

Safety Evaluation Report

related to the operation of
Palo Verde Nuclear Generating Station,
Units 1, 2, and 3

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

Arizona Public Service Company, et al.

**U.S. Nuclear Regulatory
Commission**

Office of Nuclear Reactor Regulation

May 1985



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ABSTRACT

Supplement No. 8 to the Safety Evaluation Report for the application filed by Arizona Public Service Company et al. for licenses to operate the Palo Verde Nuclear Generating Station, Units 1, 2 and 3 (Docket Nos. STN 50-528/529/530), located in Maricopa County, Arizona, has been prepared by the Office of Nuclear Reactor Regulation of the Nuclear Regulatory Commission. The purpose of this supplement is to update the Safety Evaluation Report by providing an evaluation of (1) additional information submitted by the applicant since Supplement No. 7 was issued and (2) matters that the staff had under review when Supplement No. 7 was issued, specifically those issues which required resolution prior to plant operation of Unit 1 above 5% full power.

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1 INTRODUCTION AND GENERAL DISCUSSION

1.1 Introduction

On November 13, 1981, the Nuclear Regulatory Commission (NRC) staff issued its Safety Evaluation Report (SER) relating to the application for licenses to operate the Palo Verde Nuclear Generating Station, Unit Nos. 1, 2, and 3 (PVNGS 1-3); Supplement Nos. 1 through 7 to the SER were issued on February 4, 1982; May 17, 1982; September 23, 1982; March 15, 1983; November 28, 1983; October 31, 1984; and December 31, 1984, respectively. The application was submitted by the Arizona Public Service Company (APS or the applicant*) on behalf of itself, the Salt River Project Agricultural Improvement and Power District, Southern California Edison Company, El Paso Electric Company, Public Service Company of New Mexico, Los Angeles Department of Water and Power, and Southern California Public Power Authority. An operating license (NPF-34) restricted to 5% of full power was issued for Unit 1 on December 31, 1984.

In the SER and its supplements, the staff identified certain issues for which either further information was required of the applicant or additional staff effort was needed to complete the review of the application. The purpose of this supplement is to update the SER by providing an evaluation of (1) additional information submitted by the applicant since Supplement No. 7 to the SER was issued, and (2) matters that the staff had under review when Supplement No. 7 was issued, specifically, those issues which required resolution prior to plant operation of Unit 1 above 5% full power.

Each of the following sections of this supplement is numbered the same as the section of the SER (and its supplements) that is being updated and, unless otherwise noted, the discussions are supplementary to and not in lieu of the previous discussions. Appendix A to this supplement is a continuation of the chronology. Appendix B, References, lists material used in preparing this supplement. Appendix E is a list of abbreviations used in this supplement. Appendix F is a list of principal contributors to this supplement.

1.9 Summary of Outstanding Issues

Section 1.9 of Supplement No. 7 contained a list of six issues that required resolution prior to plant operation of Unit 1 above 5% full power. These issues are listed below, along with the section of this supplement wherein the resolution of each issue is discussed.

- (1) Increased blowdown from pressurizer safety valves (5.2.2)
- (2) Pressurizer auxiliary spray system test (part of natural circulation cool-down test) (5.4.3)

*As of the issuance date of this SSER, APS is the licensee of PVNGS Unit 1 and the applicant of PVNGS Units 2 and 3. However, throughout this SSER, APS is referred to as the applicant.

- (3) Periodic testing of containment isolation valves (6.2.4)
- (4) Chemistry control and sampling system (9.3)
- (5) Offsite emergency preparedness (13.3.3)
- (6) Scope and schedule for revised Chapter 15 safety analyses (15)

Also, there are four issues relating to PVNGS Units 2 and 3 which are still outstanding. These issues are listed below and will be addressed in a future supplement to the SER.

- (1) Guide tube wear surveillance, Unit 2 (4.2.5)
- (2) Preservice inspection program, Units 2 and 3 (5.2.4, 6.6)
- (3) Pressurized thermal shock, Units 2 and 3 (5.3.3)
- (4) Operating experience of shift staffing, Units 2 and 3 (13.1.2.4)

1.11 License Conditions

Section 1.11 of Supplement No. 7 to the SER listed a number of issues for which a condition was included in License No. NPF-34 for PVNGS Unit 1. Subsequently, the applicant provided additional information to resolve several of the issues so that a license condition is no longer necessary. These issues are listed below along with the section of this supplement where they are discussed.

- (1) Fuel surveillance (4.2.4)
- (2) Guide tube wear surveillance (4.2.5)
- (3) Pressurizer safety valves (5.2.2)
- (4) Chemistry control and sampling systems (9.3)

In addition, several of the conditions have now been satisfied and were confirmed in letters submitted by the applicant. These conditions are listed below along with the date of the confirmation letters.

- (1) Environmental qualification of Target Rock valves (ANPP letter 32383, dated April 12, 1985)
- (2) Environmental qualification of RTDs, Valcor solenoid valves and ITT Barton transmitters (ANPP letter 32702, dated May 23, 1985)
- (3) Incorporation of ICCI system into emergency operating procedures (ANPP letter 32400, dated April 15, 1985)
- (4) Installation and testing of seals in auxiliary feedwater pump compartment (ANPP letter 32705, dated May 23, 1985)
- (5) Operability of Anchor Darling valves (ANPP letter 32383, dated April 12, 1985)

- (6) Operability of atmospheric dump valves and check valves (ANPP letter 32703, dated May 22, 1985)
- (7) Seismic qualification of remote shutdown panels (ANPP letter 32383, dated April 12, 1985)
- (8) Completion of corrective actions for a number of human engineering discrepancies in the control room and remote shutdown panel (ANPP letter 32741 dated May 28, 1985)
- (9) Implementation of the provisions of Regulatory Guide 1.97, Revision 2 (ANPP letter 32695, dated May 22, 1985)
- (10) Submittal of safety analysis for the safety parameter display system for staff review (ANPP letter 32008, dated February 27, 1985)
- (11) Completion of responses to Generic Letter 83-28 for staff review (ANPP letter 32455, dated April 19, 1985)

Several of the conditions are no longer necessary since the applicant has provided acceptable letter commitments. The commitments along with the dates of the applicant's letters are listed below.

