

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos. 50-528/88-34, 50-529/88-33, 50-530/88-32
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 Units 1, 2, and 3
Inspection at: Palo Verde Units 1, 2, and 3.
Inspection Conducted: October 4 - October 7, 1988

Inspector: James F. Melfi 11/2/88
J. F. Melfi, Reactor Inspector Date Signed

Approved By: Stu A. Richards 11/2/88
S. A. Richards, Chief, Engineering Section Date Signed

Summary:

Inspection on October 3, 1988 - October 7, 1988 (Report 50-528/88-34, 50-529/88-33, 50-530/88-32)

Areas Inspected: A routine, unannounced inspection of open items. This inspection assessed followup, unresolved items, and part 21 reports. The containment air cooling system was inspected to provide information in accordance with Temporary Instruction (TI) 2515/98. Inspection procedures 30703, 71707 and 92701 were used.

Results:

For the items inspected, there were no violations or deviations identified. No specific general conclusions regarding the adequacy of the licensee's programs were made during this inspection. There were no new unresolved items identified.

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DETAILS

1. Persons Contacted

Arizona Nuclear Power Project

- *J. G. Haynes, Vice President, Nuclear Production
- *J. D. Driscoll, Nuclear Production Support
- *D. N. Stover, Nuclear Safety Manager (Acting)
- *K. L. McCandless-Clark, Lead Compliance Engineer
- *L. G. Papworth, QA Director
- *W. F. Quinn, Nuclear Safety and Licensing Director
- S. Karami, Compliance Engineer

2. Temporary Instructions

(Closed) Temporary Instruction 2515/98, "Information on High Temperatures inside Containment" (71707)

This Temporary Instruction (TI) was issued to obtain historical information of containment temperatures during the summer months of 1987. This TI also required the inspector to assess whether the containment air cooling system maintains the air temperature below assumed limits, if any dead air spaces are in containment, and if any environmental qualification (EQ) limits are exceeded.

The inspector obtained the information for Palo Verde Units 1 and 2. Since Palo Verde Unit 3 was not operational in 1987, the Unit 3 temperature information was obtained for the summer months of 1988.

The inspector assessed the containment air flow and determined that it does not appear to have dead air spaces. From the review of the historical data, the containment air temperatures are kept below the 120 °F temperature limits in the Technical Specifications. The inspector was informed that the maximum localized temperatures reached in containment are 130 °F, which is at the lower gripper coil for the Control Rod Drive Mechanisms (CRDMs).

The historical information on the containment temperatures will be forwarded to the Office of Nuclear Reactor Regulation (NRR) for review.

This Temporary Instruction is closed.

3. Followup Items (92701)

A. (Open) 88-01-04, "Hydrogen Generation in Battery Room"

This item was opened during the Safety System Functional Inspection (SSFI) at Palo Verde. The concern identified by the SSFI was that hydrogen gases generated during recharging of the batteries could be trapped in the battery rooms, possibly to explosive concentrations (2 percent hydrogen by volume). The areas postulated in the battery room where the hydrogen could be trapped was above the ventilation system vents in areas formed by the structural steel system.



The licensee wrote Work Request (WR) 221481 to monitor the buildup of hydrogen in the battery room after float and equalizer charging. The licensee performed the work request, but determined that the results from the tests were invalid. During review of the work, it was determined that the meter used did not have the required accuracy to monitor the hydrogen concentrations at low levels. The licensee issued two new work requests (317401 and 317402) to conduct the test properly and with the appropriate instrumentation.

This item will remain open pending the review of the results of these two work requests.

B. (Closed) 88-01-05, "Battery Room Minimum Design Ambient Temperature"

This item was opened during the SSFI at Palo Verde. The concern identified by the SSFI team was whether the battery cells were kept above the minimum design temperature (60°F). The lower the battery temperature, the less capacity the battery has. There was a licensee calculation (13-MC-HJ-001) which assumed a 59°F battery temperature during plant start-up. This item was opened pending confirmation that the licensee had a calculation which demonstrated that the essential HVAC system can maintain the required 60°F temperature during a Loss of Offsite Power event.

The inspector reviewed calculation 13-MC-HJ-A03, "Calculation to Determine Battery Room Temperature during Loss of Offsite Power (essential) Operation", dated 2/15/88. The assumptions made in this calculation were for winter conditions, and the minimum amount of loads in the adjacent rooms (minimum amount of heat sources available). The licensee then did a heat balance between the outside air and adjacent rooms to determine the temperature inside the battery room. The result of this calculation determined that the minimum temperature reached in the battery room was 65.84 °F, which is above the battery minimum design temperature (60°F).

