U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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Licensee:	Illinois Power Company
Facility:	Clinton Nuclear Power Station
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Report Details

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 Failure to Follow Radiation Safety Work Plan (RSWP)

a. Inspection Scope

The inspectors reviewed the circumstances surrounding an event involving an apparent violation of RSWP No. 96-01 regarding entries into the drywell during refueling operations. The incident was documented by the licensee as Condition Report (CR) No. 1-96-71-227.

b. Observations and Findings

RSWP 96-01 was developed to implement controls for drywell entries during fuel movement and adherence to this plan is required by station procedure 1905.10 (Step 6.2). Adherence to this procedure is required by Technical Specification (TS) 5.4.1(a). The RSWP prohibited entry above the 790' elevation when in effect. Temporary suspension of the RSWP was allowed under the following conditions: (1) fuel movement is suspended for greater than 12 hours; (2) the restricted area posting on the drywell 790' elevation and the notification posting restricting access to the drywell 767' elevation must be removed; and (3) the Dropped Fuel Bundle Warning System (DFBWS) must be placed in standby.

On November 14, 1996, three workers were allowed to perform work in the 796' elevation of the drywell without meeting any of the above-mentioned conditions for temporary suspension of the RSWP. This was an apparent violation of TS 5.4.1(a) (EEI 50-461/96012-01). The workers were in the area about 10 minutes (average dose rates between 30-50 mrem/hr) before being escorted out of the drywell once the licensee realized that entries were not permitted at this time. The workers received a total exposure of 6 millirem. A verbal hold had been placed on fuel movement and no fuel movement occurred while the workers were in the drywell.

Although verbal controls were in place controlling fuel movement, previous NRC reviews of the radiological controls for BWR drywells during spent fuel movement have identified lack of communication between fuel operators and personnel at radiological control points as a problem. If operations had failed to notify RP prior to moving fuel and having the workers exit the area, this could have resulted in a potentially significant exposure.

Multiple breakdowns in communication between RP personnel and other work groups contributed to this event. Of greatest significance was the failure to notify the shift outage manager (SOM) and lead drywell RPT of the revised procedural requirements made earlier that day to the RSWP. Potentially lethal doses to workers can occur in the upper drywell levels should a mishap occur during fuel handling. Therefore, these administrative controls are among the most important radiological controls at the station and, as such, must be thoroughly understood and followed by all workers who are involved with work in this area.

Several immediate corrective actions were taken after this event, including: counseling of the SOM and RPT; revising the RSWP to clearly state the intent; and written guidance to RP personnel regarding the RSWP requirements. Other planned corrective actions included issuing a memo to station and outage management (including first line supervisors) delineating the responsibilities and authority of the RPSSs in radiological decisions involving radiation safety and ALARA, and briefing those personnel that make decisions affecting the implementation of the RSWP requirements.

c. Conclusions

Communication problems and a lack of a thorough understanding of the intent of RWSP 96-01 requirements led to the failure to follow the RWSP and is considered an apparent violation of Technical Specification (TS) 5.4.1(a).

R1.2 Radiological Events During Solid Radioactive Waste Processing

a. Inspection Scope

The inspectors reviewed the circumstances surrounding the contamination of three workers from a radioactive spill in the radwaste shipping bay.

b. Observations and Findings

On January 7, 1997, three workers were sluicing sediment from a 55 gallon drum into a radwaste shipping package. The drum contained sediment from the drywell floor drain sump and had a maximum contact radiation level of 1 Rem/hr. A spill occurred while the workers were investigating a blockage in a discharge hose connected to a pump used to sluice the material. Specifically, when the workers disconnected the hose, it rapidly depressurized spraying them with the sludge. All three workers were contaminated, with the highest levels being 2.4 mrad/hr to the chest of the worker who had removed the hose. The licensee decontaminated the workers and determined that each had received an external (skin) and internal dose below 10 mrem, respectively. The licensee halted further radwaste processing activities and documented the event in a CR (No. 1-97-1-068).

The sluicing was performed using a vendor operated system, consisting of hoses (with quick disconnect fittings) from the drum to an air diaphragm pump and into the radwaste container. A venting path was established from the pump to the Waste Evaporator (WE) tank and pressure valves were located on the intake to the radwaste container and on the discharge side of the pump. The procedure describing the process (No. STD-P-03-028, "Waste Sluicing Procedure") was a vendor procedure that the licensee had approved for use. The workers consisted of a vendor operator and a licensee RPT and Hazardous Materials (HAZMAT) specialist.

Prior to disconnecting the hose, the operator vented the remaining air in the pump and cycled both pressure valves while holding the hose. A slight decrease was noted in the system pressure gauge (on the pump) and some decompression was noted in the hoses, suggesting to the operator that the hoses were depressurized.

Additionally, the RPT surveyed the hoses (maximum hose contact radiation level was 60 mrem/hr) and plastic bags were used to capture residual liquid. In interviews with the inspectors, the workers stated that this process had been successfully used to alleviate blockage during past sluicing jobs.

The inspectors' review concluded that the event resulted from a lack of conservative decision-making by the workers performing the sluicing and an inadequate procedure used for the sluicing process, which lacked guidance concerning hose blockage and did not describe the actual sluicing process. Specifically, the following weaknesses were identified:

- The prejob briefing conducted for this job did not address the previous occurrences of hose blockage during sluicing or address contingency planning for this situation;

- Neither the RPT nor vendor operator contacted RP management prior to breaching the system to determine the cause of the blockage nor could it be verified whether RP management was contacted during similar past events. This was not in accordance with station management expectations for conservative decision-making;

- The actual disconnecting of the hose was performed by the RPT with the vendor operator assisting. This resulted in the RPT no longer providing a radiological oversight role; and

- The vendor procedure used had not been reviewed by the RP department and was inadequate for the process. Specifically:

    - It did not contain radiological hold points or contingencies for reasonably expected problems (such as hose blockage);

    - It did not describe the vent path to the WE tank; and

    - It did not describe the actual sluicing wand used during the job.

