Palo Verde Nuclear
Generating Station

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102-05639-CDM/SAB/GAM
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Attn: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS)**
**Units 1, 2 and 3**
**Docket Nos. STN 50-528, 50-529, and 50-530**
**Response to NRC Request for Additional Information Regarding Generic Letter 2006-02, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power"**

By letter no. 102-05531, dated July 13, 2006, Arizona Public Service Company (APS) submitted to the NRC a response to Generic Letter (GL) 2006-02, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power." By letter dated December 5, 2006, the NRC provided to APS a request for additional information (RAI) regarding GL 2006-02. An NRC letter dated December 13, 2006, extended the RAI response due date to January 31, 2007. Responses to the RAI are enclosed.

There are no commitments made to the NRC by this letter. If you have any questions, please contact Thomas N. Weber at (623) 393-5764.

Sincerely,

David Mauldin

CDM/SAB/GAM/gt

Enclosure: As stated

cc: B. S. Mallett NRC Region IV Regional Administrator
M. B. Fields NRC NRR Project Manager
M. T. Markley NRC NRR Project Manager
G. G. Warnick NRC Senior Resident Inspector for PVNGS



A123

## Enclosure

## Response to NRC Request for Additional Information Regarding Generic Letter 2006-02, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power"

Note: The NRC request for additional information dated December 5, 2006, requested responses for Palo Verde Nuclear Generating Station only to questions 5 and 6.

**NRC Question 5** **Seasonal Variation in Grid Stress (Reliability and Loss-of-offsite Power (LOOP) Probability)**

**Certain regions during certain times of the year (seasonal variations) experience higher grid stress as is indicated in Electric Power Research Institute (EPRI) Report 1011759, Table 4-7, Grid LOOP Adjustment Factor, and NRC NUREG/CR-6890. Do you adjust the base LOOP frequency in your probabilistic risk assessment (PRA) and Maintenance Rule evaluations for various seasons? If you do not consider seasonal variations in base LOOP frequency in your PRA and Maintenance Rule evaluations, explain why it is acceptable not to do so.**

**APS Response 5**

A condition based approach to modifying the LOOP frequency, rather than just changing the LOOP frequency in the summer months, will be used at Palo Verde as described below.

**Background**

NRC Information Notice (IN) 2006-06 was issued on May 3, 2006. The IN made reference to the assessment in NUREG-1874 (December 2003) stating that switchyard and grid-related LOOP events occurred mostly during the summer months. Also, IN 2006-06 made reference to NUREG/CR-6890 (prepared by INEEL, December 2005) assertions that station blackout (SBO) and overall LOOP frequencies are twice as high during the summer period when compared to an annual average. These elevated summer period frequencies apply to all LOOP categories (plant-centered, weather-related, switchyard-centered, and grid-related). More specifically, IN 2006-06 stated that 22 summer and two non-summer LOOP events occurred between 1997 and 2004. This, in turn, led to the conclusion that SBO frequency of occurrence must be higher during the summer period. The IN and the INEEL report also noted regional variation in LOOP frequency.

**Discussion**

Information Notice 2006-06 suggested that an appropriate response to the "insight" provided in the IN is to use a larger LOOP frequency value in the summer months than in the winter. This is not the optimal resolution to this issue as it would use an adjusted LOOP frequency whether the adverse condition existed or not. Any change in the LOOP frequency needs to be driven by the existence of specific conditions that affect this value. For example, the report states that weather related LOOP events have an increased frequency in the summer months. This result is obviously driven by the more frequent occurrence of adverse weather conditions in the summer months than winter months. The best method for modeling this is to adjust the LOOP frequency when adverse weather conditions exist, in both winter and summer months. This is the approach taken at PVNGS for weather related events, implemented through procedure 70DP-0RA05, "Assessment and Management of Risk When Performing Maintenance in Modes 1 and 2," Revision 4. This approach also explicitly takes into account regional variations in this factor that are due to regional differences in weather patterns.

Although changes in LOOP frequency due to weather can be accounted for somewhat easily due to the simplicity in identifying the condition that drives the change in this parameter, the other three categories of LOOP events (plant-centered, switchyard-centered, and grid-related) are not as easily analyzed.

