

U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-272/87-30
50-311/87-31

Docket No. 50-272
50-311

License No. DPR-70 Priority -- Category C
DPR-75

Licensee: Public Service Electric and Gas Company
P. O. Box 236
Hancock Bridge, New Jersey 08038

Facility Name: Salem Nuclear Generating Station

Inspection At: Hancock Bridge, New Jersey

Inspection Conducted: October 19-23, 1987

Inspectors: Jean A. Bresich - Cioppa for 12/4/87
R. M. Loesch, Radiation Specialist date
Jean A. Bresich - Cioppa for 12/4/87
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M. Shanbaky, Chief, Facilities date
Radiation Protection Section

Inspection Summary: Inspection on October 19-23, 1987 (Combined Inspection Report Nos. 50-272/87-30; 50-311/87-31).

Areas Inspected: Reactive, unannounced inspection of the licensee's Radiological Controls Program. The following incidents were reviewed: hot particle contamination of a worker, a primary spill from the No. 13 steam generator and subsequent decontamination effort, and the reported intentional defeat of locked high radiation area doors.

Results: Three violations were identified: 1) failure to adequately control locked high radiation area doors, T.S. 6.12; 2) failure to follow RWP requirements, T.S. 6.11; and 3) failure to have procedures for use and calibration of breathing-zone air sampler (MPC-hr meter), T.S. 6.8.

DETAILS

1.0 Personnel Contacted

1.1 Licensee Personnel

During the course of this inspection, the following personnel were contacted or interviewed:

- J. Beattie, Training Instructor
- H. Bergerdahl, Sr. Supervisor, RP-OPS
- *E. Browde, Station QA Supervisor - Nuclear Operations
- *T. Cellmer, Radiation Protection Engineer, Hope Creek
- *J. Clancy, Principal Health Physicist, RPS
- J. Lewis, Sr. Health Physics Technician
- *D. Mohler, Radiation Protection Engineer
- T. Parry, Sr. Health Physics Technician, BG&E
- D. Radley, Jr., Decon Technician, HPTS
- J. Rodriguez, Decon Technician, HPTS
- *G. Roggio, Station Licensing Engineer
- S. Simpson, Sr. Supervisor, RP - Projects
- *J. Trejo, Radiation Protection/Chemistry Manager
- *J. Zupko, General Manager, Salem Operations

Other licensee or contractor personnel were also contacted.

1.2 NRC/State Personnel

- T. Kenny, Senior Resident Inspector
- *K. Gibson, Resident Inspector
- *N. DiNucci, Dept. of Environmental Protection, State of New Jersey

The representative from the State of New Jersey accompanied the inspectors during various periods of the inspection.

*Denotes attendance at the Exit Meeting held on October 23, 1987.

2.0 Purpose

The purpose of this reactive inspection was to review the radiological protection activities associated with three incidents. Areas inspected included:

- o spill of primary water from the No. 13 Steam Generator on October 9, 1987, and the subsequent decontamination effort;
- o fuel particle (hot particle) contamination of an individual associated with the steam generator decontamination; and
- o defeating of locked high radiation doors.

3.0 Steam Generator Primary Spill

On October 9, 1987, a spill of primary coolant into the 78' elevation of the Unit 1 containment resulted upon removal of the steam generator(S/G) #13 cold leg diaphragm. Original estimates indicated approximately 8500 gallons of coolant leaked into containment; subsequent review of containment sump levels, etc., led to a revised estimate of the spill volume of approximately 900 gallons. Eight individuals in the area were contaminated. Details concerning operational aspects of the spill are discussed in the NRC Resident Inspectors Report (Combined Report No. 272/87-28; 311/87-30). Regional radiation specialists reviewed health physics aspects related to the spill by the following methods:

- interview of cognizant (Radiation Protection) RP staff, including the RP technician covering the diaphragm removal operation,
- review of the following documentation:
 - o RWP 87-0810, "13 S/G Primary Manway Removal/Clean, Inspect Flange,"
 - o Radiological Occurrence Report (ROR) #381 and the ROR logbook,
 - o selected whole body count results for four individuals contaminated in the spill,
 - o selected radiological survey results,
 - o Procedure RP 205, Rev. 0, "Decontamination of Personnel and Skin Dose Assessment."