Similar conclusions were reached during a subsequent licensee critique of the event. Corrective actions included halting further sluicing activities pending completion of the licensee's investigation, review and subsequent revision of vendor procedures as necessary, evaluating the sluicing equipment to determine what hardware problems may have existed and any necessary modifications needed and counseling the RPT and vendor operator on management expectations.

10 CFR 20.1501(a) requires that licensees perform surveys that are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present. In 10 CFR 20, survey is defined as an evaluation of the radiological conditions and potential hazards incident to the transfer of radioactive material. The failure of the workers to determine the extent of the radiological hazards present (i.e. that the radioactive contents of the hose were under pressure) prior to disconnecting the hose from the pump is an apparent violation of 10 CFR 20.1501(a) (EEI 50-461/96012-02). The failure to have an adequate procedure for

the transfer of radioactive material, as noted above, is an apparent violation of TS 5.4.1(a), which requires the use of those procedures described in Appendix A to Regulatory Guide (RG) No. 1.33 (dated February 1978). Section 7(b)(1) of Appendix A to this RG requires procedures for spent resin and sludge handling (EEI 50-461/96012-03).

c. Conclusions

The inspectors concluded that the contamination of three workers during radwaste vendor sluicing operations resulted from the failure to consider problems encountered during past sluicing operations, the failure to contact RP supervision when encountering problems during current sluicing operations and the failure to perform these operations with a procedure that reflected the actual work being performed. These were considered apparent violations of 10 CFR 20.1501(a) and of TS 5.4.1(a).

R1.3 Inadequate Evaluation of Insulation Removal Job

On January 3, 1997, four workers were contaminated and low level contamination was spread during the removal of mirror insulation from reactor water cleanup (RWCU) system piping. Although low level contamination was expected due to known leaking RWCU system vent valves in the work area, ventilation to control the airborne spread of contamination was not in use during the removal activities. Additionally, job history files, which showed high contamination levels in the area, were not used in the preparation for the job. Had this information been used, additional engineering controls could have been specified to control the spread of contamination. As a contamination control measure, workers were instructed to wet the insulation as it was being removed; however, it appears that this control was not used for the duration of the job. This resulted in the contamination of the workers and the general area. Failure to adequately evaluate this job and specify/use appropriate engineering controls is considered an apparent violation of 10 CFR 20.1501(a) (EEI 50-461/96012-04).

R1.4 Review of Refueling Outage Performance

a. Inspection Scope

The inspectors reviewed the licensee's ALARA controls and performance for the sixth refueling outage (RF-6). The inspection consisted of a review of records (ALARA plans, Radiation Work Permits (RWPs), etc), discussions with workers and in-plant observations. The following radiologically significant jobs were reviewed:

- Inservice Inspection (ISI) activities inside the bioshield and drywell
- Support activities (shielding, scaffolding, insulation removal) inside the bioshield and drywell
- Reactor vessel disassembly and reassembly
- Drywell undervessel work
- Control Rod Drive (CRD) exchange and rebuilding
- Radiography of feedwater piping

b. Observations and Findings

As of January 20, 1997, the licensee had accrued about 315 rem (320 rem goal) with about 90% of the scheduled work completed. The overall outage dose was expected to exceed the original goal owing to emergent work (in particular the rebuild and subsequent testing of the feedwater regulating valves) and outage work scope growth. The extent of insulation removed for ISI work inside the bioshield and scaffolding requirements had been significantly underestimated by the licensee. For example, about 500 scaffold requests were identified in the original outage scope; however, early in the outage, about 1200 scaffold requests were received. Similar scope increases had occurred during the fifth refueling outage (RF-5). In addition, as noted below, there were examples of poor work planning and rework that also added to the total dose for support activities. Had the full scope of insulation removal and scaffolding needs been better planned, dose could have been reduced for these activities. The RPM indicated the reasons for the scope increase will be addressed in the RF-6 post-outage critique.

In general, the licensee effectively implemented ALARA controls such as mockup training, shielding, and the use of remote cameras, communications and teledosimetry for outage activities. Major outage activities were assigned a task manager who was responsible for developing (with RP assistance) and implementing the ALARA plan and tracking dose performance. Although these managers were knowledgeable of the ALARA plans and job dose status, there were some examples of poor planning and/or rework that were not well communicated to the RP department. Some specific examples included:

- During ISI work, an NRC inspector observed workers fixing a testing apparatus while in a 500-2000 mrem/hr field inside the drywell. The decision to fix this equipment was made by the ISI group and was not coordinated with the RP department.

- An inspector noted an RP drywell logbook entry regarding multiple entries by workers to remove recently installed bioshield insulation to accommodate work. This event was documented in a CR (No. 1-96-11-170) after an inspector raised questions regarding the re-entries. During interviews, the bioshield insulation Task Manager described several other examples of poor planning or rework that resulted in at least 2 rem of additional exposure.

Some of the task managers interviewed stated that these problems could reasonably be expected during the outage, did not warrant individual documentation and would be addressed in the post outage critique. However, this prevented the licensee from taking early corrective actions for these events. Additionally, RP management stated that the poor documentation of problems resulted in an inaccurate accounting of dose attributed to poor work planning and/or rework.

The inspectors attended prejob briefings, reviewed RWPs and RSWPs and performed in-field observation of feedwater piping radiography. Control of this job was good, but during in-plant observations of other work activities, there were numerous examples of radworker performance problems identified. Some examples included poor radiological housekeeping, poor control of contaminated areas,

loitering in radiation areas, and evidence of eating/drinking in radiologically controlled areas. The inspectors interviewed several workers and determined that these problems were accepted by some workers as a normal consequence of the outage and were not being documented.

c. Conclusions

The inspectors concluded that while the overall dose expended during the outage was reasonable for the work accomplished, a number of problems were not well communicated to the RP department, precluding an accurate assessment of outage radiological performance. Some task managers and radiation workers acceptance of rework and poor work practices contributed to these issues not being captured.