The inspector reviewed the calculation and found some minor transcriptional errors, but reached the same conclusion. The inspector identified the errors to the licensee, who said that they would revise the calculation to correct the errors. This item is closed.

C. (Open) 88-01-06, "Diesel Generator Load Inadequacies and Recalculation"

This item was opened during the SSFI at Palo Verde. The concern identified by the SSFI team was that the Diesel Generator Sizing Calculations were found to be inadequate for Forced ShutDown (FSD), Loss of Coolant Accident (LOCA) and Loss of Offsite Power (LOP) events. The concern stems from the fact that the Diesel Generator delivers the electrical power to emergency pump motors for these events and the maximum Brake-Horsepower (BHP) requirements for these motors were found to be more than what the licensee calculated. The BHP is defined as the actual energy delivered to the shaft of the motor (power delivered to the motor minus losses). From these identified team concerns, the licensee reanalyzed all loads on the



diesel greater than 100 HP. On the basis of the new analyzed loads for the pump motors, the LOCA/LOP load increased 3.8% (207.2 kW) and the FSD load increased 2.2% (120.9 kW). Nevertheless, the design margin for the diesel for the LOCA/LOP load was at least 14.5%.

The item remained open in the SSFI team report pending review that the licensee's calculation had been fully revised and supported the plant design configuration.

At the time of the inspection, the licensee had not fully revised the calculation. The licensee stated that the calculation should be complete by the beginning of November. This item remains open pending the licensee's completion of the calculations of LOCA/LOP and FSD.

D. (Closed) 88-01-07, "Battery Sizing Calculation Errors"

This item was opened during the SSFI at Palo Verde. One concern identified by the SSFI team was that the Vital Battery and Battery Charger Calculation (13-EC-PK-100, Revision 5) utilized an erroneous methodology, and data which understated the average inverter load on the battery. Another concern of the team was that an auxiliary relay cabinet load was found to be understated in the calculation.

On the basis of the team's concerns, the licensee performed a reanalysis of the battery sizing. The SSFI team reviewed a draft calculation on January 23, 1988 for the battery sizing reanalysis and did not identify any concerns. This item was left open pending a review of the licensee's completed calculation.

The inspector reviewed calculation 13-EC-PK-A02, "Class 1E Battery and Battery Charger Sizing Calculation", which supersedes the original calculation 13-EC-PK-100. The licensee could not obtain information from the manufacturer of inverter efficiency when the inverter is operating at low loads. The inverter is the least efficient when it is lightly loaded. The licensee performed actual measurements of the efficiency of the inverter based on measurements of the input and output loads on the inverter when the inverter is lightly loaded. The efficiency for the inverter was determined to be 71%, which is less than the full load efficiency. The licensee recalculated the inverter loads based on the actual measurements. This efficiency of the inverters used in the calculation seems conservative and appropriate.

The calculation was also revised to show all the auxiliary relay cabinets as continuously energized. This is conservative since in an actual emergency, not all the relays and indicating lamps would be continuously energized.

The calculation showed that the batteries were adequately sized with the newer, more conservative assumptions. This item is closed.

E. (Closed) 88-01-08, "DC Voltage Calculation Inadequacies"

This item was opened during the SSFI at Palo Verde. One concern identified by the SSFI team related to the Direct Current (DC) power cable sizing calculation that verified the adequacy of power cables



to provide adequate voltage at the equipment. The concerns identified were:

- (1) The first minute voltage of the batteries was assumed to be higher than actual tests indicate (125 assumed vs. 111 volts actual).
- (2) The minimum assumed starting voltage for DC motors was assumed to be 80% of rated voltage in the absence of vendor data. The calculation did not address any requirement for DC motors starting at less than 105 Volts, which is a higher voltage than what needed to be assumed (80% of 115 Volts = 92 Volts).
- (3) The motor cable feeder voltage drop to certain DC motor operators on valves was less than assumed criteria.

The team reviewed a draft recalculation that showed that Palo Verde met the voltage drop requirements for the DC valves. This item remained open pending review of the approved final calculation.

The inspector reviewed calculation 13-EC-PK-A03, "Class 1E DC Cable Sizing." The calculation showed that the licensee was using the appropriate voltage from the battery, and were meeting the assumed criteria of minimum voltage and cable voltage drops for the DC motors. This item is closed.