- (1) Prior to exceeding 5% of full power, the inadequate core cooling instrumentation system will be operable and an implementation letter report will be submitted to the staff (ANPP letter 32695, dated May 22, 1985)
- (2) Nine months prior to the first refueling outage, the initial inservice inspection program will be submitted for staff approval (ANPP letter 32642, dated May 15, 1985)
- (3) Three months following completion of the loose parts monitoring system test, a report for the system will be submitted to the staff (ANPP letter 32642, dated May 15, 1985)
- (4) Prior to exceeding 5% of full power, the post accident sampling system will be operable (ANPP letter 32695, dated May 22, 1985)
- (5) By October 1, 1985, the confirmatory Chapter 15 reanalysis will be submitted for staff review (ANPP letter 32401, dated April 15, 1985)

3 DESIGN CRITERIA - STRUCTURE, COMPONENTS, EQUIPMENT AND SYSTEMS

3.11 Environmental Qualification of Electric Equipment Important to Safety and Safety-Related Mechanical Equipment

In Sections 3.10 and 3.11.1 of SSER No. 7, the staff stated that the seismic and environmental qualification of certain temperature elements had not been completed. Subsequently by letter dated April 26, 1985, the applicant requested approval to change the classification for these elements from Quality Class "Q" to non-Quality Class "Q".

The purpose of the temperature elements is to provide the operators with a temperature differential indication between upstream and downstream of the charcoal filters to alert them with alarms if there is a potential approach to the charcoal ignition temperature. The staff estimates that the maximum temperature of influent air to the ESF fuel building essential air handling units resulting from a postulated design basis accident (DBA) to be less than 180 F (Table 1 of Regulatory Guide 1.52) as compared to the minimum ignition temperature of 600 F for charcoal. In the FSAR, the applicant states that there are no ESF filter units where the carbon bed temperature can exceed 200 F following a postulated DBA.

The staff, therefore, finds the applicant's request for downgrading these temperature elements from Quality Class "Q" to non-Quality Class "Q" to be acceptable. As a result, seismic and environmental qualification of these temperature elements is not required.

By letter dated May 1, 1985, the applicant submitted a Justification for Continued Operation (JCO) for two additional radiation monitors. The applicant stated that these monitors were inadvertently omitted from previous submittals. The equipment is used to monitor Regulatory Guide 1.97 Category I, Type C variables. Because of this inadvertent omission, the applicant initiated a review of the qualification status of all Regulatory Guide 1.97 equipment to ensure that the equipment is either fully qualified or a JCO had been submitted to the staff.

By letter dated May 10, 1985, the applicant informed the staff that this review has been completed. Based on its review, the applicant has concluded that all Regulatory Guide 1.97 equipment are either qualified for use at PVNGS or a JCO has been provided to the staff.

The staff has reviewed the JCO for the radiation monitors and finds it acceptable, since it addresses the appropriate considerations of 10 CFR 50.49(i).

4 REACTOR

4.2 Fuel System Design

4.2.4 Fuel Assembly Surveillance

In SER Supplement No. 5 (SSER No. 5) the staff identified a license condition on fuel assembly surveillance that requires the applicant's reanalysis and modification of fuel rod axial growth prior to startup of the second cycle of operation because of excessive fuel rod growth experienced in other CE plants.

By letter dated May 15, 1985, the applicant states that, prior to the startup after each refueling, it will either provide a technical report to demonstrate adequate shoulder gap clearance or implement hardware modifications for at least the next cycle of operation. The applicant further states that it will meet this commitment until the NRC staff agrees that the shoulder gap clearance is adequate for the design lifetime of the PVNGS fuel. Inasmuch as the applicant has made an acceptable commitment to maintain an adequate shoulder gap clearance, the staff concludes that a license condition on fuel assembly surveillance is no longer required.

4.2.5 Guide Tube Wear Surveillance

In SER Supplement No. 2 (SSER No. 2) the staff identified a license condition on guide tube wear that requires the submittal of the details of the applicant's fuel assembly guide tube wear inspection program for PVNGS Unit 1 for staff review and approval.

By letter dated May 15, 1985, the applicant states that, six months prior to the first refueling outage for PVNGS Unit 1, it will submit the details of the fuel assembly guide tube wear inspections program for NRC staff review and approval, and will perform the program during the first refueling outage. Since the applicant has made an acceptable commitment to examine the guide tube wear problem, the staff concludes that a license condition on guide tube wear is no longer required.

4.4 Thermal Hydraulic Design

4.4.1 Loose Parts Monitoring System

In SSER No. 5, the staff requested that the applicant submit a report which covers the items specified in Section 4 of Regulatory Guide 1.133, after completion of the startup tests for the Loose Parts Monitoring System. This staff request was made a condition of the operating license for PVNGS Unit 1.

By letter dated May 15, 1985, the applicant has committed to provide this report within three months following completion of the startup tests. Therefore, based on this acceptable commitment, the staff concludes that a license condition on the Loose Parts Monitoring System is no longer required.

5 REACTOR COOLANT SYSTEM AND CONNECTED SYSTEMS

5.2 Integrity of Reactor Coolant Pressure Boundary

5.2.2 Overpressurization Protection

In a letter dated December 18, 1984, the applicant requested staff review and approval of the proposed design changes on primary and secondary safety valves that were documented in Amendment 9 to the CESSAR System 80 FSAR. The changes to the safety valve parameters in Tables 5.4.13-1 and 5.4.13-2 of the CESSAR System 80 FSAR reflect an 18.5% maximum blowdown through the pressurizer safety valves and an approximately 11% maximum blowdown through the main steam safety valves. Both of the proposed changes to the maximum blowdown values exceed the values assumed in the safety analyses applicable to the Palo Verde units. The applicant referenced CE Topical Report CEN-227, "Summary Report on the Operability of Pressurizer Safety Relief Valve in CE Designed Plants," to justify the adequacy of the changes made to the pressurizer safety valves. During its review of these proposed changes, the staff found that more information was needed before a conclusion could be reached. As a result, the staff imposed License Condition 22 on Palo Verde Unit 1. This license condition states, "prior to initial criticality, APS shall establish the acceptability of increased blowdown of the pressurizer safety valves for power operation."

On the basis of the staff review of CEN-227, the applicant was requested to provide additional information on the following concerns: (1) the limiting event identification, (2) the potential moisture carryover into the pressurizer safety valve, and (3) the effect of these changes, along with other Palo Verde design changes, on the results of safety analyses.

