U.S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos. 50-528/91-09, 50-529/91-09, 50-530/91-09

License No. NPF-41, NPF-51, NPF-74

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

Facility Name: Palo Verde Nuclear Generating Station Units 1, 2 and 3

Inspection at: Wintersburg, Arizona

Inspection Conducted: March 4-8, 1991

Inspected by: GP Yuhas for
W. K. TenBrook, Radiation Specialist — 3/29/91 Date Signed

GP Yuhas for
L. C. Carson, Radiation Specialist — 3/29/91 Date Signed

Approved by: GP Yuhas
G. P. Yuhas, Chief
Reactor Radiological Protection Branch — 3/29/91 Date Signed

Areas Inspected: Inspection of solid radioactive waste processing, compliance with 10 CFR 20 and 10 CFR 61 radioactive waste management requirements, shipping of radioactive materials, and review of actions taken under a Justification for Continued Operation for a postulated reactor coolant pump seal cooler leak. Inspection procedures 84722, 84850, 86750 and 92700 were used.

Results: Violations were identified for failure to implement a procedure for software control (Section 4) and improper identification of containers in a radwaste shipment (Section 5).

Section 4 discusses the following strengths and weaknesses: The quality assurance department had effectively identified deficiencies in quality criteria and quality classification for radwaste systems and activities. Frequent isotopic verifications of the waste classification data bases were a strength. Waste minimization performance had improved. Quality assurance and quality control by the radiation protection department were thorough, but organizational responsibilities were not clear in selected procedures. Overall the licensee's solid radioactive waste processing, transportation and disposal programs were fully capable of meeting their safety objectives.

DETAILS

1. Persons Contacted

Licensee

J. Albers, Radiation Protection Operations Manager
R. Badsgard, Supervisor, Site Nuclear Engineering
R. Fullmer, Manager, Quality Audits and Monitoring
S. Guthrie, Deputy Director, Quality Assurance
R. Hazelwood, Quality Assurance Supervisor
R. Henry, Site Representative, Salt River Project
T. Hillmer, Manager, Radiation Protection Support
P. Hughes, Radiation Protection General Manager
S. Kanter, Senior Coordinator, Owner Services
D. Kissinger, Supervisor, Quality Engineering
D. Larkin, Compliance Engineer
R. Rouse, Compliance Supervisor
C. Russo, Manager, Quality Control
R. Schaller, Assistant Plant Manager, Unit One
J. Sills, Corporate Assessment Radiation Protection

Nuclear Regulatory Commission

F. Ringwald, Resident Inspector

The persons listed above attended the exit meeting held March 8, 1991. The inspectors also held discussions with other personnel during the inspection.

2. Errata

Inspection report 50-528/91-06 described radiation measurements using an ion chamber instrument incorrectly identified as serial number 897, due for calibration February 3, 1991. The instrument used was serial number 9154, due for calibration February 26, 1991.

3. Followup of Licensee Event Reports (92700)

Licensee Event Report 50-528/90-01-LO (Open): This report concerned a licensing analysis for a postulated break in the reactor coolant pump high pressure seal cooler that could result in a reactor coolant system leak outside of containment. This inspection addressed the adequacy of chemistry analyses pursuant to the resulting Justification for Continued Operation (JCO).

The JCO stated that a seal cooler pipe break would result in stable leakage of 0.8 gallons per minute (gpm) leakage per NUREG/CR-4572, "NRC Leak-Before-Break Analysis Method..," with safety factor included. The inspector performed an independent calculation to confirm that the licensee's routine sampling would detect one-tenth of the stated 0.8 gpm stable leakage per NUREG-1061. Using the current specific activity of

radioiodine in the reactor coolant at Unit Two, the lower limit of detection for radioiodine in shiftly nuclear cooling water analyses and the fourteen hour routine sampling period, the inspector estimated that 40 million gallons would be needed to dilute 0.08 gpm leakage below detection limits, far in excess of the 40 000 gallons in the nuclear cooling water system. The calculation demonstrated that the licensee's routine analytical schedule was conservative. Other aspects of this Event Report will receive further NRC review.

