PACIFIC GAS & ELECTRIC COMPANY

DIABLO CANYON NUCLEAR POWER PLANT

INDEPENDENT DESIGN VERIFICATION PROGRAM

INTERIM TECHNICAL REPORT NO. 22

REVISION 1

VERIFICATION OF THE MECHANICAL/NUCLEAR DESIGN OF THE AUXILIARY FEEDWATER SYSTEM

PERFORMED BY

STONE & WEBSTER ENGINEERING CORPORATION

DOCKET NO. 50-275

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PROJECT MANAGER John E. Sestak for F. Sestak, Jr. DATE 4/20/83

PROGRAM MANAGER'S PREFACE

DIABLO CANYON NUCLEAR POWER PLANT - UNIT 1
INDEPENDENT DESIGN VERIFICATION PROGRAM

INTERIM TECHNICAL REPORT

VERIFICATION OF THE MECHANICAL PORTION OF
THE AUXILIARY FEEDWATER SYSTEM

This is Revision 1 to the twenty-second of a series of Interim Technical Reports prepared by the DCNPP-IDVP for the purpose of providing a conclusion of the program.

This report provides the analytical results, recommendations and conclusions of the IDVP with respect to the initial sample.

As IDVP Program Manager, Teledyne Engineering Services (TES) has approved this ITR, including the conclusions and recommendations. The methodology followed by TES in performing this review and evaluation is described by Appendix B to this report.

ITR Reviewed and Approved
IDVP Program Manager
Teledyne Engineering Services

D.C. Stratouly
Assistant Project Manager

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SECTION 1

INTRODUCTION

Stone & Webster Engineering Corporation (SWEC) reviewed the design of the Auxiliary Feedwater (AFW) System. The review was performed in accordance with the SWEC Scope of Work defined in Appendix D (DCNPP-IDVP-PP-002) of the IDVP Phase II Program Management Plan issued by Teledyne Engineering Services (TES) as IDVP Program Manager.

This Interim Technical Report (ITR) discusses the analysis of the Mechanical/Nuclear portion of the AFW System. Specific areas of review were:

- Existing system design compared to the Technical Specifications
- System redundancy
- Hydraulic design
- System specified design pressure and temperature
- Regulatory requirements
- Field verification of mechanical design.

Fire protection, high energy line breaks (HELBs), high energy line cracks (HELCs), and moderate energy line breaks (MELBs) as they affect the AFW System are addressed in separate ITRs.

For the mechanical portion of the AFW System, extensive documentation was both reviewed and prepared. These documents were also used for other scopes of work described in the other ITRs. PG&E documentation was supplied that included approximately:

- 600 pages of design criteria-related material
- 100 pages of Final Safety Analysis Report (FSAR) description
- 400 pages of related licensing documents and reports
- 150 drawings
- 30 equipment and component specifications.

In turn, the IDVP prepared documentation necessary for the review of this material. This review resulted in and was documented by approximately:

- 400 pages of documented review task packages
- 10 sketches and marked-up DCNPP-1 drawings
- 300 pages of calculations including 20 computer simulations of hydraulic characteristics
- 100 hours of field inspection
- 40 hours of technical exchange background meetings.

This review provided the IDVP a high degree of understanding concerning the licensing basis, as-built design, and performance characteristics of the AFW System.

SECTION 2

DEFINITION OF ITEMS REVIEWED

The following subsections provide a brief Scope of Work for the AFW System.

2.1 REVIEW OF THE AFW SYSTEM DESIGN FOR COMPATIBILITY WITH THE TECHNICAL SPECIFICATION REQUIREMENTS

The AFW system design was compared with the Technical Specification requirements. Items reviewed included water storage requirements, number of pumps required to operate for various modes of plant operation, and system surveillance testing requirements.

2.2 SYSTEM REDUNDANCY AND SINGLE FAILURE REVIEW

A review of redundancy and single failure was performed to determine if the AFW system design satisfies the single failure criteria as defined in the FSAR, Sections 3.1.1 and 10.4.8.

2.3 SYSTEM HYDRAULIC REVIEW

System hydraulic capabilities and Net Positive Suction Head available (NPSHa) were calculated and compared to licensing commitments and equipment capabilities. Pump driver power requirements were compared to installed driver capability.

2.4 SYSTEM DESIGN TEMPERATURE AND PRESSURE

The selected design pressures/temperatures for the piping, valves, fittings, and equipment were reviewed based on system operating conditions. Temperature conditions including the effects of outside environmental temperatures were evaluated.

