Consumers Power Company

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January 3, 1978

Director of Nuclear Reactor Regulation
Att: Mr Albert Schwencer, Chief
Operating Reactors Branch No 1
US Nuclear Regulatory Commission
Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 -
PALISADES PLANT - OVERPRESSURE
PROTECTION SYSTEM

Attached are proposed Technical Specifications changes relating to the Palisades Plant overpressure protection system. The purpose of these proposed changes are to meet requirements established by the NRC staff in their letter of July 18, 1977 which documented the review of plant specific reports concerning low-temperature reactor vessel overpressure protection systems.

The Palisades Plant specific analysis was submitted on June 24, 1977 and supplemented on November 28, 1977. Attachments 1 and 2 of this letter provide an update of the Palisades Plant "overpressure protection subsystem" and responses to the July 18, 1977 staff "positions."

David P. Hoffman

David P Hoffman
Assistant Nuclear Licensing Administrator

CC: JGKeppler, USNRC

CONSUMERS POWER COMPANY
Docket 50-255
Request for Change to the Technical Specifications
License DPR-20

For the reasons hereinafter set forth, it is requested that the Technical Specifications contained in Provisional Operating License DPR-20, Docket 50-255, issued to Consumers Power Company on October 16, 1972 for the Palisades Plant be changed as described in Section I below:

I. Changes

A. Add the following paragraph:

"3.1.1.i. During the cooldown of the primary coolant system, the cold leg temperature shall not be decreased below 225°F until the overpressure protection system is enabled for operation at the low set point of 400 psia. The overpressure protection system shall remain in the armed condition whenever the PCS cold leg temperature is below 225°F and the primary coolant system is not otherwise protected from overpressurization."

B. Add the following paragraph:

"3.1.1.h. During cooldown, at least one PCP must be in operation until there are equilibrium conditions ($T_{hot} \leq T_{cold} + 2°F$) in the PCS and the PCS is 180°F or less."

C. To the end of BASIS section of 3.1.1, add:

"The Palisades Plant overpressurization analysis(5) had identified design bases transients that must be protected against to assure that 10 CFR 50, Appendix G limits are not exceeded. Current control is accomplished by utilizing an overpressure protection system during particular PCS conditions.

(5)'Palisades Plant Overpressurization Analysis,' Energy Incorporated, June, 1977."

D. Add the following paragraph:

"3.3.3 Whenever the pressurizer pressure is below 1,400 psia, and the PCS is not otherwise protected from overpressurization, the control system fuses in their fuse holders for the HPSI pumps (P66A, P66B and P66C) are to be removed from the circuit."

E. Add to Table 4.1.3:

"TABLE 4.1.3

Channel Description	Surveillance Function	Frequency	Surveillance Method
15. PCS Overpressure Protection System	A. Test	R	A. Introduce simulate signal levels sufficient for system operations. Observe solenoid actuation.
	B. Calibrate	R	B.
	(1) Temperature		(1) Apply known resistances for temperature devices.
	(2) Pressure		(2) Apply known pressures."

II. Discussion

The above Technical Specifications changes are being proposed to complete requirements identified by the staff in their review of the plant specific reports concerning low-temperature reactor vessel overpressure protection systems.

III. Conclusion

Based on the foregoing, both the Palisades Plant Review Committee and the Safety and Audit Review Board have reviewed these proposed Technical Specifications changes and recommend their approval.

CONSUMERS POWER COMPANY

By C R Bilby
C R Bilby, Vice President
Production & Transmission

Sworn and subscribed to before me this 3rd day of January 1978.

Linda R Thayer
Linda R Thayer, Notary Public
Jackson County, Michigan
My commission expires July 9, 1979.

ATTACHMENT 1

PALISADES PLANT
PRIMARY COOLANT SYSTEM
OVERPRESSURIZATION SUBSYSTEM DESCRIPTION

PREPARED BY
ENERGY INCORPORATED
NOVEMBER 1977

FOR
CONSUMERS POWER COMPANY

PALISADES PLANT PRIMARY COOLANT SYSTEM OVERPRESSURIZATION PROTECTION SUBSYSTEM

Purpose

The Primary Coolant System Overpressurization Subsystem is designed to provide automatic pressure relief of the primary coolant system whenever the conditions of low temperature (250°F or lower) and high pressure (400 psia or higher) exist concurrently.

General

Two redundant and separate overpressurization protection channels are provided. A channel includes a power operated pressure relief valve (PORV), a temperature loop, a pressure loop, a control switch and indicator lights. The channels are identified as channel "A" and channel "B". Figure 1 is a logic diagram for channel "A".

