U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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Licensee:	Consumers Power Company
Facility:	Palisades Nuclear Generating Plant
Location:	27780 Blue Star Memorial Highway Covert, MI 49043-9530
Dates:	November 13-20, 1996
Inspectors:	P. Louden, Senior Radiation Specialist R. Glinski, Radiation Specialist
Approved by:	T. Kozak, Chief, Plant Support Branch 2 Division of Reactor Safety

Report Details

R1 Status of Radiological Protection and Chemistry (RP&C) Controls

R1.1 ALARA Reviews and Preparation of Radiation Work Permits for REFOUT96

a. Inspection Scope (83729)

The inspectors reviewed several procedures used for the development of Radiation Work Permits (RWP) and ALARA controls. The inspectors also reviewed several RWPs, Pre-Job ALARA checklists, and In-Progress ALARA Reviews; and interviewed staff regarding work activities for the 1996 refueling outage (REFOUT96).

b. Observations and Findings

The inspectors verified that selected Pre-Job ALARA reviews and RWPs were comprehensive and were prepared in accordance with station procedures. The ALARA reviews addressed the following radiation protection items: (1) use of historical files for similar jobs, (2) collection and containment of liquids, (3) shielding and decontamination, (4) ventilation and control of airborne radioactivity, and (5) special tools and mock-up training. The Pre-Job ALARA reviews were conducted by Chemical and Radiological Services (C&RS) and work planning staff and had the appropriate supervisory approval. The reviewed RWPs contained sufficient information about the radiological conditions and radiation protection (RP) measures to ensure workers were informed of the hazards in the areas and enable workers to maintain their dose ALARA.

Procedure No. HP 11.1, "Processing Radiation Work Permits and ALARA Reviews", stated that In-Progress ALARA job reviews should be performed when the actual dose for a task reached 125% of the original dose estimate. The inspectors observed that the In-Progress reviews were conducted in accordance with station procedures and that they were performed before the dose threshold had actually been reached. In addition, the staff identified the specific problems that caused the radiation dose to exceed the budgeted goals and developed efforts to address the problems.

Although this inspection occurred early in the outage, the inspectors noted that C&RS staff had already conducted several In-Progress ALARA job reviews. The causes for these reviews were equipment problems, higher dose rates in some areas, and rework due to personnel errors. The inspectors noted that some equipment problems may have been due to insufficient maintenance and that personnel errors were often due to miscommunication or lack of licensee oversight of contractor activities (See Section 4.1).

As an example, the RWP for disassembly and moving of the reactor head specified the placement of temporary shielding on the reactor floor to reduce dose rates from the reactor annulus. However, a contract ALARA coordinator determined in the field

that installation and subsequent removal of this shielding would not be ALARA based on time necessary to conduct these activities. The absence of shielding on the reactor floor, coupled with higher than expected reactor annulus dose rates, polar crane problems, moving dosimetry to the thigh, and problems encountered throughout various cavity work evolutions, resulted in an expenditure of 109% of the dose when only 81% of the work had been accomplished. The In-Progress review stated that in addition to the installation of the floor shielding for tensioning activities, more shielding would be placed around the flanges and stakes during re-assembly. The review also indicated that the engineering, personnel, and procedural problems should be further evaluated.

c. Conclusions

In general, the pre-job ALARA planning was based on applicable data and established sufficient radiological control measures to control dose. However, the inspectors determined that various problems encountered during selected outage activities resulted in higher dose expenditures and performance of In-Progess ALARA reviews which challenged the ALARA planning staff.

R1.2 Internal Exposure Controls for Primary Cooling System Work

a. Inspection Scope (83729)

The inspectors reviewed air sample data and station procedures regarding the control of airborne radioactivity and respiratory protection decision making criteria for internal exposure controls to ensure total effective dose equivalents (TEDE) are maintained as low as is reasonably achievable (ALARA).

b. Observations and Findings

In 1993, the licensee experienced a fuel failure which led to significant amounts of transuranic radioactive material being introduced into the Primary Cooling System (PCS). The transuranic material presents an alpha radiation hazard at a level which is atypical for most operating nuclear power plants. Since that time, the C&RS technical group has closely analyzed the transuranic radioisotopic content in the PCS. This information was used to develop a site specific Derived Air Concentration (DAC) to account for the alpha radiation hazard when working on PCS components.

The inspectors reviewed selected air sample data, TEDE-ALARA evaluations, and internal alpha dose assignments for PCS work performed during the current refueling outage. The inspectors noted during the review that work on the "A" primary coolant pump (PCP) seal resulted in an internal dose assignment (attributable to alpha inhalation) of 186 mrem to four workers. The external dose received by the workers was less than 60 mrem each. The RWP and TEDE-ALARA reviews did not require respiratory protection for the job. These dose assignments prompted the inspectors to question the C&RS group's process in assessing the total radiological hazard present during this work.

