

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos. 50-528/88-19, 50-529/88-20, 50-530/88-19

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

License Nos. NPF-41, NPF-51, NPF-74

Licensee: Arizona Nuclear Power Project
P. O. Box 52034
Phoenix, Arizona 85072-2034

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

Inspection Conducted: June 13, 1988 through June 17, 1988

Inspector:

J. F. Burdoin

J. F. Burdoin, Project Inspector

7/13/88

Date Signed

Approved by:

S. Richards

S. Richards, Chief, Engineering Section

7/14/88

Date Signed

Summary:

Inspection on June 13, 1988 - June 17, 1988 (Report Nos. 50-528/88-19, 50-529/88-20 and 50-530/88-19)

Areas Inspected: An announced inspection by one regional inspector of various vital areas and equipment in the plant, and follow-up of enforcement items, open items, and bulletins/notices/LER(s). Inspection Procedures Nos. 71707, 90712, 92700, 92701, 92702, 92703, and 30703 were used as guidance for the inspection.

Results: No violations or deviations were identified. The licensee's corrective measures for enforcement items and actions on followup items were appropriate, well documented and adequate.

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DETAILS

1. Persons Contacted

The below listed technical and supervisory personnel were among those contacted:

Arizona Nuclear Power Project (ANPP)

- R. Adney, Manager, Plant Standards and Control
- B. Albert, Licensing Engineer
- J. Allen, Plant Manager, Unit 1
- F. Buckingham, Operations Manager, Unit 2
- R. Butler, Director, Standards and Technical Support
- W. Fernow, Manager, Training
- D. Hansen, Operations Engineering
- J. Haynes, Vice President, Nuclear Production
- W. Ide, Plant Manager, Unit 2
- S. Karimi, Compliance Engineer
- J. Kriner, Instrumentation and Control Engineer
- J. Kuan, Licensing Engineer
- M. Lantrip, Senior Mechanical Engineer
- *K. McCandless-Clark, Compliance Engineer
- *W. Quinn, Director, Nuclear Safety and Licensing
- *A. Rogers, Manager, Licensing
- P. Sagaser, Reliability Engineer
- J. Scott, Work Control Manager, Unit 2
- *T. Shriver, Compliance Manager
- G. Sowers, Manager, Engineering Evaluation
- *E. Sterling, Manager, Engineering
- G. Turner, Shift Supervisor, Unit 2

The inspector also talked with other licensee personnel during the course of the inspection.

*Attended the Exit Meeting on June 17, 1988.

2. Area Inspection (71707)

An independent inspection was conducted in the Unit 2 and 3 Control and Auxiliary Buildings. The inspector examined areas and equipment for debris, potential hazards, oil and water leakage, and equipment condition, e.g., oil level, valve position, and electrical connection configuration and cleanliness. The equipment and areas inspected included:

Unit 2

- A. Two containment spray pump areas.
- B. Two LPSI pump areas.
- C. Two HPSI pump areas.

- D. Three charging pump areas.
- E. Two essential cooling water pump areas.
- F. Two 480V motor control center rooms (trains A and B).

Unit 3

- A. Two 4160/480V switchgear rooms (trains A and B).
- B. Four 125V battery rooms.
- C. Four battery equipment rooms.
- D. Two diesel generator control rooms.
- E. Two diesel generator machine rooms.
- F. Two remote shutdown panel rooms.

Housekeeping and equipment status appeared to be acceptable.

No violations or deviations were identified.

3. Followup of Enforcement Items (92702)

- A. (Closed) 50-528/87-37-01, 50-529/87-36-01 and 50-530/87-38-01
Internal, Crimped Nylon Insulated Wire Connectors

During the Environmental Qualification (EQ) inspection the licensee's files did not adequately document qualification of dual-voltage limitorque valve operators because internal crimped nylon insulated wire connectors could not be traced to the crimped connectors that had been qualified in the test specimen.

At the time of the EQ inspection the licensee believed that the wire connectors had been adequately qualified under qualification program PE-5731 included in the licensee's file. This program qualified three types of connectors for inside containment service; Thomas & Betts Model RB 873, Burndy Model YAE 14N53, and Hollingsworth Model XSS20826. The qualification documents; CE Report V-MPS-86-054 and Limitorque Test Report B0119 were included in the licensee's qualification file. An NRC inspection conducted at the limitorque facility in the summer of 1987 revealed that no documentation could be located to identify type or manufacture of the nylon insulated wire connectors use as a subcomponent of the limitorque test specimen. The conclusion was that qualification of the nylon insulated wire connectors was inadequate due to the lack of documentation (tracability of components).