In response to the staff's request, the applicant met with the staff on April 4, 1985, to discuss the information required to satisfy License Condition 22. In letters dated April 12, 1985, and April 15, 1985, the applicant submitted the following: (1) the results of an analysis to identify the most limiting event which leads to the maximum pressurizer level, (2) the results of an analysis for the identified limiting event to demonstrate that there is sufficient margin to meet the acceptance criteria, and (3) the proposed reevaluation of Chapter 15 analyses that will consider the design changes of primary and secondary safety valves.

The results of the applicant's analyses have shown that the loss of condenser vacuum (LOCV) is more adverse than the loss of load, and the LOCV and feedwater line break (FWLB) events are the most adverse events in the decreased heat removal category that result in the greatest increase in pressurizer water level and reactor coolant system (RCS) temperature. To determine which of these two transients (FWLB or LOCV) results in the greatest increase in pressurizer water level, the system responses to these events were analyzed using plant-specific parameters (auxiliary feedwater, high pressure safety injection, low pressure safety injection, and primary and secondary safety valves) and the CESEC III

Code. Both transients (FWLB and LOCV) were analyzed using the same set of initial conditions. The results of the comparison have shown that the FWLB with loss of offsite power (LOOP) has the limiting maximum pressurizer water level.

The blowdown of the pressurizer safety valves is assumed to be 18.5% (closure at pressures below 2040 psia). The results of the applicant's analysis have shown a CESEC-predicted maximum pressurizer water volume of 1178 ft³. To conservatively account for subcooled insurges and phase separation during the transient, the applicant made a conservative adjustment to the limiting FWLB with LOOP to increase the CESEC-predicted maximum level response by 293 ft³ to reach a two-phase pressurizer level of 1471 ft³. Even for this limiting case, the pressurizer level (at 79%) is 20% below the elevation of the bottom of the pressurizer safety valve nozzle (at 99.4%). This corresponds to more than 7 feet below the nozzle. Because of this large margin, moisture carryover through the pressurizer safety valves is believed to be minimal. The results of the analysis have also shown that sufficient margin exists on RCS subcooling (>20°F) and that the acceptance criteria with respect to maximum RCS pressure and minimum departure from nucleate boiling ratio are met for the event analyzed.

On the basis of the above, the staff finds that the applicant's proposed design changes to the pressurizer safety valve minimum blowdown set pressure are acceptable. Therefore, the staff concludes that Palo Verde Unit 1 License Condition 22 has been satisfied.

The applicant has incorporated the design changes of the primary and secondary safety valves into its reevaluation of the Chapter 15 analyses as required by License Condition 21 (see Section 15 of this SSER). The staff evaluation of the effect of the safety valve design changes on the results of transients and accidents is addressed in Section 15 of this SSER.

5.4 Component and Subsystem Design

5.4.3 Shutdown Cooling (Residual Heat Removal) System

In SER Supplement No. 7 (SSER No. 7), the staff stated that the applicant planned to perform natural circulation and boron mixing tests at Palo Verde Unit 1 during the power ascension test program at 50% and 80% power levels. In a letter dated January 31, 1985, the applicant submitted a revised natural circulation and boron mixing test procedure for staff review. This revised test procedure has incorporated a test to demonstrate adequate depressurization capability by the auxiliary pressurizer spray (APS) system with the main spray valves in the full-open position, and with the change in design of the main pressurizer spray line that deleted the internals from Check Valve RC-V-244. The applicant's revised test procedure is currently under staff review. The staff comments will be provided in sufficient time so that an acceptable test procedure can be finalized for the tests.

6 ENGINEERED SAFETY FEATURES

6.2 Containment Systems

6.2.4 Containment Isolation System

Amendment 14 to the Final Safety Analysis Report (FSAR) incorporates several containment systems related changes, including: (1) a revised pressure response analysis of the pressurizer compartment to account for physical modifications that have occurred; (2) revisions to the Type C leak test program; (3) the replacement of the motor operators on the power access purge valves with pneumatic operators; and (4) isolation valve additions and valve operator changes for certain penetrations as a result of startup testing. The following is the staff's evaluation of the applicant's FSAR changes pertaining to containment systems:

- (1) As a result of physical modifications to the pressurizer compartment, the applicant reanalyzed the pressure response of the compartment to the postulated surge line break. The analysis was based on a revised compartment model (including vent path descriptions) which reflects the physical changes made. The applicant's calculation shows the peak differential pressure increased from 54 psid to 72.4 psid. Since the analysis was done in a manner similar to that used before, the staff finds the results of the reanalysis acceptable. By letter dated April 25, 1985, the applicant has confirmed the design adequacy of the pressurizer compartment structure to withstand the increased load.
- (2) The applicant has modified the Type C leak testing program to exclude the 24-inch butterfly valves (SIA-UV673, SIA-UV674, SIB-UV675, and SIB-UV676) in the safety injection system suction piping from the containment recirculation sump. These valves are normally closed, and opened post-accident to provide for recirculation of safety injection and containment spray water. Since the sump suction lines are submerged following an accident, they do not constitute containment atmospheric leak paths. As such, these valves need not be subject to the test requirements of Appendix J. Therefore, excluding these valves from the Type C leak testing program is acceptable.
- (3) The applicant replaced the motor operators on the power access purge supply and exhaust line isolation valves with air operators both inside and outside containment. These valves are automatically isolated at the onset of an accident. Because the air-operated valves close more quickly, and fail closed on loss of power to the valve operators, they provide a greater margin of safety than motor-operated valves for these lines. Therefore, the change in the valve operators is acceptable.
- (4) The applicant added two solenoid globe valves (SGA-UV134A and SGA-UV134B), one in each of two bypass lines on main steam system branch lines. The valve configurations satisfy the requirements of GDC 57. The valves have a postaccident function in that they open to admit steam to the turbine-driven auxiliary feedwater pump. On the basis of the above, the change is found acceptable.

- (5) The applicant changed valve operators on certain isolation valves in penetrations 11, 12, 29, 31, and 52 (shown on FSAR Figure 6.2.4-1, sheet 4) from local manual or pneumatic operators to solenoid operators. Since these nonessential lines are now either automatically isolated or remain so, the valve operator changes are acceptable.

On the basis of the staff's review of the FSAR changes in Amendment 14 pertaining to containment systems, the staff concludes that the changes discussed above are acceptable.