The historical data which C&RS used during their evaluation indicated that no detectable alpha airborne concentrations existed during previous PCP seal work. Thus, the C&RS group concluded that respiratory protection was not necessary for the PCP seal replacement. Once the airborne alpha contamination was detected, the job was reevaluated and respirators were specified for use during future PCP seal work.

The inspectors determined that, based on historical data for this particular job, the initial TEDE-ALARA evaluation was adequate. However, given the unexpected airborne alpha contamination problem during the PCP seal replacement and the fact that a significant amount of transuranic material has been introduced into the PCS, the inspectors questioned whether the licensee should anticipate an airborne alpha contamination problem on other future PCS component work. The inspectors' concern mainly resided with the possibility that, due to the amount of fuel dispersed in the PCS, jobs which did not previously exhibit alpha problems could during future work on PCS components. Contributing to this concern was the fact that the annual limits of intake (ALIs) for alpha emitting radionuclides are considerably smaller than those for gamma emitting radionuclides which are normally encountered at nuclear reactor facilities.

The inspectors discussed this observation with station management at the exit meeting (Section X1). C&RS management acknowledged the inspectors' observations and indicated that a self-assessment and reevaluation of the TEDE-ALARA evaluation process for PCS work would be initiated with special emphasis on the adequacy of evaluating the alpha radiation hazard.

c. Conclusion

The inspectors determined that the C&RS group's methodology for determining the need for respirator protection was adequate. The initial evaluation of the PCS seal work was based on available historical data for similar activities. However, the inspectors questioned whether the known alpha contamination problems identified during previous work on other PCS components should be considered when evaluating all PCS work in the future.

R1.3 Radiation Protection Measures for Upper Guide Structure (UGS) Activities

a. Inspection Scope (83729)

The inspectors reviewed administrative radiological controls established for this activity, attended the pre-job briefing, and observed the work activities in progress for the UGS. This review included interviews with cognizant plant personnel regarding the UGS activities.

b. Observations and Findings

The inspectors reviewed the RWP and Pre-Job ALARA review and determined that the radiological conditions associated with the work were properly identified. During the pre-job briefing the inspectors observed that the meeting was attended by all workers involved in the activity, the radiation protection specialists (RPS) assigned for coverage, the containment crew leader, and supervisory staff. The briefing effectively addressed the radiological conditions, ALARA measures, safety equipment, and specific job hold points. Sufficient time was allowed for questions and answers regarding ALARA activities.

The inspectors reviewed air sample data collected in the UGS area on November 12. This sample indicated an airborne alpha concentration of about 25 Derived Air Concentrations (DAC). A sample taken two days later revealed that the alpha airborne radioactivity decreased to about 5 DAC, and subsequent air samples indicated a decreasing trend. Given the DAC levels measured during the initial air sample, the job was conducted with negative pressure full face respirators. Other radiation protection and safety measures were implemented as prescribed. The RPS staff exercised good job coverage during the evolution. One illustration of this performance was evidenced by the stopping of work by the RPSs when dose rates reached the pre-established hold point.

c. Conclusions

The C&RS staff effectively planned and implemented radiological controls for the UGS activities conducted to date. RP coverage of UGS activities was good.

R1.4 Radiological Controls within the Auxiliary Building and Containment

a. Inspection Scope (83729)

The inspectors observed various work activities, reviewed data, and interviewed station personnel regarding the control of radiological conditions within the auxiliary building and containment.

b. Observations and Findings

The inspectors observed good control of potentially contaminated material, as items were either within the boundaries of designated areas or were appropriately bagged and labeled in accordance with procedures. However, early in this inspection period, the inspectors observed that housekeeping in the containment building was poor. The inspectors noted the presence of clutter, various materials that would have to be handled as potential radwaste, protective clothing gloves in cable trays, and an inconsistent use of radiological signs. Following an outage stand-down which occurred during the inspection, the housekeeping within containment improved significantly.

C&RS staff effectively controlled access into containment. The inspectors noted that RPSs at the containment access control points consistently challenged workers regarding their tasks, logged workers into the area, and instructed workers regarding current radiological conditions and low dose waiting areas. Additionally, the station had positioned large signs denoting low dose waiting areas and the inspectors noted that staff utilized these areas.