In response to the NRC concerns regarding qualification of the nylon connectors and at the time of the EQ inspection, the licensee initiated a review of dual-voltage limitorque motor operators. At PVNGS, there are 62 valves with dual voltage motor actuators in each unit. All of these actuators are located in areas outside the containments. The licensee also initiated an evaluation of the nylon connectors to establish qualification. The evaluation is based upon known material properties and previous testing. The evaluation concluded that the nylon connectors are qualified for six years. The evaluation is documented in Equipment Change Evaluation, ECE-ZZ-A144, which has been included in qualification file PE-5731.



Although qualification of the nylon connectors has been demonstrated, the licensee intends to replace all of the nylon insulated wire connectors with environmentally qualified AMP butt splices and Raychem heat shrink sleeves prior to the end of each unit's first refueling outage or no later than six years, the qualified life of the connectors. The replacement of the nylon connectors in Unit 1 was completed during the Unit 1 first refueling outage.

The inspector, to verify the licensee's corrective actions, examined equipment change evaluation ECE-ZZ-A144 and reviewed completed work orders (258960, 258978, 258979, 258980, 258981, 258982 and 259004) for replacement of the nylon connectors in Unit 1. The inspector also examined the licensee's Regulatory Commitment Tracking System (RCTS) which identified the schedule for replacing the nylon insulated wire connectors in Units 2 and 3 prior to the end of first refueling outage or by the end of their six year qualified life. The documents appeared to be in order and to accomplish the licensee's above described corrective actions.

The licensee's corrective actions in response to this violation appear to be adequate. This item is closed.

B. (Closed) 50-528/87-37-02, 50-529/87-36-02 and 50-530/87-38-02; Limatorque Valve Operators Inside Containment

During the E/Q inspection of limitorque operators inside Unit 1 containment, certain discrepancies were identified which were deviations from the qualification limitorque operator test specimen. Specifically valve SIA-UV-673 had a grease fitting installed in a grease relief; and on valve SIB-UV-614, the T-drain was not located at the low point of the motor (positioned 30 degrees above bottom of motor).

The licensee has conducted inspections in all three containments since the November 1987 EQ Inspection, that verified there were no other instances where grease fittings were installed in grease reliefs on limitorque operators located inside containment. The licensee contends, based on the results of these inspections, that the grease fitting discrepancy was an isolated instance of personnel error. This deficiency was corrected by removing the grease fitting from the grease relief of valve operator SIA-UV-673.

The licensee contacted the vendor to confirm the guidance available in limitorque reports for locating T-drains. The guidance is that the T-drains should be positioned at the lowest available point with no guidance on the maximum angle allowed above the bottom of the motor. The licensee concluded that the installation met the vendors requirements, and therefore was adequate.

The licensee, to prevent future occurrences similar to the discrepancies identified above, is in the process of revising preventive maintenance procedure 32MT9ZZ47, "Maintenance of Motor Operators."

To verify the licensee's corrective actions the inspector examined completed work orders 00256075 (Unit 1), 00256965 (Unit 2), and 00255756 (Unit 3), for inspection of limitorque operators inside containment(s) for proper location of T-drains and examination of the grease reliefs. The inspector also examined the draft revision to maintenance procedure 32MT9ZZ47. The documents appeared to be in order, and to accomplish the licensee's above described corrective actions.

The licensee's corrective actions in response to this violation appear to be adequate to achieve compliance. This item is closed.

C. (Open) 50-528/87-37-03, 50-529/87-36-03 and 50-530/87-38-03; Conax Electrical Conduit Seal Assemblies (ECSAs)

During the EQ inspection the licensee did not adequately document qualification of in-containment transmitters because the installation configuration differed from the qualification test configuration. Specifically, sheath cracks in vertical top entry conduit could permit standing water to collect against the transmitter's Conax cable entrance seal, possibly violating the seal qualification and thus failing to provide the integrity required for transmitter qualification.