F. (Closed) 88-01-22, "Emergency Lighting Battery Condition"

This item was opened during the SSFI at Palo Verde. During the tour of the battery rooms, sediment was noticed on the bottom of the battery jars for the emergency lighting. This sediment was determined to be from the negative plates, and formed a layer on the bottom of the jars. This layer of sediment, in conjunction with the positive plates in the jar, provided an internal discharge path (short circuit) within the battery. The team identified this concern to the licensee for the Unit 1 batteries. At the time of the inspection, the licensee was performing the annual capacity tests for these batteries. The test was successful, but the batteries could not be recharged after the test apparently due to the significant degradation of the batteries.

The licensee identified in Licensee Event Report (LER) 86-59 and 86-59, supplement 1, that Preventative Maintenances (PMs) had not been performed on these batteries. The licensee had taken action to ensure that these batteries were tested at the required frequencies. The team's concerns with the licensee's PM program were the following:

- (1) To assess the licensee's program for trending the results of PMs on these batteries.
- (2) The team had a generic concern with the practice of waiving PMs, as identified in procedure 30AC-9ZZ02, "Preventative Maintenance", which allowed the waiving of a non technical specification or licensing commitment related PM up to 3 consecutive times by the planner coordinator.

The inspector talked with the system engineer and verified that the licensee has a program to trend the results of maintenance and test results. The trends identified by this program were discussed with the licensee. Based on this discussion, the program seems appropriate.

The licensee issued a new revision to procedure 30AC-9ZZ02, which now specifies that waiving a PM work order now requires written concurrence by the Maintenance Manager or his designee. The waiving of PMs is now raised to a higher level of management, which should resolve the concern identified by the SSFI team.

This item is closed.

G. (Open) 88-01-23, "Manual Valve PMs and Surveillance"

This item was opened during the SSFI at Palo Verde. The team attempted to review the licensee's program for maintenance and surveillance of system manual isolation valves. The SSFI team discovered that the licensee did not have a program to perform surveillance (e.g. stroking) or PMs (e.g. stem lubrication) on these valves. This issue was discussed in IE Notice 86-61, "Failure of Manual Isolation Valve." The notice referenced NUREG-1195, "Loss of Integrated Control System Power and Overcooling Transient at Rancho Seco on December, 26, 1985," where the event was described in further detail.

The licensee group that initially reviews information notices is the Independent Safety Engineering Group (ISEG). During the SSFI inspection, it was determined that the licensee had not formally responded to the concerns identified in the notice, though more than a year and a half had elapsed. The licensee indicated that they would review this item to determine if and how a program should be implemented to perform PM's and surveillance on manual isolation valves. This item remained open pending a review of the licensee's response.

The inspector determined that the licensee had not completed their review of the program. The licensee had selected the valves and the frequencies for PM tasks. The inspector did not have any concerns with the choices of valves. In discussions with the licensee, the inspector determined that the licensee was not going to verify local position indication. This was not identified in the notice, but poor local position indication was identified in the NUREG-1196 as a contributing factor (section 6.8) to the failure of the valve. The licensee agreed to review the appropriateness of including local position indication in their PM program.

The specifics of the PM tasks needs to be reviewed during a future inspection. Some of the specifics that were identified in IN 86-61 and NUREG-1195 as contributing factors for that event and should be assessed in the licensee's PM program are:

- (1) Lubrication of the stem threads and other working components in the valve in accordance with vendor recommendations (IN 86-61).



- (2) Verifying that the local position indication is readable to the operator (NUREG-1195).
- (3) Valves that are not operated frequently should be periodically worked (IN 86-61).

This item will remain open pending review of the above sub-items.

H. (Closed) 88-01-25, "MOVATS for other Valves, Licensee Evaluation"

This item was opened during the SSFI at Palo Verde. The team determined that several motor operated valve (MOV) motors were marginally sized to perform their function. The improper sizing of these valves was found during performance testing with the motor operated valve analysis and testing system (MOVATS). The licensee had completed testing of valves required to be tested under IE Bulletin 85-03, "Motor Operated Valve Common Mode Failures due to Improper Switch Settings". The team questioned the licensee to determine if they planned to extend their valve program to all safety-related valves. The licensee stated that they were evaluating the need to expand the MOVATS program to other valves.

The inspector determined that the licensee is planning to expand the MOVATS program to include all safety-related MOVs. This planned expansion will determine if the valve can operate under maximum differential pressure conditions across the valve, and if the switch setting will need to be changed.

Based on the planned licensee expansion of the MOVATS program, this item is closed.