2.5 REGULATORY REQUIREMENTS

A review of the applicable sections of NUREG 0578, 0611, 0660, 0694, and 0737 requirements and the PG&E commitments to the Standard Review Plan 10.4.9, Revision 1, was performed.

2.6 FIELD VERIFICATION

A field inspection was performed to confirm that the overall as-built AFW system arrangement is equivalent to that used in the various reviews and as identified in the licensing documents.

SECTION 3

DESCRIPTION OF REVIEW

Reviewing ITR No. 29, entitled "Design Chain - Initial Sample" determined the service-related contractors and/or internal PG&E engineering groups involved in the mechanical/nuclear design of the AFW System. The PG&E Mechanical Engineering Group was identified as being responsible for the mechanical/nuclear design of the AFW System. No service-related contractors were identified. The review also identified an interface between PG&E and Westinghouse for design criteria. The application of the Westinghouse design criteria to the AFW system design by PG&E was reviewed; however, the use of interface information by Westinghouse was not within the scope of this review. The DCNPP-1 licensing documents pertaining to the AFW System were reviewed and applicable licensing commitments were identified. The detailed review, described in the following sections, was then conducted to determine if the AFW system licensing commitments were satisfied.

3.1 REVIEW OF THE AFW SYSTEM DESIGN FOR COMPATIBILITY WITH THE TECHNICAL SPECIFICATION REQUIREMENTS

The Technical Specifications are part of the operating license for the DCNPP-1 and consist of a set of conditions which must be met during operation. The AFW system design was reviewed for compatibility with the specification requirements. The requirements can be grouped into the following areas with the applicable Technical Specification sections shown in parentheses.

- AFW system water supplies (Sections 3.7.1, 3/4.7.1, 3.3.3)
- Pump performance (Sections 4.7.1, 3/4.7.1)
- AFW system area temperature limits (Section 3.7.1)
- Power supply and load timer set points (Table 4.8-2).

Water supply requirements included minimum allowable volume and tank level indication. Westinghouse provided the minimum volume criteria for cold safe shutdown (Westinghouse letter J. S. Fuoto to D. V. Kelley of PG&E, dated December 2, 1975). SWEC performed an independent calculation to verify that the condensate storage tank capacity (primary AFW supply) meets Westinghouse and Technical Specification criteria.

Pump performance requirements included minimum pump head and minimum flow rate. Pump head requirements were compared to the pump vendor head versus flow curves. The hydraulic calculations described in Section 3.3 were used to verify that required flow rates could be met.

AFW system area temperature limits were specified for both the motor-driven pump room and the area containing level control valves LCV 113 and LCV 115. Location and control drawings were checked to determine if temperature indicators and recorders were provided for these areas.

An electrical and control circuit review was made of the power supply and load timer set points, as well as the minimum time for AFW system operation to verify that Technical Specification requirements were met.

The In-Service Inspection and Testing Program Plan plus the Technical Specification Section 4.7.1 were reviewed to evaluate acceptance criteria for pump performance.

3.2 SYSTEM REDUNDANCY AND SINGLE FAILURE REVIEW

Piping schematics and drawings depicting the power supply and control circuits to components were reviewed to determine the capability of the AFW System to meet the single failure criteria, as described in FSAR Sections 3.1.1 and 10.4.8. Various single active or passive failures were postulated, including failure of a diesel generator or failure of individual components, such as pumps, valves, piping, or instrumentation. Their effects on the AFW System were evaluated. Loss of all offsite power was assumed to occur simultaneously with the postulated failure in all cases.

3.3 SYSTEM HYDRAULIC REVIEW

The AFW System was hydraulically modeled with the computer program "HY-66 - Piping System Analysis Program," using the latest PG&E piping drawings and component hydraulic characteristics. Computer Program HY-66 has been documented in accordance with the requirements of the Stone & Webster Standard Nuclear Quality Assurance Program. A calculation was performed to compare the computer program results with actual test data. The comparison was made to determine that the model could duplicate system characteristics within ±10 percent. This computer model was used to independently verify that flow rates identified in FSAR Sections 6, 10, 15, 16, and PG&E responses to

NRC IE Bulletin 80-04 were calculated correctly by PG&E. Accident conditions and shutdown flows were also verified. For feedwater and main steam line break accidents, flow through the break and flows to the intact steam generators were verified. Various component failures were evaluated to determine worst case flows. NPSHa to the operating pumps was calculated for all flow conditions, and the calculated NPSHa was compared to the required NPSH shown on pump vendor documentation. The piping drawings were compared to the piping schematics to confirm that the system arrangement was correct for hydraulic modeling purposes.

