

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos. 50-528/87-38, 50-529/87-37, 50-530/87-39

Docket Nos. 50-528, 50-529, 50-530

Licensee: Arizona Public Service Company  
P. O. Box 52034  
Phoenix, Arizona 85072-2034

Facility Name: Palo Verde Nuclear Generating Station

Inspection at: Wintersburg, Arizona

Inspection Conducted: October 26-30, 1987

Inspectors:

J. Russell  
J. Russell, Health Physicist

12-3-87  
Date Signed

G. P. Yuhas  
G. P. Yuhas, Radiation Specialist

12/3/87  
Date Signed

Approved by:

G. P. Yuhas  
G. P. Yuhas, Chief, Facilities Radiological  
Protection Section

12/3/87  
Date Signed

Summary:

Inspection on October 26-30, 1987 (Report Nos. 50-528/87-38, 50-529/87-37, and 50-530/87-39)

Areas Inspected: Routine unannounced inspection by two regionally based inspectors of occupational exposure during extended outages (in Unit 1), Allegation No. RV-87-A-0066, followup of nonroutine events, and a tour of the facility. Inspection Procedures 30703, 92701 and 83729 were addressed.

Results: In the four areas inspected, one apparent violation was identified involving Technical Specification 6.2.2.2.b (see Section 2.B.).



## DETAILS

### 1. Persons Contacted

#### A. Licensee

- J. Allen, Unit 1 Plant Manager
- \*W. Ide, Unit 2 Plant Manager (Corporate QA/QC Manager)
- \*O. Zeringue, Unit 3 Plant Manager (Technical Support Manager)
- \*L. Brown, Radiation Protection and Chemistry Manager
- P. Brandjes, Outage Manager
- \*T. Shriver, Compliance Manager
- \*G. Perkins, Central Radiation Protection Manager (Radiological Services Manager)
- \*L. Souza, Quality Audits and Monitoring Manager
- \*J. Mann, Corporate Health Physics/Chemistry Supervisor
- K. Oberdorf, Unit 1 Radiation Protection Manager
- \*T. Bradish, Compliance Supervisor
- K. Contois, Dosimetry Supervisor
- R. Selman, ALARA Supervisor
- \*D. Bland, Compliance Engineer

#### B. NRC

- \*J. Ball, Acting Senior Resident Inspector

\*Denotes present at exit interview.

( ) Denotes stated title if different from present licensee proposal.

The inspectors also met with and held discussions with other members of the licensee and contractor staff.

### 2. Occupational Exposure During Extended Outages

#### A. Planning

##### (1) ALARA

Pre-job reviews of outage work were reviewed to determine the level of review and adequacy of requirements to ensure that exposures were kept As Low As Reasonably Achievable (ALARA). The licensee performed estimations of dose as the work was projected to progress. Reviews appeared to be conducted on a case-by-case basis, rather than formatted for conformance with each other. No specific exposure goal had been set by job function. The only exposure goal set was 275 person-rem for the outage. The licensee staff stated that it was their intention to set goals for following outages based on the results of the current outage. At the time of the inspection, the licensee staff had calculated that cumulative exposure for the outage was approximately 70 person-rem. This would, for

the point in the outage, be just under the cumulative amount expected, consistent with a 275 person-rem outage total.

No violations or deviations were identified.

(2) Changes

The licensee was in the final stages of an organizational change. The thrust of the change was to place individual unit Radiation Protection Managers (RPMs) under unit Plant Managers. The RPMs would also report to a Radiation Protection and Chemistry Manager. Support functions, such as Dosimetry and Respiratory Protection, were to be under a central RPM. Potential impact of these changes is discussed in paragraphs 2.B and 2.C, below.

B. Staffing and Administration

Contractor resumes, work hour time records, and training records were reviewed. Contract Radiation Protection personnel used by the licensee to fill Technical Specification (TS) 6.3, "Unit Staff Organization," positions met or exceeded the minimum qualifications of ANSI 3.1-1978, as required in TS 6.3. Work hour overtime limitations are specified in TS 6.2.2.2 which states, in part:

"6.2.2.2 The unit staff working hours shall be as follows:

"a. Administrative procedures shall be developed and implemented to limit the working hours of unit staff who perform safety-related functions; e.g., Senior Reactor Operators, Reactor Operators, radiation protection technicians, auxiliary operators, and key maintenance personnel..."

"...during extended periods of shutdown for refueling, major maintenance, or major plant modifications, on a temporary basis, the following guidelines shall be followed..."