An interview with the RP technician covering the diaphragm removal work identified three individuals that were on the steam generator (S/G) platform when the spill occurred. Licensee surveys identified a total of eight people that were contaminated as a result of the spill. Four of these eight individuals received subsequent whole body counts on the basis of contamination greater than 200 cpm over background above the neck, in accordance with procedure RP205. Initial whole body count results and intake estimates for these individuals ranged from approximately 2 to 8 MPC-hrs; these values are well below regulatory limits (520 MPC-hrs/quarter).

The maximum intake was measured for the RP technician. This individual stated that during the incident the force of the spill unseated the respirator on his face and he subsequently discovered a small amount of water inside his respirator.

Air samples were being taken on the S/G platform but were soaked during the spill. Results from air samples drawn in an adjacent area on the same elevation indicated air activity was less than 0.1 MPC for iodine and particulates as a result of the spill.

The inspector reviewed licensee actions relative to the subsequent decontamination of the inner bioshield area. Air samples were taken prior to and during the decontamination effort; however no survey was made and documented to show radiation and contamination levels inside the bioshield prior to initiating decontamination efforts. The licensee indicated that a decision not to perform such a survey had been made consciously, to conserve exposure. The licensee indicated, however, that an appropriate evaluation of radiological hazards was made prior to allowing work in the area, as:

- based on a knowledge of coolant activity, the licensee knew the area was highly contaminated, and provided appropriate protective clothing and respiratory protection,
- an RP technician provided direct coverage and surveys during decontamination.

The inspector noted the licensee in effect performed an "evaluation" of radiological hazards consistent with the 10 CFR 20.201 definition of "survey" and had no further questions in this area.

Overall, licensee follow-up actions in response to the S/G spill appear appropriate. The inspector did identify, however, that an MPC-hr meter was not worn by the worker performing the S/G diaphragm removal as required on the RWP. This is discussed in Section 6.0.

4.0 Hot Particle Contamination Incident

On October 10, 1987, at approximately 0030, an individual who had been performing decontamination work inside the Unit 1 containment (78' elevation) alarmed the contamination monitor at the control point. Subsequent investigation identified that a small, high activity fragment (hot particle) was located in the sleeve seam of the individual's T-shirt, close to the armpit. No contamination was identified on other members of the decontamination crew.

The inspector evaluated the licensee's investigation into the hot particle contamination incident by the following methods:

- interview of the contaminated individual;
- interview of cognizant members of the RP staff;
- review of the following documentation;
 - o ROR logbook;
 - o draft procedure RP 808, "Discrete Radioactive Particle Exposure and Contamination Control";
 - o licensee memo RP 87-413, "Handling of Discrete Particle Contaminations."

Licensee subsequent analysis of the particle identified it as a fuel fragment or "fuel flea" rather than an activated corrosion product. Preliminary dose calculations performed independently by the licensee and the NRC using the VARSKIN computer code indicated a potential skin exposure (approximately 12 rem), which was in excess of the regulatory limit of 7.5 rem/quarter to the skin of the whole body. The licensee stated they felt this preliminary value to be an overestimate and was still in the process of evaluating the dose during the period of this inspection. A time motion study was performed which indicates the dose may have been distributed over a larger area of skin (i.e., 16 cm²) than that assumed in the computer calculations. The licensee has also sent the particle to a contract laboratory for further analysis.

Final determination as to whether the fuel fragment contamination incident discussed above constitutes an exposure in excess of regulatory limits remains unresolved pending licensee completion of their final dose estimate (50-272/87-30-05).

The inspector noted the licensee's actions upon identification of the above fuel fragment appear appropriate. Decontamination and subsequent particle analysis was timely. The individual was also suspended from work inside the radiologically controlled area pending completion of the licensee's evaluation. During NRC interview, the subject worker indicated that the licensee's RP staff had been conscientious in explaining the status of their ongoing evaluation.