The required motor horsepower for the motor-driven AFW pumps was calculated and compared to vendor documentation for compatibility. The turbine driver size was reviewed for capability and the capacity of its steam lines to provide the required flow was determined. The set points of the Runout Control System were reviewed and a failure analysis of the system was made to determine the effects on the AFW System. Time to deliver water to the steam generators was reviewed against Technical Specification Section 3.3.2 and FSAR Section 7.4.1. Additionally, logic diagrams were reviewed to determine if steam generator blowdown and sampling lines were isolated as specified in FSAR Section 10.4.8. The FSAR Chapter 15 accident analyses requiring AFW system operation (refer to PG&E to NRC letter, dated October 9, 1980, which responded to NRC requests for information concerning the design basis of the AFW system) assumed the blowdown valves were shut during the period when the auxiliary feedwater is operating.

3.4 SYSTEM DESIGN TEMPERATURE AND PRESSURE

The major items reviewed included the following:

- Specification of design pressure for pipe fittings, equipment, and stress input
- The isolation of low pressure components and piping from the effects of the higher pressure portion of the system
- A review of all equipment and components for compatibility with the specified design pressure.

FSAR Tables 3.2-3 and 3.2-4 were reviewed to identify the applicable piping codes. Technical documentation including PG&E line designation tables, specifications, drawings, and calculations were reviewed to identify the design basis.

An independent calculation and analysis were made to determine if the selected design pressure met the applicable piping code requirements. The pump curves, arrangement drawings, and the piping code were used as the basis for the calculation of system design pressure. Piping schematics were reviewed to determine if low pressure components could be exposed to high pressure sources.

The FSAR Sections 1, 2, 3, and 9 and Appendix 29, site weather information documents, and piping drawings were used to determine if the common suction line was susceptible to freezing.

3.5 REGULATORY REQUIREMENTS

Correspondence between PG&E and the NRC was reviewed to identify specific commitments concerning modifications that would be made as a result of the Three Mile Island (TMI) event. The PG&E responses to NUREG Documents 0578, 0611, 0660, 0694, and 0737 were specifically reviewed to identify licensing commitments.

A comparison was made between the "NRC Standard Review Plan - Auxiliary Feedwater System" SRP 10.4.9, Revision 1, and PG&E's commitments regarding this SRP in its letter of March 13, 1980. The system design was reviewed to verify these commitments were met.

3.6 FIELD VERIFICATION

A field verification was made of the AFW System to confirm its overall as-built arrangement; however, this verification did not include the dimensional accuracy of pipe lengths as it applies to pipe stress analysis. The as-built piping configuration was compared to the piping drawings to assure no significant differences exist from a hydraulic operational viewpoint. Specific items of review included:

- A walkdown to determine if the overall as-built system was equivalent to the piping schematics. Items checked included: line size, sequence of piping branch connections, installation of major components, approximate piping lengths compared to the piping drawings, and equipment elevations.

- The ability to cross-connect the various water supplies to the AFW pumps suction was reviewed including the condensate storage tank, firewater storage tank, reservoir, and seawater.

- The condensate storage tank configuration was reviewed to determine that it met the licensing commitments set forth in FSAR Section 9, FSAR Appendix 2, and SER Supplements 7 and 8.

- The steam supply to the turbine-driven AFW pump was reviewed for configuration and location of steam traps.

- The system valve type, pressure rating, manufacturer, and model number were reviewed.

- TMI-related modifications were reviewed.

SECTION 4

SUMMARY OF REVIEW RESULTS

This section provides a summary of the review results and identifies all concerns raised as a result of this review.

4.1 REVIEW OF THE AFW SYSTEM DESIGN FOR COMPATIBILITY WITH THE TECHNICAL SPECIFICATION REQUIREMENTS

Within the scope of the IDVP Phase II Program Management Plan, the system design was compatible with the applicable requirements of the Technical Specifications. The AFW pumps can be tested in accordance with the Technical Specification Section 4.7.1 requirements.

The condensate storage tank was found to contain sufficient reserve volume to meet the NSSS vendor criteria (Westinghouse letter J. S. Fuoto to D. V. Kelley of PG&E, dated December 2, 1975), and a level switch initiates an alarm in the control room before the minimum volume is reached. The tank was also found to conform to all Technical Specification requirements (Sections 3.7.1, 3/4.7.1, 3.3.3). The required level indication at the hot shutdown panel was also located.

