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SUBJECT: Forwards revised response to NRC GL 89-13,"Service Water Sys Problems Affecting Safety Related Equipment."

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EXECUTIVE VICE PRESIDENT
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102-02678-WFC/RAB/DLK
October 1, 1993

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References: 1) Letter 102-02626, dated September 3, 1993, from W. F. Conway, APS, to USNRC, "Reply to Notice of Deviation 50-528/529/530/93-17-02"

2) Letter 161-02801, dated January 26, 1990, from J. N. Bailey, APS, to USNRC, "Response to NRC Generic Letter 89-13, Service Water System Problems Affecting Safety Related Equipment"

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Docket Nos. STN 50-528/529/530
Revised Response to NRC Generic Letter 89-13
File: 93-010-026

This letter forwards Arizona Public Service Company's (APS) revised response to NRC Generic Letter (GL) 89-13, as discussed in the reply to Notice of Deviation 50-528/529/530/93-17-02 (Reference 1). This revised response supersedes APS' original response to GL 89-13 (Reference 2). The enclosure to this letter is APS' revised response.

Should you have any questions, please contact Richard A. Bernier at (602) 393-5882.

Sincerely,

WFConway

WFC/RAB/DLK/rv
Enclosure

cc: B. H. Faulkenberry
B. E. Holian
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ENCLOSURE

REVISED RESPONSE TO NRC GENERIC LETTER 89-13

"SERVICE WATER SYSTEM PROBLEMS AFFECTING SAFETY RELATED EQUIPMENT"

Revised Response to NRC Generic Letter (GL) 89-13 Recommended Actions

Recommended Action I

For open-cycle service water systems, implement and maintain an ongoing program of surveillance and control techniques to significantly reduce the incidence of flow blockage problems as a result of biofouling. A program acceptable to the NRC is described in "Recommended Program to Resolve Generic Issue 51" (Enclosure 1). It should be noted that Enclosure 1 is provided as guidance for an acceptable program. An equally effective program to preclude biofouling would also be acceptable. Initial activities should be completed before plant startup following the first refueling outage beginning 9 months or more after the date of this letter. All activities should be documented and all relevant documentation should be retained in appropriate plant records.

APS Response

The only safety-related open-cycle service water system at PVNGS is the Spray Pond (SP) system which serves as the ultimate heat sink. Under normal operating conditions, the SP system does not communicate with any untreated water or outside sources of biofouling. Thus, only water chemistry controls are necessary to minimize system component erosion, corrosion, and biological growth that originates in the SP system. Water chemistry is maintained in accordance with 74AC-9CY04, "Systems Chemistry Specification." Biocides are added to the SP system to control biological growth (primarily algae) prior to and during the normal growing season. Test coupons, representative of materials within the SP system, are periodically evaluated to determine the effectiveness of the SP system water chemistry controls.

The SP system is also monitored for total system flow and heat exchanger pressure drop on a monthly basis. These data are trended and reviewed for indications of gross heat exchanger flow blockage between inspection intervals. The heat exchanger inspection program is discussed in the response to Recommended Action III.

Recommended Action II

Conduct a test program to verify the heat transfer capability of all safety-related heat exchangers cooled by service water. The total test program should consist of an initial test program and a periodic retest program. Both the initial test program and the periodic retest program should include heat exchangers connected to or cooled by one or more open-cycle systems as defined above. Operating experience and studies indicate that closed-cycle service water systems, such as component cooling water systems, have the potential for significant fouling as a consequence of aging-related in-leakage and erosion or corrosion. The need for testing of closed-cycle system heat exchangers has not been considered necessary because of the assumed high quality of existing chemistry control programs. If the adequacy of these chemistry control

programs cannot be confirmed over the total operating history of the plant or if during the conduct of the total testing program any unexplained downward trend in heat exchanger performance is identified that cannot be remedied by maintenance of an open-cycle system, it may be necessary to selectively extend the test program and the routine inspection and maintenance program addressed in Action III, below, to the attached closed-cycle systems.

