May 25, 2001

Mr. Robert G. Byram
Senior Vice President and
Chief Nuclear Officer
PPL Susquehanna, LLC
Susquehanna Steam Electric Station
2 North Ninth Street
Allentown, Pennsylvania 18101

SUBJECT: SUSQUEHANNA STEAM ELECTRIC STATION - NRC INSPECTION REPORT 05000387/2001-007, 05000388/2001-007

Dear Mr. Byram:

On May 4, 2001, the NRC completed a supplemental inspection at your Susquehanna Steam Electric Station Units 1 and 2. The enclosed report documents the results of the inspection, which were discussed on May 4, 2001, with Mr. R. Anderson 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 inspection was an examination of your activities associated with a White inspection finding related to the proper characterization and control of radiological hazards associated with highly radioactive particles. The inspection was conducted in accordance with NRC inspection procedure 95001,"Inspection for One or Two White Inputs in a Strategic Performance Area."

No findings of significance were identified.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publically Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/NRC/ADAMS/index.html (The Public Electronic Reading Room).

If you have any questions, you may contact Mr. John R. White, Chief, Radiation Safety and Safeguards Branch, at (610) 337-5114.

Sincerely,

/RA/

Wayne D. Lanning, Director
Division of Reactor Safety

Docket Nos. 05000387, 05000388
License Nos. NPF-14, NPF-22

Enclosure: Inspection Report 05000387/2001-007, 05000388/2001-007

Attachment 1: NRC's Revised Reactor Oversight Process

cc w/encl:
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G. T. Jones, Vice President - Nuclear Engineering and Support
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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos:	05000387, 05000388
License Nos:	NPF-14, NPF-22
Report No:	05000387/2001-007 05000388/2001-007
Licensee:	PPL Susquehanna, LLC
Facility:	Susquehanna Steam Electric Station
Location:	Post Office Box 35 Berwick, PA 18603
Dates:	April 30, 2001 to May 4, 2001
Inspector:	J. Noggle, CHP, Senior Health Physicist
Approved by:	John R. White, Chief Radiation Safety and Safeguards Branch Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000387/2001-007, 5000388/2001-007, on 04/30-05/04/2001; PPL Susquehanna, LLC; Susquehanna Steam Electric Station; Units 1&2. Inspection for one White input in the Occupational Radiation Safety performance area in accordance with Inspection Procedure 95001.

This supplemental inspection was conducted by a region-based radiation specialist on April 30 - May 4, 2001. The purpose inspection determined the adequacy of the PPL Susquehanna's problem identification, root cause evaluation, and corrective action implementation relative to a White finding previously identified in NRC inspection reports 05000387/2000-009, 05000388/2000-009, dated January 30, 2001, respectively. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at http://www.nrc.gov/NRR/OVERSIGHT/index.html.

Cornerstone: Occupational Radiation Safety

This supplemental inspection was performed by the NRC to assess the licensee's evaluation with respect to the proper characterization and control of the radiological hazards associated with highly radioactive particles generated during an irradiated reactor hardware disposal project. This performance issue was previously characterized as having low to moderate risk significance ("White") in NRC Inspection Report #05000387/2000-009, 05000388/2000-009. During this supplemental inspection, performed in accordance with Inspection Procedure 95001, the inspector determined that the licensee performed acceptable evaluation of the radiological significance of the hazards associated with the presence of highly radioactive particles.

The inspection determined that PPL Susquehanna's efforts in characterizing problems associated with effective radiological control of discrete radioactive particles, evaluating the root and contributing causes that led to substantial potential for personnel exposure in excess of the regulatory limits, and subsequently discerning appropriate corrective measures to prevent recurrence were acceptable. Appropriate actions were initiated to further develop root causes associated with hydrolazing of equipment prior to removal from underwater storage and use locations. The extent of condition review was adequately accomplished, and corrective actions were sufficient to address identified root and contributing causes.

Due to the licensee's acceptable performance in addressing the characterization and control of highly radioactive particles, the White finding associated with this issue will only be considered in assessing plant performance for a total of four quarters in accordance with the guidance in IMC 0305, "Operating Reactor Assessment Program." Implementation of the licensee's corrective actions will be reviewed during a future inspection.