Review of the electrical drawings indicated that area temperature limits for the motor-driven pump room and the LCV area are monitored and recorded by temperature recorders. Logic diagrams indicate that when the temperature rises 1 degree Fahrenheit above the design limit, an alarm is sounded in the control room.

Power supply and load timer set points, as well as the minimum time required for AFW system operation, were specifically stated in the Technical Specification Table 4.8-2. This review of design documents verified the system design met the required Technical Specifications.

4.2 SYSTEM REDUNDANCY AND SINGLE FAILURE REVIEW

The review verified that the AFW System has adequate mechanical and electrical redundancy to meet the single failure criteria of FSAR Sections 3.1.1 and 10.4.8 and can perform its intended safety function.

4.3 SYSTEM HYDRAULIC REVIEW

The AFW System was hydraulically modeled with a computer program (HY-66) to calculate system pressure and flow rates in the various operating modes and accident conditions. The computer program comparison to test data confirmed that the model could reproduce system characteristics.

The accident analysis calculations verified that the PG&E calculated flows that are documented in PG&E response to NRC IE Bulletin 80-04 of April 30, 1980, and FSAR Section 15.4.2 were conservative and, thus, acceptable. The calculated flow for normal shutdown and cooldown verified for all possible pump combinations, including single pump operation, that the committed flow rates in FSAR Sections 6, 10, and 16 can be obtained. In addition, NPSHa during accident and normal shutdown conditions always exceeded the vendor required NPSH.

The AFW system piping schematic versus piping drawing review resulted in only minor discrepancies, such as vent and drain placement. Differences were evaluated, and none were found that would affect safety, the hydraulic analysis, or licensing commitments.

The review of the motor-driven pump performance, using the most recent field test data, verified that the pumps are capable of performing their function without exceeding the nameplate motor horsepower. The review of turbine steam supply line size and turbine characteristics indicates the turbine-driven pump can supply the minimum required flow specified in FSAR Sections 6, 10, and 16 over the expected range of steam generator pressures.

The review of system response time and blowdown and sampling line isolation circuits verified that all applicable licensing commitments from Technical Specification Section 3.3.2 and FSAR Section 10.4.8 were met. The diesel generator loading logic diagrams indicated full system flow will be available within the committed time from Technical Specification Table 8.3-5 and FSAR Section 7.4.1. System logic diagrams indicated the blowdown and sampling line valves receive a signal to close on automatic AFW system start.

Computer hydraulic analyses performed using the runout control set points indicated that less than the minimum required flow may be produced under certain operating conditions. As a result, a concern over the design of the safety grade flow limiting control scheme provided to prevent a motor-driven AFW pump from running out on its pump curve in the event of a depressurized steam generator was identified. Control valves LCV 110, 111, 113, and 115

normally respond to steam generator level. The addition of the runout control logic results in the valves responding to pump discharge pressure when the pressure decreases to 1,360 psig. At 1,310 psig, the pressure signal will provide the maximum flow limiting signal to the control valve which results in the valve closing. The level control signal and the pressure control signal may, at times, be commanding the valve to perform opposite functions simultaneously. A concern existed that the flow limiting feature, utilizing a pressure and level control loop linked to one valve, would not perform its intended function without adverse interaction during all modes of operation. The analyses indicated that the pressure control set points may not be low enough to permit the minimum required flow to the steam generators when only one motor-driven pump is operating.

PG&E provided a resolution for this concern which consists of set point changes and startup testing for dynamic stability. The resolution has been reviewed and an analysis of the new set points has been performed. Based on the analysis of the new set points and the commitment to perform appropriate startup testing of the Runout Control System, the resolution is acceptable.

4.4 SYSTEM DESIGN TEMPERATURE AND PRESSURE

The review of the selected design pressure for piping, fittings, components, and mechanical equipment, determined that the applicable design codes for selection of design pressure were not met. These design codes require the system to be designed for the most severe condition of coincident pressure, temperature, and other loading. Additionally, the effects of static head, maximum sustained pressure at any pump load per ANSI B31.1 102.2.5(e) and

pressure surges must be accounted for. The design pressure shown in the Line Designation Table does not meet the requirements of the code based on:

- Selecting 1,300 psia as a design pressure from a pump curve based on nominal TDH at design flow. This does not account for suction conditions or lower pump operational flows.

- The selected design pressure of 1,300 psia does not envelop the sustained pressure developed during recirculation mode, including suction static head, as documented in the Pre-Op Test Procedure 3.7 of September 15, 1980.

- Under many operating conditions, including rated flow, but particularly reduced flow operation, the 1,300 psia is exceeded (Pre-Op Test Procedure 3.1, Addendum 1, October 25, 1978).