Monitoring for potential airborne radioactivity was extensive. The inspectors observed a number of air samplers throughout the containment building and reviewed numerous air sample results. Many of the air samples were collected by lapel samplers worn by workers during their activities. Air sample data, as well as historical files, were used by the C&RS staff to determine the need for respiratory protection and engineering controls (See Section R1.2).

c. Conclusion

The inspectors concluded that, after some initial housekeeping problems, the C&RS exercised good radiological controls for work within the auxiliary and containment buildings.

R1.5 Contamination Control Initiatives

a. Inspection Scope (83729)

The inspectors reviewed and observed licensee initiatives to control the spread of contamination and reduce personnel contaminations.

b. Observations and Findings

Due in part to past failed fuel problems, the plant has experienced an ongoing challenge to control hot particles and fuel particles. C&RS staff logged a number of personnel contamination incidents (PCI) due to particles from the spent fuel pool (SPF) and track alley areas, which were considered clean areas. Additionally, fuel transfer carriage and primary system work increased the number of PCIs. In an effort to control these particles, the C&RS staff established "red zones" for areas which have a potential for particle contamination. Control measures for red zone areas included extra protective clothing (PC), paper coveralls, segregation of red zone doffing areas and PCs, and use of a type of porous cleaning cloth referred to as "rhino rugs" for decontamination of equipment and materials. Other areas throughout the plant were cleaned by either masselin mopping, damp mopping, or vacuuming.

C&RS management designated two individuals to track/trend PCIs and address control of contamination. After reviewing data and worker practices, two recommended actions were implemented which decreased the PCIs. The first action was to adjust the clothing frisker (ALF) used to survey materials returned from the laundry vendor. The station surveyed all of the scrubs, mopheads, skull caps, and glove liners, as well as a percentage of the PC coveralls. C&RS had determined that

ALF would not alarm when material with a 20,000 disintegrations per minute (dpm) particle was surveyed. Therefore, the detector was positioned closer to the surveyed material and the alarm set point was lowered. These changes resulted in detection of more incoming contaminated material. C&RS staff had also noted that movements of the overhead crane increased the PCIs and that the crane cables and rigging straps were contaminated with particles. The crane rails and trolley were subsequently decontaminated. As of November 18, only four particle PCIs required shallow dose assessments and the assigned doses ranged from 535 - 2,590 millirem (mrem).

Overall, the inspectors observed that radworker practices were good. The inspectors identified isolated instances of inappropriate practice such as: (1) a worker entered containment with TLD dosimetry mispositioned, (2) another worker left his electronic dosimeter at the containment undressing area, and (3) station personnel did not turn frisking instruments in the 649' frisking booth back to the on position after moving radwaste through this area. When apprised of these occurrences, the C&RS staff took immediate action. The inspectors noted that all survey and sampling instrumentation were within calibration.

c. Conclusions

Overall, the measures to control radiological conditions within the reactor building were effectively implemented. Housekeeping improved throughout the inspection and no adverse trends in radworker practices were noted.

R1.6 Primary Coolant System (PCS) Shutdown Chemistry Controls

a. Inspection Scope (83750)

The inspectors reviewed the chemistry department's implementation of chemistry procedure CH 3.38 "Primary Coolant System Shutdown Chemistry Control", and reviewed the results of this activity with chemistry department supervision.

b. Observations and Findings

Historically, the plant has performed early boration and hydrogen peroxide (H_2O_2) addition to the PCS during shutdowns for refueling and maintenance outages. The chemical treatment process creates an acid-reducing condition which provides for cleaning of the primary system. This process is reversed through the addition of H_2O_2 which facilitates a large release of corrosion products (crud burst) that is subsequently removed from the PCS by the purification system.

The station operations and chemistry department personnel coordinated efforts to implement the CH 3.38 procedure. The acid conditions were achieved early in the cooldown stages and approximately 58 hours of purification cleanup were achieved. The chemistry department estimated that 447 curies of activated corrosion products and 4.1 pounds of elemental nickel were removed during this shutdown.

The chemistry department identified areas for improvement for future shutdowns such as an increase in the purification letdown flow rate from 90 gpm to 120 gpm, and better preparation for the availability of a demineralizer for lithium removal during the entire cooldown.

Electronic dosimeters placed along various system piping to monitor the radiological effects of the crud burst indicated that dose rates were generally typical of previous shutdowns. However, dose rates in the steam generator (SG) channel heads were somewhat higher than previously measured. Initial reviews of the SG dose rates indicated a relation to startup pH, but not to the chemical additions during shutdown. The SG dose rate issue was being further evaluated by station and vendor organizations.

c. Conclusion

The inspectors determined that the licensee had effectively implemented chemical additions during reactor shutdown which resulted in an overall reduction of the source term.