Report Details

01 Inspection Scope

This supplemental inspection was performed by the NRC to assess the licensee's evaluation associated with the insufficient characterization and control of the radiation safety hazards due to highly radioactive particles that resulted from a fuel pool cleanout project conducted during September through December 2000. This performance issue was previously characterized as "White" in NRC Inspection Report # 05000387/2000-009, 05000388/2000-009 and is related to the occupational radiation safety cornerstone in the reactor safety strategic performance area. This inspection consisted of a review of the licensee's evaluation and corrective actions taken to address the issue and preclude recurrence. This review consisted of:

a. Applicable highly radioactive particle condition reports, associated root cause analyses, and corrective actions taken
b. Revised health physics technical bases for characterizing dose rates from highly radioactive particles utilizing conventional survey instruments and the revised basis for setting highly radioactive particle dose rate limits for personnel exposure control
c. Revised highly radioactive particle monitoring and personnel exposure control procedures
d. Radiation work permits utilized to implement highly radioactive particle controls
e. Nuclear Assurance Services (QA) assessments and surveillances associated with the fuel pool cleanout project and highly radioactive particle events
f. Interviews with irradiated reactor hardware decontamination staff, RP technical staff, QA staff, and refueling floor management

02 Evaluation of Inspection Requirements

02.01 Problem Identification

a. Determine that the evaluation identifies who (i.e., licensee, self-revealing, or NRC), and under what conditions the issue was identified.

Although the licensee, promptly responded to NRC-identification of this issue, the NRC role in identifying the highly radioactive particle exposure control deficiencies was absent in the licensee's evaluation. However, the technical issues were properly identified within the conditions existing during the fuel pool cleanout project.

b. Determine that the evaluation documents how long the issue existed, and prior opportunities for identification

The licensee's evaluation properly identified how long the issue existed and documented a number of previous opportunities for identifying this issue. The licensee's investigation identified that highly radioactive particles were generated during the fuel pool cleanout project between July 2000 and December 15, 2000. A plant historical review indicated that during the previous fuel pool cleanout project in 1991 there were 2 highly radioactive particles measuring 40R/hr and >100R/hr, but the potential for excessive personnel exposure was not identified. Also, the licensee's evaluation indicated that during the project there were other opportunities to identify the issue

including an October 12, 2000 event that resulted in a Level 1 condition report requiring event review and root cause analysis due to the discovery of a 75 mCi highly radioactive particle on the refueling floor. Subsequently, on 10/23/00, 11/28/00 and 12/4/00, four other high activity (9-20 mCi) highly radioactive particles were identified on the refueling floor. The licensee's evaluation indicated that prior identification of the issue was missed since there were no actual significant personnel exposures associated with these conditions, and the potential for personnel exposure in excess of the regulatory limits was not considered.

c. Determine that the evaluation documents the plant specific risk consequences (as applicable) and compliance concerns associated with the issue.

In response to the White finding, the licensee's evaluation effectively identified the issue of highly radioactive particle exposure in direct contact with personnel with respect to skin dose equivalent and deep dose equivalent regulatory limits.

02.02 Root Cause and Extent of Condition Evaluation

a. Determine that the problem was evaluated using a systematic method(s) to identify root cause(s) and contributing cause(s).

The licensee's evaluation was conducted by an event review team that applied a systematic use of timeline, barrier analysis, cause and effect charting, and change analysis. In addition, an INPO assist team provided additional insights and an independent review of the highly radioactive particle radiological challenges.

b. Determine that the root cause evaluation was conducted to a level of detail commensurate with the significance of the problem.

The root cause evaluation was generally conducted in a thorough manner consisting of detailed questioning of the facts identified in the investigation. One exception involved the root cause associated with the transfer of highly radioactive particles to the refueling floor. The issues associated with possible deficiencies in the decontamination (hydrolazing) effort or containment of components removed from underwater storage or use locations was not fully developed and initially effected the development of an effective corrective measure for this cause. Subsequently, the licensee initiated an additional condition report (no. 331854) to address this issue. Notwithstanding, the licensee's root cause efforts were conducted at a level commensurate with the significance of the problem.

c. Determine that the root cause evaluation included a consideration of prior occurrences of the problem and knowledge of prior operating.

