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RECIP. NAME      RECIPIENT AFFILIATION

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SUBJECT: Application for amends to licenses NPF-41, NPF-51 & NPF-74, respectively. Amends change TS 3/4.8.2 & associated Bases 3/4.8, allowing replacement of existing Class 1E, 125 volt dc batteries w/low specific gravity cell batteries.

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10 CFR 50.90

10 CFR 50.91

102-04053 – JML/SAB/RMW

December 17, 1997

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Mail Station P1-37  
Washington, DC 20555-0001

Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS)**  
**Units 1, 2 and 3**  
**Docket Nos. STN 50-528/529/530**  
**Request for Amendment to Technical Specification (TS) 3/4.8.2,**  
**Electrical Power Systems, D.C. Sources, and Bases Section 3/4.8.**

Arizona Public Service Company (APS) requests an amendment to Technical Specification 3/4.8.2, Electrical Power Systems, D.C. Sources, and associated Bases Section 3/4.8, for each Palo Verde Nuclear Generating Station (PVNGS) Unit. The proposed amendment would allow replacement of the existing Class 1E, 125 Volt DC batteries with low specific gravity cell batteries that are manufactured by vendors other than those specified in the current specifications. This proposed amendment will replace the reference to Exide with the generic reference of "low specific gravity cells", and remove the asterisked foot notes referring to one time exemptions that are in the subject Technical Specifications for Units 2 and 3. The performance characteristics for the low specific gravity rectangular cells and the high specific gravity round cell batteries that are specified in the current specifications are not affected by this proposed amendment.

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This amendment is necessary because APS plans to replace the existing high specific gravity round cell batteries with conventional low specific gravity rectangular cell batteries during the next refueling outage for each Unit. The batteries are being replaced as a preventive measure due to recent industry and PVNGS experience with the high specific gravity round cell batteries. The high specific gravity round cell batteries are experiencing premature capacity loss due to lead sulfate forming on some of the plates in the battery.

The specifications for both the low specific gravity rectangular cell and high specific gravity round cell batteries will be maintained in the Technical Specifications to allow for having both types of batteries installed during the replacement sequence of the battery banks. This flexibility is required so that one train of Class 1E, 125V DC power sources is maintained operable during the replacement of the battery banks. Once replacement of all of the high specific gravity round cell batteries has been completed in all three units, APS will submit a followup Technical Specification Amendment Request that will remove the references to the high specific gravity round cell batteries from the current, or Improved (if implemented), Technical Specifications for each unit. The battery replacement work should be completed during the spring of 1999. Therefore, it is anticipated that the followup Technical Specification Amendment Request will be submitted for your review by the end of the second quarter of 1999.

Provided in the enclosure to this letter are the following sections which support the proposed Technical Specification amendments:

- A. Need for the Amendment
- B. Description of the Proposed Technical Specification Amendment
- C. Purpose of the Technical Specification
- D. Safety Analysis of the Proposed Technical Specification Amendment
- E. No Significant Hazards Consideration Determination
- F. Environmental Consideration
- G. Revised Technical Specification Pages

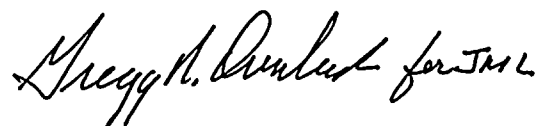
APS requests that this amendment request be reviewed and approved prior to February 28, 1998. Approval prior to this date will allow the replacement of the high specific gravity round cell batteries to commence during Unit 1's next refueling outage.

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In accordance with Technical Specification Section 6.5, the Plant Review Board and Offsite Safety Review Committee have reviewed and concurred with this proposed amendment. By copy of this letter this request is being forwarded to the Arizona Radiation Regulatory Agency (ARRA) pursuant to 10 CFR 50.91(b)(1).

Should you have any questions, please contact Scott A. Bauer at (602) 393-5978.

Sincerely,

A handwritten signature in cursive script, appearing to read "Gregg H. Dunkel for JML".

JML/SAB/RMW/mah


Enclosure

cc: E. W. Merschoff (all w/Enclosure)  
K. E. Perkins  
J. W. Clifford  
J. H. Moorman  
A. V. Godwin (ARRA)

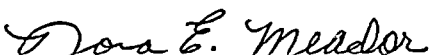


STATE OF ARIZONA       )  
                                  ) ss.  
COUNTY OF MARICOPA   )

I, G. R. Overbeck, represent that I am Vice President - Nuclear Production, that the foregoing document has been signed by me on behalf of Arizona Public Service Company with full authority to do so, and that to the best of my knowledge and belief, the statements made therein are true and correct.