9 AUXILIARY SYSTEMS

9.3 Process Auxiliaries

Introduction

The staff's safety evaluation concluded that the applicant's process sampling system, the chemical and volume control system (CVCS), and the secondary water chemistry monitoring and control system were acceptable. The issue of the containment spray as a fission product cleanup system was resolved in SSER No. 5

By letters dated December 10, 18, and 21, 1984, the applicant (1) revised the materials compatibility of the hydrazine transfer line in the containment spray system; (2) revised the purge flow rate of the process sampling lines and the process sample pressure for relief protection in the CVCS; (3) revised or deleted some of the water chemistry limits for the demineralizer effluent in the reactor makeup water system, the reactor coolant makeup water, and the primary coolant water; and (4) revised or deleted some of the water chemistry limits for the steam generator secondary water, feedwater, and condensate.

In SSER No. 7, it was reported that these changes would not affect the health and safety of the public, provided 5% full power was not exceeded. Thus, the staff conditioned the license as follows:

(23) Chemistry Control and Sampling Systems (Section 9.3, SSER 7)

By February 1, 1985, APS shall provide details for staff review on: (1) the type of material used in the hydrazine transfer line in the containment spray system; (2) the pressure for relief protection in Nuclear Sampling System; (3) the water chemistry limits for the reactor coolant makeup water, the primary coolant water, the steam generator secondary water, the feedwater, condensate, and the demineralizer effluent in the reactor makeup water system.

By letters dated January 31, February 26, March 8, and April 15, 1985, the applicant provided the required information.

Evaluation

(1) Hydrazine Transfer Line

The review and acceptance of the containment spray system reported in SER Section 6.5 included consideration of the need to replenish the hydrazine supply in the storage tank. The staff concludes that the transfer line between the hydrazine backup tank and the hydrazine supply tank need not be safety grade because damage to this line could be repaired during the activities associated with the hydrazine storage tank replenishment. Therefore, License Condition 23 for Item 1, on the type of material used in the hydrazine transfer line in the containment spray system is removed.

(2) Pressure Relief Protection in Nuclear Sampling System

The staff's safety evaluation concluded that the nuclear sampling system was acceptable. By letters dated December 10, 1984, and January 31 and February 26, 1985, the applicant proposed to revise the system design pressure in the nuclear sampling line of the chemical and volume control system from 75 psig to 140 psig to increase sample flow rates.

The sampling system pressure is controlled by a needle valve and was limited only by the low pressure relief valve setpoints and pressure instrument capabilities. The other components are designed to operate at system pressure in excess of 140 psig. The relief valve setpoints and the pressure instruments have been upgraded consistent with the increased design pressure. Purge flow will be high enough to minimize depositing of suspended solids and to remove crud from sampling lines. All sample lines are sized to ensure turbulent flow during purging.

The staff has determined that these provisions meet acceptance criteria 3.a and 3.c in Section 9.3.2 of Standard Review Plan (SRP, NUREG-0800) to ensure representative samples from liquid process streams, to reduce plate-out on sample lines, and to remove crud from the sampling lines by purging with turbulent flow. They are, therefore, acceptable.

On the basis of the above evaluation, the staff concludes that the increase in system design pressure to 140 psig is acceptable, that the applicant has adequately addressed the issue, and therefore, License Condition 23 for Item 2, on the pressure for relief protection in the nuclear sampling system is removed.

(3) Water Chemistry Limits for Reactor Coolant Makeup Water, Primary Coolant Water, Steam Generator Secondary Water, Feedwater, Condensate, and Demineralizer Effluent in the Reactor Makeup Water System

The staff's safety evaluation, determined that the above listed systems were acceptable. By letters dated December 18 and 21, 1984, and January 31, February 26, March 8 and April 15, 1985, the applicant proposed to revise certain chemistry limits.

The revised reactor coolant makeup water, the primary coolant water, and the demineralizer effluent limits are consistent with the nuclear steam supply system vendor's recommendations. They do not alter specifications on oxygen, chloride, or fluoride, which are the parameters that are required to be monitored by the plant Technical Specifications. Therefore, the staff finds the proposed changes acceptable.

The revised condensate, feedwater, and steam generator secondary water chemistry limits are consistent with the recommendations in "PWR Secondary Water Chemistry Guidelines" (EPRI 1982), which has been endorsed by the staff. Therefore, are acceptable. The applicant has also proposed to monitor additional impurities, such as sulfate, that are not presently in the guidelines. The staff finds this acceptable.

The staff's proposed resolutions of Generic Issue A-4 include a recommendation that licensees implement a condenser inservice inspection program. The program should be defined in plant-specific safety-related procedures and include procedures to implement a condenser inservice inspection program that will be initiated if condenser leakage is of such magnitude that a power reduction corrective action is required more than once every 3-month period. This will be reviewed under the generic resolution of A-4.

On the basis of the above evaluation, the staff concludes that the proposed water chemistry limits for the reactor coolant makeup water, the primary coolant water, the steam generator secondary water, the feedwater, the condensate, and the demineralizer effluent in the reactor makeup water system are acceptable, and that the applicant has adequately addressed the issues. Therefore, License Condition 23 for Items 3 and 4, is removed.

Conclusion

On the basis of the above evaluation, License Condition 23 on chemistry control and sampling systems (Section 9.3, SSER No. 7) is considered resolved, and, therefore, is deleted.

9.5 Other Auxiliary Systems

9.5.1 Fire Protection Program

9.5.1.1 Introduction

In SSER No. 7, the staff stated that the review of the fire protection program, as described in letters through December 17, 1984 and through Amendment 13 to the applicant's Final Safety Analysis Report (FSAR), was acceptable.

Subsequently, the applicant submitted FSAR, Amendment 14 which contains information that had already been provided to the staff concerning the fire protection program that the staff had evaluated in SSER No. 7.

By letters, dated March 25 and 29, and April 15 (two letters), 25, and 29, 1985, the applicant provided additional information.

9.5.1.2 Fire Protection Systems Description and Evaluation

Fire Detection System

In the SER, the staff found the design and installation of fire detectors acceptable. By letter dated March 25, 1985, the applicant requested approval for a deviation from Section 4-3.7.3 of National Fire Protection Association (NFPA) Standard No. 72E to the extent that it requires that at least one fire detector be installed in each bay formed by floor/ceiling beams that exceed 18 inches in depth.

The fire protection system for the power block is designed to take into consideration air flow patterns and the potential for smoke stratification. Because smoke from a "smoldering" fire may not be detected by fire detectors located only at the ceiling within a bay, the applicant installed detectors at the ceiling, with alternate detectors located at a 3-foot minimum distance

below the ceiling. This is in accordance with other guidance provided in NFPA 72E. Because, the detectors in the power block are installed at a greater density than required and because the above design concept provides reasonable assurance that fire and smoke will be detected, the staff considers this concept to be an acceptable deviation from Section 4-4.7.3 of NFPA 72E.