"...An individual should not be permitted to work more than 16 hours in any 24-hour period, nor more than 24 hours in any 48-hour period, nor more than 72 hours in any 7-day period, all excluding shift turnover time..."

"Any deviation from the above guidelines shall be authorized by the PVNGS Plant Manager or his designee who is at supervisory level or above, or higher levels of management, in accordance with established procedures and with documentation of the basis for granting the deviation...."

A review of time records for contractor personnel disclosed that two individuals had worked seven consecutive days of 12 hours each. The licensee stated that the individuals, who worked the 12 hour days respectively on October 10 to 16, 1987, inclusive, and October 13 to 19, 1987, inclusive, had not received prior authorization, since

they had days off work in the calendar weeks preceding and following the period of work. When presented with the findings, the licensee stated that procedure 10 AC-OZZ07, "Overtime Limitations," was restricted to Arizona Nuclear Power Project personnel, and not to contractors. The technicians noted above, during the subject periods, were both assigned to coverage of outage work, such as radiological surveys and monitoring of work activities.

Failure to limit the work hours of the technicians represents an apparent violation of TS 6.2.2.2.a (87-38-01).

C. Training and Qualifications of New Personnel

- (1) Training records and resumes of several contractor personnel newly hired for the outage were reviewed. Observations by the inspectors established that personnel assigned to safety-related positions had the qualifications required by ANSI 3.1-1978. Incoming radiation protection personnel receive the same training as other new hires. The licensee used a pre-test to assess the extent of training required. Training for the purpose of meeting 10 CFR 19.12, "Instructions to Workers," was either a full training session or an abbreviated session, governed by the pre-test results. The licensee had assigned escorts and a German/English interpreter to several foreign national contract technical consultants from the Reactor Coolant Pump (RCP) manufacturer.
- (2) The licensee had recently instituted procedure 75RP-9ZZ83, "Hot Particle Control," with an effective date of October 13, 1987. Radiation Protection Technicians with whom this procedure was discussed stated that training on the procedure had consisted of reading the procedure once and signing a training document indicating they had done so. Four technicians responsible for Hot Particle Control Areas (HPCA) stated that they had periodically reviewed the procedure on their own, in addition to the initial review.

The inspectors discussed hot particle control and 75RP-9ZZ83 with the following personnel:

- Radiation Protection and Chemistry Manager (RPCM)
- Central Radiation Protection Manager (CRPM)
- Unit 1 Radiation Protection Manager (RPM)
- Radiation Protection Outage Coordinator (RPOC)
- Three (Lead) Radiation Protection Technicians (LRPT)
- One ANPP RPT



- Seven Contractor RPTs, ANSI 3.1-1978 qualified, directly assigned to HPCA work
- Four Contractor RPTs, ANSI 3.1-1978 qualified, not so assigned
- Three Contractor RPTs, not ANSI 3.1-1978 Seniors (Junior RPTs)

During these discussions, the inspectors made the following observations:

- Only three of the fifteen Senior RPTs were able to accurately describe the modified R02/R02A and discuss survey techniques appropriate to the instrument.
- One Senior RPT was observed using the modified R02/R02A for surveys of personnel in an HPCA. The RPT used the instrument at an angle that could have precluded incident betas from reaching the open window, and did not survey all high contact areas as called for in 75RP-9ZZ83.
- One Senior RPT assigned to HPCA work stated he did not trust and would not use the modified R02/R02A for personnel surveys.
- One Senior RPT in the Reactor Building (RB) described the modified R02/R02A as having a "round hole" for a beta window. The instrument had a slotted window and the RPT had an instrument in his possession, i.e., on his desk.
- Two Senior RPTs in the RB stated that 20,000 dpm per probe area on the modified R02/R02A would indicate the presence of a hot particle. The instrument has a scale calibrated in mr/hr, and no external probe. The RPTs had an instrument on their desk.
- Ten of the Senior RPTs were unfamiliar with the action levels associated with stop-work orders based on radiation exposure estimates specified in 75RP-9ZZ83. Most of the errors were conservative. The inspectors concluded that hot particles, if discovered during surveys of personnel, would be unlikely to result in unconservative actions.
- One technician stated that he thought dose estimations for hot particle exposures were averaged over the whole-body skin area.
- An assembly from RCP-1B was removed from a hot particle control area without being surveyed to preclude the presence of hot particles and placed in a tent not marked as an HPCA. The inspectors called this to the licensee's attention approximately eight hours after the move

occurred. The tent area was posted HPCA approximately five hours later.

