UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

April 15, 2010

Mr. Charles G. Pardee
Senior Vice President, Exelon Generation Company, LLC
President and Chief Nuclear Officer, Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: THREE MILE ISLAND STATION, UNIT 1
NRC INSPECTION REPORT 5000289/2010007

Dear Mr. Pardee:

On March 12, 2010, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the Three Mile Island Station. The enclosed report documents the inspection results which were discussed on March 12, 2010, with Mr. W. Noll and other members of your staff.

The inspection examined activities under your license as they related 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. Specifically, the inspectors reviewed and evaluated the circumstances associated with a November 21, 2009, airborne radioactivity control occurrence within the Unit 1 Containment.

This report documents three findings of very low safety significance (Green). The findings were determined to involve violations of NRC requirements. However, because of the very low safety significance and because they were entered into your corrective action program, the NRC is treating the 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 basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administration, Region I; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspectors at the Three Mile Island facility. In addition, if you disagree with the characterization of the cross-cutting aspect of any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region I and the NRC Senior Resident Inspectors at the Three Mile Island facility. The information you provide will be considered in accordance with Inspection Manual Chapter 0305.

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 NRC's document system (ADAMS). ADAMS is accessible from the NRC Website at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

We appreciate your cooperation. Please contact me at (610) 337-5114, if you have any questions regarding this letter.

Sincerely,

for

John R. White, Chief
Plant Support Branch 2
Division of Reactor Safety

Docket No. 50-289
License No. DPR-50

Enclosure: Inspection Report 05000289/2010007
w/Attachment: Supplemental Information

cc w/encl: Distribution via ListServ

We appreciate your cooperation. Please contact me at (610) 337-5114, if you have any questions regarding this letter.

Sincerely,

/RA by Peter R. Wilson for/

John R. White, Chief
Plant Support Branch 2
Division of Reactor Safety

Docket No. 50-289
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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No:	50-289
License No:	DPR-50
Report No:	05000289/2010007
Licensee:	Exelon Generation Company
Facility:	Three Mile Island Station, Unit 1
Location:	Middletown, PA 17057
Dates:	November 21, 2009 – March 12, 2010
Inspectors:	R. Nimitz, CHP, Senior Health Physicist D. Kern, Senior Resident Inspector J. Brand, Resident Inspector D. Spindler, Resident Inspector E. Burkett, Reactor Inspector W. Schmidt, Senior Reactor Analyst (Part Time)
Approved by:	J. R. White, Chief Plant Support Branch 2 Division of Reactor Safety (DRS)

Enclosure

SUMMARY OF FINDINGS

IR 05000289/2010007; 11/21/09 - 03/12/10; Three Mile Island Unit 1; Event Follow-up.

This report covers the period November 21, 2009 through March 12, 2010, and discusses inspection by resident inspectors and region based inspectors. Three Green findings, all of which were non-cited violations (NCVs), were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

Executive Summary

Background

During late fall 2009, Three Mile Island (TMI) Unit 1 was undergoing a refueling and steam generator (SG) replacement outage. To accomplish the SG replacement, on November 12, Exelon completed cutting an approximate 24 foot (ft) X 26 ft construction opening into the TMI Unit 1 Reactor Building (Containment). The opening provided an access point to support removal of the old SGs and subsequent installation of the new SGs. Exelon had established an Engineering Change Request (ECR) to support use of the opening and to maintain the Containment purge system as required by procedures to induce airflow into Containment and to maintain the Containment at negative pressure. Without negative pressure, and inward airflow, airborne contamination could be free to escape the Containment through the construction opening.

On November 21, Exelon conducted primary pipe interior vacuuming operations within the Containment in preparation for pipe end decontamination of the "A" steam generator cold leg (SG A-1A) located in the "A" D-ring on the 281 ft elevation. The vacuuming was conducted to remove debris that could potentially impact the decontamination equipment. Workers used a vacuum cleaner designated "Wet Use", which was not equipped with a high efficiency particulate air (HEPA) filter, to vacuum dry and damp highly radioactive material from the pipe interior, including some residual water within the loop drain. The workers conducting the vacuuming did not recognize that the vacuum lacked a HEPA filter and that use of the unfiltered vacuum cleaner, was dispersing airborne radioactive particulate contamination into the Containment. The airborne radioactivity caused alarms on various real-time airborne radioactivity monitors including a monitor at the construction opening.

The alarming airborne radioactivity monitors prompted a Containment evacuation of about 175 workers. All of the individuals were subsequently evaluated via personnel contamination monitoring and whole body counting to ascertain the nature and extent of possible internal or external contamination. Of the 175 workers, 145 workers were determined to have sustained either low-level external radioactive contamination or low-level intakes of airborne radioactivity associated with the event.

Exelon's investigation of the alarming airborne radioactivity monitors prompted general recognition that the Containment was exhibiting outward airflow thereby providing a pathway for airborne particulate radioactivity release to the environment. Exelon took actions to realign ventilation systems to increase negative pressure within Containment and inward airflow, and to draw close curtains on the Containment openings to halt the release of radioactivity. However, some air continued to flow around the curtain. Exelon successfully established an inward airflow into the construction opening at about midnight on November 21. This eliminated the pathway for radioactivity release to the environment. Subsequent collection and analyses of air samples, and environmental monitoring station sample analyses identified low levels of radioactivity had been released to the environment through the pathway.

Exelon informed the Commonwealth of Pennsylvania, Department of Environmental Protection, and NRC of this condition on November 21. Exelon subsequently issued a press release on November 21, and subsequently issued a 10 CFR 50.72 notification to the NRC on November 22.

NRC Conclusions

The NRC determined that Exelon did not effectively control reactor primary system decontamination activities on November 21 resulting in elevated airborne radioactivity within the Containment. Further, Exelon did not effectively manage the Containment openings and ventilation systems to prevent unfiltered radioactive releases from the Containment during the period November 12 through November 21. The following were independently identified or verified:

1. The source of the airborne radioactivity in the Containment on November 21 was the effluent from a non-HEPA filtered vacuum cleaner used to clean the interior of the "A" steam generator cold leg (SG A-1A).

2. Maximum occupational worker dose consequences due to this event were less than 1% of applicable NRC regulatory limits.

3. Radiation doses to a member of the public due to this event were less than 1% of the NRC ALARA design criteria specified in 10 CFR 50, Appendix I, "Numerical Guidelines for Design Objectives for Operation to Meet the Criterion As Low As Is Reasonably Achievable For Radioactive Material In Light-Water-Cooled Nuclear Power Plant Reactor Effluents.

4. Workers were evacuated from Containment in a timely manner. All personnel were removed from Containment within about 27 minutes.

5. No Emergency Action Levels (EALs) were applicable for this occurrence and therefore no Emergency Plan implementation was required.

NRC-Identified and Self-Revealing Findings

Based on NRC's independent review and evaluation of the events and circumstances surrounding this matter, and application of NRC's performance-based and risk-informed Reactor Oversight Process, NRC determined that the following Findings were identified:

Cornerstone: Occupational Radiation Safety

- **Green**: A self-revealing non-cited violation (NCV) of 10 CFR 20.1701 was identified because Exelon did not use process or other engineering controls, to the extent practicable, to control the concentration of radioactive materials in air. Specifically, process or engineering controls were not used to the extent practicable, during vacuuming of a Unit 1 reactor coolant system cold leg, of the "A" steam generator, on November 21, 2009. The vacuum was unfiltered and caused generation of airborne radioactivity, subsequent internal and/or external contamination of 145 personnel; dispersal of airborne radioactivity to the Containment work areas, and release of low-level contamination to the offsite environment. Workers were evacuated from Containment, the source of the radioactivity was stopped, and the issue was documented in the corrective action program (AR 996823).

