UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 94 TO FACILITY OPERATING LICENSE NO. NPF-51

ARIZONA PUBLIC SERVICE COMPANY, ET AL.

PALO VERDE NUCLEAR GENERATING STATION, UNIT NO. 2

DOCKET NO. STN 50-529

## 1.0 INTRODUCTION

By letter dated March 23, 1996, the Arizona Public Service Company (APS or the licensee) submitted a request for changes to the Technical Specifications (TS) for the Palo Verde Nuclear Generating Station, Unit 2 (Appendix A to Facility Operating License No. NPF-51). The Arizona Public Service Company submitted this request on behalf of itself, the Salt River Project Agricultural Improvement and Power District, Southern California Edison Company, El Paso Electric Company, Public Service Company of New Mexico, Los Angeles Department of Water and Power, and Southern California Public Power Authority. The proposed amendment would modify TS 4.8.2.1.e, "DC Sources - Operating," to specify that the provisions of TS 4.0.1 and 4.0.4 are not applicable. This provision expires upon entry into Mode 4 coming out of the sixth refueling outage or upon any deep discharge cycle of the battery.

Palo Verde Nuclear Generating Station Units 1, 2, & 3 have AT&T LINEAGE 2000 Round Cell batteries installed in the safety-related 125V DC battery banks. To date, Units 1 and 3 have experienced the expected capacity from these batteries. The batteries installed in the Unit 2 125V DC battery, however, are experiencing degraded capacity. Capacity discharge tests run in March 1996, indicate capacities of 88 percent for bank C and using that data, a projected capacity of 88 percent for bank D. Banks C and D are below the 90 percent limit of TS 4.8.2.1.e. Both banks have currently been declared inoperable. The proposed change to the technical specifications is necessary to allow Unit 2 to continue fuel movement. Replacement cells, which when installed will restore capacity above 90 percent, are not due onsite until April 8, 1996.

The licensee requested an emergency TS change in order to declare the Unit 2 batteries operable based upon the current capacities of the batteries without having to satisfy the surveillance requirement of TS 4.8.2.1.e., and thereby continue completing the refueling outage activity.

## 2.0 EVALUATION

TS 3.8.2.1, "DC Sources - Operating," requires the operability of two trains of DC power sources to ensure that sufficient power will be available to supply the safety-related equipment required for (1) the safe shutdown of the facility, and (2) the mitigation and control of accident conditions within the facility.

The proposed amendment would allow operation of the Unit 2 safety-related 125V DC battery banks at less than the required capacity in TS 4.8.2.1.e. Four Class 1E direct current (DC) power banks designated A, B, C, and D are provided in each unit. The DC banks A and B provide control power for alternating current (AC) load groups 1 and 2, respectively. These banks also provide vital instrumentation and control power for channels A and B, respectively, of the reactor protection and engineered safety features (ESF) systems and diesel generators A and B, respectively. The DC banks C and D provide vital instrumentation and control power for channels C and D, respectively, for the reactor protection and ESF systems, and other safety-related loads as referenced in Table 8.3-6, Class 1E DC System Loads, of the Updated Final Safety Analysis Report (UFSAR). Each Class 1E DC power bank consists of one 125V DC battery, one battery charger, one distribution panel, and is supplied with 480V AC power from a different motor control center (MCC). Four inverters, supplied from the DC banks, provide four independent 120V AC vital instrumentation and control power supplies for the banks of reactor protection and ESF systems. (See Figures 1 and 2.)

During normal operation, the normal battery charger supplies DC power to the control center at a float voltage of 135V DC. In addition to carrying the loads on the DC control center, the normal battery charger provides a float (trickle) charge to the battery to keep the battery fully charged. The battery is available as a standby DC source to carry the control center load automatically in case of loss of the charger. In case of complete loss of AC power, each DC control center will be fed by its battery for at least 2 hours. Upon restoration of AC power, the battery charger is operated in the equalize mode to supply all the steady state loads and the charging current required to restore the battery from the design minimum charge state to the fully-charged state within 12 hours. In case of loss of AC power to the normal battery charger or non-availability of the normal battery charger due to maintenance or testing, the backup battery charger is manually connected to the control center to supply control center loads and trickle charge the battery.

Each train of the Class 1E battery has sufficient capacity to independently supply the required loads as shown in Table 8.3-6 of the UFSAR for 2 hours. The sizing of the batteries is based on a minimum temperature of 60°F in the battery room for the 2-hour service period. The PVNGS design exceeds the IEEE Standard 450-1980 requirement for 25 percent design margin in that battery banks (C and D) have a design capacity of 344 percent and 667 percent, respectively, of the required end-of-life capacity. The technical specification references capacity to the "manufacturer's rating." A 100 percent manufacturer's rating for battery bank C is, therefore, a 29 percent design capacity. The safety margin is based on the safety-related functions

requiring 29 percent of the manufacturer's rating for battery bank C. The current technical specification requires the as-found capacity to equal or exceed 90 percent of manufacturer's rated capacity and was conservatively selected based upon the expectation that the AT&T LINEAGE 2000 Round Cell battery capacity would increase for the rest of plant life.