- The "K16" pipe specification rating is exceeded under some operational conditions including operation in the recirculation mode.

- ANSI B16.5 900# flange ratings and valve ratings are exceeded under turbine overspeed conditions at reduced flows and in the recirculation mode.

In addition, the pipe stress analysis may be nonconservative due to use of a low design pressure.

PG&E provided a resolution for this concern which consists of lowering the turbine overspeed trip set point, recalculating system design pressure, and replacing system components which are rated below the new design pressures. Independent calculations were performed to verify the new design pressures are code acceptable and to determine whether equipment ratings will be adequate. The analysis showed that the new design pressures are code acceptable and the adequacy of equipment ratings will be determined after the modifications are complete.

The protection of low pressure components and piping from the effects of high pressure sources was reviewed. It was determined that the applicable design code was not met. A valve was added by DCO-E-M-472 that provides additional backpressure and flow through the turbine bearing coolers. Prior to this change, the system was code acceptable with the existing valve acting as the division valve. The added throttle valve effectively becomes the division valve, now violating Paragraph 102.2.5(a) of ANSI B31.1. Additionally, the original valve is equivalent to a pressure reducing valve per P 102.2.5(b). The low pressure portion does not have pressure relieving components downstream, violating Paragraph 102.2.5(b). The piping and components are not adequately protected against surges and a variety of operating conditions including:

- Operating when aligned to the reservoir resulting in higher discharge pressure

- Turbine overspeed (testing or inadvertent)

- Throttled pump 1-1 or running in recirculation mode

- Running pumps 1-1, 1-2, and 1-3 resulting in higher backpressure in the recirculation return line

- Inadvertent operation of valves including the valve with the handwheel removed and Valve 22 in the bearing common discharge piping to the 1-1 pump suction.

PG&E has provided a resolution for this concern which consists of modifications to the turbine pump recirculation lines. A design change has been issued to implement these modifications. This design change has been reviewed against the applicable code requirements for separation of low pressure piping from higher pressure piping. The proposed changes are in compliance with the code.

The review of components, by evaluating specification and manufacturer's data, showed they were compatible with the existing specified pressure/ temperature. These items were re-evaluated in the design pressure resolution.

A review of valve actuator sizing indicated FCV 37, FCV 38, and FCV 95 were designed to open and close against a maximum differential pressure of 805 psi. These valves could be required to operate against a differential pressure in excess of 1,100 psi. As an example, FCV 95 may be required to open during conditions where steam generator safety valves are lifting.

PG&E has provided a resolution for this concern which consists of modifications to the gear ratio of the FCV 95 actuator in accordance with manufacturer's recommendations. It has been determined that FCV 37 and FCV 38 do not require modifications because these valves are not required to operate for safe shutdown of the plant.

The AFW pump suction line from the condensate storage tank is common to all three pumps for a portion of the system and was reviewed for susceptibility to freezing conditions. Based on the site temperature data and the location of piping, the common suction line was judged not to be susceptible to freezing.

4.5 REGULATORY REQUIREMENTS

The review of licensing correspondence and commitments identified in Section 3.5 of this report was compared to the system design. This comparison review indicated all commitments have been implemented.

4.6 FIELD VERIFICATION

The field verification resulted in two concerns regarding approved design changes that were not made to the system; however, PG&E provided a resolution subsequent to the field verification that resulted in a conclusion that no technical concerns exist in the actual field installation of the system.

One concern involved the AFW steam supply to the AFW turbine. PG&E believed that condensate from steam line 593 (steam supply to the AFW turbine) was the cause of problems encountered during AFW turbine cold start testing. Design Change DC-1-G-M-1017 was written to add an additional steam trap to line 593 between traps 104 and 105. Piping Schematic 102004, Sheet 5, was revised in Change 10 to show the trap, but the piping drawing (500058, Coordinate D-10) and the field piping have not been changed. The concern was that excessive condensate may be present during operation and could contribute to turbine cold start difficulties including overspeed trip; however, startup testing performed successfully (DCP Procedure 3.7) without the steam trap in place.

The other concern involved the long-term cooling water supply system. Design Change DCO-E-M-404 R1 replaced a hose station with a single valve and cap. Piping Schematic 102016, Sheet 5A, was revised to reflect the change. Design Change DCO-G-M-2264 added a relief valve for overpressure protection and the drawing was revised again. A check valve in the manifold line originally shown in Revision 8 of the Piping Schematic, and shown to be removed in DCO-E-M-404 R1, was identified in the field as installed; however, current documentation shows it removed. The concern was that safety-related modifications were not implemented in the field. The PG&E resolution for this concern stated that the drawings were mistakenly revised but that the field installation is acceptable according to DCO-E-M-404-R1. It was determined that the field design is acceptable as is and no technical concern exists.

