TABLE OF CONTENTS (Continued)

3.2 HIGH PRESSURE INJECTION, CHEMICAL ADDITION, AND LOW TEMPERATURE OVERPRESSURE PROTECTION (LTOP) SYSTEMS

Applicability

Specification 3.2.1 applies to the operational status of the high pressure injection and chemical addition systems. Specification 3.2.2 applies to the operational status of the Low Temperature Overpressure Protection (LTOP) Systems when the RCS temperature falls below 350° F and is not open to atmosphere, which includes the Reactor Vessel head removed, any one of the 4 OTSG manways open, the pressurizer heater bundle removed, or the pressurizer manway removed.

Objective

Specification 3.2.1 provides for adequate boration under all operating conditions to assure ability to bring the reactor to a cold shutdown condition. Specification 3.2.2 defines the necessary conditions for preventing an excessive overpressure transient to occur at low temperatures.

Specification

3.2.1 The reactor shall not remain critical unless the following conditions are met:

3.2.1.1 Two pumps capable of supplying high pressure injection are operable (also see Specification 3.3.2).

3.2.1.2 The borated water storage tank and its flow path to the reactor for high pressure injection are operable.

3.2.1.3 A source of concentrated boric acid solution in addition to the borated water storage tank is available and operable. This requirement is fulfilled by the concentrated boric acid storage tank. This tank shall contain at least the equivalent of 10,000 gallons of 7,100 ppm boron. System piping and valves necessary to establish a flow path for high pressure injection shall also be operable and shall have at least the same temperature as the boric acid storage tank. One associated boric acid pump is operable. The concentrated boric acid storage tank water shall not be less than 70F, and at least one channel of heat tracing shall be operable for this tank's associated piping. The concentrated boric acid storage tank boron concentration shall not exceed 8,500 ppm boron.

3.2.2 The Low Temperature Overpressure Protection System will require the following conditions:

3.2.2.1 LTOP will be manually enabled prior to the Reactor Coolant System temperature dropping below 350°F during plant cooldown.

3.2.2.2 All HPI Systems will be locked out whenever the RCS temperature is below 350°F. This shall be done by opening and tagging the circuit breakers for the four HPI Motor-Operated Valves (Loop A: SFV-23809, SFV-23811; and Loop B: HV-23801, SFV-23812) with the valves in the closed position.

3.2.2.3 The makeup tank water level is to be less than 86 inches.

3.2.2.4 The pressurizer water level will be maintained at or below 220 inches at system pressures above 100 psig and less than 275 inches for pressures less than or equal to 100 psig except during RCS filling and draining.

3.2.2.5 The core flood tank discharge valves are closed and the circuit breakers for the motor operators are racked out before the RCS pressure is decreased to 600 psig.

3.2.2.6 When LTOP is required, only one HPI pump will be operated except during the transition of pumps that will supply Reactor Coolant Pump seals and makeup flow for the RCS.

storage tank during critical operations. The minimum volume for the borated water storage tank (390,000 gallons of 1800 ppm boron), as specified in section 3.3, is based on refueling volume requirements and easily satisfies the cold shutdown requirement. The specification assures that the two supplies are available whenever the reactor is critical so that a single failure will not prevent boration to a cold condition. The minimum volumes of boric acid solution given include the boron necessary to account for xenon decay.

The quickest method allows for the necessary boron addition in less than one hour. The primary method of adding boron to the primary system is to pump the concentrated boric acid solution (7100 ppm boron, minimum) into the makeup tank using the 50 gpm boric acid pumps. Using only one of the two boric acid pumps, the required volume of boric acid can be injected in less than 3.5 hours. The alternate method of addition is to inject boric acid from the borated water storage tank using the high pressure injection pumps.

Concentration of boron in the concentrated boric acid storage tank may be higher than the concentration which would crystallize at ambient conditions. For this reason and to ensure that a flow of boric acid is available when needed, this tank and its associated piping will be kept above 70F (30F above the crystallization temperature for the concentration present). Once in the high pressure injection system, the concentrate is sufficiently well mixed and diluted so that normal system temperatures ensure boric acid solubility. The value of 70F is significantly above the crystallization temperature for a solution containing 12,200 ppm boron.

