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AUTH.NAME:      AUTHOR AFFILIATION

IDE, W.E.      Arizona Public Service Co. (formerly Arizona Nuclear Power

RECIP.NAME      RECIPIENT AFFILIATION

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SUBJECT: Requests that Palo Verde submit info re double sequencing & auxiliary feedwater to NRC. Info discussed in 971211 phone conversation attached. Ltr does not make any commitments to NRC.

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Palo Verde Nuclear  
Generating Station

William E. Ide  
Vice President  
Nuclear Engineering

TEL 602/393-6116  
FAX 602/393-6077

Mail Station 7605  
P.O. Box 52034  
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April 20, 1998

U. S. Nuclear Regulatory Commission  
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Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS)  
Units 1, 2, and 3  
Docket Nos. STN 50-528/529/530  
Phone Call Regarding Double Sequencing and Auxiliary Feedwater**

In a December 11, 1997 phone conversation, the Palo Verde and NRC staffs discussed additional questions that the NRC staff had regarding the August 31, 1997 submittal (102-04004) on double sequencing and auxiliary feedwater. In a subsequent phone call the NRC staff requested that Palo Verde submit the information discussed in the phone conversation to the NRC. Attached is the information discussed in the December 11, 1997 phone conversation. Please contact Mr. Scott Bauer at (602) 393-5978 if you have any questions or would like additional information regarding this matter. This letter does not make any commitments to the NRC.

Sincerely,

Attachment

WEI/SAB/RKR/rlh

cc: E. W. Merschoff  
K. E. Perkins  
M. B. Fields  
J. H. Moorman

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**ATTACHMENT**

**Phone Call Regarding Double Sequencing and Auxiliary Feedwater**



**SUMMARY OF December 11, 1997 PHONE CALL WITH THE NRC**  
**REGARDING DOUBLE SEQUENCING AND AFW**

In a December 13, 1996 letter summarizing a meeting between the NRC and Palo Verde, the NRC included a request for additional information (RAI) regarding double sequencing and associated issues regarding the auxiliary feedwater (AFW) system. Palo Verde responded to the RAI in an August 31, 1997 letter (102-04004). The purpose of the December 11, 1997 phone call was to discuss the RAI response. A scenario where an emergency diesel generator (EDG) failure could result in a complete loss of AC power to the B train was discussed. The initiating event for this scenario is a feedwater line break with a concurrent loss of offsite power (LOP). If the EDG failure happened at just the right time [i.e., after both AFAS actuations had occurred, but prior to receiving a differential pressure (DP) lockout], automatic isolation of the affected SG following the DP lockout would not occur. This would result in AFW flow being diverted from the intact steam generator (SG) to the affected SG.

Based on a review of the Palo Verde licensing basis and the single failures assumed in the Updated Final Safety Analysis Report (UFSAR), it was determined that the failure sequence discussed above was not valid for Palo Verde. Section 15.0 of both the Combustion Engineering Standard Safety Analysis Report (CESSAR) and UFSAR listed the single failures assumed. For the failure of an EDG, the assumed failure was a failure to start, run, or load. Therefore, for the Palo Verde licensing basis, the EDG would never assume any loads. Based on this, the isolation valves to the intact SG would never open because the LOP and EDG failure would occur prior to AFAS and the flow path would not be available.

Even though this event was not possible based on a review of the Palo Verde licensing basis, this event was reviewed to ensure that it was not an event that should be of concern. A PRA evaluation of this event determined that the probability of this event was  $8E-12$  per year. Therefore, based on risk, this was not an event of concern.

This event was also evaluated for impact on the Palo Verde safety analysis. It was determined that this event was bounded by the chapter 15 events. This event is an undercooling event. The undercooling events analyzed in the UFSAR would result in higher peak RCS pressures than this event. This event could also effect long term cooling. A review of other scenarios showed that conservatively there were 20 to 30 minutes to take operator action before there would be a loss of secondary cooling. Approximately 45,000 gallons of cooling water would be used during the first 30 minutes (with almost 300,000 gallons available from the CST). Therefore, there is sufficient time for operator action and there is sufficient cooling water to mitigate the event.





The analysis for the feedwater line break does not take credit for any cooling from the affected steam generator. However, there would be some cooling provided by the AFW flow to the affected SG, further increasing the time for operator action. The NRC asked if that would be true for a double-ended, guillotine break. For a large FW line break (greater than 0.4 sq. ft.) this event would not occur, since the larger the break size, the quicker the affected SG will depressurize, resulting in a simultaneous AFAS and DP lockout.

During the discussion, the NRC staff referred the answer to the second question in the August 31, 1997 submittal, where it was stated that the AC valves were powered from separate MCCs and concluded that a single active failure associated with the AC bus would not prevent isolation of the affected SG. The NRC staff questioned the response assuming a failure of the 4160 volt bus. The Palo Verde staff referred to the response to the third question, which states that "APS has reviewed AFW and loss of power scenarios described in the Palo Verde licensing basis. This review did not identify any events, other than degraded voltage, where a failure and a loss of power would result in uncontrolled flow to either an intact or faulted steam generator."

The NRC staff pointed out that this same vulnerability to loss of AFW flow exists for selected application of the timing of the loss of offsite power. For example, if the EDG is out of service for maintenance, and the accident occurs, then the LOP occurs during the window between the second AFAS and the S/G delta-P lockout, the same result is achieved. It was pointed out that since the EDG is out of service and in an action statement, single failure requirements are not considered. Therefore, when in the action time, it is not a requirement to assume a single failure of the EDG.

