July 16, 2004

MEMORANDUM TO: Stephen Dembek, Chief, Section 2
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

FROM: Mel Fields, Senior Project Manager, Section 2 /RA/
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3
RE: OFFSITE POWER GRID RELIABILITY (TAC NOS. MC3642, MC3643, AND MC3644)

On June 14, 2004, at 9:45 a.m. CDT, all offsite power supplies to the Palo Verde Nuclear Generating Station (Palo Verde) were disrupted, with a concurrent trip of all three units. The purpose of this memorandum is to document the basis for the staff's conclusion that the licensee had taken adequate actions to correct the vulnerability that led to this event before restarting the three Palo Verde units.

The trip of the three units started with a insulator failure in the 230 kiloVolt (kV) Liberty transmission line that resulted in a single phase to ground fault. The protection system designed to isolate this 230 kV line from the remaining portions of the 230 kV transmission system did not function properly. The end result was loss of load and all offsite power supplies to the three Palo Verde units.

The licensee identified a vulnerability in the 230 kV protection system, that there was no redundancy in a portion of the protective relay scheme used to transmit a fault signal to the appropriate isolation breakers. The corrective actions taken by the licensee included adding a redundant auxiliary relay in the protection system associated with the 230 kV Liberty transmission line where the fault originated and a review of the other protection systems for similar single failure vulnerabilities. The licensee identified one similar design issue in a separate 230 kV transmission system tied to the Palo Verde offsite 500 kV transmission system and added similar redundant auxiliary relays to eliminate this single failure vulnerability.

In addition, the licensee removed the negative sequence trip function on the three Palo Verde-to-Hassayampa 500 kV transmission lines. The licensee concluded that had these lines not isolated due to the negative sequence trip that occurred about 12 seconds into the event, the offsite power system would have remained stable, resulting in no loss-of-offsite power (LOOP) to the Palo Verde units. The licensee's basis for this conclusion is contained in a letter to the NRC dated June 17, 2004, from David Maulin, Vice President, Nuclear Engineering and Support, Arizona Public Service Company.

The staff believes that the removal of the negative sequence trip function on the three Palo Verde-to-Hassayampa 500 kV transmission lines will improve the stability of the site's offsite power system and possibly could have prevented the LOOP event. At this time, the staff does

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not have sufficient information to make a final determination as to whether having the Hassayampa transmission lines available would have prevented a LOOP event at the Palo Verde site. However, this issue was not a primary factor in our determination that the plants could resume power. The bases for staff acceptance that the plants could resume power operations were the investigative activities and corrective actions completed by the licensee to eliminate single failure vulnerabilities of the 230 kV protection systems, as discussed above.

The licensee stated that it was their understanding that the Western Electric Coordinating Council will conduct a detailed investigation of this event. The licensee will request that the investigation include a study to verify that the Palo Verde switchyard would have remained stable had the Palo Verde-to-Hassayampa transmission lines remained in service. The licensee will forward the findings of the study to the NRC when they become available.

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