  This finding is more than minor because it adversely affected the Occupational Radiation Safety Cornerstone objective to ensure adequate protection of worker health and safety. Using the IMC 0609, Appendix C, Occupational Radiation Safety Significance Determination Process, the finding was determined to be of very low safety significance because it did not involve: (1) as low as is reasonably achievable collective exposure planning and controls, (2) an overexposure, (3) a substantial potential for overexposure, or (4) an impaired ability to assess dose. The cause of the finding is related to the cross-cutting area of Human Performance, Work Control aspect H.3(a), in that radiological controls requirements, developed for this task, were not adequately planned, coordinated, or incorporated to preclude its occurrence. (Section 4OA3.3.5)

Cornerstone: Public Radiation Safety

- **Green**: A self-revealing NCV of Technical Specification 6.8 was identified because Exelon did not properly establish and implement procedures for control of radioactivity to limit materials released to the environment and limit personnel exposure as specified in Appendix A of Regulatory Guide 1.33, 1978. Specifically, from November 12 to November 21, 2009, Exelon did not effectively manage Unit 1 Containment openings and ventilation system flows, following removal of a section of the Containment liner, to maintain inward airflow and promptly detect and minimize the release of radioactivity from the construction opening as required by Engineering Change Request TM-06-00816. As a result, an uncontrolled airborne radioactivity release occurred from the construction opening on November 21 at about 3:45 p.m. Further, airborne radioactivity was released from the opening during periods of outward airflow following the removal of a section of the Containment construction opening liner on November 12 through the time of the uncontrolled release, until midnight on November 21 when inward airflow was re-established. Exelon documented this issue in its corrective action program. (ARs 994989 and 1000819)

  This finding is more than minor because, if left uncorrected the issue had the potential to lead to a more significant safety concern. Using the Public Radiation Safety Significance Determination Process (IMC 0609, Appendix D), the finding was of very low safety significance because the licensee was able to assess the dose impact to members of the public and the dose impact to a member of the public from the radiological release was less than the dose values specified in both Appendix I, to 10 CFR Part 50, and 10 CFR

20.1301(e). The cause of the finding is related to the cross-cutting area of Human Performance, Resources aspect H.2(b), because procedures developed for both control and timely detection of radioactive effluents from the Containment construction opening were inadequate. (Section 4OA3.3.6)

- **Green**: The inspectors identified an NCV of Technical Specification 6.11 because from November 16 through November 21, 2009, Exelon did not implement timely follow-up and corrective action to minimize radioactivity released to the environment as required radiation protection procedures, RP-AA-1, RP-AA-10, and RP-AA-14. Specifically, upon discovery on November 16 of an unplanned, unfiltered radioactive release pathway from the Containment construction opening to the environment, station personnel did not promptly initiate a condition report or assign appropriate significance to the issue. Consequently, an unfiltered release pathway from the Containment existed until appropriate control of Containment openings and the ventilations system were re-established on November 21. Condition reports 1041529 and 1042874 were initiated to evaluate timeliness of actions to stop the unfiltered radioactive release to the environment.

  This finding is more than minor because, if left uncorrected the issue had the potential to lead to a more significant safety concern. Using the Public Radiation Safety Significance Determination Process (IMC 0609, Appendix D), the Finding was of very low safety significance because the licensee was able to assess the dose impact to members of the public and the dose impact to a member of the public from the radiological release was less than the dose values specified in both Appendix I, to 10 CFR Part 50, and 10 CFR 20.1301(e). The cause of the finding is related to the cross-cutting area of Problem Identification and Resolution, Corrective Action Program aspect P.1(d), because appropriate corrective actions to assess and correct the cause of the outward air flow from the Containment construction opening were not properly prioritized and implemented in a timely manner commensurate with their safety significance and complexity. (Section 4OA3.3.7)

Licensee Identified Findings

None

REPORT DETAILS

4. OTHER ACTIVITIES [OA]

4OA3 Event Follow-up

.1 Inspection Scope (71153, 71121.01, 71122.01, 71124.01, 71124.02, 71124.03, 71124.04, 71124.05, 71124.06, 71124.07)

The inspectors reviewed the circumstances and Exelon's evaluations with regard to an airborne radioactivity event that occurred within the Three Mile Island (TMI) Unit 1 Reactor Building (Containment) on November 21, 2009. The airborne radioactivity was caused by use of an unfiltered (non-High Efficiency Particulate Air (HEPA)), vacuum cleaner, to remove radioactive contamination from within the "A" steam generator reactor "A" cold leg (SG A-1A) loop in preparation for planned pipe end decontamination.

During use of the vacuum cleaner, radioactive contamination was discharged from its exhaust into the "A" steam generator D-ring open area, located on the 281-ft. elevation of Containment, resulting in airborne radioactivity. The airborne radioactivity was subsequently circulated throughout the Containment by air handling systems. Subsequently, various local portable air monitoring systems alarmed which alerted personnel to the presence of airborne radioactivity. Due to inadequate control of Containment ventilation, airborne radioactivity was discharged to the environment from the Containment construction opening. The airborne radioactivity did not result in alarms of any plant permanently installed airborne radioactivity monitoring systems since the monitors are downstream of filters. Exelon corrective action program document AR 996823 provided a description of the event; associated evaluations and observations, including root and contributing causes; and corrective actions.

The inspectors observed and inspected Exelon's performance of licensed activities and independently assessed the circumstances and conditions surrounding this occurrence in accordance with regulatory processes, policies, and standards. The inspectors reviewed the chronology of the occurrence; and examined and evaluated Exelon's performance relative to: 1) documentation and reporting of the issue; 2) determination of the pertinent circumstances, events, and details associated with the matter; 3) evaluation of the safety and risk significance of the occurrence on plant operations, and public health and safety; 4) evaluation of the extent of condition; 5) investigation to determine the source of airborne radioactivity; 6) implementation of mitigation and repair activities; and 7) determination of the potential radiation dose consequences to members of the public and to occupational workers.

The inspectors reviewed: notification and reporting; Containment evacuation actions; EAL entry evaluation, including assessment methods; corrective action implementation including conduct of a RCE; occupational dose consequences; public dose consequences including assessment of releases; operational aspects; control of engineering changes regarding the construction opening; and effluent control procedure aspects for the construction opening.

The inspectors walked down and visually inspected the location of the vacuum cleaner and the associated ongoing work. The inspectors examined areas around the Containment construction opening both inside and outside the Containment, including the steam generator transfer platform. The inspectors also reviewed occupational and environmental radiation and airborne radioactivity monitoring and sampling results for these areas, including the representativeness of samples and identification of the complete radionuclide source term. Documents reviewed for this inspection activity are listed in the Attachment, Supplemental Information.