Upon the identification of this deficiency, the licensee contacted the vendor, Conax, concerning the submergence testing of the ECSAs. The licensee obtained, from Conax, a copy of the report of the previous ECSA submergence testing; and after reviewing the report, concluded that the submergence testing that was conducted did not fully meet the licensee's requirements. Therefore, since the previous testing did not provide complete qualification; the licensee negotiated with Conax to initiate a new testing program to fully qualify the ECSAs for post-accident submergence at PVNGS. This qualification program is expected to take approximately 1.5 years based on estimates provided by the vendor. Note that this estimated duration encompasses a complete qualification test program including aging, irradiation, and a 200 day post-LOCA submergence test.

In the interim, until the qualification testing described above can be completed, the licensee has written a Justification for Continued Operation (JCO) to provide for interim qualification of the ECSAs. This JCO credits the previous Conax testing as providing a strong basis for interim qualification of the ECSAs.

Subsequent to the licensee's response to this deficiency, the NRC identified an additional concern that ECSAs other than those manufactured by Conax might have been used with the Anaconda flex conduit. In response to this concern, the licensee's Engineering Department conducted a review of the equipment qualification files. The review indicated that several Rosemount pressure transmitters located inside containment utilized an ECSA other than Conax. The Rosemount transmitters are supplied with their own ECSAs designated as Rosemount Model No. 353C. The Rosemount ECSAs were the only



instance where an ECSA other than Conax was identified as being used with 50.49 equipment.

Rosemount informed the licensee that the Model 353C conduit seals have been qualified for post-accident submergence. Rosemount conducted a two week post-LOCA submergence test that is documented in Rosemount Reports D8400336 and D8400177. These reports have been reviewed by the licensee's equipment qualification group and found to support that model 353C conduit seals are qualified for post-accident submergence.

The inspector reviewed the licensee's justification for continued operation and concluded that it is adequate.

This item is closed for Units 1 and 3, but remains open for Unit 2. The status and actions for Unit 2 will be reported in a future inspection report.

D. (Closed) 50-528/87-37-04, 50-529/87-36-04, and 50-530/87-38-04, Skinner Solenoid Valves

During the EQ inspection, the licensee's files did not adequately document qualification of Skinner solenoid valves because design and material differences between the plant equipment and test specimens were not evaluated in detail. However, the qualification file (at the time of the inspection) did contain a similarity evaluation. The similarity evaluation did not contain sufficient detail to allow an independent auditor to verify qualification of the valves. The cause of this qualification file deficiency was personnel error.

To correct this deficiency (during the EQ inspection), the licensee performed a more detailed similarity evaluation for the skinner solenoid valves to verify adequate similarity between the models subjected to qualification testing (model numbers V5H61090 and V5H61100) and the models supplied to PVNGS (model numbers V5H65590 and V5H65600). The results of the review indicate that the only difference between the model numbers are for the coil drawing numbers and the electrical housing types.

The difference in the coil drawing numbers between the tested and supplied models allows for different coil configurations inside the housing. The coil materials are identical and the difference in coil configuration does not affect the coil operability or its continuous operating temperature of 160°C.

The tested models use an electrical housing designed "EN". This electrical housing is used in low voltage DC and AC applications and uses a two pin AN electrical connector. This housing is normally specified for military applications. The supplied models use an electrical housing designated "EC". This electrical housing uses a 1/2 inch NPT conduit, as required by Underwriters Laboratories and many local government ordinances for most industrial, commercial and domestic applications where the valve is not otherwise enclosed. This is the only type housing approved for explosion-proof



applications. The electrical housing is a metallic material and no non-metallic materials are affected by the difference in housings. There are no differences in size or weight between the housings.

In conclusion, based upon the above two differences between the model numbers, adequate similarity does exist between the model numbers to justify the qualification of the valves supplied to PVNGS. This similarity evaluation was incorporated into Note 3 of qualification file 13-MM-234A on November 12, 1987.

The inspector reviewed the similarity evaluation and concluded it was acceptable; and also verified that the similarity evaluation was contained in the qualification file.

The licensee's corrective actions in response to this violation appear adequate to achieve compliance. This item is closed.

E. (Closed) 50-528/87-37-05, 50-529/87-36-05 and 50-530/87-38-05; Masoneilan Valve Position Transducers

During the EQ inspection the licensee files did not adequately document qualification of Masoneilan valve position transducers because the file did not contain a complete qualification test report or evidence that a complete test report had been reviewed; only a summary test report was included.