The referenced NUREG (NUREG/CR-6890) noted both a seasonal variation and a geographical variation in LOOP frequency data, but failed to assess if the seasonal variation was observed in all geographical regions. A review of the data resulted in the following observations:

- INEEL report (NUREG/CR-6890) concluded that the grid-related LOOP events showed a "Regional Trend". A similar conclusion was reached by Westinghouse report WCAP-16316-P. In the US Western region there was only one non-grid related LOOP and one grid-related LOOP event that occurred to a plant that was at power.

- Review of Western Region (WECC) potential LOOP events over the period 1990 to 2005 (EPRI reports 1002987 and 1013239) revealed the following:

    - A total of 14 potential LOOP events occurred at a WECC region nuclear site.

    - Five of the 14 potential LOOP events were grid-related. Of these five grid-related potential LOOP events, three occurred during the summer months of which only one resulted in a plant trip and actual LOOP (one of five).

- The one grid-related summer LOOP event (PVNGS June 14, 2004) had no seasonal cause. It could have occurred at any other time of the year.

- Only one non-grid related event (Diablo Canyon May 15, 2000) resulted in a plant trip and LOOP. This event did not occur in the summer months.

- Three LOOP events occurred while the plant was already shutdown. None of these events were grid-related nor occurred during the summer months (or had seasonal causes).

Therefore the WECC LOOP data does not suggest a direct correlation between increased LOOP event frequency and seasonal variation for the WECC region.

The PVNGS PRA and EOOS models implemented the "Regional Trend" in modeling of grid-related LOOP events. Any further breakdown of LOOP events by seasons is not supported by a statistically significant number of data points. That is due to the availability of only one LOOP (non-grid-related) and one grid-related event in the Western region.

Additionally, the PVNGS LOOP statistical evaluation (study 13-NS-C04 Revision 005) listed a total of 26 LOOP events (1990 to 2003 events) applicable to the PVNGS LOOP analysis. Of those, only nine events occurred during the summer months (June through September). This distribution does not indicate any summer period clustering of LOOP events.

These facts lead to the conclusion that a condition based approach to modifying the LOOP frequency, rather than just changing the LOOP frequency in the summer months, is the best approach. This approach will be taken at PVNGS, and will be implemented in procedure 70DP-0RA05, "Assessment and Management of Risk When Performing Maintenance in Modes 1 and 2." The remainder of the discussion will discuss specifics for each of the four LOOP types.

Weather Related LOOP Events

As stated in the example above, the approach taken at PVNGS for weather related events is to adjust the LOOP frequency in EOOS for the following conditions:

- Tornado Watch or Warning
- Severe Thunderstorm Watch or Warning
- High Winds Watch or Warning

Plant-Centered and Switchyard-Centered LOOP Events

These types of LOOPs are driven by failures of equipment in the plant or switchyard, possibly exacerbated by other equipment being out of service. The equipment concerned with these types of events is modeled explicitly in the PVNGS PRA model. The failure rates are not expected to be seasonal. Removing equipment from service for maintenance is explicitly modeled and thus also reflected in the risk assessments. No additional changes to our current practice for these types of LOOP events is anticipated.

Grid related LOOP Events

Condition based risk assessments for grid related LOOP events are made difficult for two basic reasons:

- The conditions that contribute to increased LOOP frequencies are not quantitatively understood and

- Contemporaneous monitoring of grid conditions in the western region of the US is not sophisticated enough to support quantitative assessments.

Currently PVNGS makes no adjustment to the LOOP frequency based on grid conditions. However, by the end of the first quarter of 2007 LOOP frequency adjustments will be implemented in EOOS upon receipt of information from our transmission system operator. The Internal Events LOOP (IELOOP) change will not be limited to the summer season; instead, it will occur based on notifications from the transmission system operator. The magnitude of the IELOOP increase will be based on qualitative factors, as there is no sound technical basis for a quantitative value.

**NRC Question 6** **Interface With Transmission System Operator During Extended Plant Maintenance**

**How do you interface with your grid operator (GO) when on-going maintenance at the nuclear power plant, that has been previously coordinated with your GO for a definite time frame, gets extended past that planned time frame?**

**APS Response 6**

In the response to NRC Question 6(b) in APS letter number 102-05451, dated March 29, 2006, responding to GL 2006-02, APS identified how maintenance activities that can have an impact on the transmission system are coordinated with the transmission system operator (TSO). If those activities were to be extended, the TSO would be apprised of the extension.

In addition, during an extended EDG outage (between 72 hours and 10 days), the system dispatcher will be contacted once per day and informed of the EDG status along with the power needs of the facility, as described TS Bases B 3.8.1, Action B.4.