.2 Event Description and General Chronology

During late fall 2009, Three Mile Island (TMI) Unit 1 was undergoing a refueling and steam generator (SG) replacement outage. On November 12, in support of SG replacement activities, an approximate 23 ft X 26 ft construction opening was cut into the TMI Containment structure. The opening provided an access point to Containment to support removal of the old SGs and subsequent installation of the new SGs. When the opening had been made, Exelon suspended operation of Containment air handling systems to prevent air movement from impacting the large segment of the cut-out Containment liner plate. Once the plate was removed, Exelon did not fully re-establish inward air flow to Containment.

On November 21, Exelon removed the "A" steam generator and was conducting various work activities including: "B" D-Ring steam generator work, core flood "A" work activities, and "A" steam generator D-Ring cold leg debris removal in preparation for pipe end decontamination activities. The debris removal, from the "A" cold leg, involved personnel using a non-HEPA filter equipped vacuum cleaner, estimated at about 15 gallons capacity. The vacuum was used to vacuum out radioactive contamination and residual dry debris from the open "A" steam generator cold leg piping. The vacuum cleaner was labeled "SG #1 Wet Use" indicating that the device was intended for wet use only.

At approximately 3:45 pm on November 21, work commenced on vacuuming out the "A" cold leg on the 281 ft elevation of the Containment in order to support pipe end decontamination. There were 4 individuals directly involved in the activity. Exelon held a general work briefing 5 days earlier to describe the overall pipe decontamination activities. Exelon also held a radiological controls briefing prior to the start of the specific task work to principally discuss Locked High Radiation Area Controls associated with the vacuuming. During this latter briefing, workers also reviewed pictures of the inside of the pipe and the material/debris to be removed. Notwithstanding, the briefings did not include any discussion on the type of vacuum cleaner to be used, limitations on the acceptability of the device as an engineered control for radioactive contamination control, or limitations relative to the use of the "Wet Use" vacuum device.

Prior to the start of the vacuuming, a radiation protection (RP) technician conducted a radiological survey on the vacuum cleaner and noted about 23 mR/hr on contact. The vacuum cleaner hose, about 20 feet in length, was new and did not indicate any radiation dose rates.

(Note: Post-event review indicated the "Wet Use" vacuum had been used earlier to vacuum dry debris from another location, i.e., the "A" Steam generator skirt. Exelon did not identify personal intakes or contaminations associated with that use. Exelon had encountered some nuisance alarms on portable air monitors attributable to short term dose rate increases from component movement. Exelon replaced the monitors with a type less susceptible to changes in ambient background radiation.)

The "A" cold leg vacuuming was conducted for about 1 minute commencing at about 3:45 p.m. After the vacuuming, the RP technician performed a second radiation survey of the vacuum cleaner and noted increased radiation levels of 400- 600 mR/hr on contact. Despite the increase in radiation dose rates on the vacuum cleaner, the RP technician allowed vacuuming to continue for an additional approximately 30 seconds. During or shortly after the vacuuming activities, local airborne radioactivity monitors on the 281-ft. elevation of Containment began alarming in the vicinity of the "B" steam generator D-ring. In addition, other portable air monitors in the Containment began alarming.

Based on the number of alarming monitors, the levels of radioactivity indicated, and the lack of understanding as to the cause, radiation protection personnel initiated a Containment evacuation. RP personnel toured throughout Containment directing workers to leave the Containment. Although no formal evacuation announcement was made over the page system, Exelon estimated all personnel were removed from Containment within about 27 minutes. Notwithstanding, Exelon identified areas for enhancement in the evacuation process and documented them in the corrective action program.

.3. Areas of Inspection

.3.1 Reportability

a. Inspection Scope

The inspectors reviewed Exelon's reporting of the November 21, Containment airborne radioactivity event. The review was against reporting criteria contained in 10 CFR 20, "Standards for Protection Against Radiation," 10 CFR 50.72, "Immediate Notification Requirements for Operating Nuclear Power Reactors," Technical Specifications (TS), the Off-site Dose Calculation Manual (ODCM), NUREG-1022, "Event Reporting Guidelines:10 CFR 50.72 and 10 CFR 50.73," and with respect to Exelon procedures.

b. Findings and Observations

No findings of significance were identified.

On November 21, Exelon informed the Commonwealth of Pennsylvania about the event and, as a result, subsequently notified the NRC, in accordance with 10 CFR 50.72, due to notification of another government agency. No other specific formal reporting requirement was identified.

.3.2 Emergency Declaration Aspects

a. Inspection Scope

The inspectors reviewed the emergency declaration aspects of the airborne contamination event. The review was with respect to criteria contained in Exelon Emergency Action Level (EAL) procedures.

b. Findings and Observations

No findings of significance were identified.

Exelon conducted a prompt evaluation of the need to enter an EAL. The event did not result in need for declaration of an emergency condition as described in the station's Cold Matrix EALs. Exelon used bases documents (Offsite Dose Calculation Manual) to evaluate entry conditions associated with radioactive releases. In addition, no specific operational condition warranted EAL entry.

.3.3 Containment Evacuation Aspects

a. Inspection Scope

The inspectors reviewed the implementation of Containment evacuation procedures, as appropriate. The review was with respect to criteria contained in Exelon procedures.

b. Findings and Observations

No findings of significance were identified.

Due to the number of alarming monitors, the levels of radioactivity indicated, and the lack of understanding as to the cause, radiation protection personnel initiated a prompt Containment evacuation. Radiation protection personnel toured throughout Containment directing workers to leave the Containment. The Containment was fully evacuated within 27 minutes and workers exited the Containment via both the Unit 1 Containment Personnel Hatch and the Containment construction opening. No Containment evacuation alarm or announcements were made since applicable procedure prerequisites were not reached. As personnel exited these locations, whole body monitoring was conducted to ascertain any contamination impact. Radiological surveys were conducted on the steam generator transfer platform, an area demarcated as a Radiological Controlled Area, outside the Containment. No radioactivity was detected on the platform or other areas outside the Containment. Personnel exited the Personnel Hatch inside the Radiological Controlled Area and were also monitored upon exit. Exelon did detect low-level contamination outside the Personnel Hatch and decontaminated the area. Exelon closed off the Personnel Hatch and Construction opening with tarps once all personnel were evacuated. Exelon's evaluation identified areas for enhancement relative to the use of an evacuation alarm and documented this matter in the corrective action program. (AR 997418)

.3.4 Operational Aspects

a. Inspection Scope

The inspectors reviewed the operational aspects of the activities to locate, isolate, and control the airborne radioactivity. The inspectors reviewed process plant computer (PPC) data, control room logs, and interviewed Exelon personnel to understand if the plant experienced any operational effects. In addition, the inspectors performed plant walkdowns, and examined and reviewed licensee investigation and work activities.

b. Findings and Observations

No findings of significance were identified.

The inspectors determined there were no issues identified associated with operational reactor safety. The reactor had been fully de-fueled for the outage.

.3.5 Occupational Exposure Control

a. Inspection Scope

The inspectors reviewed the occupational radiological safety aspects associated with the airborne radioactivity event that occurred on November 21. Specifically, the inspectors reviewed the radiological controls for workers involved in the conduct of the vacuuming operation and those workers impacted by airborne radioactivity. The inspectors reviewed the following matters:

- adequacy and implementation of radiation work permits (RWPs), ALARA reviews, and associated controls for the work task, including worker briefings;
- radiation dose and airborne radioactivity monitoring and assessment, including availability and maintenance of representative sample results;
- occupational dose calculations associated with the event including external and internal exposure calculations;
- monitoring and release of personnel from the Radiological Controlled Area (RCA),
- contamination controls;
- controls used to allow personnel re-entry into the RCA;
- use of engineering controls to minimize occupational dose; and,
- monitoring and release of personnel from the site including documentation.