One particular concern identified by the NRC during the audit was the fact that the qualification files did not contain the irradiation certifications for the components. The reason for this violation is that the licensee incorrectly believed that the summary qualification reports provided by the vendor were adequate to demonstrate qualification of the Masoneilan valve position transducers. The questions of how much and what type of information to include in the files to adequately demonstrate qualification is, in part, a matter of judgment. The complete qualification test reports, including irradiation certifications, were obtained from Masoneilan shortly after the completion of the equipment qualification inspection. These qualification reports have been incorporated into the licensee's qualification file 13-JM-312.

The licensee has conducted a review of the equipment qualification files for other equipment that is required to be qualified by 10CFR50.49. This review did not identify any other instances where the vendor had supplied inadequate documentation to support qualification of equipment. As an additional corrective action, this inspection finding has been reviewed with the licensee's Equipment Qualification Group to re-emphasize the importance of ensuring that the vendor supplied documentation is complete and is adequate to demonstrate qualification of the item.

The inspector examined the complete qualification test reports including the irradiation certifications and verified that they were incorporated into qualification file 13-JM-312. Everything appeared to be in order.



The licensee's corrective actions in response to this violation appear adequate to achieve compliance. This item is closed.

No violations or deviations were identified.

4. Followup of Previous Identified Inspection Items (92701)

A. (Closed) 50-528/87-37-06, 50-529/87-36-06 and 50-530/87-38-06; Kaman High-Range Radiation Monitor

The EQ inspection team examined Kaman Qualification Report 460036-002, Revision A, dated February 4, 1985 for Kaman High-Range Area Radiation Monitors. Appendix K of the qualification report discusses a spurious transient current caused in the mineral-insulated, metal-sheathed triaxial cable by the LOCA increasing temperature transient. The peak magnitude of the spurious current in Kaman's testing was about 150 picoamperes. Methods for reducing the spurious current are mentioned, such as reducing the rate of temperature increase by enclosing the cable in conduit.

The licensee's November 20, 1987 submittal provided additional information including a calculation showing that the maximum spurious current could result in containment radiation readings that are high by a factor of six for about 20 seconds early in a LOCA, and for less than five minutes during a main steam linebreak (MSLB). The submittal contained preliminary analysis indicating that such transient readings and the associated alarm are acceptable.

The EQ inspection team's concern was whether or not a change should be made to the FSAR to reflect the above condition. At the time of the inspection the licensee had not made a determination to revise the FSAR.

The licensee decided to revise FSAR table 1.8.1 by adding a note which explains radiation monitors RU 148 and 149 deviations from the accuracy requirement of Regulatory Guide 1.97.

The inspector examined the licensee's log no. 3038 package of the proposed change to the FSAR to reflect the above described condition. The package appeared to be in order and to be adequate. This item is closed.

B. (Open) 50-528/87-37-07, 50-529/87-36-07 and 50-530/87-38-07 Veam-Litton Connectors for Core Exit Thermocouples

The Palo Verde core exit thermocouple system was supplied by Combustion Engineering (CE). In May 1987, CE submitted letters to the NRC and to affected licensees stating that the effect of LOCA moisture on cable connectors doubled the system error from the $\pm 22^{\circ}\text{F}$ value given in the test report. The licensee reviewed the additional information and analysis provided by CE and concurred in CE's conclusion that the system still met all operational



requirements. However, the licensee commented to CE on the revised test report.

The CE qualification test report, U-PAK-543, recommends a periodic maintenance and surveillance program for the connectors. However, the licensee's file states that a maintenance and surveillance program is not required. Three maintenance and surveillance procedures - 36ST-9ZZ09, 36MT-9RI06 and 36MT-R109 - partially address routine maintenance of the connectors.

This concern is considered to be an Open Item pending (1) file revision incorporating resolution of the licensee's comments to CE, (2) possible additional NRC review of the additional test results and analyses, and (3) the licensee's resolution of the maintenance and surveillance recommendation.

The inspector reviewed this item with the licensee; and also coordinated with the technical staff of the Office of Nuclear Reactor Regulation (NRR) concerning review of additional test results and analysis which is incomplete at this time.

This item is closed for Units 1 and 3, but remains open for Unit 2 pending the technical staff completing their review.

No violations or deviations were identified.

