7112103	Radiation Monitoring Instrumentation	2OS3
71151	Performance Indicator Verification	4OA1

LIST OF DOCUMENTS REVIEWED
(Not Referenced in the Report)

Section 1R01: Adverse Weather Protection

CR 881048
AR-030-001, AR-128-001, and AR-228-001

Section 1R04: Equipment Alignment

Condition Reports:

CR 781995, 928741, 927746,
PCWOs 804080, 830323
ERPM 823856

Procedures:

OP-155-001, Control Rod Drive Hydraulic System, Rev. 43
Unit 2 Control Rod Drive Hydraulics System Health Report (2006 – 2007)
TS 3.8.2, Motor Operated Valve Thermal Overload Protection – Continuous
SE-150-003, Unit 1 RCIC Isolation Logic, Rev.12
SO-150-002, Quarterly RCIC Flow Verification, Rev. 36
SO-150-004, Quarterly RCIC Valve Exercising, Rev. 25
TS 3.5.3, RCIC System
EO-000-104-2, Secondary Containment Control, Rev.2
Unit 1 Reactor Core Isolation Cooling System Health Report (2006 – 2007)
SO-149-001, RHR Monthly Alignment Check, Revision 15
SO-116-001, Monthly RHRSW System Alignment Check, Revision 11
MT-085-001, Revision 15, Freeze Protection, Process Heat Trace Testing and Maintenance
WI-940271, Replace Unit 2 Heat Trace ET-237-02 Located on North Side of Condensate
Storage Tank OT 522 B
NDAP-00-0024, Revision 12, Winter Operation Preparations
AR 940154
E-1663-60, Inspect Condensate Storage Tank Freeze Protection System
OP-285-001, Revision 12, Freeze Protection System

Work Order:

C-7030-01, TSL-00812B, Calibrate U2 CST Heat Trace Alarm Switch TSL-00812B

Drawings:

E106260, Sheet 1 of 1, Revision 48, SSES Unit 1 P&ID High Pressure Coolant Injection
E106261, Sheet 1 of 2, Revision 32, SSS Unit 1 P&ID HPCI Turbine Pump
E106261, Sheet 2, Revision 8, SSES Unit 1 HPCI Lubricating and Control Oil P&ID
E106213, Sheet 1 of 2, Revision 50, SSES Unit 1 Condensate and Refueling Water Storage
E-325, sheet 29, Revision 9, Schematic Diagram Annunciator Miscellaneous Plant Instrument
and Recording Vent Board OC 693
DMU-781-237, Revision 2, Nelex Heater Installation Susquehanna Nuclear Station #2

E107158, Sheet 62, Revision 19, Single Line Meter and Relay Diagram 480 and Motor Control
Center 2B142, Unit 2
DMU-721-730, Revision 4, Wiring Diagram Breaker/Alarm Panel 36 Circuit
CMU-781-731, Revision 0, Wiring Diagram Breaker/Alarm Panel Door Circuit 36

Section 1R05: Fire Protection

Pre-Fire Plan FP-013-161, Revision 6, Unit 2 Upper Cable Spreading Room
Pre-Fire Plan FP-013-161, Revision 6, Unit 2 Upper Relay Room (C-502)
Pre-Fire Plan FP-013-142, Revision 6, Unit 2 Lower Relay Room (C 201)
Pre-Fire Plan FP-013-146, Revision 5, Unit 2 Lower Cable Spreading Room (C301)
Susquehanna Steam Electric Station, Fire Protection Review Report

Procedures:

71111.05, Fire Protection (Annual/Quarterly)
SE-013-007, Fire Protection CO₂ System Isolated to Perform Two Year Inspection of Fire
Barriers Per SE-013-007

Section 1R11: Licensed Operator Regualification Program

EO-100-102, "RPV Control,"
EO-100-113, "Level/Power Control,"
EO-100-103, "Primary Containment Control,"

Section 1R12: Maintenance Effectiveness

Condition Reports:

CR 936370, 937107, 937371, and 935933

Other:

Operability followup request 936290, Revision 0 and Revision 1;
EWR 942217, followup for 12/13/07 conference call with NRC;
OP-ORF-007, underwater fuel inspection and repair;
Root cause evaluation for CR 935833, loose fuel assembly (spacer) material was found
in spent fuel pool at three fuel preparation machines.