The inspectors also reviewed and evaluated Exelon's RCE conducted to evaluate the event and establish corrective actions.

b. Findings and Observations

The specific workers involved in the vacuuming activity did not sustain detectable external or internal contamination associated with the event. Exelon's review of the occupational dose consequences of the event identified that worker low-level external contamination did not result in any significant dose consequence. Further, worker

internal dose evaluations, validated by independent industry technical experts, did not indicate any workers sustained an internal dose in excess of 1% of applicable regulatory dose limits.

The airborne radioactivity event resulted in 145 workers sustaining external and or internal low-level radioactive contamination. Of the 145 workers, one worker sustained a recordable internal exposure (i.e., committed effective dose equivalent) in excess of 10 millirem (but less than 11 millirem), as compared to a total effective dose equivalent limit (i.e., deep dose equivalent plus committed effective dose equivalent) of 5,000 millirem. None of the workers sustained external shallow or deep dose equivalent requiring recording associated with the contamination. Exelon indicated workers were briefed on exposure results and provided reports, as requested.

Because of the sensitivity of personnel contamination monitors in use, personnel continued to alarm whole body contamination monitors after the event and were restricted from access to radiological controlled areas, except with specific permission and controls. Workers alarmed site exit monitors, due to low-level, residual contamination. These individuals were evaluated and provided egress authorizations for site release. Exelon did not identify any public dose impact associated with the release of the personnel. Exelon identified that all personnel had egress authorizations completed. However, Exelon could not locate two such records and placed this issue into its corrective action program (AR1037241). Notwithstanding, personnel contamination records and whole body count data was available and maintained for each affected worker.

The following Finding was identified:

Introduction: A Green self-revealing non-cited violation (NCV) of 10 CFR 20.1701 was identified because Exelon did not use process or other engineering controls, to the extent practicable, to control the concentration of radioactive materials in air. Specifically, process or other engineering controls were not used, to the extent practicable, during pipe interior vacuuming of the "A" steam generator cold leg on November 21.

Description: On November 21, Exelon conducted primary pipe interior vacuuming within the Containment in preparation for pipe end decontamination of the "A" steam generator cold leg (SG A-1A). The vacuuming was conducted to remove debris that could potentially impact the specialized decontamination equipment. During the vacuuming of the pipe interior, workers used a vacuum cleaner designated "SG#1 Wet Use," that was not equipped with a high efficiency particulate air (HEPA) filter, to vacuum dry and damp highly radioactive debris from the pipe interior, including some residual water within the loop drain. The workers did not recognize that use of the vacuum cleaner to remove the loose debris within the pipe was dispersing airborne radioactive particulate contamination to the Containment. The resulting airborne radioactivity caused alarms on pre-staged local, real-time airborne radioactivity monitors. The use of the unfiltered vacuum resulted in the generation of elevated airborne radioactivity, subsequent internal

or external contamination of 145 personnel; and unplanned release of low-level airborne radioactivity to the Containment. Exelon conducted a Containment evacuation as a result.

Analysis: The failure to use process or engineering controls, to the extent practicable, to minimize airborne radioactivity in accordance with 10 CFR 20.1701 is a Performance Deficiency. The Performance Deficiency constitutes a Finding that is more than minor because no similar example was identified in IMC 0612, Appendix E, and it was associated with the Occupational Radiation Safety attribute of Program and Process and adversely affected the Cornerstone objective. Specifically, failure to control the concentration of radioactive materials in air did not ensure adequate protection of worker health and safety. The lack of use of effective controls resulted in elevated airborne radioactivity, unplanned internal and external contamination of personnel and unplanned release of airborne radioactivity to the environment. The finding is not subject to Traditional Enforcement because it did not affect the regulatory process or result in actual safety consequences. Using IMC 0609, Appendix C, Occupational Radiation Safety Significance Determination Process, the finding was of very low safety significance (Green) because it did not involve: (1) as low as is reasonably achievable (ALARA) occupational collective exposure planning and controls, (2) an overexposure, (3) a substantial potential for overexposure, or (4) an impaired ability to assess dose.

The cause of the finding is related to the cross-cutting area of Human Performance, Work Control Component aspect H.3(a.) in that radiological controls requirements, developed for this task, were not adequate to preclude its occurrence. The program procedures and job radiological controls documents (e.g., procedures, RWP or ALARA plan) did not provide guidance as to what constituted "wet use" to preclude the occurrence of airborne radioactivity as a result of inappropriate use or ensure use of adequate engineering controls.

The inspectors' review, and Exelon's RCE, determined that additional contributing causes were associated with the use of the unfiltered vacuum cleaner. These were control, oversight, and performance of the work activity in accordance with procedure guidance and expectations. Specifically, procedure nonconformance attributes contributed to the event. The specific examples included: failure to issue the vacuum to a specific individual and train the individual on the limitations of the vacuum; failure to suspend the use of the vacuum upon detection of elevated radiation dose rates; failure to implement radiological hold points; and lack of complete survey data. In addition, there were weaknesses in management and oversight of the supplemental work force to ensure work was performed to requirements, processes, and performance standards, including use of proper engineering controls to minimize airborne radioactivity. Exelon highlighted these contributing aspects within its RCE (AR 996823). Exelon implemented prompt corrective actions to address these issues including suspension of work activities pending additional reviews, validation of radiological work controls to support resumption of work, suspension of personnel qualifications, enhanced supervisory and management oversight, and implementation of procedure enhancements.

Enforcement: 10 CFR 20.1701 requires use of process or other engineering controls, to the extent practicable, to control the concentration of radioactive materials in air. Contrary to this requirement, Exelon did not use, to the extent practicable, process or other engineering controls during pipe interior vacuuming of the "A" steam generator cold leg on November 21, 2009, resulting in airborne radioactivity and personnel contamination. Because the failure to use process or other engineering controls to minimize airborne radioactivity, was determined to be of low safety significance (Green) and was entered into the licensee's corrective action program (AR996823), this violation is being treated as an NCV consistent with Section VI.A of the NRC Enforcement Policy, NUREG-1600. **(NCV 05000289/2010007-01, Failure to Use Process or Engineering Controls Caused Airborne Radioactivity)**

.3.6 Engineering Change Request Control Aspects

a. Inspection Scope

The inspectors reviewed the station controls and implementation of planned activities per engineering change request ECR TM-06-816, "OTSG Replacement- Containment Structural Opening," Rev. 2, to maintain the Containment purge system as required by Exelon procedures to induce airflow into Containment and to maintain the Containment at negative pressure during removal and replacement of the steam generators. Without negative pressure and inward airflow, airborne contamination could be free to escape the Containment through the construction opening or equipment hatch instead of being directed through the purge exhaust system where it would be removed by the Containment purge exhaust and filtration system. The inspectors reviewed Exelon's RCE and an Apparent Cause Evaluation documented in ARs 996823, "Unexpected Airborne Rad Activity In RB," and AR 1000819, "RB Not Negative Pressure During High Contamination Work." In addition, the inspectors reviewed AR 994989, "RB Purge Not Available Due To Clearance on Supply valves," performed field walk-downs, and interviewed operators, engineers, and radiation protection technicians and managers.