R1.5 Review of Internal Dosimetry Program

a. Inspection Scope

The inspectors reviewed the licensee's internal dosimetry program, including: a licensee evaluation to implement a diagnostic whole body counting program; selective recent WBC results; and the calibration and maintenance history of the whole body counter (WBC).

b. Observations and Findings

The licensee revised the whole body counting requirements for plant personnel from mandatory annual counting to a diagnostic system. Diagnostic counts were performed on those individuals who have the potential (based on job activity and location) for an intake and/or have a likely intake. The inspectors confirmed that the licensee's basis for the diagnostic counting process was consistent with industry practice and reviewed several diagnostic count results; no problems were identified.

The licensee maintains two WBCs; a standup FASTSCAN WBC, used as the primary system, and a chair WBC used as a backup counter. The inspectors observed that both WBCs were in good condition and noted that the necessary maintenance, calibrations and Quality Control (QC) checks were performed. Calibration sources were appropriate for their use, properly leak-tested, and secured against unauthorized access.

The inspectors also made the following technical observations:

- The RP staff was unaware of the minimum detectable activities (MDAs) for the chair WBC, so confidence with their lower limits of detection (LLDs) was not established. During calibrations, the chair WBC computer internally calculated the MDAs, but these values were not reviewed by the RP staff. The licensee determined the MDA values during the inspection, verified that they could guarantee the LLDs, and established a program to regularly check these MDAs. The inspectors verified that a similar problem did not exist with the FASTSCAN WBC and that the MDAs for both WBCs were appropriate.

- The licensee performed a cross check of the WBCs response using a radioactive source provided by an outside contractor. However, there was no established RP acceptance criteria and the licensee was unaware of the contractor's acceptance criteria. The RP group established acceptance criteria (consistent with industry practice) and determined the basis of the contractor's acceptance criteria, during the inspection.

Although neither of these findings significantly impacted the operation of the WBCs, they had existed for over a year and were not identified by the licensee. This was considered a weakness in the RP staff's technical oversight of the WBCs.

c. Conclusions

The licensee's internal dosimetry program was effective, but a weakness was identified in the RP staff's technical oversight of the WBCs.

R1.6 Review of External Dosimetry Program

a. Inspection Scope

The inspectors reviewed the licensee's external dosimetry program including the use of thermoluminescent (TLD) and electronic (ED) dosimetry and TLD processing. The inspection consisted of reviewing external dosimetry procedures and TLD processing results, observations of the TLD processing laboratory and interviews with the licensee dosimetry supervisor and other cognizant staff. The inspectors also reviewed the individual worker doses.

b. Observations and Findings

The TLD counting equipment was serviced, maintained, and calibrated in accordance with vendor instructions and written procedures. The inspectors observed the performance of a TLD count by an RPT and noted that appropriate quality controls were utilized. During interviews, cognizant licensee staff exhibited good technical knowledge of the program.

However, the inspectors noted the following problems:

- Processing of TLDs classified as high priority (for workers whose EDs indicated potentially high doses) was not always timely. This delayed updates in the licensee's computer database (PREMS), which was used to calculate a worker's remaining allowable dose margin for each entry into the radiological area.

- A higher-than-expected bias between TLD and ED readings for high dose rate jobs existed. This bias was non-conservative (the TLDs were reading higher) and were occasionally outside the expected 20-33% bias per the manufacturer's specifications for the EDs. The RP technical staff recommended that the EDs be adjusted to read 5% higher than the TLDs and that a periodic evaluation be performed to verify the adjustments were effective.

These problems were recognized by the licensee prior to the refueling outage, but were not communicated to the RPTs so that dose margins and ED setpoints could be appropriately adjusted. The licensee subsequently adjusted dose margins and ED setpoints to account for the above problems and was performing a more detailed technical evaluation of the ED/TLD response. A review of dose records indicated that no exposure above regulatory limits occurred due to this problem or otherwise.

The licensee maintains an administrative limit of 2 rem for annual total effective dose equivalent (TEDE). To date, only eleven workers have received exposures greater than 1 rem with only one greater than 2 rem (2.01 rem). Most of these workers were contractors associated with high dose jobs during RF-6. During in-plant observations, the inspectors verified through interviews that workers were cognizant of ED alarm setpoints and of general dose rates in work areas.

c. Conclusions

The implementation of the external dosimetry program was acceptable; however, a non-conservative discrepancy between TLDs and EDs was not acted upon in a timely matter.

R1.7 Implementation of Chemistry Program

a. Inspection Scope

The inspectors reviewed the implementation of the licensee's radiological and non-radiological chemistry program including: chemistry technician (CT) performance; intralaboratory comparison checks; and chemistry sampling results and water quality charts. The inspectors also reviewed two chemistry department self-assessments regarding CT personnel errors and compliance with the Updated Safety Analysis Report (USAR).

b. Observations and Findings

Chemistry laboratory housekeeping was generally good and CTs used good sampling techniques and RP practices. The inspectors also noted that CTs had performed well in intralaboratory nonradiological and radiological cross checks. However, chemistry management had initiated a CR (No. 1-95-11-064) documenting an adverse trend in chemistry department personnel errors. These errors were minor in nature and resulted from inattention to detail. The errors will continue to be trended and corrective actions were being developed.