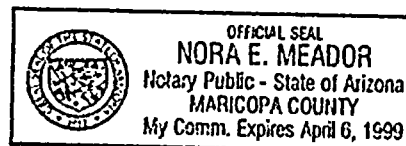
  
\_\_\_\_\_  
G. R. Overbeck

Sworn To Before Me This 17 Day Of December, 1997.

  
\_\_\_\_\_  
Notary Public

My Commission Expires

April 6, 1999







**ENCLOSURE**

**Proposed Amendment to Units 1, 2 and 3 Technical  
Specification 3/4.8.2 and Bases Section 3/4.8**



## **A. NEED FOR THE AMENDMENT**

Technical Specification 3/4.8.2 was amended March 6, 1992, Amendments 59, 46 and 32 for Units 1, 2 and 3, respectively, to allow replacement of the original low specific gravity rectangular cell batteries with high specific gravity round cell batteries. The replacement of the batteries was necessary due to two problems that the industry and PVNGS were experiencing with the rectangular batteries. These problems were cracking of the positive post seal nut or cell case due to corrosion of the positive post, and copper contamination of the negative plates due to defects in the lead plating on the positive post. APS proposed to replace the low specific gravity rectangular cell batteries with high specific gravity round cell batteries. Based on the information available at that time, APS believed that the high specific gravity round cells were superior in performance and that they would last the life of the plant. The Technical Specifications for each unit were amended to reflect the use of battery cells manufactured by either Exide or AT&T. This amendment allowed the replacement of all four Class 1E, 125V DC battery banks to occur during a refueling outage for each unit. One train of Class 1E, 125V DC power sources was taken off-line for battery replacement while the other train was maintained operable. Each train of Class 1E, 125V DC power sources has two separate battery banks.

Recent industry and PVNGS experience with the high specific gravity round cell batteries has indicated that these batteries are experiencing unexpected capacity loss. The industry, in cooperation with the battery manufacturer, formed the Round Cell Nuclear Utilities User's Council to address this issue. The failure mode investigation included testing and destructive examination of a group of round cells at Argonne National Laboratories. The testing performed to date indicates that lead sulfate, an insulator, is forming on the plates of the cells. Although no root cause of failure has been determined, it appears the lead sulfate is produced during deep discharging of the cell. This degradation of the cell progresses slowly and does not result in the immediate loss of capacity of the battery bank.

APS has determined that the high specific gravity round cell batteries should be replaced during the next refueling outage for each unit. The high specific gravity round cell batteries will be replaced with conventional, low specific gravity rectangular cell batteries. The replacement low specific gravity rectangular cell batteries incorporate a new design that significantly reduces the previous low specific gravity rectangular cell battery issues that were experienced at PVNGS. The post seals have been redesigned and the battery posts are made entirely of lead. These engineering solutions significantly reduce the probability of occurrence of cracking of the seal nut or cell case due to corrosion of the post and copper contamination of the lead plates due to defects in the lead plating of the battery posts.

The replacement battery banks have been designed in accordance with IEEE 485-1978, Recommended Practice for Sizing Large Lead Storage Batteries for Generating Stations and Substations, and will provide the same margin of safety as the existing battery banks. The replacement low specific gravity rectangular cell batteries have the same performance criteria and cell parameters as that of the Exide batteries listed in Table 4.8-2 of each unit's current Technical Specifications. Since both types of batteries will be in service while the battery banks are being replaced, APS proposes that Technical Specification 3/4.8.2 and Bases Section 3/4.8 for each unit be revised to replace the brand name "Exide" with "low specific gravity cells". No changes are proposed to the Technical Specifications with respect to the AT&T batteries.

## **B. DESCRIPTION OF THE PROPOSED TECHNICAL SPECIFICATION AMENDMENT**

Technical Specification 3/4.8.2 and Bases Section 3/4.8 will be revised such that all references to Exide will be replaced with the generic reference of "low specific gravity cells". No change will be made to this Technical Specification with respect to the AT&T batteries. Maintaining the specifications for both the low specific gravity rectangular cell and high specific gravity round cell batteries in the Technical Specifications will allow for having both types of batteries installed during the replacement sequence of the battery banks. This flexibility is required so that one train of Class 1E, 125V DC power sources is maintained operable during the replacement of the battery banks.

The asterisked foot note on page 3/4 8-10 of the Unit 2 Technical Specifications will be removed. This footnote was requested on a one-time basis to allow refueling operations to continue during the sixth refueling outage with the Class 1E, 125V DC batteries not conforming to the battery capacity specification. This footnote expired when Unit 2 entered Mode 4 coming out of the sixth refueling outage.