The inspectors also reviewed the supplemental airborne radioactivity monitoring established and implemented to monitor and assess any potential airborne radioactivity release from the construction opening during the work activities. Documents reviewed are listed in the Attachment, Supplemental Information.

b. Findings and Observations

Introduction: A self-revealing non-cited violation (NCV) of TS 6.8 was identified involving failure to properly establish and implement procedures for control of radioactivity to limit materials released to the environment and limit personnel exposure as specified in Appendix A of Regulatory Guide 1.33, Rev. 2, 1978.

Description: Exelon did not properly establish and implement procedures, including ECR TM-06-00816, to minimize the potential release of radioactive material from the Containment construction opening. Specifically, openings and ventilation system flows were not effectively managed during the period November 12 through midnight November 21, to maintain inward airflow, and minimize the potential for air outflow. In

addition, Exelon did not establish procedures to ensure timely evaluation of outward airflow and detection of potential radioactive effluent releases to the environment when the construction liner was removed. Exelon did have continuous airborne radioactivity sample capability installed.

The safety-related ECR properly recognized unique challenges including weather protection, sampling, and control and monitoring of potentially radioactive materials generated during the demolition process and during steam generator replacement activities. Notwithstanding, the ECR for the approximately 24-ft. X 26-ft. opening did not specify steps to properly manage Containment openings and the purge system to provide in ward airflow to the Containment. Specifically, Section 1.2.1.2.h of the ECR stated, in part, that breaching the Containment liner plate results in another path whereby airborne contamination can potentially exit the Containment and that purge will be maintained, as required, to induce airflow into Containment. The ECR also indicated that the Containment purge is a monitored release path and must be maintained. An airborne radioactivity monitor would be placed near the construction opening for continuous assessment of the release pathway in the event of loss of the Containment purge. The ECR also indicated that should radiological protection (RP) monitoring identify a potential release issue, of if there is a ventilation failure for any reason, RP may direct that any of the following measures be taken until the purge is restored: a) Discontinue work activities with potential airborne contamination levels; and b) Close all openings to the outside environment, including the Containment access opening.

During the period November 12 through midnight on November 21 outward airflow occurred from the construction opening. The inspectors determined the cause of the outward airflow was a deficient ECR and deficient configuration control of the Containment purge system and openings (i.e., equipment hatch, personnel hatch, and construction opening), as intended by the ECR. Specifically, the purge exhaust system was not in service between November 7, and November 20 contrary to the requirements of the ECR. In addition, alternative measures prescribed in the ECR for cases when the purge was not available were not applied.

The inspectors determined that during development of the ECR, station personnel had considered the need to install a Containment equipment hatch tarp to maintain Containment negative pressure and inward airflow via the construction opening. However, the use of an equipment hatch tarp was not incorporated into the ECR which was determined necessary to re-establish in ward airflow. An apparent cause evaluation (ACE) per AR1000819 (Assignment 2) determined the cause for deficient implementation of the ECR requirements was that a single point of contact for all ventilation related activities as recommended during the ECR approval process was not maintained.

As a result, airborne radioactivity was released from the construction opening on November 21 at about 3:45 p.m., following an in-Containment airborne radioactivity event. Further, airborne radioactivity was also released during periods of outward airflow following removal of the Containment construction opening liner on November 12 through midnight on November 21 when negative (inward) airflow was restored.

The inspectors' review also determined that a procedure had been established to provide for analysis of airborne radioactivity samples associated with the Containment construction opening. However, the procedure did not require timely analysis of the samples collected. Exelon counted samples from the air sampler on November 18 and recognized that low-level particulate radioactivity releases were occurring. Exelon documented this matter in the corrective action program. Exelon's corrective actions efforts to terminate the airborne radioactivity releases were unsuccessful until mid-night of November 21. Exelon subsequently implemented actions to provide for enhanced controls of the potential for outward air flow from Containment openings.

Analysis: The Performance Deficiency involves a deficient ECR and deficient configuration control of the Containment purge system and Containment openings as directed by the ECR contrary to TS 6.8. The Performance Deficiency is more than minor because no similar threshold example was identified in IMC 0612, Appendix E, and if left uncorrected, the Performance Deficiency had the potential to lead to a more significant safety concern. Specifically, adequate measures to promptly control outward, unfiltered airflow from the Containment were not in place and numerous ongoing work activities were occurring that presented significant airborne radioactivity source term potential. The finding is not subject to Traditional Enforcement because it did not affect the regulatory process or result in actual safety consequences.

Using the Public Radiation Safety Significance Determination Process (IMC 0609, Appendix D), the finding was of very low safety significance (Green) because the licensee was able to assess the dose impact to members of the public, and the dose impact to a member of the public was less than the dose values specified in both Appendix I, to 10 CFR Part 50, and 10 CFR 20.1301(e). The cause of the finding is related to the cross-cutting area of Human Performance, Resources aspect H.2(c) because program procedures developed for both control and timely detection of effluents from the Containment construction opening were inadequate.

Enforcement: TS 6.8 requires that procedures be established, implemented and maintained covering the applicable procedures specified in Appendix A of Regulatory Guide 1.33, 1978. Regulatory Guide 1.33 recommends, in Section 7, procedures for control of radioactivity (for limiting materials released to environment and limiting personnel exposure). Contrary to the above, Exelon did not establish, and implement procedures, as appropriate including ECR TM-06-00816 for removal of a section of the Containment liner, to properly manage the building openings and ventilation system flow to maintain inward airflow, and promptly detect and minimize the potential for air outflow and airborne radioactivity releases. Because the finding is of very low safety significance and has been entered into Exelon's corrective action program (AR 1000819, AR 1041529), this violation is being treated as a non-cited violation, consistent with Section VI.A.1 of the NRC Enforcement policy. **(NCV 05000289/2010007-02, Deficient Design Change Implementation and Controls Resulted In Unfiltered Radioactivity Release to the Environment)**

.3.7 Corrective Action to Stop Outward Airflow from Unit 1 Construction Opening.

a. Inspection Scope

The inspectors reviewed the corrective actions implemented by station personnel to stop outward air flow from the construction opening following identification of this condition on November 16. The inspectors conducted interviews, document reviews, and plant walk-downs to verify the outward airflow was stopped and to evaluate whether corrective actions to preclude recurrence were implemented in a timely manner. Documents reviewed are listed in the Attachment, Supplemental Information.

b. Findings

Introduction: The inspectors identified a Green NCV of TS 6.11 because personnel did not implement timely corrective action to resolve an adverse condition involving outward airflow from the Containment construction opening to minimize radioactivity released to the environment. Specifically, from November 16 until November 21, Exelon did not conduct a timely follow-up and take effective corrective action to minimize outward airflow, and associated unfiltered entrained airborne particulate radioactivity to the environment, in response to reports on November 16 that significant outward airflow was occurring from the Containment construction opening.

Description: On November 16, station personnel identified significant outward airflow from the Containment Construction opening. As a result of the observation, the Outage Control Center (OCC) and Operation Work Control Center (OWCC) staffs were informed of the issue including concern that this situation challenged the station's radioactive effluent control program effectiveness. No corrective action document (i.e., Issue Report) was initiated to document this concern. Initial assessment was that the outward airflow existed because the Containment purge ventilation system was tagged out of service for maintenance.