A program acceptable to the NRC for heat exchanger testing is described in "Program for Testing Heat Transfer Capability" (Enclosure 2). It should be noted that Enclosure 2 is provided as guidance for an acceptable program. An equally effective program to ensure satisfaction of the heat removal requirements of the service water system would also be acceptable.

Testing should be done with necessary and sufficient instrumentation, though the instrumentation need not be permanently installed. The relevant temperatures should be verified to be within design limits. If similar or equivalent tests have not been performed during the past year, the initial tests should be completed before plant startup following the first refueling outage beginning 9 months or more after the date of this letter.

As a part of the initial test program, a licensee or applicant may decide to take corrective action before testing. Tests should be performed for the heat exchangers after the corrective actions are taken to establish baseline data for future monitoring of heat exchanger performance. In the periodic retest program, a licensee or applicant should determine after three tests the best frequency for testing to provide assurance that the equipment will perform the intended safety functions during the intervals between tests. Therefore, in the periodic retest program, to assist that determination, tests should be performed for the heat exchangers before any corrective actions are taken. As in the initial test program, tests should be repeated after any corrective actions are taken to establish baseline data for future monitoring of heat exchanger performance.

An example of an alternative action that would be acceptable to the NRC is frequent regular maintenance of a heat exchanger in lieu of testing for degraded performance of the heat exchanger. This alternative might apply to small heat exchangers, such as lube oil coolers or pump bearing coolers or readily serviceable heat exchangers located in low radiation areas of the facility.

In implementing the continuing program for periodic retesting of safety-related heat exchangers cooled by service water in open-cycle systems, the initial frequency of testing should be at least once each fuel cycle, but after three tests, licensees and applicants should determine the best frequency for testing to provide assurance that the equipment will perform the intended safety functions during the intervals between tests and meet the requirements of GDC 44, 45, and 46. The minimum final testing frequency should be once every 5 years. A summary of the program should be documented, including the schedule for tests, and all relevant documentation should be retained in appropriate plant records.

APS Response

APS will conduct heat exchanger thermal performance testing on the Essential Cooling Water (EW) heat exchangers. The test procedures will be developed using Electric Power Research Institute (EPRI) guideline NP-7552, "Heat Exchanger Performance Monitoring Guidelines." The EPRI guideline provides five methods for monitoring heat exchanger performance. The initial test program at Palo Verde will be based on the "Heat Transfer Method," using both portable and installed instrumentation. The "Heat Transfer Method" uses flow and both service water and process side temperature measurements to determine heat transfer rate and log mean temperature difference. These are used to calculate the overall heat transfer coefficient, service water side fouling resistance, and projected performance at limiting conditions.

Once the initial testing program is complete (i.e., three tests performed on each EW heat exchanger), a periodic retest program will be established based on one of the five methods described in the EPRI guideline with a retest interval of less than five years.

In lieu of thermal performance testing, the small open-cycle service water system heat exchangers (i.e., Diesel Generator support system heat exchangers) will be cleaned and inspected every other refueling outage.

Closed-cycle service water system heat exchangers are subjected to a closely monitored chemistry control program, and as such are not included in the thermal performance testing program. Engineering performed a review of closed-cycle service water system chemistry results and determined that the few out of specification chemistry conditions that did occur had little or no impact on system integrity. The engineering review of closed-cycle service water system chemistry results was completed in September 1993, and documented in Engineering Evaluation Report 93-EW-006.

Recommended Action III

Ensure by establishing a routine inspection and maintenance program for open-cycle service water system piping and components that corrosion, erosion, protective coating failure, silting, and biofouling cannot degrade the performance of the safety-related systems supplied by service water. The maintenance program should have at least the following purposes:

A. To remove excessive accumulations of biofouling agents, corrosion products, and silt;

B. To repair defective protective coatings and corroded service water system piping and components that could adversely affect performance of their intended safety functions.

This program should be established before plant startup following the first refueling outage beginning 9 months after the date of this letter. A description of the program and the results of these maintenance inspections should be documented. All relevant documentation should be retained in appropriate plant records.