9.5.1.4 Emergency Lighting

The SER stated that 8-hour battery-powered emergency lights are provided in all areas of the plant necessary for safe shutdown. By letter dated April 15, 1985, the applicant confirmed that this design concept includes the access and egress routes to these areas. This is in accordance with the technical requirements of Section III.J of Appendix R to Title 10 of the Code of Federal Regulations Part 50 (10 CFR 50). It is, therefore, acceptable.

9.5.1.5 Fire Protection for Specific Areas

Other Plant Areas

The SER evaluated the fire hazards and corresponding fire protection for a number of plant locations and found them acceptable. By letter dated April 15, 1985, the applicant stated that the fire load in auxiliary building fire zone 54 was incorrectly calculated. The corrected loading is 88,000 Btu/ft² instead of 1400 Btu/ft². This change is simply an error correction. It does not represent new hazards or combustible material. This was confirmed in an inspection by NRC fire protection engineers between March 4 and 8, 1985. Therefore, the staff's previous conclusion as to the acceptability of the fire protection program in this location remains valid.

9.5.1.7 Administrative Controls and Fire Brigade

The SER concluded that the self-contained breathing apparatus for the fire brigade and control room personnel was acceptable. By letter dated April 29, 1985, the applicant deleted reference to a supplemental air compressor that had been in Amendment 13. However, the guidelines of Section D.4 of Appendix A to NRC Branch Technical Position (BTP) APCS 9.5-1 are still being met because the required 6-hour reserve air supply is provided via bottled air. Therefore, the staff's SER conclusion that the system is acceptable remains unchanged.

9.5.1.10 Summary of Deviations From Appendix A to BTP APCS 9.5-1 and Appendix R to 10 CFR 50

SSER No. 7 listed the approved deviations from the staff's fire protection guidelines. On the basis of the above evaluation, the staff also concludes that the following deviation is acceptable:

- (25) Location of certain fire detectors below the ceiling. (9.5.1.2)

13. CONDUCT OF OPERATIONS

13.1 Organizational Structure of Applicant

13.1.2 Operating Organization

13.1.2.4 Operating Shift Crews

The applicant plans to operate Unit 1 with six shift crews. Five crews will be staffed with licensed senior operators who have enough hot operating experience to meet the guidelines of NRC Generic Letter 84-16. The remaining crew will use experienced shift advisors to supplement the licensed senior operators. The staff will evaluate the operating shift crews for PVNGS Units 2 and 3 in a future supplement to the SER after the applicant has provided the information for these units regarding conformance to Generic Letter 84-16.

The staff has evaluated the applicant's shift advisor program for PVNGS Unit 1 as discussed below.

Shift Advisor Program

By letter dated March 21, 1985, the applicant has submitted information regarding the Palo Verde shift advisor program. The staff has reviewed this information for conformance to Generic Letter 84-16. The review has covered four main areas: shift advisor experience, the shift advisor training program, the procedure used to define shift advisor duties and responsibilities, and other matters pertaining to the use of shift advisors.

(1) Shift Advisor Experience

The applicant has obtained the services of two individuals from Southern California Edison Company (SCE) who are available to act as shift advisors at Palo Verde Unit 1. Both individuals meet the guidelines of Generic Letter 84-16. Both have more than 4 years of power plant experience (including more than 2 years of nuclear plant experience), and both have well over 1 year of licensed supervisory experience at a large operating pressurized water reactor. For example

- The first individual has held a senior operator license at San Onofre Units 2 and 3 for more than 2 years. He has exercised supervisory responsibility for the operation of two nuclear units.
- The second individual has been a control operator at San Onofre Units 2 and 3 for more than 2 years. He holds a reactor operator license and is in training to take the senior operator exam. He directed the initial criticality of Unit 2 and the low power testing of Units 2 and 3.

By virtue of their considerable on-shift operating experience, the staff concurs that these two individuals may participate in the Palo Verde shift advisor program.

In addition to the two prospective shift advisors from SCE, the applicant has identified two of its own training instructors who have senior operator licenses at Palo Verde and who meet the guidelines of Generic Letter 84-16. Although they are not assigned to shift crews at Palo Verde Unit 1, they could be used as shift advisors if, because unforeseen circumstances, the primary shift advisors from SCE become unavailable.

(2) Shift Advisor Training Program

The shift advisor training program is 4 weeks long and includes 3 weeks of classroom training and 1 week of simulator training. The classroom segment will cover plant systems, procedures, and Technical Specifications. The simulator segment will cover plant startup, plant shutdown, and various transient situations. The purpose of the training program is to give temporary personnel enough information about Palo Verde operations so they can meet their shift advisor responsibilities.

The staff finds the applicant's shift advisor training program acceptable. By letter dated April 19, 1985, the applicant has certified that the two SCE individuals described in (1) above have satisfactorily completed the training programs. Therefore, they are qualified to act as shift advisors at Palo Verde Unit 1.

(3) Shift Advisor Procedure

The duties and responsibilities of the shift advisor are described in Operating Department Guideline No. 37. This procedure establishes operations review and assessment duties, log-keeping and shift-turnover requirements, and other detailed duties and responsibilities of the shift advisor position. The shift advisor will monitor plant conditions, provide advice to shift management and to the operating shift crews, and keep control room personnel apprised of potential problem areas.

The staff has reviewed Operating Department Guideline No. 37, Revision 0, and finds it acceptable.

(4) Additional Shift Advisor Issues

Plant management should monitor the performance of each shift advisor as part of the ongoing observation of overall shift performance.

Training in the role of the shift advisor has been completed for the shift crew that will have an advisor. The operator requalification program has also been supplemented with shift advisor training.

13.3 Emergency Preparedness Evaluation

13.3.1 Federal Emergency Management Agency Findings on Offsite Emergency Plans and Preparedness

In SSER No. 7, the staff reported that the State and local radiological response plans for the Palo Verde facility were under review by the Federal Emergency Management Agency (FEMA). FEMA has completed its review and, in a memorandum to the NRC dated March 15, 1985, reported that, on the basis of a review of the

State of Arizona and Maricopa County radiological emergency response plans by the FEMA Region IX Regional Assistance Committee, FEMA finds that, overall, the State and local plans are adequate. On the basis of the results of the November 1984 exercise, FEMA finds that offsite emergency preparedness has been demonstrated to be adequate and there is reasonable assurance that appropriate protective measures can be implemented by offsite jurisdictions around the Palo Verde Nuclear Generating Station to protect the health and safety of the public in the event of a radiological emergency.