4. Solid Radioactive Waste Management (84722, 84850, 86750)

Quality Assurance Department Audits and Monitoring

The inspector reviewed the licensee's appraisal programs in the area of solid radioactive waste and transportation of radioactive materials. The last quality assurance (QA) audit covering solid radioactive waste, Audit Report No. 89-16, "Radioactive Material Transport," was reviewed during a prior inspection. The next solid radwaste audit was scheduled for mid-1991. The licensee was planning to use contractor QA auditors specializing in solid radioactive waste to supplement the licensee's staff.

The inspector examined the QA "Monitoring Observation Report (QAMR) Log/Index" for the period of January 1990-February 1991. There were some 200 monitoring activities associated with radiation protection support services. The inspector examined 25 monitoring reports documenting observations of radwaste activities by vendor and licensee personnel. Thirteen deficiencies were identified. Several deficiencies were corrected on the spot. Eleven of the deficiencies involved inadequate labeling and identification of radioactive materials. Quality Deficiency Report (QDR) 90-372, dated 9/21/90, described adequate corrective actions to assure compliance with 10 CFR 20.203(f)(2), "Container Labeling."

The inspector examined the qualifications of personnel who had monitored radwaste activities. Personnel met the experience and training levels commensurate with monitoring radwaste activities, including ANSI/ASME N45.2.6, "Qualifications of Inspection, Examination and Testing Personnel for Nuclear Power Plants." The QA monitoring group recognized that monitoring personnel were weak in specialized training for waste classification, characterization and quantification and planned to obtain specialized training.

Various aspects of the licensee's solid waste operations involved vendor services requiring QA vendor surveillances. Discussions were held with vendor surveillance personnel regarding vendor audits on computer software, shipping casks and radwaste processing applications. The vendor of software used in radwaste classification and manifesting had been audited in 1988.

On 3/4/91 the licensee issued Source Verification Plan 91-046 for an audit of their principal radwaste processing vendor. The audit confirmed the following:

- Radwaste processing system vendor onsite personnel met ANSI/ANS 3.1-1978 qualifications.

- Adequacy of process control programs, procedures and documents related to vendor onsite/offsite operations.

- The vendor surveillance also audited the design and configuration control over the RVR-800 radwaste volume reduction system, installed in all three units. QA concluded that an independent reviewer could not reconstruct the system from design documents nor were all three systems installed consistently. Corrective Action Report 91-01 had been issued to address the configuration control problems.

The level of vendor quality assurance contained in Source Verification Plan 91-046 met the applicable requirements of 10 CFR 50, Appendix B.

The inspector learned that radiation protection support was purchasing new polyethylene high integrity containers (Poly-HICs) with bead internals. The inspector reviewed the level of QA procurement involvement in the radiation protection support purchase request. The Poly-HIC specific limitations and requirements were part of the purchase request and QA review. The purchase was treated as quality class "Q." The inspector had no concerns in this area.

The inspectors reviewed the Quality Augmented Task Force Final Report, dated 2/20/91. The report assessed QA commitments for non-safety related systems, components, structures and activities, such as radwaste management. The report identified misclassified components and failures to implement QA commitments for radwaste management. The report recommended commitments to additional 10 CFR 50, Appendix B criteria in accordance with 10 CFR 71.101 (f) and Regulatory Guide 1.143, Revision 0, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light Water Cooled Reactors." The inspectors concluded that the corrective actions and findings in the report would further enhance the radwaste program.

The quality assurance department had improved their performance by identifying deficiencies in quality criteria and classification for radwaste systems and activities. No violations were identified.

Quality Verification by Radiation Protection Support and Radiation Protection Technical Services

The inspectors examined the following portions of the radwaste quality assurance and quality control program:

- 76DP-0AP02, "Review of Radwaste and Radwaste Process Control Program"
- 76DP-0AP04, "Radwaste Technical Support Observation Program"
- 76DP-0AP06, "Radwaste Computer Software Control"
- 76DP-0AP07, "Control of Vendor Documents and Operations"

Procedure 76DP-0AP02 required a complete radwaste/PCP review by the radwaste technical support staff every two years. The licensee completed their most recent review on 9/26/90, with adequate scope and depth.