Pressure relief for the primary coolant system is accomplished by the automatic opening of power operated relief valves (PORV) PRV-1042B and/or PRV-1043B. The automatic opening will occur when the primary system temperature is less than 250°F and the pressure is equal to (or greater than) 400 psia.

Two redundant and separate pressure and temperature control loops will be utilized.

Each control loop will be powered from a separate power source. Channel separation will be provided either by distance or physical barriers separating wire and equipment.

Three annunciators are provided and are labeled:

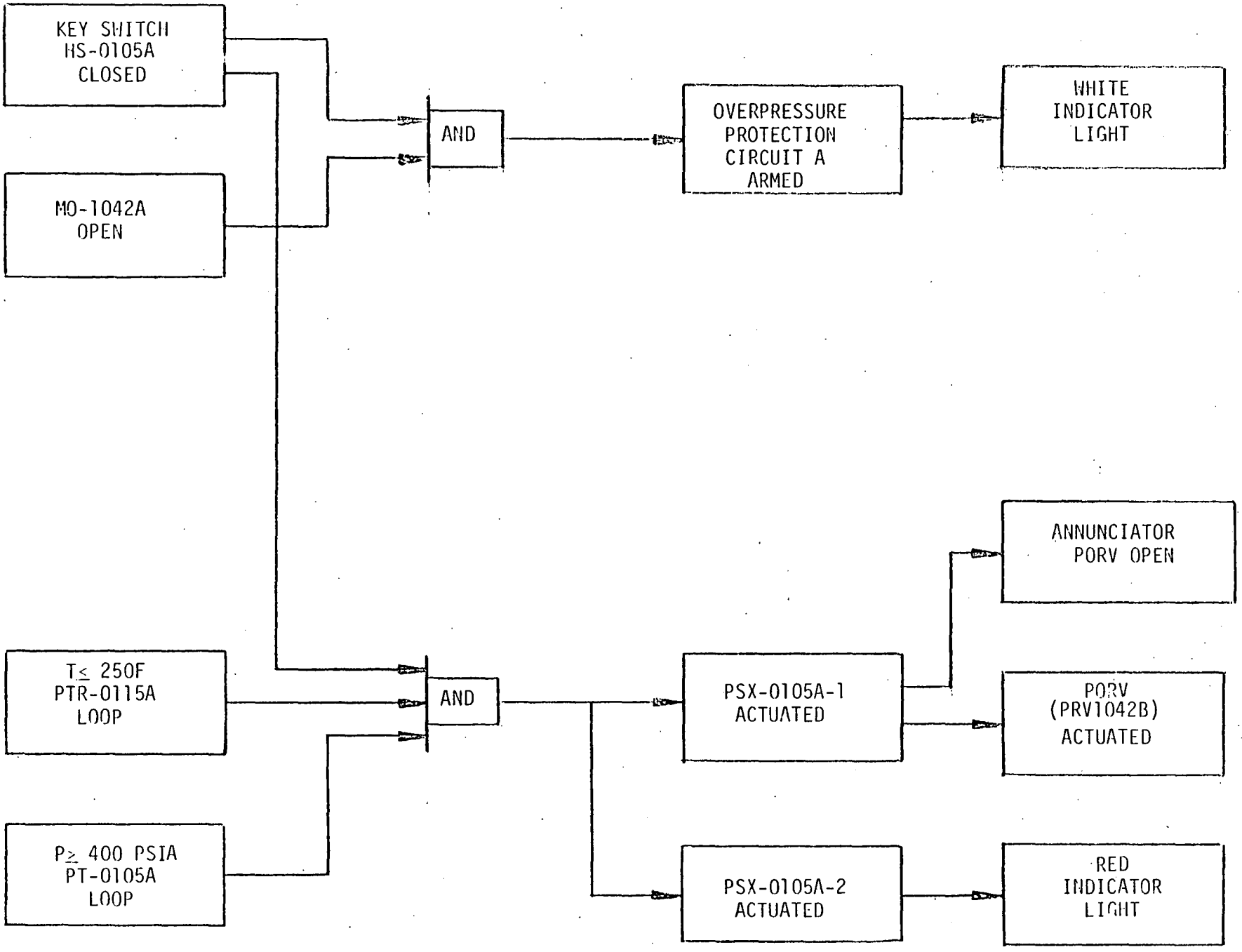

KEY SWITCH
HS-0105A
CLOSED
MO-1042A
OPEN
AND
OVERPRESSURE
PROTECTION
CIRCUIT A
ARMED
WHITE
INDICATOR
LIGHT
T≤ 250F
PTR-0115A
LOOP
P≥ 400 PSIA
PT-0105A
LOOP
AND
PSX-0105A-1
ACTUATED
PSX-0105A-2
ACTUATED
ANNUNCIATOR
PORV OPEN
PORV
(PRV1042B)
ACTUATED
RED
INDICATOR
LIGHT

FIGURE -1

(1) "NO PCS PROTECTION"

(2) "PCS PRESSURE 375 PSIA"

(3) "PORV OPEN"

The first annunciator will advise the operator to arm the system (if it has not already been done) when the primary coolant system (PCS) decreases to a temperature of 300°F as the system is cooled down from an operating condition. Figure 2 is a logic diagram for the "No PCS Protection" annunciator.