- The Unit 1 RPM stated that he had been informed that RCP shaft/impeller assemblies being decontaminated were "coming up particle-free." RPTs assigned to RCP work in the decontamination area stated that they did not perform surveys for particles on material inside posted HPCAs due to excessive dose rates.
- The RPOC stated that she had not received any formal training on 75RP-9ZZ83, but was sure that the contractor RPTs had received such training during initial General Employee Training (GET).
- The Unit 1 RPM stated that, although he was not familiar with operation of the modified RO2/RO2A, he was sure the RPTs were.
- The CRPM expressed familiarity with 75RP-9ZZ83, but was unable to recall dose estimation/stop work action levels called for therein.
- The RPCM stated at the exit interview that he had been under the impression that the Nuclear Training Department had presented a formal lecture on hot particle control for new hire RPTs. The inspector verified that a formal lecture on hot particle control had not been presented.

The inspectors discussed these observations with the licensee during a meeting held on October 18, 1987, and at the exit interview. The licensee acknowledged the observations and stated that a video presentation on hot particle control had been prepared for review prior to viewing by RPTs on shift. The licensee showed the inspectors two recent memoranda addressed to all personnel, emphasizing proper radiological controls in areas where hot particles were suspected.

No violations or deviations were identified.

#### D. External Exposure Control

##### Dosimetry

Personnel dosimetry was observed in use and representative licensee records were reviewed. The licensee uses pocket dosimeter readings for daily accumulated exposure. TLD readings are compared to pocket dosimeter readings when the TLD is read and the record is updated to reflect the TLD reading. Anomalous comparisons and lost/offscale dosimeter readings are investigated.

The licensee's dosimetry program is National Voluntary Laboratory Accreditation Program (NVLAP)-certified. Quality control and abnormal TLD readings were reviewed. Anomalous readings are





investigated by the licensee through visual examination of TL phosphors and analysis of causes for abnormal readings. Dose estimations were performed for those cases in which defective TLDs were determined to be the cause. Representative examinations of abnormal readings were reviewed and observed to be adequate.

According to licensee records, no personnel received whole body exposures in excess of the limits of 10 CFR 20.101(a) for the current and second quarters of 1987. All personnel records reviewed, except for those of the foreign nationals previously mentioned, contained form NRC-4 equivalents completed in accordance with 10 CFR 20.102, prior to approaching the limits of 10 CFR 20.101(a).

The licensee distributes an occupational dose status report twice daily on weekdays during the outage, organized by department and by record number. Department managers can then review their department, and individuals can locate their most recent update by a unique number assigned to them, or alphabetically by their departmental report.

No violations or deviations were identified.

E. Internal Exposure Control

Licensee records of MPC-hour calculations, bioassay, whole body counting and internal exposure estimations were reviewed. No personnel had exceeded 40 MPC-hrs for the outage. Adequate air sampling appeared to be in use for airborne radioactivity areas. Bioassay calculations and air sampling results appeared to be consistent. Records for two personnel, determined to have ingested small quantities of Sb-124, were examined.

No violations or deviations were identified.

F. Control of Radioactive Material and Contamination, Surveys, and Monitoring

Use of field radiation instruments, portal monitors, friskers, and monitoring practices were observed by the inspectors. One RM-20 frisker No. 993 being used by personnel for frisking in a clean area was located just inside an area posted "contaminated area." One RM-20, Serial No. 725, was available in the same clean area, but with battery power too low to allow operation. The instrument was not connected to a power line. One RM-20, Serial No. 649, dated calibration due October 26, 1987, was observed to be in use at the exit to the radiation control area on October 27, 1987. The instrument was immediately removed from use by an RPT accompanying the inspectors. On October 29, 1987, the same RM-20, Serial No. 649, dated calibration due October 26, 1987, was observed in use for personnel frisking in the Unit 1 Turbine Building. The instrument was immediately removed from use by an RPT accompanying the inspectors.



Waste volume reduction efforts appeared adequate. Personnel bringing material into the RCA were observed to be removing packaging materials prior to entry, and the licensee used segregation of waste to prevent mixing of uncontaminated and contaminated waste.

The licensee utilized a group of contractor personnel to perform area decontamination, in order to reduce the total area within contaminated areas, and to reduce contamination levels to minimize the spread of contamination. The process appeared to be effective in that contaminated areas in the auxiliary and radwaste buildings were smaller than during the last inspection. Housekeeping was generally improved.

No violations or deviations were identified.