Section 1R13: Maintenance Risk Assessments and Emergent Work Control

Condition Reports:

CR 928549, 927852, 928878, 927852, 928970, 928511,
AR 841813, 935833,

Procedures:

TS 3.1.7, Standby Liquid Control System
Alarm Response AR-107-001, "Standby Liquid Control Tank HI\LO Temp," Rev. 27

Section 1R15: Operability Evaluations

Condition Reports:

CR 918927, 921867
AR 935833

Procedures:

TS 3.4.6, RCS Leak Detection System
Bases for TS 3.4.6, RCS Leak Detection System
SC-273-102, Monthly Functional Test of the Unit 2 Containment Radiation Detection System,
Rev. 19
Chemistry Department Log for November 12, 2007
Operations Department Log for November 12, 2007
Unit 2 "B" CRM Functional Test Tailboard Checklist, Pre-Job Brief SC-273-105

Section 1R19: Post-Maintenance Testing

Condition Reports:

CR 912386
OP-275-001
ON-275-001, Loss of 24 VDC bus
AR 903897 and CR 931841

Procedures:

TP-055-010, CRD stroke timing in Mode 1 or 2
SO-152-002, Quarterly HPCI Flow Verification, Rev. 42

Section 1R20: Refueling and Outage Activities

Risk Management Documents

Unit 1 ORAM Risk Profile
Unit 2 EOOS Risk Profile Mode 1

Procedures

NDAP-QA-0338, "Reactivity Management and Controls Program"
NDAP-QA-0505, crane, hoist, and rigging program
NDAP-QA-0507, "Conduct of Refuel Floor"
GO-100-004, "Plant Shutdown to Minimum Power"
GO-100-005, "Plant Shutdown to Cold Shutdown"
GO-100-006, "Cold Shutdown, De-fueled and Refueling"
OP-249-002, "RHR Shutdown Cooling Operation"
ON-149-001, "Loss of RHR Shutdown Cooling Mode"
OP-0RF-008, "Fuel and Blade Guide Handling Activities"
OP-181-001, "Unit 1 Refueling Platform Operation"
SO-181-001, "Weekly Unit 1 Refueling Platform Grapple Operability"

SO-156-003, "Refuel Mode One-Rod Out Interlock Check"
ON-081-002, "Refueling Platform Operation Anomaly"
SR-100-008, "In-Sequence Critical and Shutdown Margin Demonstration"
GO-100-002, "Plant Startup Heatup and Power Operation"
GO-100-010, "ECCS/Decay Heat Removal in Mode 4, 5 or Defueled."

Condition Reports (CRs):

912680, 911846, 911954, 911601, 912476, 910150, 910979, and 909908.

Other:

EWR 914171, operability impact for A-D SRMs (AR 914006)
Troubleshooting plan for Unit 1 refuel platform (TP-181-003/AR910847)

Section 1R22: Surveillance Testing

Procedures:

SR-155-004, Scram Time Measurement of Control Rods, dated 10/31/07.

Section 1R23: Temporary Plant Modifications

Procedures:

LS-0K112B-001, High Motor Or Bearing Temperature/Low Oil Pressure, Revision 0.

Work Orders:

831191, 812325, and 812094

Miscellaneous:

812322, Bypass 0K112B Hi Bearing Temperature and Hi Compressor Discharge Gas Temperature Alarm/Trip Function, Revision 1
TSs 3.7.4, Control Room Floor Cooling System, Amendment 178
TSs Bases B 3.7.4, Control Room Floor Cooling System, Revision 1
PCAF 2006-4181, 0K112B Control Structure Chiller B Safety Indicator Panel, dated 9/25/06.
5059-01-1080, Elimination of 50.59 & 72.48 Screens for Equivalent Changes, Revision 0;
Calculation EC-028-0009, Revision 2, ESSW pump structure heat loss.

Section 2OS1: Access Control to Radiologically Significant Areas; Section 2OS2: ALARA Planning and Controls; and Section 2OS3: Radiation Monitoring Instrumentation

Condition Reports:

875056; 875559; 875611; 875825; 875828; 876077; 876086; 876108; 876341; 876483; 876592;
877057; 877095; 877511; 878638; 878939; 879538; 880330; 881289; 881694; 881750; 881769;
883147; 884385; 884543; 884996; 885083; 885169; 885359; 885880; 885950; 886237; 886817;
887021; 887156; 887423; 887986; 888119; 888877; 888879; 888938; 889211; 889286; 889569;

889990; 890393; 890451; 890691; 890909; 891725; 891738; 891741; 891742; 892693; 893248; 894011; 894205; 894295; 894660; 895147; 896176; 896455; 897742; 898331; 900272; 900404; 900502; 900599; 900790; 901220; 901262; 901530; 901854; 902385; 902700; 904175; 904962; 905250; 905567; 905864; 906634; 907517; 908254; 910050; 910080; 910179; 910260

CR Evaluation:

886817 and 891738

Apparent Cause Evaluation:

891742 and 896455

Section 40A2: Identification and Resolution of Problems

Condition Reports

388219, 811196, 560587, 864760, 617245, 882278, 886646, 891288, and 933511

Condition Report Actions

409941, 409963, 834604, 877638, 705654, 878995, 898795, 921830, and MRA 913238

Drawings

E106228, Sheet 9: SSES Unit 1 P&ID: Process Sampling 1C21OB Reactor Building, Revision 2