The inspectors verified that chemistry water sampling was conducted as described in Station Procedures 9940.01 "Weekly Chemistry Surveillance Log" and 6001.01 "Sampling and Analysis Requirements." A selective review of water chemistry parameters from January 1996 through October 1996, indicated plant water quality was very good with no significant problems noted. Feedwater iron levels were reduced from 3-5 parts-per-billion (ppb) to 1-1.5 ppb mainly due to three particulate filters which were installed as part of the condensate filtration project. The licensee expects feedwater iron levels to decrease to 0.5 to 1 ppb after three additional

filters are installed next year. Overall, the water chemistry program was consistent with the Electric Power Research Institute (EPRI) BWR Water Chemistry Guidelines.

The licensee had detected small amounts (slightly above the environmental LLDs) of cobalt-60 and manganese-54 in sludge samples from the onsite Sewage Treatment Plant (STP). The STP was used to treat site biological waste and sludge samples were routinely collected per the aforementioned sampling program procedure. The affected sludge was transferred to another treatment tank for eventual disposal as radioactive waste.

A CR (No. 1-96-08-063) was initiated for several licensee identified discrepancies between the chemistry sampling program as implemented and as described in the USAR. Most of these discrepancies were of a minor nature and were implemented several years ago. However, the licensee had failed to identify those sections of the USAR which were affected and, therefore, did not perform a 10 CFR 50.59 Safety Evaluation (SE) prior to implementation. Some specific items included:

- The licensee was not verifying boron concentration prior to recycling water to the condensate storage tank (CST), as required by USAR section 11.2.3.2. The licensee had stopped this sampling about 3-4 years ago as boron was not being detected in the samples;

- The licensee was not monitoring condensate sodium levels (for detection of condenser tube leakage), as required by USAR section 10.4.1.5.4. This practice was stopped in 1988 owing to repeated reliability problems with the sodium monitors and an existing redundant capability to detect tube leakage via the in-line conductivity monitors; and

- The licensee was not performing analyses for silica and mercury in weekly spent fuel pool sampling, as required by USAR Section 9.1.3.2. These analyses were stopped several years ago and were performed to identify problems with fuel pool filter bed performance (silica) and fuel integrity (mercury).

Immediate corrective actions were to reinstate monitoring of boron during CST recycling and mercury analyses during weekly spent fuel pool sampling, and to perform an SE removing the requirement to perform silica analyses during pool sampling. Based on a review of historical data and of sample results to date, the licensee concluded that there was no significant operational impact from not meeting the USAR requirements. The licensee was performing SEs for the other identified discrepancies and planned to revise the USAR as needed. However, this was considered another example of an overall problem with the performance of SEs that was discussed in Inspection Report No. 50-461/96011(DRP) and will be addressed in an NRC enforcement conference scheduled for March 4, 1997. (EA 96-412).

c. Conclusions

The inspectors concluded that while reactor water chemistry was maintained within industry guidelines and the overall analytical capability of the laboratory was good,

some problems were noted with the chemistry program implementation. Specifically, there was an adverse trend in chemistry department personnel errors and there were several deviations from program requirements, as stated in the USAR, for which SEs had not been performed.

R1.8 Implementation of the Solid Radioactive Waste Program

a. Inspection Scope

The inspectors reviewed the licensee's solid radioactive waste (radwaste) program as described in the USAR and the Process Control Program (PCP) and interviewed station audit personnel regarding audit findings.

b. Observations and Findings

As described in the PCP, the licensee's radwaste included Dry Active Waste (DAW), spent resins and filters. Spent resins and filters were dewatered onsite, using a vendor system, and DAW was sent to an offsite contractor for processing. Waste not immediately sent for processing was stored in the radwaste building, which was as described in the USAR. The inspectors observed generally good housekeeping and appropriate postings and labeling in the radwaste storage and processing areas.

The 10 CFR Part 61 sampling and analysis program was conducted biennially in accordance with the PCP. Currently, the only waste stream analyzed through the program was waste sludge, a Class A waste. This sample analysis was accepted in June 1996, with the last sample analysis accepted in April of 1994. The licensee intends to conduct the next sample analysis prior to the expiration of the current analysis in early 1998. The current Waste Sludge scaling factors were compared against past scaling factors and found compatible. The station did not identify any changes to the Waste Sludge stream since the previous sample. The licensee expects to make a shipment of waste resin in 1997 and has sampled the resin for subsequent analysis and review.

The inspectors verified that the vendor dewatering system was operated in accordance with an NRC approved topical report and observed that the vendor operator was knowledgeable about this particular system. However, the inspectors identified several weaknesses with the licensee's overall review and control of vendor procedures, specifically:

- The inspectors identified that the vendor's procedure for sluicing waste sludge (see Section R1.2) had not been reviewed by the RP department. Subsequently, the licensee determined that other vendor procedures also may not have been reviewed; and

- Station procedures must be reviewed biennially for applicability, but this requirement does not apply for vendor procedures. This resulted in several differences between the aforementioned sluicing process as described in the procedure and as performed in the field.

The inspectors noted that these observations were not identified during a recent station audit of the vendor program (Audit No. Q36-96-16) conducted from September 9-20, 1996. This was discussed with members of the audit team who stated that, generally, the audit scope was limited to whether the vendor procedures were current, but did address procedural adequacy. For example, the auditors observed a waste sludge transfer and resin dewatering during the audit, but apparently did not review the procedures associated with these activities. As part of the immediate corrective actions following the resin sluicing event (discussed below), the RP programs group was reviewing the adequacy of the vendor radwaste processing procedures. Corrective actions for the other identified weaknesses were being developed by the licensee.

c. Conclusions

The inspectors concluded the while the solid radwaste program was being implemented as described in the PCP, there were some problems with the licensee's oversight for those activities performed by vendors. In particular, the overall poor oversight and review of vendor radwaste procedures was a contributing cause to the contamination of three workers during radwaste sluicing operations (see Section R1.2).