The Low Temperature Overpressure Protection System (LTOP) consists of both an active and a passive subsystem. The active subsystem utilizes the ElectroMatic Operated Valve (EMOV) which provides overpressure protection during normal plant operation. The EMOV actuation circuitry has been modified to provide a second setpoint (500 psig) that is used during low-temperature operations. The low setpoint is manually enabled at 350°F by positioning a key-operated switch in the Reactor Control Room. An alarm will sound in the Reactor Control Room if the reactor coolant pressure falls below 450 psig and the key-operated switch is not selected for low-temperature operation. After selection of low temperature operation, additional alarms will occur if either HPI pump breaker is not racked out; if either Seal Injection flow is greater than 42 gpm or makeup flow is greater than 135 gpm; if HPI valves are not closed; and if the EMOV block valve HV-21505 is not open. The passive subsystem is based on the plant design and operating philosophy that precludes the plant from being in a water solid condition (except for system hydrotests). The Rancho Seco Reactor Coolant System always operates with a steam or gas space in the pressurizer; the steam bubble is replaced with nitrogen during plant cooldown when system pressure is reduced. The requirements for a maximum pressurizer level provides for a sufficient vapor space in the pressurizer to retard the rate of increase of RCS pressure, as compared to a water solid system for all mass and heat input transients. In this manner, the operator will have time to recognize that a pressure transient is in progress and take action to mitigate the incident. For these reasons the pressurizer water level will be maintained at or below 220 inches

at system pressures above 100 psig and less than 275 inches for system pressures less than or equal to 100 psig. The only exception to these requirements will be when the RCS is being filled or drained. During the filling process the pressurizer is filled with water up to the 320 inch level. The High Point Vents are opened and nitrogen is injected into the pressurizer hence forcing the coolant into the loops. Subsequently, the High Point Vents are closed, a steam bubble is drawn and the nitrogen is released through the pressurizer vents. During the draining process, the pressurizer is depressurized, the High Point Vents and RCS Hot Leg Vents are opened thus reducing the RCS to atmospheric pressure. The loop coolant level and pressurizer level equalize at 320 inches and draining can then take place.

In conjunction with the enablement of LTOP at 350°F and the subsequent restriction on pressurizer level, analysis has shown that the HPI system is not needed when RCS temperature falls below 350°F. The requirement for a maximum makeup tank level limits the mass input available from the tank should the makeup valve fail open.

When LTOP conditions are required, only one of the two HPI pumps or the makeup pump will be allowed to operate Rancho Seco normally operates with the makeup pump supplying makeup and seal injection. Should, in the unlikely event, degradation of this pump occur while in the LTOP mode, it would be necessary to start one of the HPI pumps before stopping the makeup pump. This scenario would result in a brief overlap time period where an increase in flow through the makeup line would occur. However, because the operator is aware of the LTOP conditions, it is expected that this brief transition stage would not significantly increase the level of the pressurizer and the probability of an over-pressurization incident.

Separate power supplies are provided for the EMOV circuitry and LTOP alarms which alert the operator of an overpressurization event so that a single power source failure will not disable the EMOV and LTOP alarms. This assumes the operator is alerted so he can take action to terminate an event even if the EMOV is disabled. These alarms are high pressurizer level, high - high pressurizer level, and high makeup tank water level.

REFERENCES

1 FSAR subsections 9.2 and 9.3.

2 FSAR Figure 6.2-1.

3 Technical Specification 3.3.

TABLE 4.1-2

MINIMUM EQUIPMENT TEST FREQUENCY

Item	Test	
1. Control rods	Rod drop times of all full length rods	Each refueling shutdown
2. Control rod movement	Movement of each rod	Every two weeks
3. Pressurizer code safety valves	Setpoint	1 each refueling interval
4. Main steam safety valves	Setpoint	2 per steam generator each refueling interval
5. Refueling system interlocks	Functional	Each refueling interval prior to handling fuel.
6. Turbine steam stop valves	Movement of each valve	Monthly
7. Reactor coolant system	Leakage	Calculated inventory weekly Leakage check daily.
8. Charcoal and high efficiency filters	Charcoal and HEPA filter for iodine and particulate removal efficiencies. DOP test on HEPA filters. Freon test on charcoal filter units.	Each refueling interval and at any time work on filters could alter their integrity.
9. Fire pumps and power supplies	Functional	Monthly
10. Reactor Building isolation trip	Functional	Each refueling interval
11. Spent fuel cooling system	Functional	Each refueling interval prior to fuel handling
12. Turbine Overspeed Trips	Calibration	Each refueling interval