The second annunciator advises the operator of an approaching high pressure condition whenever the PCS is in a water solid condition.

The third annunciator advises the operator that the pressure has increased to 400 psia and the PORV's have been opened.

A key lock switch is provided for arming each channel. Indicator lights on the control panel light to inform the operator that (1) the isolation valves are open, (2) the overpressurization system is armed and (3) the overpressurization system has been activited.

Figure 3 shows the arrangement of controls and indicator lights.

Detailed Description

Figures 4a and 4b show the schematic diagrams for actuation of pressure relief channel "A". Pressure relief channel "B" will be identical. The operation of channel "A" is described in detail below (refer to Figures 4a and 4b).

To provide PCS pressure relief, both the isolation valve MO-1042A and PORV PRV-1042B must be open. MO-1042A is opened by using the existing control switches located on control panel section C-02. When MO-1042A

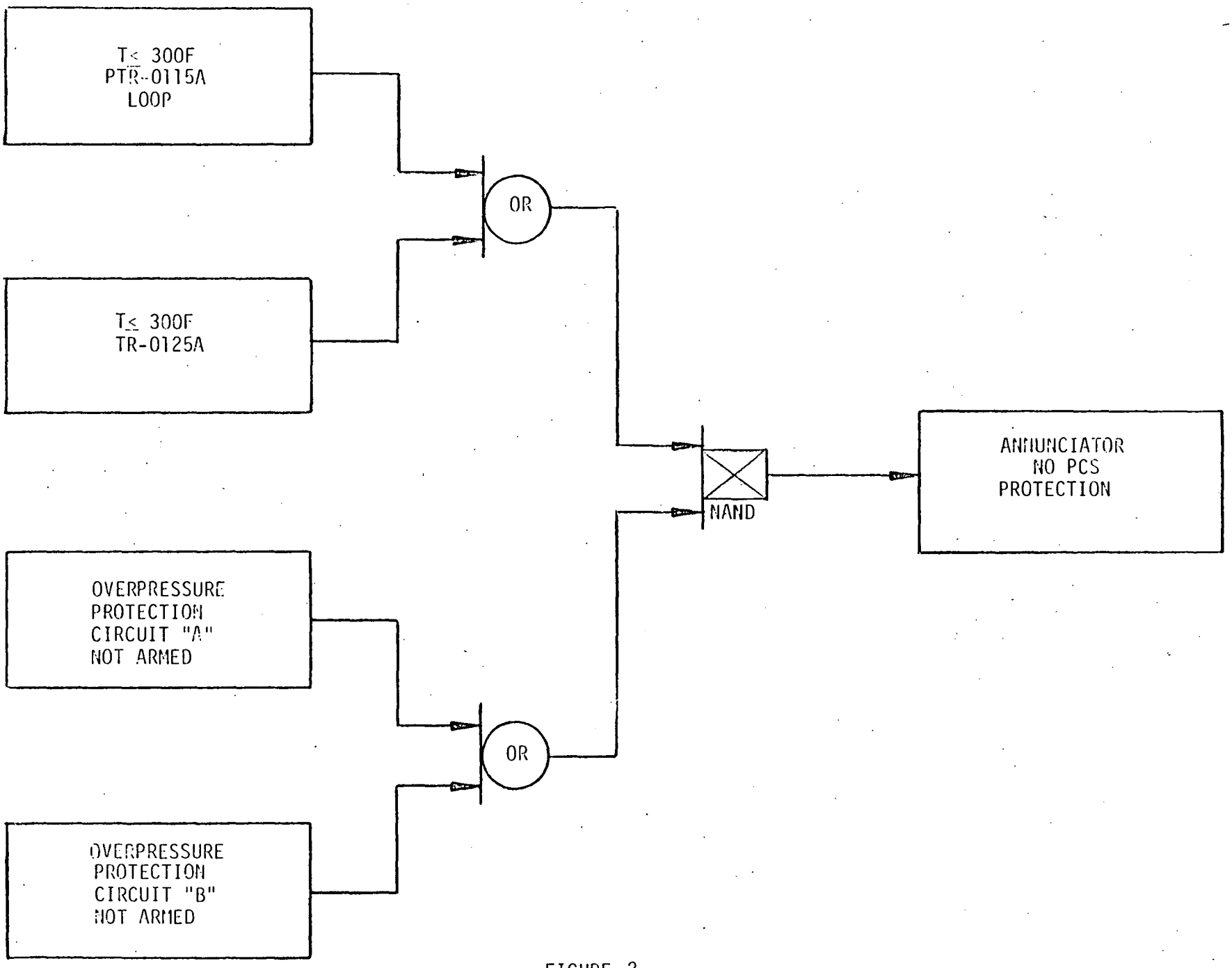
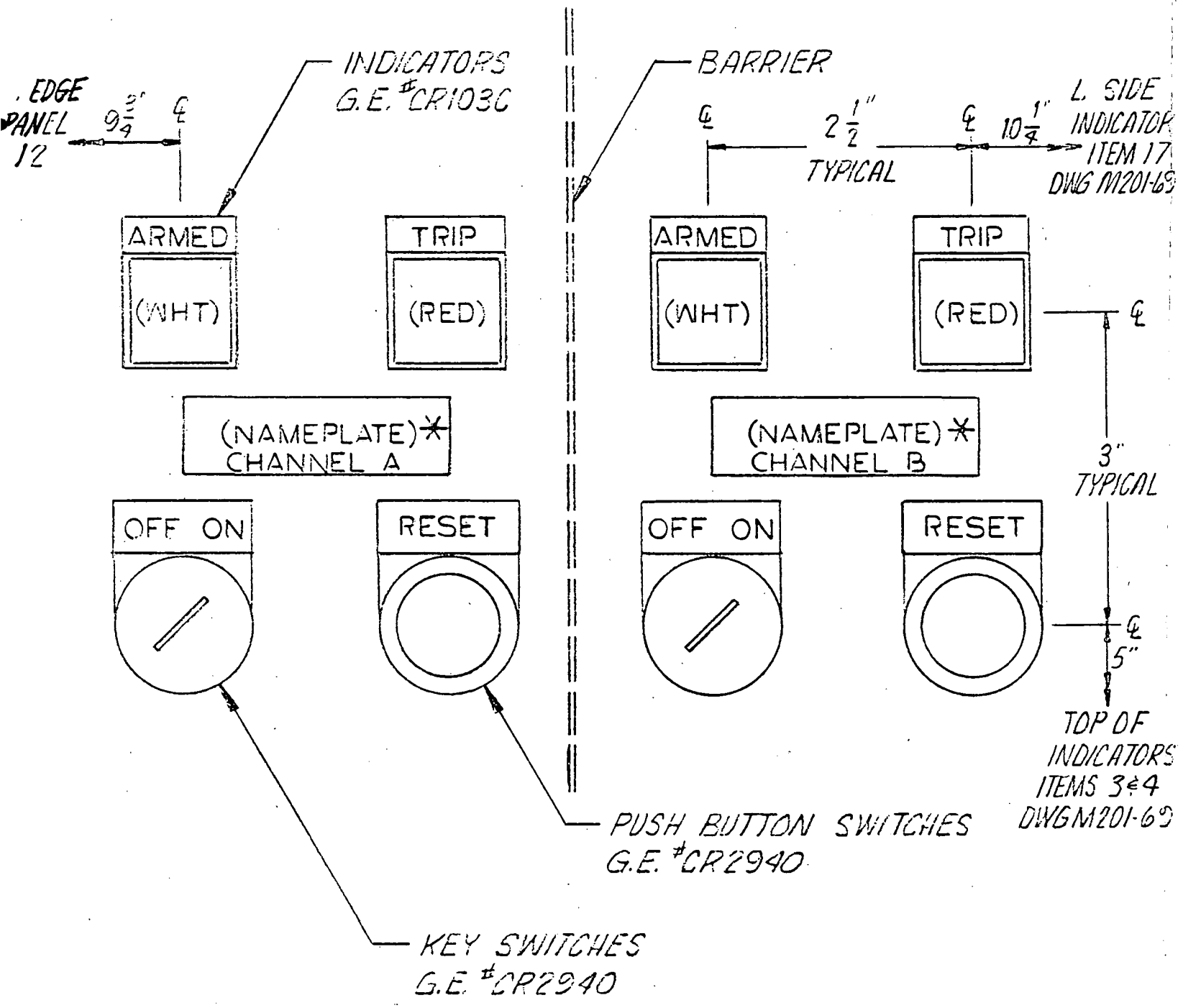
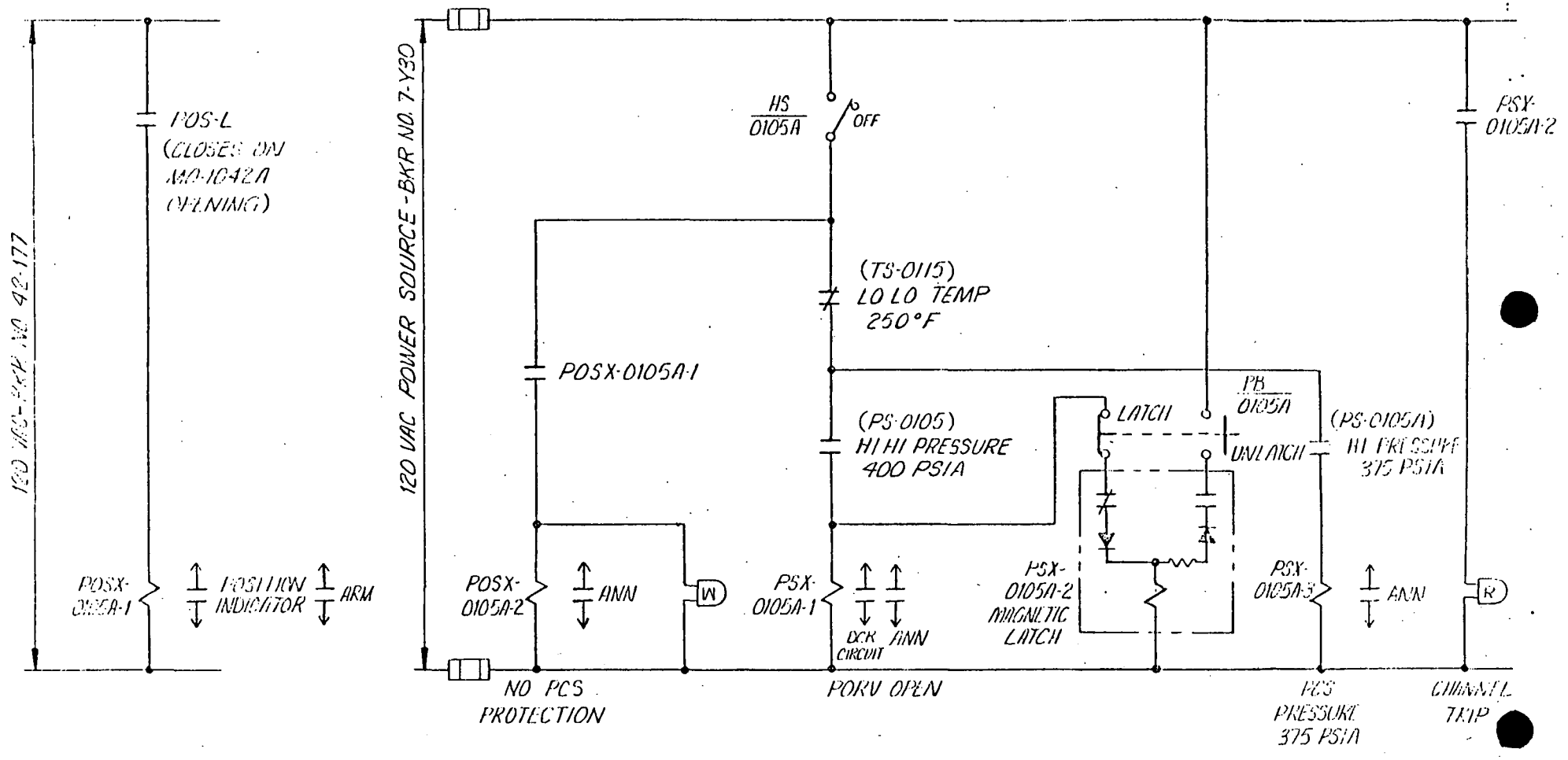