R1.9 Implementation of Radioactive Transportation Program

a. Inspection Scope

The inspectors reviewed the licensee's program for transport of radioactive materials. In particular, the licensee's implementation of the revised Department of Transportation (DOT) regulations was reviewed. The inspectors also directly observed the preparation, classification and pre-shipment checks (including radiological surveys) of a laundry shipment (No. 97-0005; Low Specific Activity (LSA-II)) and a radwaste burial shipment (No. 97-0003; LSA-II, Class A Unstable).

b. Observations and Findings

The inspectors verified that station procedures correctly referenced the revised DOT requirements and, through interviews, that workers responsible for shipping were cognizant of these requirements. There were no shipments of fissile or surface contaminated objects (SCOs), but there have been several LSA shipments (primarily classes I and II). The inspectors reviewed selected November 1996 and January 1997 shipments; no problems were identified.

The licensee used a vendor computer program (RADMAN) to classify shipments and maintained current files of certificates of compliances (CofCs) for high integrity containers (HICs), shipping cask licenses and burial site regulations. The inspectors observed that these programs correctly classified Shipments Nos. 97-005 and -003 and that the radiological and quality assurance (QA) checks for these shipments were properly performed.

c. Conclusions

The transportation program was effectively implemented.

R1.10 Implementation of the Radiological Environmental Monitoring Program (REMP)

The inspectors reviewed selected areas of the licensee's REMP including the program results documented in the 1995 Radiological Environmental Monitoring Report (REMR) and the program requirements described in the off-site dose calculation manual (ODCM) and TS. An inspector accompanied a licensee technician on the weekly rounds to change the air filters. The technician was knowledgeable in the process to change the filters and properly checked the condition of the sampling equipment and verified the flow rate. All sampling equipment observed were within calibration and in good working order. The sampling locations observed were in agreement with the maps in the ODCM and the 1995 REMR. Based on a review of licensee procedures and on discussions with applicable licensee personnel, the inspectors concluded that the REMP program was effectively implemented.

R2 Status of RP&C Facilities and Equipment

R2.1 Inspection of Infrequently Entered Radwaste Tank and Pump Rooms

a. Inspection Scope

The inspectors reviewed the results of the quarterly RP inspections, in March and June 1996, of infrequently entered radwaste tank and pump rooms. The inspectors accompanied an RPT during performance of these inspections.

b. Observations and Findings

During the March and June inspections, the licensee identified a failed sight glass that resulted in resin leakage from the chemical waste evaporator tank. The licensee was investigating the reason for the sight glass failure and had initiated a maintenance work request (MWR) for its repair. However, the licensee had verified that the leakage did not result from corrective actions taken to resolve a similar problem in 1988. During the walkdown, the inspectors observed that the resin was removed and that no visible leakage was occurring.

The majority of the equipment in the rooms that were inspected was in good condition and appropriate radiological controls were in place. The inspectors did not observe evidence of ongoing leakage, but noted some signs of past leakage and poor radiological housekeeping. Specifically:

- There was dried resin on the floor and apparent damage to the sight glass and tank inside the Unit 1 and Unit 2 Floor Drain Evaporator tank room.
- There was evidence of past leakage (crystal residue noted on tank surface) on sides of the Unit 1 Chemical Waste Tank.

- There was dried resin on the floor and evidence of poor housekeeping (tools and power cords strewn about area) inside the Unit 1 Phase Separator Tank Room.

- There was evidence of poor housekeeping (tools strewn about area) inside the Condensate Polisher/Ultrasonic Resin Cleaner Tank Room.

These observations were discussed with the radwaste system engineer who verified that they were due to past leakage. The RP department planned to develop corrective actions for the housekeeping concerns.

c. Conclusions

The licensee's program for inspecting infrequently entered radwaste tank and pump rooms was well implemented. One weakness was identified in that the inspection results were not communicated to the radwaste system engineer; this was corrected by the licensee. The inspectors did not observe evidence of ongoing leakage, but noted some signs of past leakage and poor radiological housekeeping.

R2.2 Review of Area and Process Radiation (AR/PR) Console

a. Inspection Scope

The inspectors reviewed the status of the licensee's corrective actions for weaknesses identified with the AR/PR console documented in IR No. 96003. Specifically, the review focused on: (1) progress to date on a licensee modification to replace the system; and (2) manning of the RP AR/PR console.

b. Observations and Findings

1. **Staffing of the RP AR/PR Console**

The inspectors observed RPTs manning the AR/PR console as required by Station Procedures No. 7001.02 (revision No. 6) "Conduct of Radiological Operations" (Sections 8.3.2 and 8.5.2.2) and No. 9911.24 (Revision No. 36) "AR/PR Shiftly/Daily Surveillances," and verified, through interviews, that the assigned RPTs were trained on its use.

RP management expectations were that an RPT be within earshot of the AR/PR console at all times. The inspectors interviewed several RPTs and determined that this expectation was not well understood. However, neither these interviews, a selective review of RP logbook entries from August through September 1996, nor direct observations of the console by inspectors identified any evidence where it was not met. RP management restated the guidance in a written memo to the staff to clarify the requirement. Subsequently, as mentioned in the next section, the RP console was rendered inoperable. The console in the control room was returned to service and panel monitoring responsibility was accomplished by an RPT stationed in the control room.

During a review of RP logbook entries, the inspectors identified that on September 29, 1996, the service water process radiation monitor (SWPRM) was inoperable for about 3-4 hours prior to starting compensatory sampling. This did not violate the ODCM (Table 2.7-1) requirements, as the sampling occurred within 12 hours. Although RPTs indicated that delayed response to console alarms was possible, due to workload, there were no other documented cases of this occurring. This was discussed with RP management who indicated a review of the issue would be done and appropriate corrective actions would be developed.