The licensee's evaluation indicated that during the previous 1991 fuel pool cleanout project, that two similar highly radioactive particles were identified, however, the potential exposure hazard from direct exposure to personnel was not evaluated. The licensee also reviewed industry operating experience and noted that highly radioactive particle events were only associated with skin dose hazards and the implications to the whole body dose due to the penetrating gamma radiation was a new industry issue. In addition, the licensee's evaluation acknowledged that a prior root cause analysis of this same issue was conducted relative to the discovery of a highly radioactive particle (75 millicurie) on October 12, 2000; and that the root cause analysis was not effective in preventing recurrence and was too narrowly focused. Accordingly, at that time, a separate condition report (no. 324231) was written to address this root cause/corrective action process weakness.

d. Determine that the root cause evaluation included consideration of potential common cause(s) and extent of condition of the problem.

The licensee's evaluation considered the potential spread of highly radioactive particles into other communicating plant systems. The plant engineering department provided the corresponding analysis and the radiation protection department implemented highly radioactive particle control zones for initial breaches of the specified systems during the Spring 2001 Unit 2 refueling outage. Extensive highly radioactive particle surveys were conducted with the result that no additional high magnitude highly radioactive particles were identified. The licensee has initiated a highly radioactive particle tracking and trending program that conveys summary information to upper plant management on a quarterly basis.

02.03 Corrective Actions

a. Determine that appropriate corrective action(s) are specified for each root/contributing cause or that there is an evaluation that no actions are necessary.

As mentioned in 02.02 above, the licensee's root cause with respect to how highly radioactive particles were being deposited in work areas as a result of component removal from underwater storage and use locations required additional refinement. During this inspection, the licensee initiated a new condition report (no. 331854) to address the specific underwater hydrolazing limitations that led to highly radioactive particles being transferred to the refueling floor. Corrective actions associated with this condition report are in development.

In addition, two of the licensee's listed causal factors identified were management oversight and involvement with the fuel pool cleanout project. Various organization changes were made in the management of the radiation protection department; and efforts were initiated to re-evaluate the Refuel Floor Manager roles, responsibilities and management reporting level. These latter management oversight issues were still in process at the time of this inspection.

Notwithstanding, the central regulatory issues involving appropriately characterizing the radiological hazards associated with highly radioactive particles and effecting appropriate radiological controls resulted in appropriate corrections, additions and changes to the radiation protection program. An enhanced technical basis for personnel survey frequencies has been established as evident in revised procedures, in radiation work permits, and in radiation protection technician training. No discrepancies with the radiation protection program corrective actions were noted.

b. Determine that the corrective actions have been prioritized with consideration of the risk significance and regulatory compliance.

After the December 15, 2000 NRC identification of substantial potential for personnel exposure in excess of regulatory limits due to a highly radioactive particle, the licensee appropriately recognized the risk significance of the highly radioactive particle hazards associated with activities conducted on the refueling floor, and immediately suspended these activities (fuel pool cleanout demobilization work) until exposure controls could be re-evaluated and corrected. The licensee also appropriately recognized the impact that highly radioactive particle contamination of other plant systems could have on the Spring 2001 Unit 2 refueling outage, and appropriately prioritized the establishment and implementation of the corrective actions relative to particle characterization, exposure control, radiation protection activities (including radiation work permit instructions) in support of the next outage.

c. Determine that a schedule has been established for implementing and completing the corrective actions.

The licensee was effective in establishing a schedule for implementing and completing the necessary highly radioactive particle program corrective actions prior to the Spring Unit 2 refueling outage. Radiation protection procedural limits on highly radioactive particle dose rates were established prior to the breach of potentially contaminated systems. The licensee's actions were effectively scheduled prior to the refueling outage to ensure the necessary radiological controls were in place to protect the worker.

d. Determine that quantitative or qualitative measures of success have been developed for determining the effectiveness of the corrective actions to prevent recurrence.

The licensee has established a highly radioactive particle trending and tracking program that conveys summary information to plant management on a quarterly basis. Condition report no. 302850 requires 4 effectiveness reviews of the highly radioactive particle control program to be conducted by the end of the second, third, and fourth quarters of 2001 and the first quarter of 2002. By these actions, the licensee has planned to review the highly radioactive particle program implementation and assess its adequacy to prevent recurrence.

03. Management Meetings

Exit Meeting Summary

On May 4, 2001, the resident inspectors presented the inspection results to Mr. R. Anderson and other members of your staff who acknowledged the findings.