T≤ 300F
PTR-0115A
LOOP
T≤ 300F
TR-0125A
OR
OVERPRESSURE
PROTECTION
CIRCUIT "A"
NOT ARMED
OVERPRESSURE
PROTECTION
CIRCUIT "B"
NOT ARMED
OR
NAND
ANNUNCIATOR
NO PCS
PROTECTION

FIGURE 2



* PRIMARY COOLANT SYSTEM OVERPRESSURE PROTECTION

FIGURE 3



VALVE	RELAY	BKR NO.	SCHEME NO.	DWG NO.	
SV-1042A	POSX 0105A1	42-177	B177	E-242 SH 4	CHANNEL A
MO-1043A	POSX 0105B1	42-281	B281	E-242 SH 4	CHANNEL B

VALVE	RELAY	BKR NO	SCHEME NO.	DWG NO	AFW SWITCH	RCS/T SWITCH
SV-1042B	POSX-0105A-2, PSX-0105A-1,2,3	7-Y30	S-43	E-256 SH 2	HS-0105A	PB-0105A
SV-1043B	POSX-0105B-2, PSX-0105B-1,2,3	7-Y40	S-44	E-256 SH 2	HS-0105B	PB-0105B

FIGURE 4a

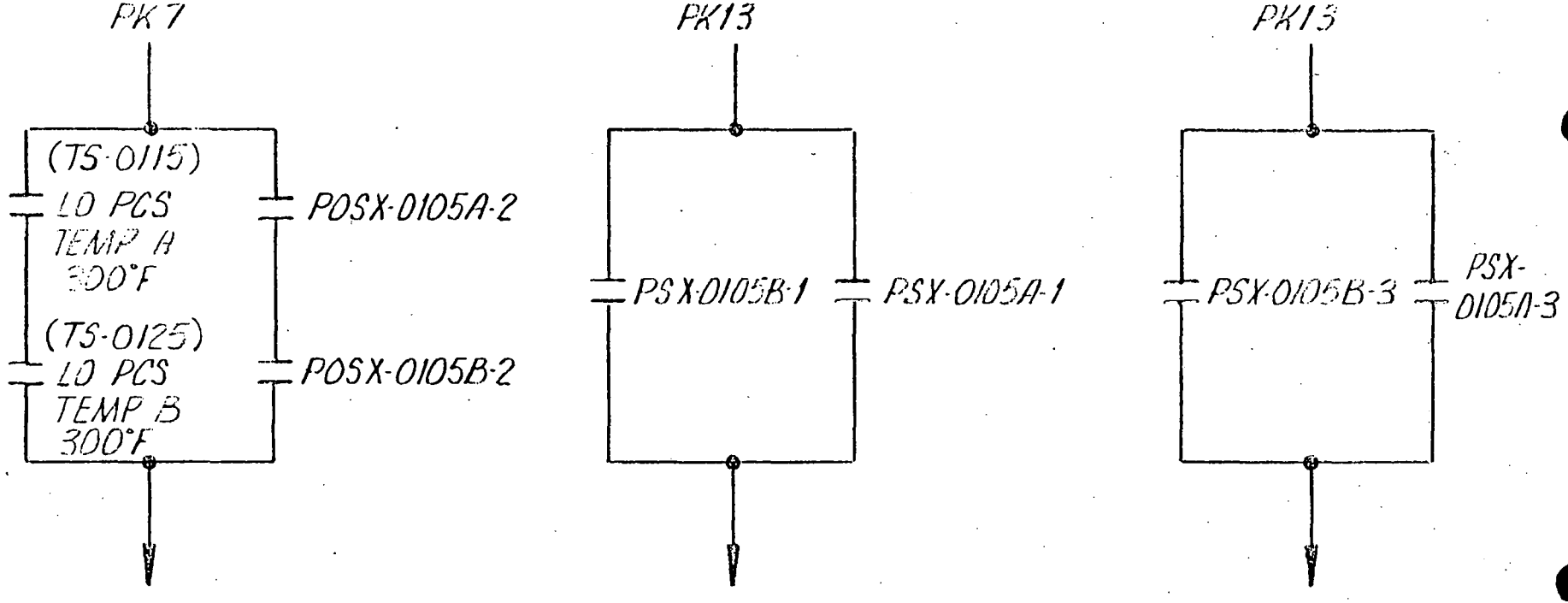

PK 7
(TS-0115)
LO PCS
TEMP A
300°F
(TS-0125)
LO PCS
TEMP B
300°F
POSX-0105A-2
POSX-0105B-2
ANN-K07-59
NO PCS
PROTECTION
(ACTUATED ON
CONTACT OPENING)
PK13
PSX-0105B-1
PSX-0105A-1
ANN-K13-73
PORV
OPEN
(ACTUATED ON
CONTACT CLOSURE)
PK13
PSX-0105B-3
PSX-
0105A-3
ANN-K-13-74
PCS PRESSURE
375 PSIA
(ACTUATED ON
CONTACT CLOSURE)

FIGURE 46

is open, contact POS-L closes actuating relay POSX-0105A-1. One contact of POSX-0105A-1 actuates a position indication light on panel C-02. The other contact of POSX-0105A-1 is in the channel "A" "Armed" circuit.

The Over Pressure Protection System channel "A" is in an "Armed" condition if key lock switch HS-0105A is closed and the POSX-0105A-1 armed contact is closed (the POSX-0105A-1 armed contact will close when MO-1042A is open). When channel "A" is "Armed", a white light on panel C-12 will be illuminated and automatic opening of PRV-1042B will result upon low-low primary coolant temperature (250°F) and high-high pressure (400 psia).