The OWCC staff determined no maintenance was being performed on the purge exhaust portion and this pathway could be restored if necessary. However, the operations shift manager determined the purge exhaust valve could not be operated until the valve suction area was heated above 60 degrees Fahrenheit (F) to address nil ductility transition temperature (NDTT) fracture concerns. Portable heaters had been installed and successfully tested for this purpose on November 7. However, as of November 19, operations personnel remained concerned about valve NDTT and directed the purge exhaust valves not be repositioned until after moving the heaters closer to the subject valve.

Based on reviewing logs, interviews, plant configuration, and recorded outside air temperatures, the inspectors subsequently determined the purge exhaust valve inlet temperature had remained above 60 F during the period November 16-21. Therefore, the determination that the purge exhaust suction valve could not be repositioned until heaters were installed to heat the valve area was incorrect.

On November 18, technicians confirmed the air flow out of the Containment construction opening. Issue Report 994989 was written to document radioactive particulate release on November 18. Subsequent measurements indicated approximately 137,000 standard cubic feet per minute. On November 20, the Containment purge exhaust system was placed in service. However, air continued to flow out of the Containment construction opening, contrary to the expected response. Station personnel did not actively evaluate this unplanned result and outward airflow continued from the construction opening. At approximately 3:45 p.m. on November 21, maintenance activities associated with installing the 'A' OTSG inadvertently created elevated levels of airborne radioactivity in the Containment. Station personnel promptly positioned a pre-installed curtain barrier over the construction opening but outward air flow did not fully stop as expected. At approximately midnight on November 21, station personnel installed a heavy tarp over the Containment equipment hatch opening. This completed the ventilation and barrier configuration necessary to stop the outward airflow.

The inspectors determined that station personnel missed several opportunities to stop the Containment construction opening air outflow and unintended release of radioactivity. Station personnel did not assign appropriate significance to the unfiltered radiological release path when it was identified. The issue was assigned a corrective action program significance level 4 (AR 994989) and received routine level response. Procedure LS-AA-120, Issue Identification and Screening Process, Rev. 10, states that "Configuration management discrepancies that result in an undesirable plant condition" meet significance level 3 criteria. The inspectors determined the issue met the criteria to be assigned a CAP significance level 3, which would have required greater management involvement by the site Management Review Committee. Consequently, insufficient priority, importance, and resources were assigned to stop the unplanned release via the Containment construction opening. This lack of timely corrective action did not ensure dose to the public was maintained as low as reasonably achievable (ALARA).

c. Analysis: The Performance Deficiency involves failure to implement radiation protection procedures in accordance with Technical Specification 6.11 to minimize release of radioactive materials. The Performance Deficiency constitutes a Finding which is more than minor because no similar example was identified in IMC 0612, Appendix E, and if left uncorrected the Performance Deficiency had the potential to lead to a more significant safety concern. Specifically, station personnel did not assign appropriate significance to the unfiltered and unplanned radioactivity release path resulting in insufficient resources and priority to stopping the outward airflow in a timely manner.

Further, numerous ongoing work activities were occurring that presented significant airborne radioactivity source term potential and adequate measures were not in-place to promptly stop releases from the opening. This finding is not subject to Traditional Enforcement because it did not affect the regulatory process or result in actual safety consequences.

Using the Public Radiation Safety Significance Determination Process (IMC 0609, Appendix D), the finding was of very low safety significance (Green) because the licensee was able to assess the dose impact to the public, and the dose impact to a member of the public from the radiological release was less than the dose values

specified in both Appendix I, to 10 CFR Part 50, and 10 CFR 20.1301(e). Projected public dose evaluations, based on actual meteorology and samples from the opening, as well as Environmental samples collected downwind, confirmed the associated elevated radioactivity release was only a small fraction of regulatory limits.

The cause of the finding is related to the Problem Identification and Resolution cross-cutting area, Corrective Action Program aspect P.1(d), because appropriate corrective actions to assess and correct the cause of the outward air flow from the Unit 1 Containment construction opening were not properly prioritized and implemented in a timely manner commensurate with their safety significance and complexity. Exelon placed this issue in its corrective action program. (AR 1044549)

d. Enforcement: TS 6.11 requires that procedures for personnel radiation protection be prepared consistent with the requirements of 10 CFR Part 20 and be approved, maintained and shall be adhered to for all operations involving personnel radiation exposure. 10 CFR Part 20 requires, in-part, in Section 20.1101(b), that the licensee shall use, to the extent practicable, procedures and engineering controls, to achieve doses to members of the public that are as low as is reasonably achievable. Procedure RP-AA-1, Radiation Protection, Rev. 0 and RP-AA-16, ALARA Program Description, Rev. 0, require that Exelon manage the radiation dose that the public receives as a result of plant operation to a value as low as is reasonably achievable (ALARA). Further, RP-AA-1 and RP-AA-14, Radioactive Material Control Program Description, Rev. 0, state that radioactive material will be controlled to prevent the uncontrolled spread of radioactivity to an area where the public may be affected. Radioactive materials, including those generated from operating license activities, shall be maintained within radiologically controlled areas. Procedure RP-AA-10, Radiation Protection Process, Rev. 1, requires the licensee to follow-up and take corrective action if radiological program or process results are not acceptable. ECR TM 06-00816 stated that with the exception of the Containment liner cut activity, the Containment purge would be maintained to induce airflow into the construction opening, thereby minimizing the potential for release of material. In the event of loss of ventilation, specific compensatory measures were to be implemented to prevent release of radioactive materials. Procedures LS-AA-120, Issue Identification and Screening Process, Rev. 10 and LS-AA-125, Corrective Action Program (CAP) Procedure, Rev. 13, specify guidance for assigning significance level to issues, require station personnel to identify conditions adverse to quality, assign appropriate significance level, and ensure appropriate immediate actions and investigations are implemented to place the situation in a safe and stable condition.

Contrary to the above, from November 16 until November 21, 2009, station personnel did not perform timely follow-up and corrective action in response to reports that there was significant outward airflow from the Containment construction opening. This resulted in a release of radioactivity from the Containment construction opening that could contribute to public dose and demonstrated that Exelon did not effectively manage the radiation dose to ensure doses were ALARA. Because the finding is of very low safety significance, and has been entered into Exelon's corrective action program (ARs 1041529 and 1042874), this violation is being treated as a non-cited violation, consistent

with Section VI.A.1 of the NRC Enforcement policy. **(NCV 05000289/2010007-03, Untimely Corrective Action to Stop Unfiltered Radiological Release)**

.3.8 Public Exposure Control

a. Inspection Scope

The inspectors reviewed the public radiological controls aspects of the November 21 airborne radioactivity event. In particular, the potential dose consequences to members of the public were evaluated. The following items were reviewed:

- radiological measurements of radioactivity samples, including analytical methodology;
- measurement results of air samples;
- radiological measurement results;
- sampling and evaluation of potential hard-to-detect radionuclides;
- evaluation of residual radioactivity;
- evaluation of any apparent anomalous sample results, as applicable;
- control of total radioactivity released;
- determination of effluent release flow rates
- assessment of the local meteorology;
- assessment of the projected radiation doses to members of the public based on possible exposure pathways and including age specific dose calculations;
- maintenance of records in accordance with 10 CFR 50.75;
- development and implementation of enhanced periodic sampling, as necessary
- Exelon's Root Cause Evaluation.