SUPPLEMENTARY INFORMATION

Key Points of Contact

E. Banks, Effluents Management Foreman
P. Benson, Effluents Management Technician
G. Deebel, Effluents Management Technician
R. Doty, Radiation Protection Manager (Acting)
J. Feno, Nuclear Assurance Services Inspector
J. Hergan, Radiation Protection Assistant Foreman
M. Hoosek, Mechanical Maintenance Supervisor
J. Jessick, Health Physicist, Instruments
D. Karchner, Refueling Floor Manager
R. Kessler, Radiological Support Supervisor
J. McCarthy, Work Management Systems Manager
E. McIlvaine, Radiological Operations Supervisor (Acting)
D. Roth, Nuclear Assurance Services Supervisor
C. Saxton, Effluents Management Specialist
J. Whyne, Effluents Management Lead Technician

List of Items Opened, Closed

Opened

None

Closed

05000387, 388/2000009-03	White	Failure to conduct an adequate radiological survey in accordance with 10CFR20.1501

Documents Reviewed

Condition Reports:

CR No. 302850, Hot particle Issues
CR No. 289959, 10/12/2000 800 R/hr Hot particle Event
CR No. 311892, Hot Particle WHITE Finding
CR No. 309276, Hot Particle Management Oversight Weakness
CR No. 297422, 11/21/2000 Effluents Personnel EPDs Alarm During Cask Decon
CR No. 284763, 9/8/2000 Fuel Pool Cleanout Worker 11.7 rem Exposure to Forearm
CR No. 301757, 12/6/2000 17 rem Exposure to Foot of Decon Tech
CR No. 287804, Discrete Radioactive Particles Found during A RWCU Pump Changeout
CR No. 331854, Evaluate Pressure Washing/Hydrolazing
CR No. 324231, Narrowly Focused (CR 289959) Resolution in HP

Procedures:

HP-TP-500, Rev. 19, Health Physics Radiological Survey Program
HP-TP-510, Rev. 16, Survey, Decontamination and Dose Calculation Techniques for Radioactive Contamination of the Skin or Clothing
HP-TP-511, Rev. 7/Draft Rev. 8, Hot Particle Controls
HP-TP-903, Draft, High Risk Radiological Evolutions

Radiation Work Permits:

2000-0301, Process Irradiated Hardware and Miscellaneous Components in the Cask Storage Pit
2000-0302, Rev. 1, Inspect/Load/Decon and Ship the CNS 3-55 Cask
2000-0304, Removal of High Radiation Irradiated Material from AC/S and Transfer AC/S to Unit 1 Equipment Pit for Maintenance
2000-0306, Work in Cat 1 Hot Particle Area on 818'
2000-0307, Rev. 1, 818' - Decon of the AC/S, AC/S Stand, AC/S Chute and Stellite Bearing Punch
2001-0052, Control Rod Blade Activities
2001-0053, Rev. 1, Unit 1 Refuel Mast Work/Support
2001-0057, Clean Bath Tub Ring from U1 & U2 Spent Fuel Pools
2001-0058, Rev. 1, Unit 2 Fuel Prep Machine Pre-Outage PMs
2001-0059, Recovery Work in Unit 1 Equipment Pit to Allow Downgrade from Cat 1 to Cat 3 HPCZ
2001-0060, Survey of Unit 2 Equipment Pit to Allow Downgrade from Cat 1 to Cat 3 HPCZ
2001-0062, Fuel Pool Cleanout Tent Recovery
2001-0063, Recovery of HPCZ on West Side of Cask Storage Pit
2001-0067, Unit 1 RWCU Hold Pump Room Valve Work
2001-0069, Hot Shop Tent Cat 1 HPCZ

Health Physics Technical Basis Documents:

No. 01-001, 1/19/01, Hot Particle Control Zone Category Dose Levels
No. 01-013, 3/28/01, Assessment of SDE Due tp Attenuation Provided by the Sole of a Shoe
No. 01-014, 3/30/01, Evaluation of SDE and DDE for Dispersed Contamination over 16 cm^2
No. 01-016, 4/12/01, Assessment Potential SDE and DDE from Discrete Radioactive Particles
No. 01-017, Draft, Evaluation of Year 2000 and 1/1-4/24/01 Discrete Radioactive Particle Data

Qualtiy Assurance Documents:

Nuclear Assurance Services Assessment No. 2001-01, “What NAS Activities have been Performed with regard to Hot Particles?”
Nuclear Assurance Services Surveillances:
- 00-028, 9/8/00, Fuel Pool Cleanout Project Initial Dose Profiling
- 00-032, 9/12/00, Spent Fuel Pool Cleanout Project Activities
- 01-012, 4/12/01, Core Shuffle during Unit 2 10RFO
- 01-006, 5/2/01, Unit 2 Refueling Activities

Nuclear Assurance Services Surveillance Plan, NASI-00-602

Other Documents:

Refueling Floor Hot Particle Recovery Plan, 10/16/2000, Rev. 10/20/2000, Rev. 10/23/2000
Cavity Draindown Specific Radiation Control Plan and RWP 2001-2013, 2014
Recovery Strategy for Remaining Components of the Fuel Pool Cleanout Project, Rev. 2, 5/4/01
Fuel Pool Cleanout 50.59 Safety Evaluation, 5/23/00, No. NL-91-011
PPL Direction 2000 Refuel Floor Team, 11/22/00
Health Physics Technician Training Lesson Plan, HP-220, Hot Particle Survey Techniques

List of Acronyms

AC/S	Advanced Crusher/Shearer
CR	Condition Report
DDE	Deep Dose Equivalent
EPD	Electronic Pocket Dosimeter
HPCZ	Hot Particle Control Zone
INPO	Institute for Nuclear Power Operators
NRC	Nuclear Regulatory Commission
PPL	PPL Susquehanna, LLC
QA	Quality Assurance
RP	Radiation Protection
RWCU	Reactor Water Clean UP
RWP	Radiation Work Permit
SDE	Skin Dose Equivalent
SSES	Susquehanna Steam Electric Station

ATTACHMENT 1
NRC's REVISED REACTOR OVERSIGHT PROCESS

The federal Nuclear Regulatory Commission (NRC) revamped its inspection, assessment, and enforcement programs for commercial nuclear power plants. The new process takes into account improvements in the performance of the nuclear industry over the past 25 years and improved approaches of inspecting safety performance at NRC licensed plants.

The new process monitors licensee performance in three broad areas (called strategic performance areas): reactor safety (avoiding accidents and reducing the consequences of accidents if they occur), radiation safety (protecting plant employees and the public during routine operations), and safeguards (protecting the plant against sabotage or other security threats). The process focuses on licensee performance within each of seven cornerstones of safety in the three areas:

Reactor Safety	Radiation Safety	Safeguards
● Initiating Events	● Occupational	● Physical Protection
● Mitigating Systems	● Public	
● Barrier Integrity		
● Emergency Preparedness		

To monitor these seven cornerstones of safety, the NRC uses two processes that generate information about the safety significance of plant operations: inspections and performance indicators. Inspection findings will be evaluated according to their potential significance for safety, using the Significance Determination Process, and assigned colors of GREEN, WHITE, YELLOW or RED. GREEN findings are indicative of issues that, while they may not be desirable, represent very low safety significance. WHITE findings indicate issues with low to moderate safety significance, which may require additional NRC inspections. YELLOW findings are more serious issues with substantial safety significance and would require the NRC to take additional actions. RED findings represent issues of high safety significance with an unacceptable loss of safety margin and would result in the NRC taking significant actions that could include ordering the plant shut down.

Performance indicator data will be compared to established criteria for measuring licensee performance in terms of potential safety. Based on prescribed thresholds, the indicators will be classified by color representing incremental degradation in safety: GREEN, WHITE, YELLOW, and RED. The color for an indicator corresponds to levels of performance that may result in increased NRC oversight (WHITE), performance that results in definitive, required action by the NRC (YELLOW), and performance that is unacceptable but still provides adequate protection to public health and safety (RED). GREEN indicators represent performance at a level requiring no additional NRC oversight beyond the baseline inspections.

The assessment process integrates performance indicators and inspection so the agency can reach objective conclusions regarding overall plant performance. The agency will use an Action Matrix to determine in a systematic, predictable manner, which regulatory actions should be taken based on a licensee's performance. As a licensee's safety performance degrades, the NRC will take more and increasingly significant action, as described in the matrix. The NRC's actions in response to the significance (as represented by the color) of issues will be the same for performance indicators as for inspection findings.

More information can be found at: http://www.nrc.gov/NRR/OVERSIGHT/index.html.