The AT&T LINEAGE 2000 Round Cell battery, although relatively new in nuclear applications, has been available for almost twenty years, and there are more than 500,000 in service today. The Round Cell battery is similar in design to other lead-acid batteries in that it uses a conventional pasted plate construction. However, the Round Cell battery is unique in that the positive grid is of pure lead and is of circular construction which creates a slow, uniform growth rate of ≈ 2 percent over 70 years compared with a growth rate of ≈ 4 percent over 15 years in conventional rectangular lead calcium batteries. Because each concentric ring of the positive grid in the Round Cell grows at the same rate, good contact with the active material (or paste) is maintained over the life of the battery.

Unit 2 Testing and Degradation Predictions

During the current refueling outage, APS is conducting capacity testing of the Class 1E batteries to satisfy the requirement of IEEE Standard 450-1980 to capacity test new batteries within the first two years in service. The test revealed that the battery capacities for the C battery bank was less than the 90 percent capacity required by TS 4.8.2.1.e (i.e., 88 percent) while Bank A was 107 percent. These results indicated degradation that was unexpected. APS has performed an analysis of the predicted capacity of battery bank D and is estimating a capacity of 88 percent. The projections for battery capacity from this evaluation indicated that battery bank D in Unit 2 is inoperable.

Cell degradation predictions for Channel D are based upon an analysis of the Channel A and C test results. Pre-test specific gravities were compared to post-test specific gravities and correlated with capacity loss during the test. This predictive model was applied to Channel D and estimates the current capacity as 88 percent and for Channel B, capacity of approximately 104 percent.

Compensatory Actions

PVNGS will also initiate the following additional compensatory actions for each Unit 2 battery below 90 percent:

1. Maintenance limitations for important equipment:

   PVNGS will protect the 125V DC system(s) required to be operable in the mode Unit 2 is in. PRA will review corrective/preventative maintenance in the 125V DC train(s) required to be operable in the mode Unit 2 is in.

2. Controls for electrical supply integrity:

   PVNGS will issue a night order to the Unit 1 Control Room stating that the offsite power supplies required by the technical specifications for the mode of operation Unit 2 is in and associated 13.8 kV buses will be protected.

   Access to Unit 2 required equipment in the switchyard will be limited. All switchyard work will be reviewed by the Unit 1 Shift Supervisor.

3. Increase the following battery testing to every other week for all cells in Channels C and D. Testing will be staggered between trains.

| Parameter | Limits/Allowable | Actions to be Taken If Outside Limits |
|---|---|---|
| Float Voltage | ≥2.18 Volts | Battery Inoperable |
| Float Current | ≤2 amps | Battery Inoperable |
| Specific Gravity | ≥1.280 | Restore within limits within 7 days |
| | Avg of all connected cells >1.290 | Restore within limits within 7 days |
| | Not more than 0.020 below average of all connected cells | Battery Inoperable |
| | Avg of all connected cells ≥1.280 | Battery Inoperable |

4. PVNGS will discharge test Channels B and D only when fuel is in the fuel pool.

Conclusions

The initial conditions of the design basis accident and transient analyses in the UFSAR, Chapters 6 and 15, assumes that engineering safety feature systems are operable. The DC electric power provides normal and emergency DC electrical power for the emergency diesel generators, emergency auxiliaries, and control and switching during all modes of operation. The operability of the DC sources is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining the DC sources operable during accident conditions in the event of (1) an assumed loss of all offsite AC power or all onsite AC power, and (2) a worst case single failure.

The degradation experienced by the Unit 2 batteries has resulted in capacities which are still in excess of that required for the batteries to perform their safety-related function. The licensee performed calculations that demonstrate that the projected capacities provide greater than 50 percent margin above that required for safety related loads. Therefore, the staff concludes that projected available capacity for each battery (88 percent), although a reduction from the current TS margin based on a minimum of 90 percent capacity, is acceptable.

## 3.0 EMERGENCY CIRCUMSTANCES

During the current Unit 2 sixth refueling outage, APS performed capacity testing on the Class 1E batteries. Battery banks A and C were capacity discharge tested on March 20, 1996, and March 22, 1996, respectively, to satisfy the requirement of IEEE Standard 450-1980 to capacity test new batteries within the first two years of service. The test results of Channel C did not meet TS Surveillance Requirement (SR) 4.8.2.1.e. On March 23, 1996, the D battery bank was declared inoperable because the predicted capacity was less than the required 90 percent capacity stated in SR 4.8.2.1.e. This predicted capacity was derived from the results of the Channel A and C testing.

The emergency circumstances exist because the two Class 1E batteries (Channel C and D) do not meet the 90 percent requirement of SR 4.8.2.1.e; therefore, PVNGS Unit 2 must comply with TS 3.8.2.2 Action a which causes the suspension of fuel movement which leaves the core partially unloaded.

The emergency circumstances could not be avoided because the degradation in battery capacity was unexpected. The batteries were installed in Unit 2 in February 1995, as replacement cells for the previously installed AT&T batteries which contained a manufacturing defect.