In a recent decision, GUARD v. NRC, 753 F.2d 1144 (D.C. Cir. 1985), the U.S. Court of Appeals vacated the Commission's interpretation of 10 CFR §50.47(b)(12) to the extent that a list of facilities was found to constitute adequate arrangements for medical services for members of the public offsite exposed to dangerous levels of radiation. The Commission has now provided guidance to be followed in determining compliance with this regulation pending its determination of how it will proceed in response to the Court's remand. In particular, the Commission directed that Licensing Boards, and in uncontested cases, the staff, should consider the uncertainty attendant to the Commission's interpretation of this regulation, especially in regard to its interpretation of the term "contaminated injured individuals." In GUARD, the Court left open to the Commission the discretion to reconsider whether that term should include members of the offsite public exposed to dangerous levels of radiation and, thus, whether arrangements for this population of individuals are required at all. For this reason, the Commission observed that it may reasonably be concluded that "no additional actions should be taken now on the strength of the present interpretation of that term." Accordingly, the Commission observed that it can be found "that any deficiency which may be found in complying with a finalized post GUARD planning standard (b)(12) is insignificant for the purposes of 10 CFR §50.47(c)(1)." In this regard, the Commission, as a generic matter, noted the low probability of accidents which might result in exposure of members of the offsite public to dangerous levels of radiation as well as the slow development of adverse reactions to overexposure. See, Emergency Planning; Statement of Policy, 50 FR 20892, May 21, 1985.

Consistent with the foregoing Statement of Policy, the applicant has, by letter dated May 24, 1985, confirmed that, in good faith reliance on the Commission's earlier interpretation of 10 CFR §50.47(b)(12), the emergency plans of the involved offsite response jurisdictions contain a list of medical service facilities. The existence of such list in the pertinent plans has also been confirmed by FEMA. As stated by the Commission, such good faith reliance, in the circumstances, can be found to constitute "other compelling reasons" within the meaning of 10 CFR §50.47(c)(1). Further, the applicant has committed to fully comply with the Commission's response to the Court's remand.

Accordingly, on the basis of the factors identified by the Commission in its Statement of Policy, the staff has determined that the requirements of 10 CFR §50.47(c)(1) have been satisfied so as to warrant issuance of the operating license pending further action by the Commission with respect to the requirements of 10 CFR §50.47(b)(12).

13.3.2 Conclusion on Emergency Preparedness

On the basis of its review of the FEMA findings and determinations on the adequacy of State and local emergency plans and preparedness, and on the previous

staff assessment of the adequacy of the applicant's onsite emergency plans and preparedness, the staff concludes that the overall state of onsite and offsite emergency preparedness provides reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at the Palo Verde Nuclear Generating Station.

15 ACCIDENT ANALYSES

In SSER No. 7, the staff addressed its concerns on the results of transient and accident analyses affected by the plant design changes made in PVNGS 1-3.

Considering the overall impact of the various engineered safety feature systems' (ESF) performance reductions on the safety analyses, and the analyses performed to date, the staff finds that the individual events fall into one of the following categories:

- (1) Events that rely on the ESF systems whose performance is reduced, but the combined effects result in an increase in margin to the staff acceptance criteria.
- (2) Events that in no way rely on the affected ESF systems.
- (3) Events that assume operation of the affected ESF systems, but the equipment actuation time, valve actuation time, or pump starting time is predicted to occur after the time of minimum departure from nucleate boiling ratio (MDNBR), peak pressure, etc.
- (4) Events that assume operation of the affected ESF systems, and the margin to the staff acceptance criteria would be reduced.
 - (a) Events that have been reanalyzed, with a licensing code, considering all ESF systems degradations.
 - (b) Events not completely analyzed, events judged to be non-limiting, events not analyzed with a licensing code, or other events.

License Condition 21 was imposed on the Palo Verde Unit 1 low power license to confirm current SER Chapter 15 findings and to provide FSAR Chapter 15 analyses that reflect the as-built plant conditions. The license condition states:

Prior to initial criticality, the applicant will submit, for staff review and approval, a schedule showing those FSAR Chapter 15 safety analyses that will be reanalyzed to account for the reduced system performance and which conform to the categorization described in Section 15 of Supplement No. 7 to the SER.

In response to the above license condition, the applicant met with the staff on March 14 and April 4, 1985 to discuss the information required to satisfy this license condition.

In a letter dated April 15, 1985, the applicant provided information which includes the following:

- (1) The results of a reevaluation, for each of the transients and accidents analyzed, of the effects of each design change; these effects are feedwater isolation valve closure time, auxiliary feedwater (AFW) system flow reduction, AFW delay, low pressure safety injection (LPSI) and high pressure safety

injection (HPSI) flow reduction, pressurizer and main steam safety valves increased blowdown, boron concentration reduction, containment spray flow reduction, change to temperature-dependent shutdown margin, and maximum AFW flow in excess of 1750 gpm. The effects are listed in the categories previously described, and justifications for the selected categorization are provided.

- (2) For events falling into Category 3 above, the elapsed time after the worst system performance is attained and before actuation of the affected equipment is provided.
- (3) The scope of reanalyses to be performed
- (4) Justification of why some Category 4b events will not to be reanalyzed.
- (5) The proposed schedule for submittal of the required reanalyses.

The applicant determined that the areas requiring reanalysis are as follows:

- (1) Chapter 15 events
 - steamline break accident: six cases
 - inadvertent deboration
- (2) Loss-of-coolant accident (LOCA) analysis
 - The limiting large break LOCA case
- (3) Containment mass and energy release data
 - the limiting LOCA case
 - main steam line break: five cases

The applicant determined that the following Category 4b events need not be reanalyzed:*

- (1) Reactor coolant pump seizure with loss of offsite power (15.3.3)
- (2) Reactor coolant pump shaft break with loss of offsite power (15.3.4)
- (3) Steam generator tube rupture with and without loss of offsite power (15.6.3.1 and 15.6.3.2)
- (4) Inadvertent pressurizer safety valve opening (15.6.1)
- (5) Non-limiting small-break LOCA (15.6.5)
- (6) Non-limiting containment LOCA (6.2)
- (7) Post-LOCA long-term cooling

*The numbers in parentheses refer to sections in the PVNGS FSAR.