Engineering Work Requests

420763, 811738, 886344

Miscellaneous

IOM 211, "Switchgear", Rev 27

LER 50-387/2002-003-00

OFR 622048, Rev 0

Station Engineering Trending Report Second Quarter, 2007

System Health Report, 4.16KV System, Units 1 and 2, First Period 2007

AR 705654 Assessment Report: Work Instruction Quality Process, 05/01/2007 - 07/06/2007

AR 898795 Assessment Report: QA Assessment of Human Performance Condition Reports vs. Station Standards, 07/30/2007 - 08/17/2007

Common Issue Analysis: Human Performance - Work Control Issues - 04/2007, Revision 6

CR 886646 Control of Work Action Status (08/17/2007), Revision 2

CR 886871 In-Progress Effectiveness Review for CR 886648 Human performance Control of Work Cross-Cutting Issue, Revision 2

Focused Self-Assessment / Formal Benchmarking Trip Report: DB&A Assessment of the

Focused Self-Assessment Report: Maintenance - Supervisor Effectiveness, 07/21/2006

Infrastructure Supporting Physical Work, 05/14/2007 - 05/28/2007

NQA Assessment: Worker Use of Human Performance Tools Management Briefing, 11/19/2007 - 11/30/2007

Self-Assessment Plan: Effectiveness of Maintenance Leadership, 07/21/2006
 Susquehanna Regulatory Affairs Report for 11/08/2007
 Susquehanna Station Status Report, Tuesday, 12/04/2007
 Susquehanna Station Status Report, Wednesday, 12/05/2007
 Susquehanna Station Status Report, Thursday, 12/06/2007
 Susquehanna Station Status Report, Friday, 12/07/2007

Procedures

MT-GE-048, "Cutler Hammer Type DHP-VR 4.16KV Circuit Breaker and Switchgear Inspection and Maintenance", Revision 5
 NDAP-00-0710, "Station Trending Program", Revision 0
 NDAP-QA-0702, "Action Request and Condition Report Process", Revision 20
 OP-000-001, "Breakers", Revision 19
 OP-104-001, "4KV Electrical System", Revision 7
 AR-107-001, Alarm Response Procedure, page 9 of 34: Standby Liquid Tank Hi/Lo Temp, Revision 27
 NDAP-QA-0029, Procedure use - Standards and Expectations, Revision 8
 NDAP-QA-0502, Work Order Process, Revision 15
 NDAP-QA-0702, Action Request and Condition Report Process, Revision 20
 NDAP-QA-1901, Susquehanna Station Work Management Process, Revision 5

Work Orders

388221, 438214, 560590, 593960, 617252, 811203, 878897, 878929, 878935, 881004, 881009, 887039, and 916408

LIST OF ACRONYMS

ALARA	As Low As Is Reasonably Achievable
CFR	Code of Federal Regulations
CR	Condition Report
CRA	Condition Report Action
CRD	Control Rod Drive
CREOAS	Control Room Emergency Outside Air Supply System
CRM	Containment Radiation Monitor
EDG	Emergency Diesel Generator
EP	Emergency Preparedness
ESW	Emergency Service Water
FDLRX	Fraction Design Limit Ratio
FME	Foreign Material Exclusion
FSAR	[SSES] Final Safety Analysis Report
GL	Generic Letter
GWD/MTU	GigaWatt-Days per Metric Tonne Uranium
HP	Health Physics
HPCI	High Pressure Coolant Injection
HX	Heat Exchanger
IMC	Inspection Manual Chapter
IP	Inspection Procedure
KV	Kilovolts

LDE	Lens Dose Equivalent
LER	Licensee Event Report
LHGR	Linear Heat Generation Rate
MFLCPR	Maximum Fraction of Limiting Critical Power Ratio
MOV	Motor Operated Valve
MSIV	Main Steam Isolation Valve
MSPI	Mitigating Systems Performance Indicators
NCV	Non-Cited Violation
NDAP	Nuclear Department Administrative Procedure
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
OA	Other Activities
OCC	Outage Control Center
OOS	Out-of-Service
PI	[NRC] Performance Indicator
PI&R	Problem Identification and Resolution
PIM	Plant issues Matrix
PMT	Post-Maintenance Test
PPL	PPL Susquehanna, LLC
QA	Quality Assurance
RB	Reactor Building
RCIC	Reactor Core Isolation Cooling
RCS	Reactor Coolant System
RG	[NRC] Regulatory Guide
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
RO	Reactor Operator
RP	Radiation Protection
RTP	Rated Thermal Power
RWCU	Reactor Water Cleanup
RWP	Radiation Work Permit
SBO	Station Blackout
SCBA	Self-Contained Breathing Apparatus
SDE	Skin Dose Equivalent
SDP	Significant Determination Process
SFP	Spent Fuel Pool
SLC	Standby Liquid Control
SSC	Structures, Systems and Components
SSES	Susquehanna Steam Electric Station
SW	Service Water
TEDE	Total Effective Dose Equivalent
TOC	Truck Operated Cell
TS	Technical Specifications
WO	Work Order