In response to hot particle contamination concerns, the licensee is implementing an increased hot particle surveillance and control program. Surveys have identified two areas, the reactor cavity and the 78' elevation inner bioshield area, as potential hot particle contamination areas. Hot particle protective measures have been included as an attachment to RWPs for these areas, and variously include the use of additional protective clothing (PC's), hourly frisking of workers by RP technicians, and shiftly hot particle surveys in the area. Additionally, the licensee has performed spot checks on protective clothing available for issue in the plant and has performed an audit of the site PC laundering facility.

During the time period of this inspection, the above measures were being implemented as RP policy and through the use of the RWP system. However, a specific hot particle control procedure was not in place. The inspector did review draft procedure RP 808 and noted it described a detailed hot particle control program. The licensee indicated that the need to formalize their hot particle program had been recognized and procedure RP 808 would be approved as soon as possible. The licensee's efforts in this area will continue to be reviewed during subsequent inspections.

5.0 Failure to Control High Radiation Area Doors

Licensee Technical Specifications (TS) 6.12.2 requires that "areas accessible to personnel with radiation levels such that a major portion of the body could receive in one hour a dose greater than 1000 mrem shall be provided with locked doors to prevent unauthorized entry..."

On October 8, 1987, licensee radiation protection (RP) technicians identified on two separate occasions that the #14 bioshield door on the 78' elevation of the Unit 1 containment was in an unlocked condition. The door was first discovered open at approximately 1030 and was secured at that time. The door was subsequently discovered open again by a different RP technician at approximately 1225. In each instance, the installed self-locking mechanism on the door had been intentionally defeated by inserting a wadded-up plastic shoecover into the door plate. The #14 bioshield door was one of four doors providing access to the inner loop area, which was posted and controlled by the licensee as a lockable High Radiation Area (HRA).

A licensee survey taken inside the bioshield area on October 6, 1987, identified dose rates of 1.5 R/hr at 18 inches from the N-16 pipe tunnel. The licensee stated that as of October 8, 1987, the N-16 pipe tunnel inside the bioshield had not been individually roped off and posted with a flashing light and sign to identify it as a high radiation area as allowed in the Technical Specifications.

NRC review into circumstances surrounding the above event, as well as station HRA key control practices, included the following:

- discussion with RP and training department personnel;
- inspection of the HRA "key trap" and key issue log.
- review of the following documentation:
 - o Procedure RP 1.016, "Issuance and Control of High Radiation Area Keys";
 - o Radiological Occurrence Reports (RORs) #87-097, 87-367, 87-368;
 - o licensee memo No. RP87-412, "Locked High Radiation Door Access", dated October 12, 1987.

Licensee immediate actions in response to the above incidents included removing the shoecovers and locking the door, ensuring the other three bioshield doors were secure, and performing tours into the bioshield area to ensure any personnel in the area were authorized. The licensee also issued two RORs addressing the events (#87-367, #87-368). The following actions were also taken by the licensee:

1. Computer access and exposure records were reviewed to identify personnel that could have been in the area and to ensure no unusually high exposures were received.

2. An investigative, "fact-finding" session was held with individuals signed in on Radiation Work Permits for the bioshield area for the subject time periods.
3. Two of the four access doors to the inner bioshield area were padlocked shut.
4. RP technician surveillance of HRA door integrity were increased, pending installation of a closed circuit TV system to monitor the most commonly used bioshield access door.
5. The RP services group conducted an audit of the bioshield access area and HRA key control.
6. A memo, describing HRA control requirements and proper use of locked doors, was issued to all Department Managers from the Salem General Manager. The memo required that all personnel be briefed by their supervisors concerning the contents of the memo.

A similar loss of control of a HRA door, in which a plastic shoecover was used to defeat the locking mechanism of the Unit 1 #14 bioshield door, was identified by the licensee on March 12, 1987. Details, along with the licensee's corrective actions, are discussed in NRC Combined Report No. 272/87-07; 311/87-08. In recognition of the licensee's identification of that event, and in accordance with 10 CFR 2, Appendix C, a notice of violation was not issued for the March, 1987, event. To encourage licensee self-identification of problems, 10 CFR 2, Appendix C states the NRC will not generally issue a notice of violation for a violation that meets the following tests:

- (1) it was identified by the licensee;
- (2) it fits in Severity Level IV or V;
- (3) it was reported, if required;
- (4) it was or will be corrected, including measures to prevent recurrence, within a reasonable time; and
- (5) it was not a violation that could reasonably be expected to have been prevented by the licensee's corrective action for a previous violation.