5. Followup of IE Bulletin(s), NRC Information Notice(s) and Licensing Event Report(s) (92703)

A. (Closed) IE Bulletin 85-03/TI 2515-73 "Motor-Operated Valve Common Mode Failure During Plant Transients Due To Improper Switch Settings"

This NRC bulletin requested all licensees to develop and implement a program to ensure that switch settings on certain safety-related Motor Operated Valves (MOVs) are selected, set, and maintained correctly to accommodate the maximum differential pressures (DPs) expected on these valves for both normal and abnormal events within the design basis. The valves addressed in this bulletin are in the High Pressure Safety Injection (HPSI) and Auxiliary Feedwater (AFW) systems.

This item was discussed in NRC Inspection Reports 528/87-22 and 528/88-02, and remained open pending technical staff review of the design basis for the systems, a review of the procedure for monitoring the work and settings on the bulletin valves in the future.

NRR's memorandum of May 16, 1988 from the Generic Communications Branch to Division of Reactor Projects, Region V transmitted the technical staff's conclusion of the review of the design basis for the systems. The conclusion is that the licensee's selection of the applicable safety-related valves to be addressed and the valves' maximum differential pressures meets the requirements of the

bulletin and that the program to assure valve operability requested by action item e. of the bulletin is now acceptable.

This bulletin and temporary instruction are closed.

B. (Closed) 50-528, 50-529, and 50-530 NRC Information Notice 87-34, Single Failure in Auxiliary Feedwater Systems

This notice alerted the licensee of two potential single failures of auxiliary feedwater pump start and pump protective trip circuitry that could cause partial or complete loss of capability to supply auxiliary feedwater (AFW) in conflict with the design basis. Each potential single failure was reviewed and is discussed separately below.

Indian Point Unit 2

At Indian Point Unit 2, the AFW pump start circuitry was designed so that the steam generator (SG) level and loss of feedwater start signals were routed through contacts of the safety injection inhibit relays. If the contacts of either inhibit relay failed in the open position, neither the low SG level nor the loss of feedwater start signals would cause the motor driven AFW pumps to start automatically.

Salem Generating Station Units 1 and 2

A design review conducted in 1985 of Salem's AFW pump trip circuitry identified several potential single failures that could stem from a single test switch, a single suction pressure instrument, and a single low suction pressure output relay. Failure of any one of these protective features associated with the low suction pressure pump trip could have resulted in tripping all three AFW pumps.

The licensee prepared Engineering Action Request (EAR) 87-2033 which requested the engineering department to review the AFW pump automatic start and protection logic to determine if the single failure mechanism described in NRC IN 87-34 could exist at PVNGS.

The licensee concluded that:

- 1) The Indian Point common cause AFW fault concerned the sequencing (where time delays are sometimes necessary to prevent the simultaneous starting of large electrical loads on the same electrical train) of both motor driven pumps. Since the Palo Verde units have only one motor driven pump which is automatically sequenced, the potential for a common mode failure due to this problem does not exist at PVNGS;
- 2) The Salem event concerned a low suction pressure trip common to multiple pumps. The PVNGS pumps have separate suction piping, and do not have a low suction pressure trip on either class pump. Therefore the potential for this common mode fault does not exist at PVNGS; and

- 3) The AFW pump start and protective pump trip circuitry were reviewed, and it was concluded that the system is single failure proof. The control circuits to the AFW regulation and isolation valves were also reviewed. There is no single failure that would isolate both steam generators from a given AFW pump.

The inspector reviewed this subject with the licensee and examined EAR 87-2033. The engineering review initiated by the EAR appeared to be comprehensive and to properly evaluate the concern.

This notice is closed for Units 1, 2 and 3.

C. Licensee Event Report Follow-up (90712 and 92700)

LER 87-26-L0 (Unit 1) associated with an operating event while refueling was reviewed by the inspector. Based on the information provided in the report it was concluded that reporting requirements had been met, root causes had been identified, and corrective actions were appropriate. The LER is considered closed based on an in-office review and inspection follow-up.

No violations or deviations were identified.

6. Exit Meeting (30703)

The inspector conducted an exit meeting on June 17, 1988, with the members of the plant staff as indicated in paragraph 1. During this meeting, the inspector summarized the scope of the inspection activities and reviewed the inspection findings as described in this report. The licensee acknowledged the concerns identified in the report.