The asterisked foot note on page 3/4 8-10 of the Unit 3 Technical Specifications will be removed. This foot note provided a one-time extension to this surveillance requirement to allow Unit 3 to complete that cycle of operation without performing a unit shutdown to perform the required surveillance tests (Technical Specification Amendment 25). Since this footnote is no longer required, APS proposes to remove this footnote from the Unit 3 Technical Specifications.

## **C. PURPOSE OF THE TECHNICAL SPECIFICATION**

The operability of the AC and DC power sources and associated distribution systems during operation ensures 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 operability of the power sources are consistent with the initial condition assumptions of the safety analyses and are based upon maintaining at least one redundant set of onsite AC and DC power sources and associated distribution systems operable during accident conditions coincident with an assumed loss-of-offsite power and single failure of the other onsite AC source.



#### **D. SAFETY ANALYSIS OF THE PROPOSED TECHNICAL SPECIFICATION AMENDMENT**

The Class 1E, 125V DC power system consists of two independent and redundant (Trains A and B) electrical power subsystems. Each train consists of two 125V DC channels (Channels A and C for Train A, Channels B and D for Train B). Each 125V DC channel consists of one battery bank, one battery charger, one inverter and associated distribution system. Each train of 125V DC power is provided with a backup battery charger that may be manually connected to either DC channel in that train. The backup battery charger is configured such that it may be connected to only one DC channel in its respective train at a time. The inverters associated with each channel of 125V DC power supply vital 120V AC power to the respective channels of the Reactor Protection and Engineered Safety Features systems. Each 125V DC battery has been sized in accordance with IEEE 485-1978 and will supply the required loads for a minimum of two hours.

The high specific gravity round cells of each battery bank will be replaced with new low specific gravity rectangular cells during the next refueling outage for each unit. The battery banks will be replaced while the unit is in Modes 5 or 6 or defueled. The battery banks for each channel of 125V DC power will be replaced during the associated train's planned work window. One train of 125V DC power will be maintained operable in accordance with each unit's Technical Specification 3.8.2.2 during the opposite train's battery bank replacement.

No new or common mode failures are being created by replacing the existing high specific gravity round cell battery banks with low specific gravity rectangular cell battery banks. Extensive industry experience has demonstrated the reliability of the low specific gravity rectangular cell batteries. In addition, the failure mechanisms of these batteries are well understood. The new, replacement, low specific gravity rectangular cell batteries have been designed such that the previous problems with low specific gravity rectangular cell batteries that were experienced at PVNGS have been addressed. The battery post seals have been redesigned and the battery posts are manufactured from lead. These engineering solutions significantly reduce the probability of occurrence of cracking of the seal nut or cell case due to corrosion of the post and copper contamination of the lead plates due to defects in the lead plating of the battery posts. The demonstrated performance of low specific gravity rectangular cell battery banks provides assurance that these batteries are capable of performing their design function when called upon to do so.

The replacement low specific gravity rectangular cell batteries have been designed in accordance with IEEE 485-1978 for the design basis load profiles for each 125V DC channel. These batteries have been designed such that they will have a capacity margin of 30% at the end of their service life. This margin exceeds the capacity margin of 25% that is recommended by IEEE 485-1978. Replacing the high specific gravity round cell batteries, which have demonstrated premature capacity loss for which a definitive root cause of failure has not been determined, with low specific gravity rectangular cell batteries that have extensive industry experience and are well understood, enhances the overall reliability and performance of the Class 1E, 125V DC system.





Installation of the low specific gravity rectangular cell batteries will require replacement of the existing battery racks. The new battery racks have been analyzed and designed to Seismic Category 1 specifications in accordance with IEEE 344-1975, Seismic Qualification of Class 1E Equipment for Nuclear Generating Stations. Therefore, there is reasonable assurance that a design basis seismic event will not cause failure of the racks.

The proposed amendment does not change the performance criteria or cell parameters for the Class 1E 125V DC sources that are defined in the current Technical Specifications for each unit. The proposed amendment replaces the references to Exide with the more appropriate generic reference of "low specific gravity cells" and removes the asterisked footnotes referring to one time exemptions that are in the subject Technical Specifications for Units 2 and 3. Since these changes are essentially editorial in nature, the margin of safety as defined by the Technical Specifications and Licensing Bases for each unit remains the same.

#### **E. 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; or (2) Create the possibility of a new or different kind of accident from any accident 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?