I. (Closed) 88-01-27, "Heat Exchanger Monitoring Program"

This item was opened during the SSFI at Palo Verde. The team determined that an important design basis identified in the FSAR (section 9.2.1.4) is that the spray pond system should be maintained at a higher pressure than the essential cooling water system at the interface between the two systems. This interface is the Essential Cooling Water System Heat Exchanger. By maintaining the spray pond system at a higher pressure, possible radioactive contamination would not be spread to the environment.

The team found no evidence that a proceduralized, periodic assessment of this design parameter had been implemented. The licensee committed to implement a proceduralized, periodic assessment of this design parameter. This item was to be reviewed during a future inspection.

The licensee has performed the test under work orders on a quarterly basis 3 times since the SSFI team inspection. The review of these results shows that the spray pond side of the heat exchanger is maintained approximately 12 to 13 psi higher than the essential cooling water side. This is in accordance with the design calculations for these systems (12-MC-SP-302 and 13-MC-EW-001). The licensee should have a procedure in place by January, 1989.



Based on the inspector's review of this item, and the licensee planned actions, this item is closed.

4. Unresolved Items (92701)

A. (Closed) 88-12-04, "Compliance of Status of Standby Power Instruments with Regulatory Guide 1.97"

During the Regulatory Guide 1.97 team inspection of Palo Verde, the team requested documentation regarding the variable, "Status of Standby Power." This variable provides the operator with information of the availability of emergency (standby) power sources. These power sources include emergency electric (AC and DC) sources, and other power sources, if applicable (e.g. emergency air sources). The licensee had not explicitly determined which variables fall under the classification of this variable, though typical instrumentation to monitor this variable existed in the control room. This aspect of conformance to Regulatory Guide 1.97 needed to be assessed in a future inspection.

The licensee has determined which instruments they consider necessary to conform to this variable. The licensee included instrumentation on the 125 volt DC buses, and the 4.16 kV buses. The licensee also included annunciators on the 120 volt AC bus and the accumulator pressure annunciator to the atmospheric dump valves. The licensee identified these in their FSAR.

The inspector reviewed the drawings, and the environmental and seismic qualifications for these indicators. The separation and ranges were also verified for these instruments as being adequate.

Based on the inspectors review, the licensee meets the Regulatory Guide 1.97 requirements with these instruments. This item is closed.

B. (Closed) 88-12-05, "Calibration Information of Pressurizer Heater Status and Status of Standby Power Instruments"

During the Regulatory Guide 1.97 team inspection of Palo Verde, the team requested verification that the variables, "Status of Standby Power" and "Pressurizer Heater Status" were in calibration. The licensee was not able to provide documentation that the instrumentation for these variables was in calibration. The verification that these meters were in calibration was to be assessed in a future inspection.

The inspector was provided with documentation showing that all these instruments were in calibration for all 3 units. The licensee also noted that these instruments were identified as a licensing commitment in their PM program.

Based on the review of these documents, this item is closed.



5. Part 21 Reports (92701)A. (Closed) 87-21-P, "Cooper Energy Service Inadequate Cooling of High Voltage Cubicle Panels for Standby Diesel Generator"

This Part 21 report was issued by Houston Lighting and Power (HL&P) Company on July 29, 1987 to the NRC. The item concerned inadequate cooling of the high voltage cubicles for the standby diesel generators. High temperatures alarms were actuated in the high voltage cubicle due to the higher than design temperatures. These higher temperatures could lead to a reduced qualified life for the equipment, or cause the control panels to degrade significantly. This led HL&P to conclude that this deficiency, if left uncorrected, could have an adverse affect on the safety of operations. Since Palo Verde has similar diesel generators, this deficiency needed to be addressed.

The inspector looked at the similar panels at Palo Verde. It was determined that the cubicles at HL&P are located in the same room as the Diesel Generator. At Palo Verde, these cubicles are not in the diesel generator room, but in a different, adjacent room. The inspector also noted that the cubicles at Palo Verde have had their cooling vents enlarged. Therefore, the cubicle is more readily cooled by the ambient air.

The inspector also noted that there is cooling ductwork which is energized when the diesel is running, cooling down the room in which the cubicle is located. This will, with the enlarged vents, keep the cubicle cool.

Therefore, this potential deficiency identified by HL&P does not seem to be a problem at Palo Verde. This item is closed.

6. Exit Interview (30703)

The inspector met with the licensee representatives identified in paragraph 1 on October 7, 1988. The scope of the inspection and the findings up to that date were discussed. The inspectors findings are documented in this report.