During system shutdown the pressure and temperature will be decreased. When the temperature in loop 1A decreases to 250°F (as sensed by TS-0115), the LOW PCS TEMP-A contact opens and provides an annunciation unless both pressure relief channels A and B are armed. If both channels A and B are armed, contacts POSX-0105A-2 and POSX-0105B-2 will be closed and the annunciator is not received.

When the PCS temperature is at 250°F or below the LOW PCS TEMP-A contact (TS-0115) is closed, and if the PCS pressure rises to 375 psia (as sensed by PT-0105A), a high pressure contact (PS-0105A) will close actuating relay PSX-0105A-3 and an annunciator, alerting the operator of approaching high PCS pressure, will be received. If the pressure continues to rise and reaches a value of 400 psia, the high-high pressure contact will close actuating relays PSX-0105A-1 and PSX-0105A-2. A contact of PSX-0105A-1 closes to actuate SV-1042B which operates PRV-1042B. A second contact of PSX-1015A-1 closes to actuate the annunciator "PORV OPEN".

A contact of PSX-0105A-2 closes to actuate a red light on panel C-12. This light will remain illuminated until it is reset by operator initiation of PB/0105A.

Equipment

Two new pressure transmitters (Rosemount Model 1151) will be installed for the pressure control loop. Radiation levels have been established for the installed locations which are below the rated capabilities of the transmitters.

Existing temperature control loops will be utilized. Rochester Instrument System Model ET-215 solid state electronic alarm modules will be installed to provide the contact closures required for actuation of the overpressurization system relays.

The relays to be used are Allen-Bradley series 700 AC control relays.

ATTACHMENT 2

The July 18, 1977 NRC letter contained the eight staff positions. Consumers Power has addressed these items previously in the submittal of the Palisades Plant specific report and supplements. To consolidate our position, the following responses are provided:

1. ΔT Across Steam Generator: A number of licensees are assuming a maximum ΔT across the steam generator in their analyses of energy addition transients. However, the licensees are not specifying how they will limit the ΔT nor how they will monitor the ΔT.

   Staff Position: Certain energy addition scenarios may be eliminated by administrative methods. The methods for maintaining less than a specified ΔT across the steam generator should be clearly spelled out as well as the means of monitoring this maximum ΔT.

   Response

   The worst case PCS overpressure event as revealed by the specific plant analysis is the start of a primary coolant pump with a ΔT of 70°F. This ΔT of 70°F is the temperature differential that could exist between the steam generator in total and the rest of the primary system after the primary coolant pumps have been shut down and shutdown cooling has reduced the rest of the primary system to 120°F.

   The plant operating procedures dictate that the last primary coolant pump shall not be shut down until the PCS has reached a temperature of 160°F to 180°F. Since the secondary side of the steam generator is vented to the condenser and its physical construction is designed expressly to transfer heat across the primary to secondary interface, the water on both sides of the unit will assume the same temperature. Furthermore, an analysis, by energy incorporated concerning the residual heat in the steam generator for extremely conservative conditions, shows the temperature of the water on the primary side will rise only 2°F after the PCP has been shut down three hours.

   Therefore, present temperature monitoring instrumentation is adequate to determine the temperature of the steam generator when the last primary coolant pump is shut down and the physical characteristics of the unit will ensure that its temperature does not increase with time. The temperature differential that must be considered is then that which exists in the PCS when the last primary coolant pump is shut down and that which exists when shutdown cooling is secured. Worse Case is 180°F - 120°F = 60°F. The specific plant analysis considered a ΔT = 70°F and determined that one PORV was capable of mitigating this event. This analysis leads us to the conclusion that temperature monitoring of secondary side of the steam generator is of no value and will not be implemented. Proposed Technical Specification 3.1.1.h. supports our conclusions.

2. Isolation Valve Alarm: The upstream isolation valve from the PORVs must be open for the overpressure protection system to properly function. Some means should be provided to insure proper alignment of the isolation valve during overpressure protection system operation.

   Staff Position: The position of the upstream isolation valve should be wired into the overpressure protection alarm so that the alarm will not clear unless the system is enabled and the isolation valve is open.

   Response

   The overpressure protection system is designed to ensure that the isolation valves MO-1042A and MO-1043A must be open to allow the arming of the system. If, in fact, they are not opened, the "armed" indicating light will not illuminate when the keylock switch is turned to the "on" position and the annunciator window "no PCS protection" will alarm when the PCS temperature decreases below 300°F.