The review in this area was against criteria contained in Technical Specifications, 10 CFR 20, "Standards for protection against radiation," and Procedure CY-TM-170-300, Rev.1, "Offsite Dose Calculation Manual (ODCM) - Three Mile Island Station."

b. Findings and Observations

No findings of significance were identified.

The inspectors independently evaluated Exelon's radiological assessment relative to public health and safety. From the data available, the inspector confirmed that the radiological conditions associated with this occurrence did not, nor were they expected to, result in any significant projected public dose in excess of NRC regulatory limits and requirements. The inspectors did not identify any significant off-site dose consequences to members of the public associated with the airborne radioactivity release. No radioactivity was detectable above background on horizontal surfaces outside the construction opening following the airborne radioactivity event. Exelon documented the evaluation of releases from the Containment in its corrective action program (AR 1000819).

Exelon conducted an analysis of radioactivity released from the Containment opening from the time of the event on November 21 until the opening was closed and inward air flow was re-established at about midnight on November 21. Exelon conducted radiological analyses of the samples and documented the abnormal release on November 21 via various release permits to account for differences in both flow characteristics associated with closure of the opening (Release Permits G200911628, Rev. 1; G200911629, Rev. 1; G200911630, Rev. 1; and G200911631, Rev. 2), and airborne radioactivity concentrations. As part of the analysis, Exelon also included any detectable release that occurred since completion of the construction opening on November 12. Exelon had instrumented the opening with an air monitor to monitor the opening for any releases, and conducted sampling and analyses designed to meet Offsite Dose Calculation Manual (ODCM) lower limits of detection. Exelon had also conducted ongoing airborne radioactivity analyses within the Containment to evaluate ambient conditions as part of ongoing radiological analyses. No significant, general airborne radioactivity had been detected prior to the event.

Exelon used actual measured flow rates and airborne radioactivity samples collected at the construction opening to estimate the radioactivity released. Exelon applied conservative and real-time meteorology to the release rates to estimate maximum potential dose, relative to parameters in its Offsite Dose Calculation Manual. Exelon also conducted analyses for "Critical Offsite Receptor." Exelon's analysis indicated a maximum projected dose of 0.05 millirem (organ) as compared to Offsite Dose Calculation Manual (ODCM) ALARA criteria of 7.5 millirem per quarter and 15 millirem per year to any organ. Exelon also evaluated releases rates to ensure conformance with applicable release rate values specified in its ODCM.

Exelon collected and processed its downwind external dose monitoring system (thermoluminescent) dosimeters which did not show any measureable dose above expected normal ambient background levels.

To evaluate potential airborne transport of particulate material, Exelon collected airborne environmental monitoring samples from its downwind continuous environmental monitoring stations. Exelon's analysis of these airborne radioactivity samples identified statistically detectable radioactivity above background at two monitoring stations (ODCM Locations: G2-1 and F1.3). Exelon conducted an inter-comparison of the dose results based on both release analysis and in-field measurements and found the dose results comparable. Using the results obtained, and Offsite Dose Calculation Manual parameters, Exelon's analysis indicated a projected maximum annual dose for the critical receptor of 0.02 millirem (organ) in a year. In comparison, NRC's annual total body ALARA dose criterion for particulate effluents is 7.5 millirem in a calendar quarter and 15 millirem per year (10 CFR 50, Appendix I); the Environmental Protection Agency's (EPA) annual dose equivalent whole body and organ limit is 25 millirem for Uranium Fuel Cycle facilities (40 CFR 190); and NRC's general regulatory annual limit for individual members of the public is 100 millirem Total Effect Dose Equivalent (10 CFR 20.1301). The calculations included age-specific consumption and exposure considerations. No other stations indicated any statistically detectable activity including Station E1-2 located at the Training Center.

Exelon also collected and analyzed river water samples and down-wind owner controlled area soil samples. The inspectors' review indicated that no radioactivity was detected in the samples that were attributable to activities at Three Mile Island Unit 1.

.3.9 Event Root and Contributing Causes and Evaluations

a. Inspection Scope

The inspectors reviewed Exelon's RCE, evaluated the root and contributing causes, and evaluated Exelon's corrective actions, including planned actions. The inspectors reviewed all available documentation, including records pertaining to the RCE.

The review was with respect to criteria contained in 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," 10 CFR 20, Standards for Protection Against Radiation; Three Mile Island Unit 1 Technical Specifications; and applicable Exelon procedures.

b. Findings and Observations

Based on independent evaluation, the inspectors concluded that Exelon appropriately identified the root and contributing causes for the November 21 airborne radioactivity event and took appropriate corrective actions.

Exelon's RCE identified one root and six contributing causes for the airborne radioactivity event. The root cause of the event was identified to be the use of a non-HEPA filter equipped wet use vacuum cleaner to remove contaminated materials from a steam generator cold leg. The vacuum cleaner exhausted portions of the contamination, that became airborne, and was dispersed throughout the Containment by the ventilation system resulting in personnel contamination and intakes.

Exelon's RCE identified six contributing causes associated with the Containment airborne radioactivity event. The six contributing causes were associated with planning, control, oversight, and performance of the work activity in accordance with procedure guidance and expectations. These included use of an inappropriate engineering control to remove material from the SG A-1A cold leg; inadequate procedure use and adherence associated with evaluation of existing conditions and presence of unexpected debris; failure to suspend use of a vacuum cleaner upon encountering elevated radiation dose rates; lack of effective management and oversight of supplemental work force; lack of adequate pre-job briefings regarding the specific type of vacuum to be used or its limitations; and inadequate controls to assess the impact of ventilation system air flow on radiologically significant work. Exelon placed these issues into its corrective action system (AR 996823) and took prompt action to correct the identified issues.

Notwithstanding the above, the NRC identified an additional cause of the airborne radioactivity release from Containment involving lack of timely corrective action to address the identification of outward airflow from the construction opening on November 16. Exelon initiated corrective actions to address this NRC identified issue and placed this matter into its corrective action process. (See Section 4OA3.3.7.)

4OA6 Meetings, including Exit

.1 Exit Meeting

The inspectors presented inspection results to Mr. W. Noll, and members of his staff on March 12, 2010. Exelon acknowledged the findings presented. Based on discussions with Exelon personnel, none of the information presented at the exit meeting and included in this report was considered proprietary. A telephone call was held on April 15, 2010 with Mr. D. Helker and others to confirm the lack of proprietary information in the report.

4OA7 Licensee-Identified Violations

None.

