APS

Palo Verde Nuclear
Generating Station

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102-04242-JML/SAB/RKR
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U. S. Nuclear Regulatory Commission
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Reference: Letter dated November 23, 1998, from Dr. R. L. Seale, ACRS to Dr. W. D. Travers, NRC, Reprioritization and Proposed Resolution of Generic Safety Issue-171, "Engineered Safety Features Failure from Loss-of-Offsite-Power Subsequent to a Loss-of-Coolant Accident"

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Docket Nos. STN 50-528/529/530
Degraded Switchyard Voltage Issues at PVNGS

The referenced letter, in addition to the discussion of Generic Safety Issue (GSI) 171, identified an apparent concern associated with Palo Verde. Specifically the referenced letter stated that "In addition, NRR has raised concerns that degraded switchyard voltage events at Salem and Palo Verde nuclear plants indicate it is possible that plants have either not implemented undervoltage protection correctly or conditions have changed that invalidate original design basis capability." The referenced letter also discusses a sensitivity study performed by BNL that showed that one of the dominant contributors to risk from a Loss of Coolant Accident (LOCA) and Loss of Offsite Power (LOOP) are "plant specific vulnerabilities, such as switchyard undervoltage effects, which may increase the probability of a delayed LOOP and overloading of pumps."

Palo Verde has a low vulnerability to a LOCA/grid collapse/LOOP scenario. Five 525 kV transmission lines converge in the Palo Verde switchyard, resulting in a robust design. Analysis, as well as Palo Verde operating experience, demonstrate that tripping of a Palo Verde unit causes only a minor perturbation to the grid. Therefore, a LOCA/grid collapse/LOOP scenario is very improbable for Palo Verde. If such an event were to occur, Palo Verde load sequencer logic is designed to respond appropriately.

In addition to the LOCA/grid collapse/LOOP Scenario, Palo Verde has investigated a second mechanism that could cause a LOOP during a LOCA. One of the effects of a LOCA is a reduction in voltage at the busses that are monitored by the degraded voltage relays (DVRs). This voltage change is the result of various automatic switching operations, including; (1) tripping of the turbine/generator which could result in a loss of switchyard voltage support, (2) fast bus transfer (FBT) of certain loads to another source which could increase the voltage drop in the distribution system, and (3) powering of required emergency equipment. Even with the pre-LOCA voltage within acceptable limits, these effects could cause the post-LOCA voltage to be pulled down to a level that could cause tripping of the DVRs, resulting in a LOOP. Palo Verde reported this potential scenario in LER 93-011 and associated LER supplements, and the NRC discussed it in NRC Information Notice 95-37, "Inadequate Offsite Power System Voltages During Design Basis Events." It should be noted that Palo Verde has not experienced a degraded voltage event as described above.

The potential scenario discussed above shows that undervoltage systems are not capable of providing protection for all scenarios since the undervoltage system is not capable of predicting post-trip voltage even though designed in accordance with NRC guidelines. This is not due to plants not implementing undervoltage properly nor changing conditions that invalidate original design basis capability. This issue was identified because the plant staff recognized the limited capability of the automatic systems. Since discovery of this potential scenario, actions have been taken, including Technical Specification changes, monitoring of relevant power system conditions, plant modifications, and administrative controls, to ensure that this potential scenario will not affect Palo Verde.

Please contact Mr. Scott Bauer at (602) 393-5978 if you have any questions or would like additional information regarding this matter. Palo Verde would be pleased to meet with the ACRS if the ACRS is interested in further discussion of this issue.

Sincerely,

JML/SAB/RKR/mah

cc: Dr. D. Powers
E. W. Merschoff
M. B. Fields
J. H. Moorman