Procedure 76DP-0AP04 required broad observations of many radwaste activities. The inspector reviewed ten observation reports conducted by radwaste technical support in May and June 1990. The programmatic review and work monitoring by radwaste technical support were effective.

Procedure 76DP-0AP06, Section 3.3.1, stated in part, "All Radwaste computer software will be benchmarked prior to use. Radwaste computer software benchmarks will also be performed after any software revision..."

The inspector selected the RADMAN computer program as a test case for implementation of 76DP-0AP06. RADMAN performed waste classification, dose-to-curie scaling calculations and generated shipping papers/ waste manifests. RADMAN was initially approved under an NRC Topical Report and the vendor was a QA-approved software supplier.

RADMAN revision 3.3 incorporated curie limit values for reportable radionuclide quantities on waste manifests/shipping papers and changes to package dose rate entry methods. The completed Appendix B to 76DP-0AP06, titled "Benchmark Verification," referred to the vendor's verification of the original version. No calculational verification was performed for revision 3.3, nor was the vendor's verification of the current revision obtained or reviewed.

Revision 3.5 incorporated second-order scaling relationships to be used when Co-60 or Cs-137 were not present in waste. Revision 3.5 was approved without any benchmark verification document whatsoever.

The inspector noted the following commitments and requirements:

10 CFR 20.311(d) states in part, "A licensee shall:...(3) Conduct a quality control program to assure compliance with parts 61.55 and 61.56 of this chapter..."

10 CFR 71.105(a), "Quality Assurance Program," states in part "The licensee shall document the quality assurance program by written procedures or instructions and shall carry out the program in accordance with those procedures throughout the period when the packaging is used."

By letter ANPP-34346-EEVB/MAJ-98.07, dated December 27, 1985, the licensee committed to use their 10 CFR 50 Appendix B quality assurance program for radioactive material packages pursuant to 10 CFR 71.101(f).

10 CFR 50, Appendix B, Criterion V, states in part, "Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings..."

Failure to benchmark changes to radwaste computer software was an apparent violation of 10 CFR, Appendix B, Criterion V.

The licensee responded by obtaining the vendor's software quality assurance procedure and initiating Quality Deficiency Report 91-0078 to resolve the procedural noncompliance. An instruction change request was issued to clarify that benchmarks were to be performed on significant software changes and in accordance with the QA manual. The radiation protection support manager stated that resolution of the Quality Deficiency Report would include a calculational check to serve as a benchmark. The violation is not being cited because the criteria in Section V.A of the Enforcement Policy were satisfied (NCV 50-528/91-09-01, Closed).

Procedure 76DP-0AP07, "Control of Vendor Documents and Operations," tasked radwaste supervisors with responsibility for assigning technicians to monitor vendor activities and operations. The inspector examined three completed radwaste package checklists; 90-3-049, 90-3-053 and 90-3-054, for solidification of liquid concentrates and resin dewatering. The checklists contained licensee verification signatures for the following vendor activities:

- Package Integrity, Container Preparation
- Radiation/Contamination Levels
- Gross Weight
- Measuring Equipment
- Valve Line-up
- Solidification Process Control and Sample Verification

The vendor also presented examples of quality discrepancy reports and emergency fabrication requests needed to support onsite operations. The level of vendor oversight approvals, plus the licensee controls of routine radwaste activities, was thorough.

Procedures generally delegated organizational and individual responsibilities consistent with Inspection and Enforcement Bulletin 79-19, "Packaging of Low-Level Radioactive Waste for Burial." However, some procedures had not been updated consistent with the licensee's reorganization. For example, procedure 76DP-0AP03, "Review and Monitoring of Shipping Activities," Section 2.2, tasked a "Performance Review Lead" to assign qualified personnel to perform quality control reviews and internal monitoring. The performance review lead position was dissolved during the reorganization. The inspector's observation was brought to the attention of the radiation protection general manager and the QA director for correction.