2. **Progress Regarding the Replacement Modification**

The licensee's actions to resolve the operational problems with the AR/PR console were not timely. After disabling the control room console in 1991, the licensee planned a modification to replace both the control room and RP consoles with a new system. In March 1996, the licensee determined that the modification could not be implemented as their design criteria could not be met with available industry systems. The licensee therefore, was designing an inhouse system scheduled for implementation by the end of 1996. However, the inspectors identified that no significant progress was made since then. The project manager for the modification stated that the delay was due to an unnecessarily complicated design and to a lack of adequate resources for the project. For example, the computer programmer assigned to the project left the company in late 1995 and was replaced with a part time programmer, but no reduction was made in the project scope.

The licensee has since simplified the design and reassigned additional resources to the project. The new design will replace the control room console and install a new console in the technical support center (TSC); the RP console will be removed. As of January 1997, the initial software development was completed and the associated 10 CFR 50.59 safety analysis and USAR sectional and plant procedural revisions were in progress. Additionally, the control room AR/PR console was returned to service and the RP console was rendered inoperable. The inspectors discussed AR/PR concerns with senior station management, who stated that the overall project was planned to be completed by the end of the first quarter of 1997.

c. Conclusions

The control room AR/RP console was returned to service with an RPT assigned to monitor the panel. Although delays in acknowledging alarms at the RP console occurred while it was in service, it appeared that TS requirements associated with out-of-service monitors were met. The licensee's actions to resolve the operational problems with the AR/PR console were not timely. This was attributed to an unnecessarily complicated design and to a lack of adequate resources for the project.

R2.3 Review of Traversing Incore Probe (TIP) System

a. Inspection Scope

This review included interviews with those involved with the containment entry during which unexpectedly high dose rates were identified near the TIP rooms.

b. Observations and Findings

On November 4, 1996, a plant operator and an RPT entered the Containment TIP penetration area (737' elevation of containment) to remove a tag from a condensate system valve (No. 1CY096C). During this entry, the RPT measured higher than expected dose rates (between 1.8-2.2 R/hr (contact)) on TIP drive Units C and D. Since these readings were similar to radiological survey results observed when the TIPs were removed from the core (on October 23, 1996), the RPT questioned whether the TIPs were in the shielded position. The higher TIP drive dose rates did not affect the operator's work, which was completed without incident.

The TIP system consists of four detectors (A through D) each with their own drive control channel and drive and indexing mechanisms; the drive and indexing mechanisms are separated by a concrete shield wall about 2'-3' thick. During TIP withdrawal, the detector passes a sensor prior to being shielded. This sensor actuates an alarm in the control room and a timing mechanism to shut off the drive unit and stop the detector around the middle of the shield wall.

The inspectors verified that the licensee addressed the provisions of NRC Information Notice (IN) 88-63 (and subsequent supplements). Specifically verified were provisions in station procedures to notify the RP department prior to placing the TIPs in the shielded position and the use of radiological hold points and controls during TIP maintenance activities. Although not stated in station procedures, RP management stated that, TIP work typically commences after a minimum of 48 hours decay time. Based on discussions with RP management, there were no events involving poor radiological control of TIPs since 1995.

The licensee suspected the cause of the higher dose rates was due to mechanical problems with the drive unit and had documented the problem in a CR. The licensee's progress on this CR will be tracked as an Inspector Followup Item (IFI 50-461/96012-05).

c. Conclusion

The licensee's followup of higher than expected dose rates in the Containment TIP penetration area was proactive in identifying a potential problem with the TIP drive units.

R2.4 Chemistry Instrumentation and Equipment

a. Inspection Scope

The inspectors reviewed the maintenance of the licensee's chemistry sampling and analytical equipment.

b. Observations and Findings

Chemistry instrument calibrations and QC performance checks were correctly performed and documented. A review of control charts indicated that instruments remained within statistical control. The inspectors noted that the licensee had corrected discrepancies with control chart documentation and long-term performance trending that were identified in Inspection Report (IR) 95005.

The inspectors verified that the High Purity Germanium (HPGe) counter was well maintained and calibrated. The licensee recently revised the HPGe free release library to eliminate all but five key radionuclides from which count times were calculated. This change increases HPGe counting efficiency by meeting the Environmental LLD release criteria for only these nuclides. This change was evaluated in a licensee Radiological Technical Evaluation (No. 96-013-TB) and was consistent with NRC Health Physics Position No. 122 "Clarification of Regulatory Guide 1.21, Section C.10, 'Sensitivity'."

c. Conclusions

The licensee was effectively maintaining chemistry sampling and analytical equipment.

R4 Staff Knowledge and Performance In RP&C

R4.1 Radiation Worker Performance Issues

a. Inspection Scope

The inspectors reviewed several licensee documented events where workers had failed to follow station RP procedures, including the discovery of a sleeping/smoking area that some workers had setup in the radwaste building and the apparent deliberate contamination of an RP technician. Additionally, the inspectors reviewed an event where the RP department relaxed radiological controls for high radiation area (HRA) entry in response to a perceived emergency as communicated by control room operators.

b. Observations and Findings

1. **Worker Adherence to Radiological Controls and Alarms**

The inspectors noted several events where workers displayed a lack of sensitivity toward RP controls and alarms. Specific examples included:

- On December 28, 1996, a records supervisor exited the plant through the gatehouse portal monitor. Although the monitor had alarmed twice, the supervisor did not contact the RP group prior to leaving, as required by station Procedure No. 1032.02 "Security Access Control" (Step 8.8.2). Since the individual had not been in the RCA and did not believe the alarm to be valid, she rationalized that the policy to call RP did not apply. A security guard subsequently reported the incident to RP.