R2 Status of RP&C Facilities and Equipment

R2.1 Onsite Storage of Radioactive Waste

a. Inspection Scope (83750)

The inspectors reviewed the licensee's program to reduce the inventory of stored radioactive waste onsite.

b. Observations and Findings

The opportunity to resume shipping radioactive waste to offsite burial and incinerator facilities became available in June of 1995. Since that time, the station's radioactive waste group has taken action to reduce the volume of stored radioactive waste onsite. Shipments through October 1996 reduced the stored volumes. The following summarizes the current radioactive waste status (all volumes in cubic feet):

Waste Type	Inventory	Generated	Shipped
Dry Active Waste	0.0	158.6	158.6
Concentrator	285.0	795.0	1822.5
Evaporator Bottoms	200.0	200.0	0.0
Filters	711.6	711.6	0.0

Waste Type	Inventory	Generated	Shipped
Resin	200.0	0.0	0.0
Irradiated Hardware	14.6	0.0	0.0
1996 Totals Through Oct.	1411.2	1862.2	1981.1

As detailed in the table above, the radioactive waste group has effectively maintained shipping of radioactive waste to eliminate the volumes generated and has shipped some volumes which were previously in storage. The inventory total in January 1996 was 2395.6 ft^3 compared to the October 1996 total of 1411.2 ft^3.

The inspectors observed the radioactive waste storage facility, located outside of the protected area but within the owner controlled area, and noted appropriate posting in and around the facility. Continuous air monitoring and filtered ventilation were used to detect and mitigate any airborne contamination. The facility included an automatic phone alert system which prompts a phone call to the main control room in the event of a fire or continuous air monitor alarm. The radioactive waste group is comprised of a lead coordinator and dedicated RPSs who operate the facility. The inspector noted that this organizational structure provided for effective control and monitoring of the stored radioactive waste, as well as consistency in preparing and receiving radioactive waste/material shipments.

c. Conclusion

The inspectors concluded that the licensee's implementation of the radioactive waste storage and shipping program was successful.

R4 Staff Knowledge and Performance in RP&C

R4.1 Increased Outage Dose Due to Personnel Errors and Rework

The inspectors reviewed radiation exposure data and interviewed staff regarding personnel errors which resulted in rework and re-entries into areas with elevated dose rates. Although this inspection occurred during the early stages of the outage, the inspectors noted a number of rework issues which resulted in higher collective dose. As examples, the inspectors noted:

- incorrect procedure steps for cavity work;
- incorrect installation of the vessel head alignment pins;
- repeated problems with the installation of the cavity seal;

- faulty installation of a nozzle dam compounded by damage to pins, fittings, and a hose led to additional jumps;

- miscommunication regarding the proper waiting area for work on the SG hot leg - workers were instructed to wait on the platform;

- inadequate lighting led to increased setup time for the platform, scaffolding, and shielding; and

- incorrect programming of the eddy current testing robot.

The overall impact of rework, miscommunication, and personnel errors on the cumulative outage dose could not be quantified at the time of the end of the inspection. However, having noted these examples, this issue will be more fully evaluated during a future inspection (IFI 50-255/96015-01).

R7 Quality Assurance in RP&C Activities

The inspectors interviewed a Nuclear Performance Assessment Department (NPAD) assessor and reviewed selected licensee audits and in-field monitoring reports which focused on the radiation safety, radioactive waste, and chemistry programs. The inspectors noted that the reports and audits were of sufficient breadth and depth to adequately assess the status of various programs. The assessments were conducted by station staff and/or peers who were experienced and knowledgeable, and the findings addressed substantial issues. C&RS supervisory staff ensured that corrective actions were implemented, and NPAD also conducted a follow-up on the corrective actions. The inspectors determined that the self-assessment/audit process was effective in improving the performance of the C&RS programs.

R8 Miscellaneous RP&C Issues

R8.1 (Closed) LER 50-255/92-027: hole in radiation door leads to potential loss of authorized access control to a high radiation area. On April 1, 1992, during a routine radiation control door check, a hole was discovered in the locked wire cage door on the 625' elevation in containment, such that a person could have reached through the wire to unlock the door. The door was immediately padlocked to prevent unauthorized entry into the regenerative heat exchanger area which exhibited radiation levels up to 2 rem/hour. The investigation into this matter could not identify a root cause. A review of electronic dosimeter (ED) results did not indicate that any EDs had been in a radiation field similar to 2 rem/hr. A review of other radiation control doors did not indicate any additional problems. The failure to control high radiation areas in excess of 1,000 mrem/hour via the use of locked doors to prevent unauthorized entry is a violation of Technical Specification 6.12.2. However, this licensee-identified and corrected violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the NRC Enforcement Policy. (NCV 50-255/96015-02).