SECTION 5

EOI REPORTS ISSUED

Seven EOI files have been issued for the verification of the Mechanical/ Nuclear portion of the AFW System. The status of these files is summarized in Appendix A.

EOI File 8009 was issued because the most severe design condition of coincident pressure, temperature, and other loadings had not been considered in system design pressure and temperature selection. PG&E has re-evaluated the AFW system design temperature/pressure and has provided a resolution for this file which involves physical modifications. This resolution has been reviewed and found acceptable. The file remains open as an Error Class A pending IDVP verification of the modifications.

EOI File 8010 was issued because the inclusion of a valve in the system to provide additional backpressure and flow through the turbine bearing coolers violates the ANSI Code and leaves some components unprotected against pressures resulting from a variety of operating conditions. PG&E has provided a resolution changing the piping configuration on the turbine pump recirculation line. The change will be code acceptable. The file remains open as an Error Class A pending IDVP verification of the modifications.

EOI File 8015 was issued because the Technical Specification describing testing of the AFW pumps does not require measurement of pump flow during testing. The NRC has approved the Technical Specifications. The AFW system design does not permit pump testing in accordance with the Technical

Specifications. The licensing commitment is satisfied. This file has been closed.

EOI File 8027 was issued because a design change (to add an additional steam trap) was issued, but field piping does not show this change. The concern is that safety-related modifications were not made in the field. There are no technical concerns with the existing configuration. Design change procedures are addressed in the R.F. Reedy Scope of Work.

EOI File 8048 was issued because safety-related modifications were not implemented according to approved documents. There are no technical concerns with the existing configuration. Design change procedures will be reviewed.

EOI File 8060 was issued because of the concern that the AFW Runout Control System will interfere with the delivery of design flow to the steam generators. PG&E has provided a resolution involving changes to the runout control set points and startup testing of the Runout Control System. This resolution is acceptable. This file has been closed.

EOI File 8062 was issued due to the concern that the valve actuators may be undersized. PG&E has provided a resolution consisting of changes to FCV 95 and a licensing basis of why FCV 37 and FCV 38 are acceptable as designed. This resolution has been reviewed and accepted. The file remains open as an Error Class A pending IDVP verification of the modifications to FCV 95.

SECTION 6

EVALUATION OF REVIEW RESULTS

6.1 REVIEW OF THE AFW SYSTEM DESIGN FOR COMPATIBILITY WITH THE TECHNICAL SPECIFICATION REQUIREMENTS

The AFW system design is compatible with the Technical Specification requirements. The IDVP acceptance criteria are met.

6.2 SYSTEM REDUNDANCY AND SINGLE FAILURE REVIEW

The system equipment redundancy and its ability to withstand a single failure were reviewed and found acceptable. Redundant sources of water for the AFW System that have been extensively reviewed by the NRC are provided. A single manual valve in the common suction line from the condensate storage tank was identified by a PG&E system reliability analysis and locked open to minimize the possibility of the valve being inadvertently shut which would isolate the initial source of water to the AFW System. This valve was confirmed during the field verification as being permanently locked open. The IDVP acceptance criteria are met.

6.3 SYSTEM HYDRAULIC REVIEW

The hydraulic review confirmed that the minimum required flow could be provided as required in the DCNPP-1 licensing documents identified in Section 4.3 and that flows submitted to Westinghouse were conservative when compared

to the independent calculated flow rates. The IDVP acceptance criteria are met.

6.4 SYSTEM DESIGN TEMPERATURE AND PRESSURE

Based on the response to identified concerns on design pressure and temperature selection and specification of maximum differential pressure used for valve actuator sizing, it has been determined that generic concerns exist which are discussed in ITR No. 34.

6.5 REGULATORY REQUIREMENTS

The regulatory requirements identified in Section 3.5 of this report and the commitments made concerning them were reviewed. The commitments reviewed were implemented as stated. The IDVP acceptance criteria are met.

6.6 FIELD VERIFICATION

Two EOI files identified approved design changes that were not implemented in the field. Design change procedures are addressed under the R. F. Reedy Scope of Work. No technical concerns exist. The as-built configuration of the AFW System is equivalent to the configuration used in the various IDVP reviews and identified in the licensing documents. The IDVP acceptance criteria are met.

SECTION 7

CONCLUSIONS

The following sections summarize whether additional verification or additional sampling of the items reviewed is required.