- On January 7, 1997, an auxiliary operator also exited the plant after twice alarming the gatehouse portal monitor and without contacting RP. The operator recognized the portal monitor alarm as a motion alarm and made several attempts (using different portal monitors) until finally receiving a clear light. The individual stated that since the alarm was a motion alarm (he was carrying things that probably broke the beam) he felt the policy of notifying RP after the alarms did not apply to this case. This incident was also reported to the RP group by a security guard.

- On January 7, 1997, an RP technician observed an individual exit a posted contamination area prior to removing his protective clothing. The area was posted as contaminated owing to detectible contamination behind a nearby door; a dress out area was set up between the door and a step-off pad. After entering the posted contaminated area the worker attempted to open the nearby door, but found it locked. The worker then crossed the pad in order to use the phone to call an individual to unlock the door. An RP technician in the area confronted the worker, and verified that no spread of contamination had occurred. The worker stated that he did not realize that he was violating station procedures by not undressing prior to exiting, as there was no detectible contamination in the dress out area. Radiological controls for proper access/egress to/from a contamination area were communicated to the workers during Nuclear General Employee Training (NGET). Station Procedure No. 1024.02 "Radiological Work Control" (Step 6.1.1) required that workers adhere to established RP control requirements unless issued written or verbal guidance from RP personnel.

- On November 22, 1996, a licensee fire protection inspector identified a sleeping/smoking area that had been set up in the 730' elevation of the radwaste building (i.e. inside the RCA). Specifically, in this area there were three sleeping areas (using foam rubber insulation material), an alarm clock, and used cigarette butts. Although the licensee could not identify who set up the area or how long it had existed, a licensee Quality Assurance inspector did observe a contract insulator apparently sleeping in the area. This area was not frequently visited by plant staff, had area dose rates $\leq$ 0.2 mrem/hr and was not contaminated. Because of the low radiological concern, an RWP is not required for access. The licensee terminated the insulator and removed the sleeping material. Prohibitions against

eating, drinking and smoking in the RCA were posted at various locations in the plant, were communicated during NGET, and were listed in the outage handbook provided to all personnel during inprocessing. Station Procedure No. 1024.02 "Radiological Work Control" (Step 6.1.1) required that workers adhere to established RP control requirements unless issued written or verbal guidance from RP personnel.

The above 4 events are examples of an apparent violation of TS 5.4.1(a) for failure to follow station procedures (EEI 50-461/96012-06).

The above events indicate that a general lack of sensitivity exists among plant workers towards radiation protection controls and alarms. The inspector observed that certain conditions exist and a number of other events occurred at the station which may have contributed to this attitude, including:

- A significant radon problem exists at the station resulting in many workers alarming the portal monitors when leaving the RCA. Workers exiting the RCA were observed by the NRC attempting to circumvent the monitors by leaning away from the detector and/or moving their feet from the foot detector. Although RPTs in the area corrected the workers, this practice was routinely observed and corrected in the field.

- As discussed in Section R1.1, workers were instructed by the lead drywell RPT to disregard radiological postings prohibiting entry into the upper drywell.

- In preparation for later work, the licensee had staged a contaminated area (including ropes, drums and a step off pad) at an entrance to the refueling floor. The only indication that this area was not actually a contaminated area was a piece of tape with the word "staged" written on it placed diagonally across the step off pad. Although allowed by licensee procedures, this practice appears to be misleading to workers.

- During undervessel work on December 3, 1996, the Dropped Fuel Bundle Warning System (DFBWS) alarmed. The workers began to evacuate, but were subsequently informed by an RPT that the alarm was a false indication and were instructed to return to their work area prior to actually exiting the drywell. The RSWP specifically stated that the drywell be immediately evacuated upon actuation of the DFBWS. Although deviations from the RSWP were allowed when approved by the Supervisor-Radiological Operations, which occurred in this case, this practice could condition workers into ignoring future, similar alarms.

The radon condition appeared to have resulted in workers believing alarms were not valid and that no safety concerns existed. In each of the events,

confusing instructions were given to workers which could contribute to their rationalizing when radiological requirements may not apply given a particular set of circumstances.

2. **Possible Deliberate Misuse of Radioactive Material**

Subsequent to the end of the inspection, on January 27, 1997, an RPT alarmed a portal monitor while attempting to exit the RCA. He identified contamination on his forehead (about 100-150 counts/minute (cpm)) with a hand-held frisker and subsequently decontaminated himself. He then surveyed his hardhat and identified a small filter paper (smear) in back of the sweatband in his hardhat having contamination levels of 500 cpm. Believing it highly unlikely that the smear accidently ended up in his hardhat, the RPT reported the event to his management as an apparent deliberate contamination event. The licensee is conducting an investigation and the NRC Office of Investigations is reviewing the incident. This issue will be tracked as an unresolved item pending completion of the licensee's investigation (URI 50-461/96012-07).

In addition, the licensee recently identified that an unknown individual had turned off the supply gas to a gas proportional portal monitor rendering it out of service. Although this did not result in a regulatory violation, it is another example of the lack of sensitivity to radiological controls.

3. **Poor Communication To RP Department by Operations**

On October 17, 1996, operators were dispatched to the Auxiliary Building (AB) to restore the "A" RHR pump to operable status. Because of the sense of urgency expressed by the operators, RP assumed the activity was a "Priority 1-emergency" (per Station Procedure No. 1001.11) and allowed the operators to enter the "A" RHR room without providing them an RWP pass (i.e. signing an RWP). The operators were familiar with radiological conditions in the area and were provided electronic dosimetry (EDs) having dose and dose rate alarm setpoints per the RWP. Although posted as an HRA, actual dose rates in the "A" RHR room were between 40-80 mrem/hr. After the entry, the RPTs logged the operators on the RWP and recorded the total dose received by the operators (1 mrem).