For items 1 through 3 above, the applicant performed scoping calculations to demonstrate that the dose increase for these events is insignificant (<1.0 rem). The staff requested that the applicant provide sufficient information with regard to the amount of steam release so that the staff can independently verify the dose increase resulting from the design changes. Item 4 need not be re-analyzed because the lower closure pressure does not affect the analysis of a stuck-open safety valve, in FSAR Section 15.6. For item 5, the staff required that the applicant provide the results of an evaluation to confirm that the limiting small-break LOCA case analyzed is still limiting despite all the design changes. The information included in the applicant's April 15, 1985 letter will be part of the applicant's October 1, 1985 submittal. The staff evaluation of item 6 is addressed in Section 6.2 of this SSER.

For Category 3 events and those Category 4B events that the applicant proposes not to reanalyze, the staff expressed concern with regard to the possible change in sequence of events as a result of the additional design changes. The staff requested the applicant to provide a program that ensures that a reevaluation of any future design changes will include the effects of the current design changes.

In response to the staff request, the applicant stated in a letter dated April 23, 1985 that the program for the review of proposed changes to PVNGS is being revised. In the revised program, proposed changes will be reviewed considering the as-built configuration and the potential impact on the FSAR Chapter 15 analyses. The revised program will be implemented by July 1, 1985. The staff finds the applicant's commitment acceptable. However, the staff requires that the applicant provide a description of the revised program in the October 1, 1985 submittal to show that the revised program for potential future analyses resolves the staff concern.

In a letter dated April 15, 1985, the applicant proposed to submit all required reanalyses by October 1, 1985.

In Section 15.3.2 of SSER No. 7, the staff required that the applicant provide the results of an evaluation to show that the limiting feedwater line break analysis still remains the limiting case. The information included in the applicant's letter dated April 15, 1985, is being evaluated, and any further information required will be identified in sufficient time for the applicant to include the information in the October 1, 1985 submittal.

The staff has reviewed the applicant's submittal, as stated above, and concludes that it is acceptable. Therefore, Palo Verde License Condition 21 has been satisfied.

APPENDIX A

CONTINUATION OF CHRONOLOGY OF RADIOLOGICAL REVIEW

December 31, 1984	Issuance of Facility Operating License No. NPF-34 authorizing fuel loading and 5% power and issuance of SSER No. 7.
January 2, 1985	Letter to applicant correcting December 18, 1984 request for proposed CESSAR changes.
January 9, 1985	Generic Letter 85-01-Fire Protection Policy Steering Committee Report.
January 11, 1985	Letter from Combustion Engineering forwarding "Palo Verde Technical Audit," which addresses inconsistencies noted between Palo Verde Technical Specification and CESSAR-F.
January 16, 1985	Letter from applicant transmitting final version of fuel load incentive program.
January 18, 1985	Letter to applicant transmitting FEMA exercise reports.
January 28, 1985	Letter to applicant regarding completion of licensing review.
January 28, 1985	Letter from applicant advising that prefire strategies book will be completed by April 30, 1985
January 29, 1985	Letter to applicant regarding planned visit to obtain views on regulatory requirements believed to have marginal importance to safety but high burdens on utilities or NRC.
January 29, 1985	Generic Letter 85-04-Operator Licensing Examinations.
January 31, 1985	Letter from applicant forwarding revised natural circulation test procedure.
January 31, 1985	Generic Letter 85-05-Inadvertent Boron Dilution Events.
January 31, 1985	Letter to applicant forwarding request for additional information on core protection calculator software.
January 31, 1985	Letter from applicant concerning chemistry control and sampling system.
February 5, 1985	Letter from applicant forwarding information on preservice examination program.

February 8, 1985	Letter from applicant forwarding certification of compliance with 10 CFR 50.49.
February 13, 1985	Letter from applicant concerning arrangements for advisors/consultants to utility management.
February 19, 1985	Letter from applicant forwarding response to January 28, 1985 letter.
February 19, 1985	Letter from applicant advising of organizational changes.
February 20, 1985	Meeting with applicant to discuss operator cross-licensing requirements.
February 26, 1985	Letter from applicant advising that January 31, 1985 letter on chemistry control and sampling systems is applicable to all units.
February 27, 1985	Letter from applicant forwarding "Palo Verde Nuclear Generating Station SPDS SAR."
February 28, 1985	Letter from applicant transmitting Amendment 14 to FSAR.
March 6, 1985	Letter from Bechtel forwarding revised pages for Amendment 14 to FSAR.
March 8, 1985	Meeting with applicant to discuss task analysis for detailed control room design review.
March 8, 1985	Letter from applicant transmitting information on chemistry control and sampling system.
March 8, 1985	Letter from applicant transmitting "Response to Questions on Palo Verde Nuclear Generating Station Unit 1, Revision 1, Core Protection Calculator Software" (proprietary and nonproprietary versions).
March 11, 1985	Letter from applicant advison of new director of technical services.
March 12, 1985	Letter from applicant concerning interpretation of 10 CFR 50.59.
March 12, 1985	Letter to applicant transmitting request for additional information.
March 12, 1985	Letter from applicant regarding survey of onsite low level radwaste interim storage.
March 14, 1985	Meeting with applicant to discuss scope of Chapter 15 reanalysis.

March 19, 1985	Letter from applicant forwarding list of revised pages to FSAR Amendment 14.
March 21, 1985	Letter from applicant providing requested information on shift advisor program.
March 25, 1985	Letter from applicant advising of a proposal for corporate restructure.
March 25, 1985	Letter from applicant transmitting information on smoke detection system installation.
March 26, 1985	Letter from applicant forwarding updated summary of remaining work and costs related to reactor coolant system pipe whip restraints and jet impingement shields.
March 28, 1985	Letter from applicant advising of schedule for Units 2 and 3: Unit 2 ready for operating license in last quarter of 1985, with power operation in second quarter of 1986; Unit 3 ready for operating license in last quarter of 1986, with power operation in second quarter of 1987.
March 29, 1985	Letter from applicant forwarding information on fire protection.
March 29, 1985	Issuance of Order Amending Facility Operating License No. NPF-34 to clarify effective date for ownership by Los Angeles Department of Water and Power.
March 29, 1985	Letter from applicant concerning salt deposition and impact monitoring plan.
April 3, 1985	Letter from applicant forwarding report and evaluation of spray pond weld corrosion concern.
April 3, 1985	Meetings with applicant to discuss secondary water chemistry and Chapter 15 reanalysis.
April 3, 1985	Letter from applicant forwarding information on differences between proposed FSAR changes and Amendment 14 changes.
April 4, 1985	Letter from applicant regarding detailed control room design review.
April 11, 1985	Letter from applicant requesting Technical Specification change to correct containment spray pump response times.
April 12, 1984	Letter from applicant providing additional information for requested Technical Specification change.
April 12, 1985	Letter from applicant confirming completion of qualification of Target Rock solenoid valves.