The licensee's programs for quality assurance and quality control by the radiation protection department were thorough, but organizational responsibilities were not clear in selected procedures. Failure to implement the procedure for software control resulted in a non-cited violation.

Program Changes

The inspector reviewed changes to the PCP, the RVR-800 liquid volume reduction systems and the resin drying (dewatering) systems. The licensee completed six change packages during the period 2/90 to 2/91, which included 10 CFR 50.59 reviews, response and reportability justifications, and administrative/technical review checklists. The change documentation and safety reviews were thorough and adequate.

Radwaste engineers were integrated with radiation protection technical services as the radwaste technical support group, effective 2/11/91. Radwaste technical support responsibilities were described in a letter dated 2/11/91, from the radiation protection general manager. The functions were summarized as follows:

- Program Administration - radwaste programs, policies and procedures
- Maintain radwaste program records - Cask/Container Certificates
- Radwaste process control program (PCP)- Confirm and review PCP methods
- Technical - radwaste trending, evaluation, reports and corrective programs
- Radwaste mixed waste analysis and radwaste special plans
- Waste Stream Characterization/Classification Studies
- Unit Support - radwaste field observations and incident investigations to assess the implementation of programs and identified deficiencies.

The inspector interviewed licensee personnel and confirmed they understood the changes to systems and procedures. However, the interviews revealed that the ongoing staff reorganization caused confusion over quality verification duties and responsibilities, which paralleled the need to update responsibility references in procedures.

The licensee's program in this area was adequate. Confusion over changes in responsibility for quality verification of the radwaste program were evident during interviews. No violations or unreviewed safety questions were identified.

Training

The inspector reviewed training for licensee personnel associated with radwaste activities. Radwaste technicians were well-trained based on timely completion of the radiation protection support task-to-training matrices, for individuals both in initial and continuing training.

The inspector reviewed the radwaste on-the-job-training technician sign-off list, dated 3/91. The list classified 28 technicians as certified and/or experts in one or more of 25 tasks requiring qualified technician signatures. Radiation protection support intended to enhance their training program by 4/91 to be consistent with procedure 15DP-0TR45, "Radiation Protection Qualification Requirements and Training Description." The radiation protection support technician training program was fully capable of meeting the requirements of ANSI/ANS 3.1-1978, including training for contract technicians.

The inspector also assessed training programs for radiation protection technical services staff involved in radwaste activities. The training was not extensive. The lack of radwaste management training was analogous to the limited QA staff expertise noted above.

The licensee's training program met the criteria of Bulletin 79-19. However, the scope and depth of radwaste management training for radiation protection technical services personnel was minimal. No violations were identified.

Waste Classification

Licensee procedure 76DP-ORW01, Rev. 1, "Waste Stream Sampling and Database Maintenance," discussed five principle waste streams: dry active waste, cartridge filters, low activity resins, high activity resins and evaporator concentrates. The inspector verified that the licensee had sampled each waste stream in an acceptable manner and frequency per the NRC Branch Technical Position. Waste stream analyses were performed specific to each Unit.

The inspector noted that cartridge filter smears at Unit One, used to estimate radionuclide fractions in the filters, had not been performed since 1989. The inspector verified that no shipments of such filters had used the older fractions. Radiation protection engineering was constructing a sample jig to be used in conjunction with RO-7 ion chamber instruments for dose-to-curie measurements and smearing of each filter. The licensee planned to resume filter shipments after the jig was constructed and the filters analyzed.

The licensee scaled waste radionuclides in low and high activity resins and evaporator concentrates using gamma isotopic analysis of representative samples. The licensee frequently compared individual waste batch radionuclide fractions to the waste classification database for the subject waste stream. Reanalysis of the waste stream was performed as indicated by the comparisons. The inspector reviewed the comparison data and concluded that the current waste stream radionuclide fractions were consistent with gamma isotopic analyses of current waste shipments.