The inspectors' review identified that the actual significance of the event to which the operators were responding to was poorly communicated to the RP department by the operators. Station management did not consider the restoration of the "A" RHR pump a "Priority 1" job. However, the operators actions at the control point prior to entry led the RPTs to believe a Priority 1 situation existed. The poor communication between the groups resulted in the operators entering the RHR "A" pump rooms without signing on an RWP. Station Procedure 1905.10 (Step No. 3.5(c)) requires that workers be provided with a copy of an RWP pass prior to performing work requiring an RWP. This is an additional example (see (1) above) of an apparent violation of TS 5.4.1(a) for failure to follow RP procedures.

c. Conclusions

The number of issues that occurred and the various procedural adherence problems indicates that there is a lack of sensitivity at the station toward RP controls and alarms. This was aptly demonstrated by the apparent deliberate contamination of a worker, which was being investigated by the licensee. These events resulted in numerous examples of an apparent violation for failure to follow station procedures.

X.1 **Exit Meeting Summary**

The inspector presented the interim inspection results to members of the licensee staff on October 4 (denoted by "*"), on November 8, 1996 (denoted by "+") and on November 28, 1996 (denoted by "#"). An exit meeting was held on January 23, 1997, during which the findings of the inspection were presented to members of the staff (denoted by "@"). With the exception of the vendor procedures reviewed in Section R4.2, the licensee did not consider any of the documents reviewed as proprietary.

@ + *W. Connell, Vice President, Nuclear
@ + *P. D. Yocum, Plant Manager
@ + *M. W. Lyon, Asst. Plant Manager--Operations
@ + *A. W. Mueller, Asst. Plant Manager--Maintenance
@# + *D. R. Morris, Director, Plant Radiation Protection and Chemistry
@ + *K. A. Baker, Director, Engineering Resource Management
@# + *R. R. Weedon, Asst. Director, Plant Radiation Protection and Chemistry
@ + *D. P. Thompson, Manager, Nuclear Station Engineering
@ + *J. F. Palchak, Manager, Nuclear Training and Support
@# + *M. S. Dodds, Supervisor, Radiological Operations
+ *R. C. Maurer, Supervisor, Chemistry
@ + R. F. Phares, Manager, Nuclear Assessment
@ + P. J. Telthorst, Director, Licensing
@ + J. R. Taylor, Director, Administration Nuclear and Technical Support Services
@ + D. M. Antonelli, Director, Plant Support
@ + D. E. Korneman, Director, Plant Engineering
@ + J. A. Hale, Director, Planning and Scheduling

PARTIAL LISTING OF DOCUMENTS REVIEWED

CR No. 1-96-11-170:	Poor work planning during bioshield insulation removal
CR No. 1-95-11-064:	Chemistry personnel errors
CR No. 1-96-08-063:	Chemistry sampling program compliance with USAR
CR No. 1-96-71-227:	Violation of RSWP
CR No. 1-97-01-068:	Contamination of Workers During Resin Sluicing

Station Procedure Nos.:

1005.01C002	"Independent Technical Reviewer Checklist"
1913.03	"Radioactive Waste Processing Vendor Interface"
1888.00	"Process Control Program"
1905.10	"Radiation Work Permit"
3322.01	"Traversing Incore Probe"
6001.01	"Chemistry Sampling and Analysis Requirements"
7001.02	"Conduct of Radiological Operations"
8629.01	"TIP Channel Calibration"
9911.24	"AR/PR Shiftly/Daily Surveillances"
9940.01	"Weekly Chemistry Surveillance Log"
3322.01	"Traversing In-core Probe"
8629.01	"TIP System Channel Calibration"
7013.11	"RADMAN, RAMSHP and TRASHP Operation and Database Maintenance"
7013.12	"Shipment of Radioactive Material"
7013.13	"Shipment of Radioactive Waste"
7013.40	"10 CFR 61 Compliance Program"

Vendor Procedures:

STD-P-01-005	"Standard Dewatering Pump Skid Operating Procedure"
STD-P-03-028	"Waste Sluicing Procedure"

RP Work Instruction No. 203 "Radioactive Waste Activity Determination"

Radioactive Shipment Package Nos: 97-0003 and -0005

1995 Radiological Environmental Monitoring Report

Preventative Maintenance Task No. 1029.01FO13 "Perform Required Maintenance on TIP Drive Motors"

Maintenance Work Request No. 1029.01F001 "Remove/Replace TIP Undervessel Guide Tubes to Support RF-6"

Radiological Technical Evaluation No. 96-013-TB regarding change to HPGe detector counting library

NRC Health Physics Technical Position No. 122

Station Audit No. Q36-96-16 regarding vendor radwaste processing activities

RSWP No. 96-01 "RF-6 Drywell Work During Refueling Outage"

RWP No. 96001102.001

INSPECTION PROCEDURES USED

IP 83750	Occupational Exposure
IP 84750	Gaseous and Liquid Radioactive Waste and Water Chemistry
IP 86750	Solid Radwaste and Transportation
TI 2515/133	Implementation of Revised 49 CFR Parts 100-179 and 10 CFR Part 71

ITEMS OPENED, CLOSED AND DISCUSSED

Opened

EEI 50-461/96012-01	Failure to follow RSWP requirements
EEI 50-461/96012-02	Failure to perform an adequate survey prior to commencing radwaste slucing operations
EEI 50-461/96012-03	Use of inadequate procedure during radwaste slucing operations
EEI 50-461/96012-04	Failure to use proper engineering controls during insulation removal
IFI 50-461/96012-05	Investigation of higher-than-expected dose rates in Containment TIP drive units
EEI 50-461/96012-06	Numerous examples of failure to follow RP procedures
URI 50-461/96012-07	Possible deliberate misuse of radioactive material

Closed

THERE WERE NO ITEMS CLOSED THIS INSPECTION

Discussed

THERE WERE NO ITEMS DISCUSSED IN THIS INSPECTION