ATTACHMENT: SUPPLEMENTAL INFORMATION

ATTACHMENT

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

D. Atherholt	Manager, Regulatory Assurance
R. Atkinson	Manager, Steam Generator Replacement Project
C. Baker	Manager, Chemistry
R. Bleistine	Normandeau Associates
T. Bradley	Normandeau Associates
J. Byrne	Licensing
W. Carsky	Director, Operations
G. Chevalier	Senior Chemist
R. Davis	Manager, Radiation Protection
D. DeBoer	Director, Operations
D. DiVitore	Manager, Radiological Engineering
T. Dougherty	Plant Manager
D. Etheridge	Manager, Radiation Protection Technical Support
T. Geyer	Manager, Programs
J. Heishman	Director, Maintenance
J. Karkoska	Manager, Site Security
R. Libra	Director, Work Management
F. Linsenbach	Manager, OTSG Replacement Radiation Protection
W. McSorley	Mechanical Design Engineer
C. Meyers,	Radwaste Supervisor
A. Miller	Regulatory Assurance
J. Murray	Manager, Operations Training
G. Navratil	Engineer
D. Neff	Manager, Emergency Preparedness
W. Noll	Site Vice President
J. Piazza	Senior Engineering Manager
T. Roberts	Supervisor, Radiation Protection
J. Schork	Lead LORT Instructor
B. Swenson	VP, Projects
M. Sweigart	Supervisor, Radwaste/Environmental
W. Taylor	Project Manager, SGT
D. Trostle	Operations Security Analyst
L. Weber	Senior Chemist
L. Weir	Manager, Nuclear Oversight Services
C. Wend	Manager, Radiation Protection

Other

D. Dyckman	Nuclear Safety Specialist Pennsylvania Department of Environmental Protection Bureau of Radiation Protection

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened/Closed

05000289/2010007-01	NCV	Failure to Use Process or Engineering Controls, as practicable, to Limit Airborne Radioactivity (Section 40A3.3.5)
05000289/2010007-02	NCV	Deficient Design Change Implementation and Controls Caused Unfiltered Radioactivity Release to the Environment (Section 4OA3.3.6)
05000289/2010007-03	NCV	Untimely Corrective Action to Stop Radiological Release (Section 4OA3.3.7)

Closed

None

LIST OF DOCUMENTS REVIEWED

In addition to the documents identified/discussed in the body of this report, the inspectors reviewed the following documents and records.

Procedures

- RP-AA-222, Rev. 3, Methods for Estimating Internal Exposure from In Vivo and In Vitro Bioassay Data
- RP-AA-220, Rev. 6, Bioassay Program
- RP-AA-350, Rev. 8, Personnel Contamination Monitoring, Decontamination and Reporting
- RP-TM-500-1005, Rev.0, Controlled Vacuum Cleaners
- RP-AA-870-1002, Rev.0, Use of vacuum Cleaners in Radiologicaly Controlled Areas
- RP-AA-401, Rev. 9, Operational ALARA Planning and Control
- RP-AA-300, Rev. 5, Radiological Survey program
- AD-AA-2001, Management and Oversight of Supplemental Workforce
- 1101-2.1, Radiation Monitoring System Setpoints, Rev. 79
- CC-AA-103, Configuration change Control For Permanent Physical Plant Changes, Rev. 19
- NO-AA-10, Quality Assurance Topical Report (QATR), Rev. 84
- OP-AA-101-113-1001, Station Event Free Clock (DFC) Program, Rev. 8
- OP-AA-106-101-1001, Event Response Guidelines, Rev. 16
- OP-AA-106-101-1002, Exelon Nuclear Issues Management, Rev. 7
- OP-AA-108-112, Plant Status and Configuration, Rev. 5
- OP-AA-108-112-1001, Response to Identified Component Mispositionings, Rev. 1
- OP-TM-AOP-001, Fire, Rev. 6
- OP-TM-AOP-050, Reactor Coolant Leakage, Rev. 1

- OP-TM-EOP-030, Loss of Decay Heat Removal, Rev. 3
- OP-TM-MAP-C0101, Radiation Level Hi, Rev. 1
- OP-TM-823-000, Rev. 4, 4A, Reactor Building Heating and Ventilation System
- OS-24, Conduct of Operations During Abnormal and Emergency Events, Rev. 17
- RP-AA-1004, Corporate RPM Event Notifications, Rev. 3
- RP-AA-1004, Radiation Protection Stop Work Authority and Corporate RPM Event Notifications, Rev. 4
- LS-AA-125, Rev. 14, Corrective Action Program (CAP) Procedure

Corrective Action Program Documents (ARs)

- AR 994989, Purge Not Available Due to Clearance
- AR 996823, Unexpected Airborne Radioactivity in Reactor Building
- AR 997418, Improvements to Communication procedures
- AR 997543, AMS 4 Problems in Containment
- AR 999752, RP Airborne Engineering Controls validation
- AR 1000225, Intermittent Airflow out Construction Opening
- AR 1000822, Improvement Opportunity for Event Communication
- AR 1000819, RB Not Negative During High Contamination Work
- AR 1000810, Procedure not Used to Issue Vacuums
- AR 1006874, REMP-Positive Sample Station G2-1
- AR 1031767, Actions from NSRB Meeting
- AR 1038142, Clock Reset Due to Contamination Event
- AR 1038567, Procedure for Releases Requires Revision
- AR 1041529, Timeliness of Tarp Installation
- AR 1042874, Release path significance level
- AR 1044549, Organizational Weakness in responding to RB Opening Outflow

Other Documents

- Shift Operating Logs Dated November 7 - December 31, 2009
- Various plant process computer data November 7 – December 31, 2009
- Work Orders C2022139
- ECR TM 09-00786, Additional Heaters Required for AH-V-1B Purge Flow, Rev. 1
- Calculation RAF 09-011, Radiological Effluent Monitoring Program for Containment Opening, Rev. 0
- Calculation 38455-CALC-C-017, Temporary Construction Curtain Design, Rev. 1
- Weather Station History (Temperatures) for period November 1 – December 31, 2009
- Non-Routine Release Number G200911628, Rev. 1
- AMS-4 Operational Check logs November 10 – 29, 2009
- Personnel Contamination Records
- Personnel Whole Body Count Records
- Contaminated Individual Release Forms
- Airborne Radioactivity Count Records
- Radiation Work Permit 09-0616, SGR Topo and Pipe End Decon(LHRA)
- ALARA Plan 09-019
- Clearance 09500697, Reactor Building Purge Exhaust Valve, AH-V-1A
- SDBD-T1-823, System Design Basis Document for Reactor Building Cooling System, Rev. 4

LIST OF ACRONYMS

ACE	Apparent cause Evaluation
ACMP	Adverse Condition Monitoring Report
ADAMS	Agencywide Documents and Management System
AR	Action Request
ALARA	As Low As is Reasonably Achievable
ASME	American Society of Mechanical Engineers
CAP	Corrective Action Program
CFR	Code of Federal Regulations
CL	Cold Leg
DRP	Division of Reactor Projects
DRS	Division of Reactor Safety
EAL	Emergency Action Level
ECR	Engineering Change Request
EOTSG	Enhanced Once-Through Steam Generator
EPA	Environmental Protection Agency
HEPA	High Efficiency Particulate Air
HRA	High Radiation Area
IMC	Inspection Manual Chapter
NCV	Non-cited Violation
NDTT	Nil Ductility Transition Temperature
NRC	Nuclear Regulatory Commission
OCC	Outage Control Center
OTSG	Once Through Steam Generator
OWCC	Outage Work Control Center
PPC	Plant Process Computer
PADEP	Pennsylvania Department of Environmental Protection
RCA	Radiological Controlled Area
RCE	Root Cause Evaluation
RCS	Reactor Coolant System
RWP	Radiation Work Permit
SDP	Significance Determination Process
SG	Steam Generator
SGR	Steam Generator Replacement
TMI	Three Mile Island, Unit 1
TS	Technical Specifications
T1R18	Fall 2009 18th Refueling Outage
VT	Visual Testing
WO	Work Order
WP	Work Package