X1 Exit Meeting Summary

The inspector presented the inspection results to members of licensee management during an exit meeting on November 20, 1996. The licensee acknowledged the findings presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

Partial List of Persons Contacted

Licensee

T. Palmisano, Plant General Manager
D. Malone, Chemical & Radiological Services Manager
J. Studemann, Chemical and Radiological Services Supervisor
W. Doolittle, Duty Health Physicist
M. Manucci, Chemical and Radiological Services Trainer
R. Vincent, Licensing Supervisor
W. Roberts, Licensing Engineer
J. Beer, Health Physics Support Supervisor
T. Neal, Environmental Services Supervisor
G. Szczotka, Nuclear Performance Assessment Manager
D. Watkins, Nuclear Performance Assessment Engineer
M. Banks, Chemistry Supervisor
K. Schneider, Chemical and Radiological Services Training Facilitator
J. Umbra, Westinghouse ALARA

NRC

M. Parker, Senior Resident Inspector, Palisades
P. Prescott, Resident Inspector, Palisades

Inspection Procedures Used

IP 83729, "Occupational Exposure during Extended Outages"
IP 83750, "Occupational Radiation Exposure"

List of Items Opened

50-255/96015-01	IFI	Unnecessary radiation dose due to personnel errors, rework, and miscommunication.

List of Items Closed

50-255/96015-02	NCV	Failure to adequately provide controls to a high radiation area in accordance with Technical Specification 6.12.2.

LISTING OF DOCUMENTS REVIEWED

Palisades Nuclear Plant (PNP) Health Physics Procedure No. HP 11.1, Revision 7, "Processing Radiation Work Permits and ALARA Reviews".

PNP Procedure No. HP 11.4, Revision 1, "Evaluating Control of Airborne Radioactivity and Respiratory Protection".

PNP Procedure No. HP 11.2, Revision 2, "Control and Use of Containments and Ventilation".

PNP Procedure No. HP 8.9, Revision 7, "DAC-Hour Dose Assignment".

PNP Procedure No. HP 2.19, Revision 15, "Airborne Radioactivity Sampling".

Consumers Power Company 10 CFR 20 Implementation Basis Documents and Attachments for 10 CFR 20.1502 and 20.1703

Palisades Nuclear Plant Site-Specific Transuranic DAC Evaluation with Enclosures, dated January 10, 1996.

REFOUT 1996 Shutdown Chemistry Treatment, dated November 21, 1996.

1996 Palisades Radwaste Inventory-Generation-Shipments Cubic Feet.

PNP Radiation Work Permit (RWP) #P965007 and ALARA reviews, Revisions 0 and 1, "Remove, Transport and Install PCP Seals".

PNP RWP #P965102 and ALARA reviews, Revision 0, "Disassemble Reactor Head and Move to Stand on 649" Elevation".

Chemical and Radiological Services Department Self-Assessment Reports 96-37 and 96-38.

Nuclear Performance Assessment Department (NPAD) Audit PA-96-20, "Palisades Health Physics and Shipping and Packaging of Radwaste".

NPAD Audit PA-95-08, "Palisades Chemistry Audit".

NPAD Field Monitoring Reports FM-P-96-109, -140, -156, -166, -168, and -169.

PNP RWP# P965104, Revisions 1, 2 and 3, "Remove and Install UGS, Refueling and support activities that include: pulling, cutting, reinstallation of Incores, Tri Nuk filter support activities. Surveillance capsule activities. Repair of cavity seal and alignment pin".

PNP RWP# P965155 and ALARA reviews, Revision 0, "Perform Eddy Current Testing. Work scope includes Steam Generator Half Jumps and Arm Entries".

PNP RWP# P965150 and ALARA reviews, Revision 0, "Install and remove Nozzle Dams in the "A" Steam Generator Hot and Cold Legs. Scope: Installation and Removal of Dams, and Inspection of Dams and Leak-off".

PNP RWP# P965151 and ALARA reviews, Revision 0, "Install and remove Nozzle Dams in the "B" Steam Generator Hot and Cold Legs. Scope: Installation and Removal of Dams, and Inspection of Dams and Leak-off".

PNP RWP# P965152 and ALARA reviews, Revision 0, "Open/Close Manways on Hot and Cold Legs. Scope: Equipment setup/removal, open and close manways, remove/replace gasket plate and gasket, install/remove ALARA doors and ventilate bowls".