Failure of the licensee to maintain the Unit 1 #14 bioshield door in a locked condition on October 8, 1987, constitutes an apparent violation of T.S. 6.12.2 (272/87-30-01). The inspector stated to the licensee that despite the licensee's identification of the door's unlocked condition on October 8, 1987, that all mitigative tests given in 10 CFR 2, Appendix C were not met and consequently a notice of violation would be issued. Specifically, the licensee's corrective actions for the March, 1987 event were not effective in preventing the October 8, 1987 recurrence.

The licensee's investigation into circumstances surrounding the October 8, 1987, event had not identified specific individuals responsible for defeating the HRA door. Part of the evaluation was directed towards

determining if the current HRA key control system was too cumbersome for workers seeking access to HRAs. If so determined, steps could then be taken to modify the procedure to ease constraints without compromising its purpose of control.

The inspector determined, through discussion with RP management and review of licensee memo RP87-412, that the intent of the HRA key control system is that qualified workers can be issued HRA keys and can open, guard, and provide positive control over HRA accesses. Interview of several technicians indicated, however, that this intent is not being carried out in the field; only RP technicians are controlling HRA keys and are physically unlocking HRA doors for each worker entry to HRA. The inspector noted that procedure RP1.016 indicates that HRA keys can be issued to personnel qualified in the use of the procedure; however it does not define who these individuals are (i.e., technicians only, or technicians and workers).

The inspector communicated this apparent inconsistency between intent and practice to the licensee, who indicated it would be evaluated.

6.0 Internal/External Exposure Control

The licensee's program relative to internal and external exposure control was reviewed against criteria contained in the following:

- Technical Specification 6.11, "Radiation Protection Program";
- Technical Specification 6.8, "Procedures and Programs";
- 10 CFR 20, "Standards for Protection Against Radiation"
- Licensee procedures:
 - RP-202, Rev. 1, "Radiation Work Permits";
 - M12-BOP-04, Rev. 0, "Evaluation of Bioassay Data";
 - AP-24, Rev. 9, "Radiological Protection Program."

Licensee performance relative to the criteria was evaluated by the following:

- Review of air sample records and associated MPC's;
- Discussions with cognizant personnel;
- Review of outage Radiation Work Permits;
- Tours of the Auxiliary Building and Containment;
- Review of survey documents;
- Review of letter dated October 5, 1986, Ref. No. RP86-123, "MPC-Hours Meter Guidelines";
- Review of vendor's manual for MPC-hour meter.

Within the scope of this inspection, two apparent violations were identified; i) failure to follow radiation protection procedures, and ii) failure to have an approved procedure for instrument use and calibrations.

1. Technical Specification 6.11, "Radiation Protection Program," requires, in part, that procedures for personnel radiation protection shall be approved, maintained and adhered to for all operations involving radiation exposure.
 - A. Procedure RP-202, "Radiation Work Permits", requires, in part, for all jobs requiring continuous Radiation Protection coverage, the Radiation Protection technician assigned to the job shall brief the work party and the pre-job briefing shall be documented on Attachment 12.3, "Pre-job Briefing Summary," and filed with the respective RWP.

Inspector review of currently posted active RWP's identified ten (10) RWP's where continuous coverage and pre-job briefings were required on the RWP. The RWP's identified were as follows: 87-787, 87-813, 87-814, 87-819, 87-821, 87-867, 87-912, 87-958, 87-980, and 87-1001. Review of the RWP Compliance Agreement sheets, to verify dates the RWP's were used, and of the RWP folders revealed that pre-job briefings were not documented as required.

- B. Attachment 12.1, "RWP Compliance Agreement", to Procedure RP-202 states that "your (the worker's) signature below indicates that you have read, understand and will abide by the provisions of the RWP referenced above."