No. The Class 1E 125V DC system provides DC power to the Class 1E DC loads for operation, control and switching, including the inverters which power the Class 1E 120V vital AC busses. This system is not an accident initiator. It is, however, an accident mitigation system. The replacement low specific gravity rectangular cell batteries have been designed to IEEE 485-1978 standards and meet all appropriate seismic criteria. There is no change in the physical or electrical separation provisions for the Class 1E 125V DC channels. These batteries are used extensively throughout the industry and their failure mechanisms are well understood. The existing high specific gravity round cell batteries are experiencing premature capacity loss for which a definitive root cause of failure has not been determined. Therefore, replacement of the high specific gravity round cell batteries with low specific gravity rectangular cell batteries increases the overall reliability of the Class 1E 125V DC system. In addition, the design requirements of the replacement batteries ensures that the batteries will be capable of reliably performing their design function during all modes of operation and will serve to mitigate any accident that may occur. The proposed amendment does not change the performance criteria or

cell parameters for the Class 1E 125V DC sources that are defined in the current Technical Specifications for each unit. Since this change is increasing the overall reliability and performance of the system and is designed to meet the same stringent requirements of the existing high specific gravity round cell batteries, it does not involve a significant increase in the probability or consequences of an accident previously evaluated.

Replacement of the high specific gravity round cell batteries will occur during acceptable modes of operation as defined in the current Technical Specifications for each unit, i.e., the work will be performed during Modes 5 or 6, or with the reactor defueled. Technical Specification 3.8.2.2, DC Sources – Shutdown, for each unit allows requires one Class 1E 125V DC train to be operable in Modes 5 or 6. With one Class 1E 125V DC train operable, the other train may be removed from service for battery cell replacement. Since the battery cell replacement will be performed within the Limiting Condition of Operation for DC Sources – Shutdown, the replacement sequence of the battery banks will 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?

No. Low specific gravity rectangular cell batteries have been used throughout the industry for many years. Some cells have been in service for 17 years and have not degraded to the extent that they require replacement. The low specific gravity rectangular cell batteries have demonstrated good reliability and the failure mechanisms associated with these batteries are well understood. The high specific gravity round cell batteries that are currently installed are exhibiting premature capacity loss for which a definitive root cause of failure has not been determined. Replacing the high specific gravity round cell batteries with low specific gravity rectangular cell batteries that have seen extensive use in the industry, are well understood and have been designed to meet the same stringent requirements as that of the existing batteries ensures that the overall system reliability is increased. No new or common mode failures are created since the replacement low specific gravity rectangular cell batteries have been designed to the same stringent requirements as the existing batteries. The proposed amendment does not change the performance criteria or cell parameters for the Class 1E 125V DC sources that are defined in the current Technical Specifications for each unit. Therefore, replacement of the high specific gravity round cell batteries with low specific gravity rectangular cell batteries does not create the possibility of a new or different kind of accident from any accident previously evaluated.



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

No. As described previously, replacing the high specific gravity round cell batteries with low specific gravity rectangular cell batteries enhances the overall system reliability. The low specific gravity rectangular cell batteries have been designed to the same criteria as the existing high specific gravity round cell batteries. The performance criteria and cell parameters specified in each unit's Technical Specifications are not affected by this change. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Replacement of the high specific gravity round cell batteries will occur during acceptable modes of operation as defined in the current Technical Specifications for each unit, i.e., the work will be performed during Modes 5 or 6, or with the reactor defueled. Technical Specification 3.8.2.2, DC Sources – Shutdown, for each unit allows requires one Class 1E 125V DC train to be operable in Modes 5 or 6. With one Class 1E 125V DC train operable, the other train may be removed from service for battery cell replacement. Since the battery cell replacement will be performed within the Limiting Condition of Operation for DC Sources - Shutdown, the work sequence for replacement of the battery banks will not involve a significant reduction in a margin of safety.

Based on the responses to these three criterion, APS has concluded that the proposed amendment involves no significant hazards consideration.

**F. ENVIRONMENTAL CONSIDERATION**

APS has determined that the proposed amendment involves no changes in the amount or type of effluent that may be released offsite, and results in no increase in individual or cumulative occupational radiation exposure. As described above, the proposed TS amendment involves no significant hazards consideration and, as such, meets the eligibility criteria for categorical exclusion set forth in 10CFR 51.22(c)(9).

**G. REVISED TECHNICAL SPECIFICATIONS PAGES**

Unit 1: Pages 3/4 8-9, 3/4 8-10, 3/4 8-12 and B 3/4 8-2

Unit 2: Pages 3/4 8-9, 3/4 8-10, 3/4 8-12 and B 3/4 8-2

Unit 3: Pages 3/4 8-9, 3/4 8-10, 3/4 8-12 and B 3/4 8-2