3. Allegation RV-87-A-0066

This refers to an anonymous allegation received by telephone concerning radiation protection personnel. The allegations were as follows:

- A. Radiation Protection (RP) personnel performed smear surveys without gloves or other anti-contamination clothing.

Several RPTs were observed in the performance of smear surveys.

No RPTs among the several observed were noted to be performing surveys without adequate protective clothing. The licensee's procedures and training describe the protective clothing appropriate for performing surveys. No other examples of this allegation were observed.

- B. An RPT was reported to have said to the alleger that he did not know what the alleger should do with some equipment which caused the RPT's frisker to read off-scale high.

The inspector discussed surveys and disposition of contaminated material with several RPTs, both ANSI 3.1-1978 Senior Technicians and three Junior RPTs. Procedure 75 RP-9ZZ61, "Radioactive Material Storage and Control," describes actions to be taken to control contaminated material. No material was observed to leave contaminated areas without an adequate survey, and all personnel engaged in discussions appeared to understand what actions should be taken. This allegation was not substantiated.

This matter is closed. (RV-87-A-0066)

4. Followup

At approximately 8:00 p.m. on October 25, 1987, the licensee's Fuel Building (FB) was contaminated extensively by deposition of airborne radioactivity when an apparently vigorous chemical reaction took place during decontamination of Reactor Coolant Pump (RCP) components. The

inspectors discussed the incident with licensee staff and toured the area.

The licensee stated that the RCP shaft and impeller assemblies were being decontaminated by a chemical process developed by Kraftwerk Union (KWU) and used extensively in nuclear power plants in Europe. If the RCP components remain in the decontamination solution for long periods, as occurred with RCP-1B, due to other equipment problems, the contractor procedure called for addition of a quantity of oxidizing agent, calculated by the "Decon Supervisor." In this case, the Decon Supervisor was a Federal Republic of Germany (FRG) national working under a Bechtel-KWU contract. The oxidizing agent was to be added to break down a passivated corrosion layer created by the long-term immersion. The addition was required after 100 hours of immersion. The licensee stated additionally that about 24 hours had transpired with RCP-1B in the solution. RCP-1B was resting on the lip edge of the tank so as to form a seal between the assembly and the tank. The mixture was being maintained at 205°F. Pressure generated from the exothermic reaction between the decon solution and the oxidizing agent was to relieve via the "kittybone" labyrinth and out a seal water flange connected to a 20-foot rubber hose. The licensee staff stated that when they began to inject the agent at the minimum speed of the air-operated diaphragm pump, they heard a rapidly increasing noise of escaping pressure and began to evacuate the area as liquid and vapor from the tank began to spray out. The licensee estimated approximately 20 gallons of mixture spewed out as water and steam, contaminating the FB. No personnel injuries occurred.

An air sample taken at the time of the incident indicated approximately 0.5 MPC for the total nuclide mix observed. Personnel in the FB at the time of the incident were surveyed for contamination and sent for whole body gamma scans. The results of whole body counting (WBC) indicated no significant uptake of airborne radioactivity.

A licensee review of the incident was in progress at the time of the inspection. No procedural changes were required by the licensee prior to resumption of the process, and decontamination of the RCP assemblies resumed. The licensee representative informed the inspector that the Decon Supervisor had been instructed to avoid the addition of chemicals which could produce similar reactions.

No violations or deviations were identified.

#### 5. Facility Tour

A tour of the facility, during which independent radiation measurements were made using an NRC ion chamber survey instrument, Eberline R02A, Serial No. 897, calibrated on September 28, 1987, and due for calibration on December 28, 1987, was conducted.

The licensee's postings appeared to comply with 10 CFR 19.11, "Posting of Notices to Workers, and 10 CFR 20, "Standards for Protection Against Radiation." However, numerous instances of practices inconsistent with the licensee's procedures as stated in 75RP-0ZZ01, "Radiological Posting," were observed:

- A radiation area posting in the concentrated radwaste evaporator room had partially fallen such that it was not easily readable.
- A contaminated area posting in a decontamination area on the 120' Radwaste Building was partially obscured.
- A high contamination area (HCA) posting near door F101 for an area which was no longer an HCA had fallen such that it appeared that an area outside the Fuel Building (FB) was an HCA.
- The contaminated area posting on the laundry monitor in the Unit 1 Radwaste Building was not visible from the side of the monitor from which surveyed laundry was removed.
- The barrier and posting for a decontamination cubicle on the 120' elevation of the Unit 1 Radwaste Building containing an RCP shaft, posted as an High Radiation Area, Respiratory Protection Required, HPCA, HCA, and Airborne Radioactivity Area had fallen to the floor, but was still visible.
- A tent containing scaffold material, located outside the FB near door F101, was posted inconsistently: One side (the entrance) was posted with only the radiation caution symbol. One side was not posted, one side was posted as a "Radioactive Material Storage Area," as was the roof which had fallen in, and the fourth side was posted as "Radioactive Material."
- A box used by the Operations Department for storage of radioactive material had its sign flipped over so it could not be read.
- An area contaminated during the incident involving airborne radioactivity in the FB, was behind a boundary rope, posted only with the radiation caution symbol. RP personnel stated that the floor had been decontaminated and therefore no protective clothing was required, but that other horizontal surfaces within the area (but not posted "contaminated area"), had yet to be released as uncontaminated.

The concerns identified above were brought to the attention of the licensee during the tour, and were corrected at that time by an RPT accompanying the inspectors. No areas requiring posting were found to be completely unposted.

The inspectors noted that housekeeping in the Auxiliary Building had improved. Little extraneous material was observed in the RB considering the outage status, and no unlabeled radioactive material was observed in uncontrolled areas. In one instance, yellow polyethylene bags, normally reserved by 75 RP-9ZZ61, "Radioactive Material Storage and Control," for radioactive material, were being used in an uncontaminated area walkway, under some heavy objects. The inspectors were informed the material was not contaminated, and that the plastic was to prevent scuffing the floor.

A tour of the radiologically controlled area outside of the Radwaste Building indicated that the same level of attention was not being given

to these areas. The outside yard area contained numerous cigarette butts and even an empty soft drink can. The area was posted "no eating, drinking, or smoking." Many of the caution signs, though still visible, were difficult to read due to deterioration. In the Radwaste Building, most areas posted as either "Radiation Area" or "Contaminated Area" contained debris. In one case, a ladder within the Radwaste Evaporator rooms was blocked completely by protective clothing, a fire extinguisher, and other equipment.

In the FB, the licensee was in the process of recovering from a contamination incident on October 25, 1987 (see paragraph 4). Much of the building, particularly within the hot particle control areas, was cluttered. The licensee staff stated that they had experienced difficulty with leakage from various connections on the decontamination system, and contamination levels were, according to RP staff in the area, extreme. By the conclusion of the inspection, however, the areas outside contaminated area boundaries were much improved.

The inspectors noted that adhesive step-off pads were used extensively at contaminated area exits, but that many were not being kept sticky by removal of expended adhesive pads.

During the tour, it was noted that three radiation monitors were alarming and unacknowledged. RU-2 and 3, for Essential Cooling Water "B" and "A," respectively, on the 70' elevation of the Auxiliary Building, were alarming. RU-2 was alarming on low flow. The licensee staff subsequently stated that both were being acknowledged, and that the RU-3 alarm was determined to be spurious. Waste Gas Decay Tank Monitor RU-12 was also alarming unacknowledged. The licensee RP staff provided the inspectors with an "Alarm Response Worksheet," showing the response to the alarm subsequent to the tour of the facility. The RU-12 alarm was also determined by the licensee to be spurious, with a reading of 6.01 E-4  $\mu\text{c}/\text{cc}$  and an alarm setpoint of 2.00 E-3  $\mu\text{c}/\text{cc}$ .

During the course of the inspection, a severe thunderstorm struck the site on October 29, 1987, resulting in a partial power outage. The inspectors noted that postings and barriers located outside had been restored, with the exception of a "potentially radioactive material storage area," where the barrier was visible. The Central RPM, upon discovering that power would not quickly be restored to respiratory protection, whole body counting, and dosimetry areas, promptly suspended all work involving a high potential for uptake of radioactivity or high external dose, until such power could be restored.

No violations or deviations were identified..

#### 6. Exit Interview

The findings of the inspection were brought to the attention of the licensee on October 30, 1987. The licensee was informed that failure to limit overtime hours worked for Radiation Protection Technicians was an apparent violation of TS 6.2.2.2. The licensee stated that TS 6.2.2.2 did not apply to contractor personnel, and that this position had been agreed to by NRC Region V management. The subject agreement was related

to a resident inspector identified overtime limitation being exceeded by a contractor working on safety-related equipment (see Inspection Report 50-528/85-26). The inspectors determined that RPTs are identified specifically in Technical Specification 6.2.2.2 (see paragraph 2.B) and the overtime limitations apply to contract as well as house technicians.