April 12, 1985	Letter from applicant transmitting information on pressurizer safety valves.
April 15, 1985	Letter from applicant regarding revised emergency operating procedures.
April 15, 1985	Letter from applicant transmitting categorization of Chapter 15 analyses and schedule of reanalysis.
April 15, 1985	Letter from applicant transmitting draft of proposed change to FSAR to correct combustible loading error in Fire Zone 54.
April 15, 1985	Letter from applicant transmitting additional information on chemistry control and sampling systems.
April 16, 1985	Generic Letter 85-06-Quality Assurance Guidance for ATWS Equipment not Safety-Related.
April 17, 1985	Generic Letter 85-02-Recommended Actions Stemming from NRC Integrated Program for Resolution of Unresolved Safety Issues Regarding Steam Generator Tube Integrity.
April 18, 1985	Meeting with Core Protection Calculator Oversight Committee to discuss improvement program.
April 19, 1985	Letter from applicant forwarding supplemental response to Generic Letter 83-28.
April 19, 1985	Letter from applicant forwarding information on operation shift advisors.
April 23, 1985	Letter from applicant regarding the revised Chapter 15 analyses.
April 25, 1985	Letter from applicant transmitting draft change to FSAR to revise pressurizer compartment design wall loading.
April 25, 1985	Letter from applicant forwarding evaluation confirming compliance with 10 CFR 50 Appendix R requirement regarding capability to achieve and maintain cold shutdown within 72 hours of control from fire.
April 26, 1985	Letter from applicant transmitting proposed change to "P&I Diagram: HVAC-Fuel Building".
April 29, 1985	Letter from applicant regarding fire fighting requirements in FSAR.
May 1, 1985	Letter from applicant forwarding justification for continued operation of primary coolant system radiation monitors.

May 2, 1985	Generic Letter 85-07--Implementation of Integrated Schedules for Plant Modifications.
May 3, 1985	Letter from applicant transmitting revised marked-up pages to Revision 3 to salt deposition and impact monitoring plan and justification for discontinuance of foliar deposition analysis.
May 10, 1985	Meeting with applicant to discuss spray pond piping weld corrosion evaluation.
May 13-14, 1985	Meeting with applicant to discuss technical specifications for Unit 1 full power license.
May 15, 1985	Letter to applicant forwarding evaluation of changes to data base constants for Core Protection Calculator Software.
May 15, 1985	Letter from applicant committing to the submittal of the initial inservice inspection program and the loose parts monitoring system report. Also discussion of fuel assembly and guide tube wear surveillances.
May 22, 1985	Letter from applicant confirming operability of atmospheric dump valves and check valves.
May 22, 1985	Letter from applicant confirming implementation of the provisions of Regulatory Guide 1.97, Revision 2.
May 22, 1985	Letter from applicant committing to operability of the post accident sampling system.
May 22, 1985	Letter from applicant committing to operability of inadequate core cooling instrumentation system.
May 23, 1985	Letter from applicant confirming environmental qualification of RTDs, Valcor solenoid valves and ITT Barton transmitters.
May 23, 1985	Letter from applicant confirming installation and testing of seals in auxiliary feedwater pump compartment.
May 24, 1985	Letter from applicant discussing compliance with the Emergency Planning Statement of Policy.
May 28, 1985	Letter from applicant confirming completion of corrective actions for a number of human engineering discrepancies in the control room and remote shutdown panel.

APPENDIX B

REFERENCES

Combustion Engineering reports

CE Topical Report CEN-227, "Summary Report on the Operability of Pressurizer Safety Relief Valve in CE Desinged Plants," December, 1982.

Electric Power Research Institute report

NP-2704-SR, "PWR Secondary Water Chemistry Guidelines," October, 1982.

Federal Emergency Management Agency memorandum

Memorandum to NRC, March 15, 1985, transmitting the FEMA reports for the exercises conducted at the PVNGS site in November 1984.

U.S. Nuclear Regulatory Commission material

Generic Letter 84-16. To all licensees of Operating Reactors, applicants for Operating License and holders of Construction permits, Subject: Adequacy of onshift operating experience for near term operating license applicants, June 27, 1984.

NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," LWR Edition, July 1981.

APPENDIX E

ABBREVIATIONS

AFW	auxiliary feedwater
APS	Arizon Public Service Company
APS	auxiliary pressurizer spray
BTP	Branch Technical Position
CE	Combustion Engineering
CESSAR	Combustion Engineering Standard Safety Analysis Report
CFR	Code of Federal Regulations
CVCS	chemical and volume control system
EPRI	Electric Power Research Institute
ESF	engineered safety feature
FEMA	Federal Emergency Management Agency
FSAR	Final Safety Analysis Report
FWIV	feedwater isolation valve
FWLB	feedwater line break
LOCA	loss of coolant accident
LOCV	loss of condenser vacuum
LOOP	loss of offsite power
MDNBR	minimum departure from nucleate boiling ratio
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission

PVNGS Palo Verde Nuclear Generating Station
PVNGS 1-3 Palo Verde Nuclear Generating Station, Unit Nos. 1, 2, and 3
PWR pressurized water reactor

RCS reactor coolant system

SCE Southern California Edison Company
SER Safety Evaluation Report
SRP Standard Review Plan
SSER Safety Evaluation Report Supplement

APPENDIX F

PRINCIPAL CONTRIBUTORS

<u>Name</u>	<u>Issue</u>
M. Ley	Project Management
E. Licitra	Project Management
H. Balukjian	Core performance
J. Guo	Containment systems
F. Kantor	Emergency planning
D. Kubicki	Fire protection
V. Leung	Reactor systems
C. Liang	Reactor systems
M. Schoppman	Licensee qualification
J. Shapaker	Containment systems
J. Wing	Chemical engineering
S. Wu	Core performance

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SER RELATED TO THE OPERATION OF PALO VERDE NUCLEAR GENERATING STATION,
UNITS 1, 2, AND 3

MAY 1985