APS Response

Existing preventive maintenance tasks periodically inspect heat exchangers and other components in the open-cycle service water system at specified frequencies. The inspection results are evaluated and deficient conditions are corrected. No routine preventive maintenance task currently exists to inspect SP system piping. However, a portion of Unit 2 SP piping has been inspected and portions of Units 1 and 3 SP piping will be inspected during their next refueling outage, 1R4 and 3R4 respectively. Engineering will evaluate the inspection results from all three units and recommend the scope and periodicity of piping inspections to be included in the preventive maintenance program by June 30, 1994. Preventive maintenance tasks will be developed based on the engineering recommendations.

The underground, SP system piping is designed with cathodic protection to reduce galvanic corrosion. Routine inspection and maintenance is performed on the cathodic protection system on an annual basis. External SP system piping surface inspections are not considered necessary.

Recommended Action IV

Confirm that the service water system will perform its intended function in accordance with the licensing basis for the plant. Reconstitution of the design basis of the system is not intended. This confirmation should include a review of the ability to perform required safety functions in the event of failure of a single active component. To ensure that the as-built system is in accordance with the appropriate licensing basis documentation, this confirmation should include recent (within the past 2 years) system walkdown inspections. This confirmation should be completed before plant startup following the first refueling outage beginning 9 months or more after the date of this letter. Results should be documented and retained in appropriate plant records.

APS Response

Confirmation that the service water system would perform its intended function was provided by test 73PE-1EW01 "Heat Balancing of Essential Cooling Water System." This test verified the design heat transfer capability of the shutdown cooling heat exchangers, EW heat exchangers and the spray ponds. The Nuclear Engineering Department (design engineering group) has completed a design review of the service water system to reverify the ability of the system to perform required safety functions in the event of the failure of a single active component. The design review was completed in July 1990, and

documented in engineering study 13-MS-A58. Additionally, Design and Systems Engineering performed service water system walkdowns, as required by the System Engineer Program (70PR-0AP01) and the System Engineer's Walkdown Checklist and Guideline (73DP-9ZZ01), and verified the as-built system is in accordance with the licensing basis.

Recommended Action V

Confirm that maintenance practices, operating and emergency procedures, and training that involves the service water system are adequate to ensure that safety-related equipment cooled by the service water system will function as intended and that operators of this equipment will perform effectively. This confirmation should include recent (within the past 2 years) reviews of practices, procedures, and training modules. The intent of this action is to reduce human errors in the operation, repair, and maintenance of the service water system. This confirmation should be completed before plant startup following the first refueling outage beginning 9 months or more after the date of this letter. Results should be documented and retained in appropriate plant records.

APS Response

The PVNGS Training Department has completed a review of Maintenance, Operations, and Technical Staff training modules that involve the service water systems, using recommendations found in GL 89-13 and NUREG 1275. The review was completed in July 1990. Based on the results, no changes were needed to the initial training modules. Industry Events training is provided as continuing training to Maintenance Technicians, Operators, and Technical Staff to share industry and in-house experience in an effort to reduce human error. Industry and in-house service water system issues are evaluated, using the Training Change System (15TR-0TA01), and included in Industry Events training if appropriate.

Another tool, currently used at PVNGS, to maintain a heightened sense of awareness among workers is the Sensitive Issues Manual. The Sensitive Issues Manual contains a list of critical systems (e.g., systems having a high impact on the Probability Risk Assessment, systems included in the PVNGS Safety Analysis, and systems warranting additional management attention). The current critical systems list includes the service water systems.

Procedures are reviewed after any significant event in which procedural guidance may have been inadequate. Procedure 03GB-0AP01 "Instruction/Procedure/Task Change Request" provides a mechanism to report problems experienced during the performance of procedures and preventive maintenance tasks (i.e., maintenance practices) to the Standards Department for procedural review and revision if necessary. The Biennial Review Program (01AC-0AP02) ensures that the maintenance, operating, and emergency

procedures are reviewed at least every two years. These procedural reviews provide confirmation that maintenance, operating, and emergency procedures ensure safety-related equipment, cooled by the service water system, will function as intended and that operators of this equipment will perform effectively.