7.1 REVIEW OF THE AFW SYSTEM DESIGN FOR COMPATIBILITY WITH THE TECHNICAL SPECIFICATION REQUIREMENTS

No additional verification or sampling is required.

7.2 SYSTEM REDUNDANCY AND SINGLE FAILURE REVIEW

No additional verification or sampling is required.

7.3 SYSTEM HYDRAULIC REVIEW

No additional verification or sampling is required.

7.4 SYSTEM DESIGN TEMPERATURE AND PRESSURE

Additional verification of PG&E designed safety-related systems is required to determine if design temperatures and pressures were developed in accordance with the applicable code and whether valve actuators are properly sized for differential pressure. This additional verification is further discussed in ITR No. 34.

7.5 REGULATORY REQUIREMENTS

No additional verification or sampling is required.

7.6 FIELD VERIFICATION

No additional verification or sampling is required.

APPENDIX A

EOI FILES

APPENDIX A

DCNPP IDVP STATUS REPORT

REV. 0 LATEST REV. PAGE ITR

FILE NO.	DATE	REV.	DATE	BY	STATUS	MODS	SUBJECT
8009	820913	0	820913	SWEC	OIR		EVAL. OF COMPLIANCE W/ANSI CODE OF AFW PIPING
8009	820913	1	821001	SWEC	PPRR/OIP		EVAL. OF COMPLIANCE W/ANSI CODE OF AFW PIPING
8009	820913	2	821022	TES	PRR/OIP		EVAL. OF COMPLIANCE W/ANSI CODE OF AFW PIPING
8009	820913	3	830113	TES	OIR		EVAL. OF COMPLIANCE W/ANSI CODE OF AFW PIPING
8009	820913	4	830214	SWEC	PER/A		EVAL. OF COMPLIANCE W/ANSI CODE OF AFW PIPING
8009	820913	5	830225	TES	ER/A	YES	EVAL. OF COMPLIANCE W/ANSI CODE OF AFW PIPING
8009	820913	6	830309	SWEC	PER/A	YES	EVAL. OF COMPLIANCE W/ANSI CODE OF AFW PIPING
8009	820913	7	830309	TES	ER/A	YES	EVAL. OF COMPLIANCE W/ANSI CODE OF AFW PIPING
8010	820913	0	820913	SWEC	OIR		EVAL. OF COMPLIANCE W/ANSI CODE BEARING COOLER
8010	820913	1	820913	SWEC	OIR		EVAL. OF COMPLIANCE W/ANSI CODE BEARING COOLER
8010	820913	2	821001	SWEC	PPRR/OIP		EVAL. OF COMPLIANCE W/ANSI CODE BEARING COOLER
8010	820913	3	821022	TES	OIR		EVAL. OF COMPLIANCE W/ANSI CODE BEARING COOLER
8010	820913	4	821029	SWEC	PER/A		EVAL. OF COMPLIANCE W/ANSI CODE BEARING COOLER
8010	820913	5	821105	TES	ER/A		EVAL. OF COMPLIANCE W/ANSI CODE BEARING COOLER
8010	820913	6	830113	TES	OIR	YES	EVAL. OF COMPLIANCE W/ANSI CODE BEARING COOLER
8010	820913	7	830304	SWEC	PER/A	YES	EVAL. OF COMPLIANCE W/ANSI CODE BEARING COOLER
8010	820913	8	830310	TES	ER/A	YES	EVAL. OF COMPLIANCE W/ANSI CODE BEARING COOLER
8015	820927	0	820927	SWEC	OIR		AUX FW SYS FLOW CAPACITY
8015	820927	1	821001	SWEC	PPRR/OIP		AUX FW SYS FLOW CAPACITY
8015	820927	2	821022	TES	OIR		AUX FW SYS FLOW CAPACITY
8015	820927	3	821029	SWEC	PER/B		AUX FW SYS FLOW CAPACITY
8015	820927	4	821105	TES	ER/B		AUX FW SYS FLOW CAPACITY
8015	820927	5	830103	TES	OIR		AUX FW SYS FLOW CAPACITY
8015	820927	6	0				AUX FW SYS FLOW CAPACITY
8015	820927	7	830210	SWEC	PPRR/CI		AUX FW SYS FLOW CAPACITY
8015	820927	8	830225	TES	PRR/OIP		AUX FW SYS FLOW CAPACITY
8015	820927	9	830225	TES	PRR/CI		AUX FW SYS FLOW CAPACITY
8015	820927	10	830225	TES	CR	NO	AUX FW SYS FLOW CAPACITY
8027	821013	0	821013	SWEC	OIR		AFWS STEAM SUPPLY TO THE AFW TURBINE
8027	821013	1	821014	SWEC	PPRR/OIP		AFWS STEAM SUPPLY TO THE AFW TURBINE
8027	821013	2	821029	TES	PRR/OIP		AFWS STEAM SUPPLY TO THE AFW TURBINE
8027	821013	3	830113	TES	OIR		AFWS STEAM SUPPLY TO THE AFW TURBINE
8027	821013	4	830209	SWEC	PPRR/CI		AFWS STEAM SUPPLY TO THE AFW TURBINE
8027	821013	5	830211	TES	PRR/CI		AFWS STEAM SUPPLY TO THE AFW TURBINE
8027	821013	6	830211	TES	CR	NO	AFWS STEAM SUPPLY TO THE AFW TURBINE
8048	821025	0	821025	SWEC	OIR		AFW LONG TERM COOLING WATER SUPPLY SYSTEM
8048	821025	1	821025	SWEC	PPRR/OIP		AFW LONG TERM COOLING WATER SUPPLY SYSTEM
8048	821025	2	821029	TES	PRR/OIP		AFW LONG TERM COOLING WATER SUPPLY SYSTEM
8048	821025	3	830111	TES	OIR		AFW LONG TERM COOLING WATER SUPPLY SYSTEM
8048	821025	4	830209	SWEC	PPRR/CI		AFW LONG TERM COOLING WATER SUPPLY SYSTEM
8048	821025	5	830211	TES	PRR/CI		AFW LONG TERM COOLING WATER SUPPLY SYSTEM
8048	821025	6	830211	TES	CR	NO	AFW LONG TERM COOLING WATER SUPPLY SYSTEM
8060	821029	0	821029	SWEC	OIR		AFW CONTROLS FOR LIMITING FLOW TO DEP.STEAM GEN.
8060	821029	1	821109	SWEC	PPRR/OIP		AFW CONTROLS FOR LIMITING FLOW TO DEP.STEAM GEN.
8060	821029	2	821123	TES	PRR/OIP		AFW CONTROLS FOR LIMITING FLOW TO DEP.STEAM GEN.
8060	821029	3	830302	TES	OIR		AFW CONTROLS FOR LIMITING FLOW TO DEP.STEAM GEN.
8060	821029	4	830311	SWEC	PER/C		AFW CONTROLS FOR LIMITING FLOW TO DEP.STEAM GEN.
8060	821029	5	830315	TES	ER/C		AFW CONTROLS FOR LIMITING FLOW TO DEP.STEAM GEN.
8060	821029	6	830315	TES	CR	NO	AFW CONTROLS FOR LIMITING FLOW TO DEP.STEAM GEN.
8062	821118	0	821118	SWEC	OIR		AFW CONTROL VALVES FCV37,39 AND 95.

