March 6, 2001

Mr. Gregg R. Overbeck
Senior Vice President, Nuclear
Arizona Public Service Company
P. O. Box 52034
Phoenix, AZ 85072-2034

SUBJECT: PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2 AND 3 - GENERIC LETTER 96-06, "ASSURANCE OF EQUIPMENT OPERABILITY AND CONTAINMENT INTEGRITY DURING DESIGN-BASIS ACCIDENT CONDITIONS" (TAC NOS. M96845, M96846, AND M96847)

Dear Mr. Overbeck:

On September 30, 1996, the U.S. Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions," which included a request for licensees to evaluate cooling water systems that serve containment air coolers to assure that they are not vulnerable to waterhammer and two-phase flow conditions, and to thermally-induced overpressurization.

In the letters of October 30, 1996, and January 28, 1997, Arizona Public Service Company (APS) submitted its 60-day and 120-day responses to GL 96-06, respectively, for Palo Verde Nuclear Generating Station, Units 1, 2 and 3 (Palo Verde). In the letters dated May 30, 1997, and June 4, August 20, and September 16, 1998, APS supplemented its 180-day response to GL 96-06. There was proprietary information in the submittal of June 4, 1998, and this was addressed in the staff's letter of July 22, 1998.

The NRC staff has reviewed APS's submittals and finds that it has adequately addressed the actions requested in GL 96-06, as discussed in the enclosed safety evaluation. Therefore, this letter closes out the staff's actions for the generic letter and TAC Nos. M96845, M96846, and M96847 for Palo Verde.

For long-term corrective actions, APS committed to install a relief valve on one of the penetrations, and adjust the valve bonnet bolt torque values downward on the remaining penetrations to ensure that the valve body-to-bonnet gasketed joint leakage pressure is below the predicted internal pressure in penetration piping between isolation valves. APS committed to implement the corrective actions during the refueling outages of Palo Verde Units 1, 2 and 3, in November 1999, May 1999, and November 1998, respectively. Your staff has stated that this work has been completed as of November 9, 1999 (ADAMS Accession No. ML010530036).

If you have any questions, please contact me at 301-415-1307, or by e-mail through the internet at jnd@nrc.gov.

Sincerely,

/RA/

Jack N. Donohew, Senior Project Manager, Section 2
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-528, STN 50-529,
and STN 50-530

Enclosure: Safety Evaluation

cc w/encl: See next page

If you have any questions, please contact me at 301-415-1307, or by e-mail through the internet at jnd@nrc.gov.

Sincerely,

/RA/

Jack N. Donohew, Senior Project Manager, Section 2
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-528, STN 50-529,
and STN 50-530

Enclosure: Safety Evaluation

cc w/encl: See next page

DISTRIBUTION
PUBLIC
PDIV-2 r/f
RidsNrrPMJDonohew
RidsNrrLAMMcAllister
RidsAcrsAcnwMailCenter
RidsOgcRp
RidsRgn4MailCenter (L. Smith)
G.Hubbard
J.Tatum
K.Manoly
B.Jain
S.Dembek
B.Wetzel
* No major changes to EMEB and SPLB Memos Dated 09/20/99 and 06/12/00

ACCESSION NO: ML010650223

OFFICE	PDIV-2/PM	PDIV-D/LA	SPLB	EMEB/SC	PDIV-2/SC
NAME	JDonohew:lcc	MMcAllister	GHubbard*	KManoly*	SDembek
DATE	2/26/2001	3/5/01	06/12/00	09/20/99	3/5/01

OFFICIAL RECORD COPY

cc:

Mr. Steve Olea
Arizona Corporation Commission
1200 W. Washington Street
Phoenix, AZ 85007

Douglas Kent Porter
Senior Counsel
Southern California Edison Company
Law Department, Generation Resources
P.O. Box 800
Rosemead, CA 91770

Senior Resident Inspector
U.S. Nuclear Regulatory Commission
P. O. Box 40
Buckeye, AZ 85326

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
Harris Tower & Pavillion
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

Chairman
Maricopa County Board of Supervisors
301 W. Jefferson, 10th Floor
Phoenix, AZ 85003

Mr. Aubrey V. Godwin, Director
Arizona Radiation Regulatory Agency
4814 South 40 Street
Phoenix, AZ 85040

Mr. Craig K. Seaman, Director
Regulatory Affairs
Arizona Public Service Company
P.O. Box 52034
Phoenix, AZ 85072-2034

Mr. John C. Horne
Vice President, Power Generation
El Paso Electric Company
2702 N. Third Street, Suite 3040
Phoenix, AZ 85004

Mr. David Summers
Public Service Company of New Mexico
414 Silver SW, #1206
Albuquerque, NM 87102

Mr. Jarlath Curran
Southern California Edison Company
5000 Pacific Coast Hwy Bldg DIN
San Clemente, CA 92672

Mr. Robert Henry
Salt River Project
6504 East Thomas Road
Scottsdale, AZ 85251

Terry Bassham, Esq.
General Counsel
El Paso Electric Company
123 W. Mills
El Paso, TX 79901

Mr. John Schumann
Los Angeles Department of Water & Power
Southern California Public Power Authority
P.O. Box 51111, Room 1255-C
Los Angeles, CA 90051-0100

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO GENERIC LETTER 96-06, "ASSURANCE OF EQUIPMENT OPERABILITY AND CONTAINMENT INTEGRITY DURING DESIGN-BASIS ACCIDENT CONDITIONS,"

ARIZONA PUBLIC SERVICE COMPANY, ET AL.

PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2 AND 3

DOCKET NOS. STN 50-528, STN 50-529, AND STN 50-530

1.0 INTRODUCTION

On September 30, 1996, the U.S. Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions," which included a request for licensees to evaluate cooling water systems that serve containment air coolers to assure that they are not vulnerable to waterhammer and two-phase flow conditions, and to thermally-induced overpressurization.

In the letters of October 30, 1996, and January 28, 1997, Arizona Public Service Company (the licensee) submitted its 60-day and 120-day responses to GL 96-06, respectively, for Palo Verde Nuclear Generating Station, Units 1, 2 and 3 (Palo Verde). In the letters dated May 30, 1997, and June 4, August 20, and September 16, 1998, the licensee supplemented its 180-day response to the generic letter.

2.0 EVALUATION

2.1 Waterhammer and Two-Phase Flow Conditions

Based on the review of the information that was provided, it is NRC staff's understanding that (a) the containment coolers are not required for accident mitigation, and (b) procedure revisions have been implemented to prevent restoration of cooling water flow to the containment coolers during those accident scenarios where waterhammer or two-phase flow conditions are possible. Based on this, the NRC staff is satisfied with the licensee's response and considers the waterhammer and two-phase flow elements of GL 96-06 to be closed for Palo Verde.

2.2 Thermally-Induced Overpressurization

In its submittal of January 28, 1997, the licensee identified six penetrations and three sections of nonsafety-related piping inside the containment as vulnerable to a water solid volume that may be subjected to an increase in pressure due to heating of trapped fluid (i.e., thermally-induced overpressurization). The licensee determined that the affected penetrations are operable based on piping plastic deformation and potential leakage through packing/valve seating surfaces.

The licensee in its submittal of May 30, 1997, stated that it has conducted further analyses and testing to provide assurance of equipment operability and containment integrity during design-basis accident conditions. The licensee developed an analytical model for predicting valve body-to-bonnet gasketed joint leakage rates for corresponding valve bonnet pressures, and validated the analytical model through test results. For its long-term corrective action, the licensee committed to install a relief valve on one of the penetrations, and adjust the valve bonnet bolt torque values downward on the remaining penetrations to ensure that the valve body-to-bonnet gasketed joint leakage pressure is below the predicted internal pressure in penetration piping between isolation valves. The licensee stated that the internal pressures in penetration piping is within the limit of Appendix F to Section III of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), and committed to implement the corrective action during the refueling outages of Palo Verde, in November 1999, May 1999, and November 1998, respectively.

In response to the NRC staff's request for additional information of March 31, 1998, the licensee, in its submittal of June 4, 1998, provided applicable design criteria for the piping and valves; pressure at which each valve was determined to lift off its seat or leak; methodology to estimate this pressure including any sources of uncertainty associated with the estimated lift off or leakage pressure; applicability of the mock-up test results to the valve sizes or types that were not tested; and the maximum calculated stress in each piping run based on the estimated leakage pressure. The licensee evaluated the nonsafety-related piping sections inside the containment and stated that potential overpressure of these lines does not impact any safety-related plant system or function. The licensee performed 18 tests for determining the leakage pressure and the leakage rate of the valve body-to-bonnet gasketed joint at room temperature and at temperature simulating loss-of-coolant accident condition. Three levels of bonnet bolt torque preload (low, designed, and high) were considered to determine the effect of bolt preload on the gasketed joint leakage pressure.

The licensee determined that the leakage pressure and the leakage rate varies with the bonnet bolt preload, and the body-to-bonnet joint leakage occurs at pressure below the maximum test pressure. This observation is consistent with the industry experience and similar tests performed by another licensee. The licensee provided a detailed report that contained results from the above tests and included a comparison between the actual leakage pressure and the analytically predicted leakage pressure considering bonnet bolt torque preload and gasket properties. In its submittal, the licensee stated that the bonnet bolt torque preload value on some of the valves will be adjusted downward to ensure that the overpressure is relieved through the valve body-to-bonnet gasketed joint before reaching the calculated internal pressure in penetration piping between isolation valves. The licensee also confirmed that the internal pressure does not exceed the limit of Appendix F to Section III of the ASME Code, and the valve body-to-bonnet joint integrity is maintained under the new lower bonnet bolt torque value for normal operating design-basis loads and a concurrent seismic event.

Based on the above, the staff finds the licensee's evaluation of thermally-induced overpressurization of piping systems for GL 96-06 reasonable and acceptable.

3.0 CONCLUSION

Based on the above evaluation, the NRC staff concludes that the licensee's corrective actions provide an acceptable resolution for the issue of thermally-induced pressurization of piping runs penetrating the containment. This completes the NRC staff's review of the licensee's implementation of GL 96-06 for Palo Verde.

Principal Contributors: J. Tatum
B. P. Jain

Date: March 6, 2001