The inspector identified three (3) instances, RWP's 87-962, 87-810 and 87-813, which required use of a MPC-hour meter. Review of the air sample log sheets and interviews with the Health Physics technicians that provided job coverage determined that MPC-hour meters were not used as required by the RWPs.

The above represents two examples of a failure to follow T.S 6.11 required procedures (50-272/87-30-02 and 50-311/87-31-01).

The above matters were brought to the licensee's attention. The licensee indicated that pre-job briefings were routinely performed as required, and that the above instances represented only a failure to appropriately document those briefings. The licensee also indicated that substantiating records (i.e, mock-up training records, radiography check lists, etc) could be provided for the majority of the RWPs listed above to demonstrate that workers received pre-job briefings concerning radiological conditions. The inspector stated that although other written records might have been available, the licensee could not produce documentation of pre-job briefings as required by the procedure.

2. Technical Specification 6.8, "Procedures and Programs," requires, in part, that procedures be established, implemented, and maintained which meet the requirements and recommendations of Regulatory Guide 1.33, 1978, Appendix "A." Regulatory Guide 1.33, 1978, Appendix "A" recommends that procedures for airborne radioactivity monitoring, personnel monitoring, and airborne radiation monitor calibrations be established.

The inspector noted that airborne radiation monitors, specifically, MPC-hour meters, were being used to monitor personnel exposure to airborne radioactive material for the purpose of showing compliance with regulatory requirements without established procedures for their use and evaluation of their results. Calibrations of the MPC-hour meters were also being performed without established procedures.

The inspector noted that the MPC-hour meters were not used as the sole monitoring device; general area air samplers were also used. It was also noted that when documentation of personnel exposures as required by 10 CFR 20.103 was necessary, the MPC-hour meter results were used in lieu of the general area air samples.

Guidelines for the use of the MPC-hour meters were issued as a memo on October 5, 1986, stating that the units were in the process of being evaluated. The inspector informed the licensee that field evaluations are appropriate, but in consideration of the time they have been in use (one year) and their routine use for showing compliance with regulations, formal procedures for their use and calibration are required. Lack of such formal procedures for equipment in routine use constitutes a violation of Technical Specification 6.8 (50-272/87-30-03, 50-311/87-31-02).

Within the scope of this review, the following additional matters were identified which should be addressed by the licensee:

- ° Inspector review of RWP's found that all RWP's that required continuous coverage did not always specify that pre-job briefings were required as specified in procedure RP-202. Health Physics management down to first line supervisors were not aware of this requirement. The licensee stated that this was not their original intention and that the procedure would be revised to reflect current administrative practices.
- ° Current use of the MPC-hour meters is in accordance with guidelines as set forth in a memo dated October 5, 1986, from the Radiation Protection/Chemistry Manager. Review of this guideline indicated that all results greater than 2 MPC-hours should have an isotopic analysis performed. In discussions with technicians in the counting facility, none of the results in excess of 2 MPC-hours were isotopically analyzed and they were not aware of any such requirement.

Prior to use, the guideline recommends checking the flow rate to verify the 2 lpm calibration only if it is equipped with a flowmeter. No other checks are required either prior to, during, or after use except for verification of a full battery charge. Review of the vendor's manual for the model P2500A's revealed that the Unit is equipped with a flow control assembly that attempts to maintain the flow rate as set during calibration. In addition, a flow control light (LED) is present to indicate that a flow control problem has occurred. The vendor recommends that this LED should be checked before turning off the pump since a problem in flow control invalidates the sample. This matter was discussed with the licensee who stated they were not aware of this feature in the unit and the necessity to check its functioning prior to determining flow.

The overall technical adequacy of the use of the MPC-hours meters for showing compliance with Federal Regulations is left unresolved pending development of formal documentation and will be reviewed in a subsequent inspection. (Item Nos. 50-272/87-30-04 and 50-311/87-31-03).

7.0 Exit meeting

The inspector met with licensee management personnel on October 23, 1987, at the conclusion of this inspection to discuss the results. At no time did the inspector provide written material to the licensee.