APPENDIX A (CONT)

DCRP IIWP STATUS REPORT

	REV. 0	LATEST REV.			POWE ITR	
FILE NO.	DATE	REV.	DATE	BY	STATUS	NODE	SUBJECT
8062	821118	1	821118	SWEC	PER/DIP		AFW CONTROL VALVES FCV37, 38, & 95.
8062	821118	2	821122	TES	PER/DIP		AFW CONTROL VALVES FCV37, 38, & 95.
8062	821118	3	830219	TES	DIR		AFW CONTROL VALVES FCV37, 38, & 95.
8062	821118	4	830304	SWEC	PER/A		AFW CONTROL VALVES FCV37, 38, & 95.
8062	821118	5	830310	TES	ER/A	YES	AFW CONTROL VALVES FCV37, 38, & 95.

APPENDIX B

PROGRAM MANAGER'S ASSESSMENT

Independent review by TES of the tasks performed by SWEC to verify the Mechanical/Nuclear portion of the AFW System was done in accordance with IDVP Phase II Program Management Plan dated June 18, 1982 and the Engineering Procedure EP-1-014.

The review involved several visits to the site and the SWEC offices for detailed discussions and review, with SWEC personnel, of the work performed by SWEC including the methodology used in this task.

The files issued by SWEC were reviewed thoroughly and specific recommendations were made to the IDVP Program Manager delineating appropriate resolution.

As a result of the verification of initial sampling selected by SWEC and the assessment of the impact of SWEC's findings, TES, as Program Manager, is of the opinion that because of the concern of design pressure and temperature selection and specification of maximum differential pressure used for valve actuator sizing, additional verification is required.