TABLE 4.1-2
MINIMUM EQUIPMENT TEST FREQUENCY

Item	Test	
13. Internals Vent Valves	Manual actuation,[1] remote visual inspection,[2] verify valve not stuck open	Each refueling interval
14. Reserved for Proposed Amendment 83, Supplement 2, Revision 2		
15. Low Temperature Overpressure Protection (EMOV)	Functional [3]	Prior to less than 350°F

1. Verifying through manual actuation that the valve is fully open with a force of $\leq$ 400 lbs. (applied vertically upward).

2. Check visually accessible surfaces to evaluate observed surface irregularities.

3. EMOV block valve closed during test.

TABLE 4.1-1 (Continued)
INSTRUMENT SURVEILLANCE REQUIREMENTS

	Channel Description	Check	Test	Calibrate	Remarks
57.	Voltage Protection	S(1)	M	R	(1) Compare voltmeter readings
	a. Undervoltage		M	R	
	b. Overvoltage		M	R	
	c. Time Delay				
58.	Reserved for Proposed Amendment 83, Supplement 2, Revision 2				
59.	Reserved for Proposed Amendment 83, Supplement 2, Revision 2				
60.	Reserved for Proposed Amendment 83, Supplement 2, Revision 2				
61.	Reserved for Proposed Amendment 83, Supplement 2, Revision 2				
62.	Reserved for Proposed Amendment 83, Supplement 2, Revision 2				
63.	Low Temperature Over-pressure Protection (EMOV)	N/A	(2)	R	(2) Prior to cooldown

S = Each shift
D = Daily
W = Weekly
M = Monthly
Q = Quarterly
SY = Semiannual
P = Prior to each startup if not done previous week
R = Once during the refueling interval

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SACRAMENTO MUNICIPAL UTILITY DISTRICT

ENGINEERING CHANGE NOTICE

ECN NO. A-4887 Rev. 2

Sheet 1 of 2

PREPARED BY J S B — S. Bagga 8/1/84 (DATE) — HIGHEST QA CLASS: 1

D. M. Prosch 8/1/84 — COGNIZANT ENGINEER — DATE

R. Fraser — NUCLEAR OPERATIONS DESIGNATED ENGINEER — DATE

WORK ORDER NO.: 104363 — NCR NO.: N/A

TYPE OF ECN: SINGULAR ☒ MAJOR ☐ SUB ☐

☐ THE FOLLOWING SYSTEM(S) WILL BE AFFECTED BY THIS CHANGE
Reactor Coolant System (RCS)
Make-Up and Purification System (MPS)
Low Temperature Overpressure Protection System (LTOP)

☐ REASON FOR CHANGE
NRC letter dated 11/2/77, Docket 50-312
IE Information Notice No. 82-45 dated 11/19/82

Mod 049

☐ DESCRIPTION OF THIS CHANGE

PROVIDE A DETAILED DESCRIPTION AND ITS EFFECT ON PLANT OPERATION. INCLUDE SKETCHES AND OTHER PERTINENT INFORMATION TO COMPLETELY DESCRIBE AND ILLUSTRATE HOW CHANGE IS TO FUNCTION AS WELL AS ILLUSTRATE INTERFACE(S) WITH EXISTING EQUIPMENT. INDICATE WHAT NEW COMPONENT(S) ARE REQUIRED. DRAWINGS AFFECTED AND ESTIMATED TOTAL COST OF PROJECT.

The system required to be installed under this ECN is for protecting the Reactor Vessel from overpressurization at low temperature of RCS. A portion of this system has been installed under ECN A-3652A, B, and G; A-4329; and A-4792 to provide desired function and protection at low temperature of RCS. The remaining work will be accomplished during 1985 and 1986 refueling outages. The work that must be accomplished in 1985 is outlined below:

2

1. Provide an alarm from pressurizer relief block valve HV-21505 to alarm in the control room via IDADS computer if the valve is closed and LTOP is selected. Install cable from HV-21505 to nearest channel B multiplexer.

2. Provide an alarm from HPI pump circuit breakers S4A04 and S4B07 if either breaker is not racked out of its cell, when LTOP has been selected at H1RC. Install cable from S4A04 to H4CDAR3 and from S4B07 to H4CDAR5.