The inspector reviewed the radioactive material shipping index for 1990-1991 and identified several instances of special radwastes that did not conform to the five waste streams discussed in procedure 76DP-ORW01. The inspector verified that these special wastes, including reactor coolant pump decontamination filters, process filters, solidified oil, waxy waste and evaporator resin fines, had each been analyzed by the vendor laboratory to establish special scaling factors.

In one case, charcoal from a portable demineralizer was not sent for offsite analysis, and the isotopic abundances from liquid radwaste resins were employed to scale the gamma isotopic concentrations in the charcoal. The inspector compared the gamma isotopic data from a sample of the charcoal to the vendor data from the resins. The fractions of key scaling nuclides in the charcoal were consistent with, or larger than,

those in the resin sample, demonstrating conservative radionuclide scaling for the charcoal waste.

As a result of failure to implement software revision benchmarks, the inspector and licensee personnel performed a calculation check on the RADMAN code employed for classification. A nuclide mix employed by the software vendor for verification calculations was entered into a RADMAN database and processed by subroutine DOSCUR. The dose-to-curie calculation of DOSCUR was consistent with the curie-to-dose calculation of the MICROSHIELD routine, based on the same radionuclide mix.

The licensee's program for waste classification fully met the requirements of 10 CFR 61 and the Branch Technical Position. Frequent isotopic verifications of the classification databases were a strength. No violations were identified.

Waste Processing

The inspector observed dewatering of steam generator blowdown demineralizer resin at Unit Three. The vendor operator was very familiar with procedure 76CP-9NP06, Revision 1, "Operating Procedure-Resin Drying (Dewatering) System," a plant-approved vendor procedure. The vendor's system was approved under NRC topical report TP-02-P-A and was intended to meet 10 CFR 61.56(a) requirements to keep water in the waste form as low as reasonably achievable.

The inspector verified that the humidity endpoints for the dewatering operation were consistent with the blowdown demineralizer resin type and the entrainment separator (resin liner suction) temperature per Attachment G. Logs of system parameters were kept up-to-date by the operator per the procedure attachments. Hydrostatic tests of lines containing radioactive material were acceptable. In each of these areas, licensee approval of vendor operations were documented as required.

The inspector confirmed that surveys for radiation levels and surface contamination were conducted daily. Air sampling was in progress during the resin drying.

The inspector reviewed documentation of portland cement solidification process control in accordance with procedure 76CP-9NP03, Rev. 0, "PCP for Class A Unstable Waste Solidification-Boric Acid." Chemical additions and water removal data from PCP records for liners 90-052, 53 and 54, processed October 1990, were acceptable.

The licensee's process control programs were continuing their previous satisfactory performance. No violations were identified.

Waste Minimization

The licensee's 1991 low-level radwaste burial volume allocation for all three units for was 24660 cubic feet. The inspector noted that the allocation equated to approximately 2000 cubic feet per month. The Radiation Protection Support Services Monthly Report for January 1991

reported a total of 1479 cubic feet of radwaste packaged, 1820 cubic feet shipped and 617 cubic feet buried, each stage less than 2000 cubic feet.

The report pointed out that items such as contaminated rigging, safety belts, chemical waste products and large items were backlogged for decontamination. The licensee continued to employ the following methods for minimizing waste:

- Liquid Abrasive Units
- Plasma Arc Cutting Torch - newly purchased
- Laundry Equipment
- Super Compactor Services - volume compaction, 1500 tons of pressure
- Unit-1 Radwaste Volume Reduction System (RVR-800)
- Grit Blaster

The vendor-supplied RVR-800 systems reduced evaporator concentrate waste to a class A unstable dry solid in 55 gallon drums for shipment and disposal. The system volume reduction factor was five compared with cement solidification, increasing the specific activity of the waste product to approximately that of the evaporator bottoms. The RVR-800 was fully operational in Unit 1 during 1990, in Units 2 & 3 the RVR-800 was 95% and 75% complete, respectively.