This request, under emergency circumstances, provides the justification to allow PVNGS Unit 2 to continue fuel movement with battery capacities less than required in Specification 4.8.2.1.e, until the battery bank capacities are returned to above 90 percent.

The licensee proposes to modify TS 4.8.2.1.e, "DC Sources - Operating," to specify that the provisions of Technical Specifications 4.0.1 and 4.0.4 are not applicable. This provision expires upon entry into Mode 4 coming out of the sixth refueling outage or upon any deep discharge cycle of the battery. This change will allow APS to declare the Unit 2 batteries operable based upon the current capacities of the batteries without having to satisfy the surveillance requirement of TS 4.8.2.1.e. The justification for this change is described below.

## 4.0 NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

The Commission has provided standards for determining whether a significant hazards consideration exists as stated in 10 CFR 50.92. A proposed amendment to an operating license for a facility involves no significant hazards

consideration if operation of the facility in accordance with a proposed amendment would not:

1. Involve a significant increase in the probability or consequences of an accident previously evaluated;

2. Create the possibility of a new or different kind of accident from any previously evaluated; or

3. Involve a significant reduction in a margin of safety.

A discussion of these standards as they relate to this amendment request follows:

Standard 1: Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

The DC power sources are required to ensure that sufficient power is available to supply safety-related equipment required for safe plant shutdown and the mitigation and control of accident conditions. Therefore, a change in battery capacity requirements does not involve a significant increase in the probability of an accident previously evaluated.

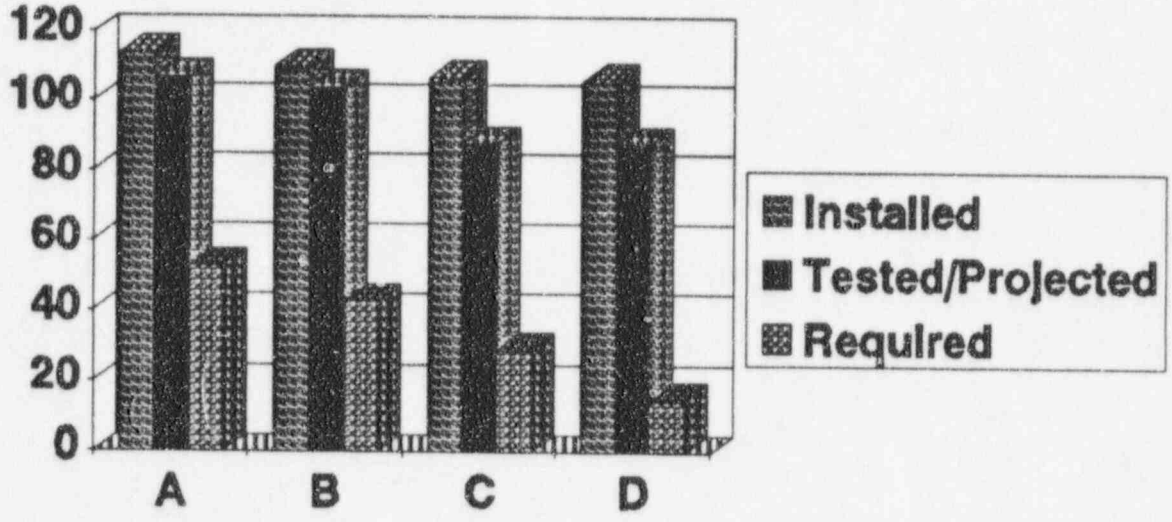
APS has determined, through calculation and test, that the Channels C and D can continue to perform their safety-related function with its capacity reduced to 88 percent of the original installed capacity. Analysis shows that the projected capacities of the banks will provide greater than 50 percent margin above that required for the safety-related loads. The projected capacities are expected to be approximately 88 percent for each bank. As such, the battery banks have sufficient capacity for the safety-related loads following a design basis event. Should any deep discharge of any battery occur, the battery will be declared inoperable. Therefore, the proposed change to the battery capacity requirement does not involve a significant increase in the probability or consequences of an accident previously evaluated.

Standard 2: Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Calculations and testing have demonstrated that the higher loaded battery bank (bank C) will continue to perform its safety-related function with an installed margin greater than 50 percent. Therefore, the proposed change will not create the possibility of a new or different kind of accident from any previously evaluated.

Standard 3: Does the proposed change involve a significant reduction in a margin of safety?

Although battery capacity is less than required by TS 4.8.2.1.e, sufficient capacity remains for the batteries to perform their intended function. The following graph demonstrates the margin in capacity based on projected capacity and actual capacities.




In the most limiting case, the C battery still has greater than 50 percent margin between the projected and required capacities. Therefore, the proposed change to battery capacity requirements does not involve a significant reduction in a margin of safety.

## 5.0 STATE CONSULTATION

In accordance with the Commission's regulations, an attempt was made to notify the Arizona State official of the proposed issuance of the amendment. The State official was not available. The State official will be contacted during the week of March 25, 1996.

## 6.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a surveillance requirement. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission made a final no significant hazards consideration finding with respect to this amendment. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

## 7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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