3. Provide an alarm in the control room via IDADS computer from HPI to RCS loop 'B' valve HV-23801 if the valve is open and LTOP is selected. Install cable from H2SFB (valve HV-23801) to channel B multiplexer H4CDAR5. 9. D.M.P.

2

4. Program the IDADS computer to provide alarms as shown on sheet 2 of 2 of this ECN - LTOP LOGIC DIAGRAM.

2 Drawings affected: E-203, sheets 58D and 60C; E-700 series; E-337, sheet 15; E-1010 series; E-345, sheet 28; P&ID's; N25-01-27, 29 and 31

Total cost for 1984 outage: $30,000. D.M.P.

PLANT WORK HAS BEEN COMPLETED
ON JUN 01 1985
RANCHO SECO SITE DOCUMENT CONTROL

☐ COMMENTS (indicate by whom)

☐ Engineering & Quality Control Supervisor — DATE

10 CFR 50.59? Yes ☑ No ☐ If "Yes", Log No. 420 Rev 1

☐ Manager, Nuclear Operations — 8-2-84 — DATE

Nuclear Engineering Staff Approval is:	Design Basis Report (DBR) is:	MOD No.	Principal Project Engineer	Manager, Nuclear Engineering
Required ☐ Not Required ☒	Required ☒ Not Required ☐	049		

CLEAR ENGINEERING APPROVALS AS INDICATED BY ☑

Mechanical	Electrical	Civil	Nuclear	Instrumentation	Licensing
	J Sheehan for RED 8/9/84			8/8/84	

Change Disapproved by (See Comments)	Issued for Doc. Prep.	Issue for Work	Work Complete	Work Complete	Work Complete
		8/14/84			5-24-85
SSC	SSC	SSC	NUC. SP. SYS. ENGR.	START-UP ENGINEERING	COGNIZANT ENGINEER
DATE	DATE	DATE	DATE	DATE	DATE

SAF D 1449 x 84

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SACRAMENTO MUNICIPAL UTILITY DISTRICT ECN NO. A-4887 REV. 2 Page 2 of 2

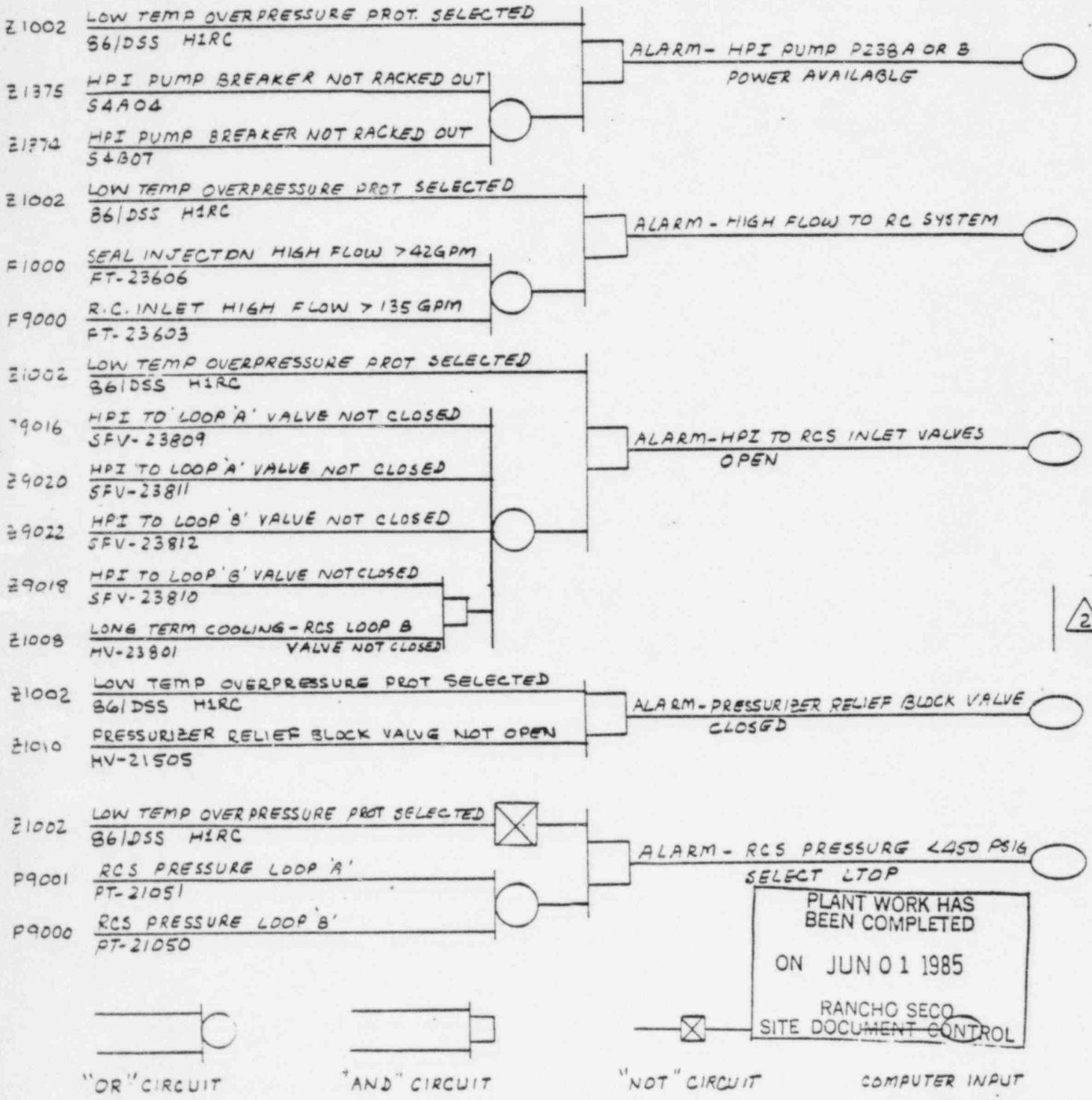
SUBJECT: LOW TEMPERATURE OVERPRESSURE PROTECTION (LTOP) COMPUTER ALARMS - LOGIC DIAGRAM