3. PORV Train Separability: A number of licensees have designed systems with one set point switch and one hi/low reset switch for both PORVs.

   Staff Position: In order to assure redundancy of the PORVs, each should have an independent keylock enable/disable switch and a hi/low reset switch or similar arrangement. Additionally, the PORVs should be connected to separate vital buses or power supplies.

   Response

   The overpressure protection system has two independent and redundant channels "A" and "B," each with its own keylock arming switch and alarm reset push button. Also, each channel derives its power from separate vital power buses. Channel "A" is connected through fuses to bus Y30 breaker #7 and channel "B" is connected through fuses to bus Y to breaker #7.

4. Circuit Diagrams: Licensees have not been submitting detailed circuit diagrams with their plant specific reports.

   Staff Position: Licensees should submit a detailed diagram of the overpressure protection circuitry with their plant specific reports for review by NRC.

   Response

   Detailed diagrams, schematics, and system operating description are included in the report "Palisades Plant Primary Coolant System Overpressurization Subsystem Description" and the construction package. This information is an attachment to this letter.

5. PORV Valve Cycling: Cycling of PORVs has not been addressed in the Combustion Engineering generic or plant specific reports.

   Staff Position: The results of your transient pressure analysis should be extended beyond the first pressure cycle. The capabilities of the PORVs with regard to pressure cycling should be discussed in detail. If the valves do not cycle, the consequences of pressure undershoot and its effect on reactor coolant pumps should be discussed.

   Response

   The PCS overpressure protection system is designed to open the PORVs, PRV-1042B and PRV-1043B, whenever the PCS temperature is less than 250°F and the pressure exceeds 400 psia. Further, the valves will close when the PCS pressure decreases to 400 psia. This circuit configuration will produce valve cycling with a cycle time of 31 seconds and will result in approximately 20 valve opening-closing cycles before credit can be taken for operator action at the 10-minute mark. This cycle time can be increased to 80 seconds or approximately 7 cycles if the circuit dead band is increased to allow the PCS pressure to sag to 200 psia. A PCS pressure of 200 psia is considered the lowest pressure level that can be tolerated before appreciable primary coolant pump seal degradation will be experienced.

   Considered opinion is that 20 valve cycles will not be any more damaging to the valve than 7 cycles, simply because if damage to the valve occurs it will take place in the first few cycles of operation. Any foreign material in the system in the vicinity of the valve will pass over its seat in the initial operation of the valve. The valve testing program should reveal the degradation effects, if any, that cycling will have on the valve.

6. IEEE 279 and Seismic Criteria: IEEE 279 and Seismic Criteria should be considered in the design of the overpressure protection system. Deviations from these standards should be clearly described and detailed justification should be provided.

   Response

   The PCS overpressure protection system design in regard to IEEE 279 and Seismic Criteria has been clearly addressed in the plant specific analysis. This system has been designed to comply with the requirements of the original plant design under which it was licensed to operate. There is no single failure of a component or system or single event that has been identified in our analysis as capable of both causing an overpressure event and defeating the protection afforded against such events.

7. Testability: The program for testing the PORVs for low pressure protection system operability is not addressed in the plant specific reports.

   Staff Position: The control circuitry from pressure sensor to valve solenoid should be tested prior to each heatup or cooldown. The PORVs should be stroked during each refueling. Deviations from this criterion should be justified.

   Response

   The location of the valve and its solenoid in addition to its physical construction/operation makes testing the PCS overpressure protection system during operation prior to cooldown not possible. The electrical portion of the system will be tested and calibrated during each refueling outage. And since the valve itself is pilot-operated, it cannot be stroked without a pressure differential existing across it. Therefore, the valve testing and frequency will be in compliance with the applicable requirements of ASME Code Section XI, Subsection IWV, and addressed in the Palisades Plant Inservice Inspection Program.

8. Technical Specifications: The overpressure protection system is not being designed to mitigate the consequences of certain scenarios. This may be acceptable if the scenario is made extremely improbable by appropriate administrative measures. However, these administrative procedures have not been discussed in the reports reviewed thus far.

   Staff Position: If a scenario is to be administratively eliminated or mitigated, the actions required to change the scenario should be placed in the Technical Specifications. A draft of the Technical Specifications should be provided with the plant specific report or soon after it is submitted. Some items which should probably be included in the Technical Specifications are:

   a. Enabling/disabling the Overpressure Protective System.
   b. Maintaining maximum ΔT across the steam generator.
   c. Disabling pumps, accumulators, heaters.
   d. Testing PORV and control circuitry.
   e. Testing ECCS with head off.

   Response

   Proposed Technical Specifications changes are attached which address the staff position.