The grit blaster had been in service for a year. The grit blaster used glass bead abrasive to decontaminate salvageable material.

The inspector also reviewed the progress of the Waste Minimization Task Force Group, the 1990 Annual Radwaste Report prepared by radiation protection support and the PVNGS 1991 Business Plan objectives to minimize radwaste. The licensee was meeting their task plan goals and the Radwaste annual report data reflected continued improved performance in the radwaste minimization program.

The licensee's waste minimization performance had improved. No violations were identified.

5. Shipping and Transportation (86750)

Quality verification, changes and training for shipping and transportation are discussed in section 3.

The inspector reviewed the licensee's use of shipping containers. The radwaste system engineer was responsible for evaluating, repairing and constructing low specific activity (LSA) boxes and strong tight packages, including sea/land containers, prior to shipments offsite, in accordance with 49 CFR 173.425(b)(1). The inspector reviewed several container engineering evaluation reports (EERs) and inspected several fabricated strong tight containers. The containers used for shipments met requirements.

The inspector reviewed all shipping container certificates of compliance, the licensee's low-level radioactive waste site use permit, No. 4387, and the current US Ecology burial License, No. WN-I019-2. The only expired

shipping container certificate, expiration date 11/30/88, was part of permanent radwaste system components, and was not used for transportation.

The inspector examined eight shipment packages, 91-RW-001 through 91-RW-008, shipped between 1/10/91 and 2/28/91, to assess implementation of the procedures 76DP-0RW07, "Shipping of Radioactive Material," and 76DP-0AP03, "Review and Monitoring of Shipping Activities." The shipping packages were completed and verified in accordance with the procedures. There were no apparent problems with radiation and contamination surveys, loading, blocking and bracing, vehicle placarding or driver instructions. However, there were deficiencies associated shipping paper documentation and package labeling identified by the licensee.

Prior to the inspection, the NRC regional office was informed by the State of Washington of one instance of violation of State statutes for waste manifests. Shipment RSR #130525, shipped January 17, 1991, contained four LSA drums on a single pallet, labeled with distinguishing numbers 90-42-68 through 90-42-71. During entry of the drum identification numbers on the manifest, the drums designated 90-42-68 through 71 were erroneously identified as 90-41-68 through 71. The manifest served as the shipping paper to fulfill Department of Transportation requirements, which falls within NRC jurisdiction.

Although the manifest error appeared minor, the error had safety significance in that an individual could not rapidly determine the radionuclide contents of eight packages, 90-41-68 through 71 and 90-42-68 through 71, because of the repetition.

10 CFR 71.5(a) states in part, "Each licensee...who delivers licensed material to a carrier for transport, shall comply with the applicable requirements of the regulations appropriate to the mode of transport of DOT in 49 CFR Parts 170 through 189."

49 CFR 172.203(d)(1) states in part, "The description for a shipment of radioactive material must include the following additional entries as appropriate:...(iii) The activity contained in each package of the shipment..."

Pursuant to their response to the State of Washington, the licensee had implemented independent verification of package identification numbers in procedure 76DP-0RW07, "Shipping of Radioactive Material," Appendix F. Radwaste and shipping personnel were counselled on the violation. The inspector noted no other instances of the violation.

Failure to identify packages of radioactive material designated 90-42-068, 90-42-069, 90-42-070, 90-42-071 on the shipping paper/waste manifest appeared to be a violation of 49 CFR 172.203(d)(1). The licensee's corrective actions for the violation were adequate and complete (50-528/91-09-02, Closed).

The licensee's shipping program had continued its previous level of performance. The licensee improperly identified containers in a radwaste shipment, resulting in one violation.

6. Exit Meeting

The inspectors met with licensee management on March 8, 1991 to discuss the scope and findings of the inspection. The inspectors presented their observations, including a discussion of ambiguously delegated responsibilities for radwaste/shipping quality verification. The inspectors described the two violations and acknowledged the licensee's completed corrective actions to remedy the waste manifest error. The licensee's representatives acknowledged the inspector's observations and presented their immediate corrective actions to verify radwaste software.