DATE: AUG 1, 1984

DEPT.: I & C

BY: J.S. BAGGA

REFERENCE: NRC LETTER DATED 11-2-77 DOCKET 50-312



PLANT WORK HAS BEEN COMPLETED
ON JUN 01 1985
RANCHO SECO
SITE DOCUMENT CONTROL

SMUD-0480 2/75

I No. 480

DESIGN BASIS REPORT

ECN A-4887 Rev. 2 NCR N/A WORK REQUEST

DISCIPLINE I&C MOD 049 DATE 8/8/84

I. PURPOSE OF DESIGN CHANGE:

The purpose of this design change is to provide a computer alarm via Interim Data Acquisition and Display System (IDADS) when the Reactor Coolant System (RCS) pressure (PT-21050 and PT-21051) gets below 450 psig if Low Temperature Overpressure Protection (LTOP) is not selected. This design change will correct the potential problem of a single power source failure disabling an overpressure protection system alarm. Additional computer alarms are provided via IDADS to preclude the possibility of overpressurizing the RCS when LTOP is selected. These additional alarms are pressurizer relief block valve (HV-21505) closed, High Pressure Injection (HPI) pumps (P-238A and P-238B) motor breakers not racked out, HPI to RCS inlet valves (SFV-23809, SFV-23810, SFV-23811, and SFV-23812) not closed, the long term cooling valve (HV-23801) not closed, and high flow (FT-23603 and FT-23606) to RCS.

These additional computer alarms require IDADS computer software programming.

II. DESIGN CRITERIA USED:

A. All circuitry and cable between the pressurizer relief block valve and multiplexer H4CDAR5 (channel B) shall be QA Class 1. | 1

B. All circuitry and cable between the HPI pump circuit breaker cells (in S4A04 and S4B07) and H4CDAR3 and H4CDAR5 shall be QA Class 1. | 2

C. All circuitry and cable for the long term cooling valve HV-23801 between H2SFB and H4CDAR9 (Channel B) shall be QA Class 1. | 3

D. The following codes and standards are applicable to this design change:

Sponsor	Number	Subject
ISA	S.5.1	Instrumentation Symbols and Identification
NEMA	WC3	Rubber Insulated Wire and Cable Transmission and Distribution of Electrical Energy (IPCEA-S-19-81)

E. Other Applicable Design Criteria:

1. Cable tray fill shall not exceed 40% by the addition of new cables to existing trays.

2. All exposed conduits for the power and control cables shall be rigid steel.

3. All new cables shall be identified with new scheme cable numbers.

4. Raceway, cable, and wire markers shall be of the same type as those orginally provided at Rancho Seco.

5. Existing conduits, terminal boxes, cable trays, etc., shall be used where possible.

III. CALCULATIONS AND DESIGN INFORMATION:

A. A currently spare limit switch contact #33-6 on pressurizer relief valve block valve HV-21505 shall be wired and connected to multiplexer H4CDAR5. The limit switch will be actuated (contact opens) when the HV-21505 valve starts to open. Shielded pair cable shall be used.

B. An alarm will occur in the control room via IDADS displays if the HV-21505 valve is closed when LTOP is selected at the H1RC console. IDADS programming and above wiring is required to be accomplished prior to startup of cycle 7.

C. Spare cell position switches for HPI pump circuit breakers S4A04 and S4B07 will be wired to H4CDAR3 and H4CDAR5 respectively. Shielded pair cable shall be used.

D. An alarm will occur in the control room via IDADS displays if breakers S4A04 and S4B07 are not racked out of their respective cells when LTOP is selected at the H1RC console. IDADS programming and above wiring is required to be accomplished prior to startup of cycle 7.

E. A limit switch contact #33-7 for valve HV-23801 at H2SFB (across red light) shall be wired to multiplexer H4CDAR9. The limit switch will be actuated (contact closes) when the HV-23801 valve starts to open. Shielded pair cable shall be used. (2)

F. An alarm will occur in the control room via IDADS displays if either of the HPI to RCS inlet valves SFV-23809, SFV-23811 and SFV-23812 are not closed when LTOP has been selected at the H1RC console. An alarm will occur in the control room via IDADS displays if both the long term cooling valve HV-23801 and SFV-23810 are not closed when LTOP has been selected at H1RC console. Necessary cabling and connections were made to SFV-23809, SFV-23810, SFV-23811, and SFV-23812 during the 1983 outage. IDADS programming as required has be completed prior to startup of cycle 7.

G. An alarm will occur in the control room via IDADS displays if either Seal Injection Flow exceeds 42 gpm or RCS Inlet Flow exceeds 135 gpm when LTOP has been selected at the H1RC console. Necessary cabling and connections were made to FT-23606 and FT-23603 respectively during the 1983 outage. IDADS programming is required to be completed prior to startup of cycle 7.

H. An alarm will occur in the control room via IDADS displays if either RCS pressure (PT-21050 or PT-21051) goes below 450 psig when LTOP has not been selected at the H1RC console. Necessary cabling and connections were completed during the 1983 outage. IDADS programming is required to be completed prior to startup of cycle 7.

I. Software logic for these alarms is per attached sheet.

IV. FAILURE MODE:

Failure of equipment installed by this design change will only affect alarms provided in the control room by this change. All previous alarms and status lights associated with LTOP will be available. The circuit (power supply) for status lights associated with valve HV-23801 is protected. Existing operating procedures are also backup to these alarms, since proper exercise of the operating procedures should alleviate the need for all the alarms. (2)

V. SPECIAL MAINTENANCE REQUIREMENTS:

N/A

VI. COMMENTS:

This design change meets the intent of NRC letter dated November 2, 1977.

VII. SPECIAL OPERATING REQUIREMENTS:

N/A

Cognizant Engineer D. M. Crook Date 8/8/84

Review Engineer J. Wilson Date 8/8/84

Nuclear Operations Designated Engineer R. Fraser Date 8/8/84

Licensing Engineer N/A Date

PLANT WORK HAS BEEN COMPLETED
ON JUN 01 1985
RANCHO SECO SITE DOCUMENT CONTROL

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SACRAMENTO MUNICIPAL UTILITY DISTRICT ECN NO. A-4887 Rev. 2 Page 4 of 5

SUBJECT: LOW TEMPERATURE OVERPRESSURE PROTECTION (LTOP) COMPUTER ALARMS - LOGIC DIAGRAM

DATE: AUG 8, 1984

DEPT. I E C

BY J.S. BAGGA

REFERENCE: NRC LETTER DATED 11-2-77 DOCKET 50-312