NRC Resolution of Facility Comment

Facility Comment on Q57

The question asks the applicant to determine the status of pressurizer heaters based on plant conditions. The terminology used in the distractors is "ON" and "OFF"; this is unclear because "ON" and "OFF" are control switch positions, whether or not heaters are "ENERGIZED" or "DEENERGIZED" depends both on switch position and, for proportional heaters, on whether or not the master pressure controller is providing a demand. Accordingly, two correct answers 'B" and "C" should be accepted.

NRC Resolution:

Facility comment accepted, two correct answers accepted. Five applicants missed the question. The examiner reviewed documentation provided by the facility, exam bank questions for this system, and the system lesson plan. All use the "energized" or "deenergized" terminology to describe whether or not the heaters are powered, and "ON" or "OFF" for breaker position.

Question 57

Recommendation: The facility recommends accepting two correct answers for question # 57 (B and C).

Reason: Terminology in the question created a misunderstanding of the status of the "Pressurizer Heaters Control Group."

57. The plant was at 100% power when a load rejection occurred. Current conditions:

- Rx Power is 71% and stable
- Tavg is 565 and stable
- RCS \pressure is 2250 psig and stable
- All PRZR heaters are in AUTO
- 2RCS-PK444A, PRZR Press Control is in AUTO at 42% output
- 8% PRZR level insurge has occurred
- NO operator actions have occurred.

What is the current status of the pressurizer heaters?

A. All heaters are OFF.

B. All heaters are ON.

C. Only Backup heaters are ON.

D. Only Proportional heaters are ON.

The intent of the question was to test the students' knowledge of whether the pressurizer heaters were energized or off based on a specific set of plant conditions. Using the terminology of ON (vs energized) created a second correct answer due to the normal system alignment (NSA) and terminology used at BVPS.

The Proportional heaters (also called "Control Group C" heaters) operate differently than the Backup heaters. The supply breaker for the Proportional heaters is NSA ON (breaker CLOSED, benchboard red light illuminated) with the heater output based on the status of 2RCS-PK444, PRZR Pressure master pressure controller. Therefore, the Proportional heaters are ON, but can be energized OR deenergized based on 2RCS-PK444 output. The Backup heaters, on the other hand, are energized when their supply breaker is CLOSED, and deenergized when their supply breaker is OPEN (ON and energized, or OFF and deenergized).

The normal switch position of the Proportional heaters is After-ON (see attached 2OM-6.3.C "Power Supply and Control Switch List"). In this condition, the benchboard red light is illuminated (see attached image).

The Proportional heaters are referred to in plant procedures as "ON" when the control switch is in the After-ON position (see attached 2OM-6.1.D). They will be energized or deenergized based on the output of 2RCS-PK444.

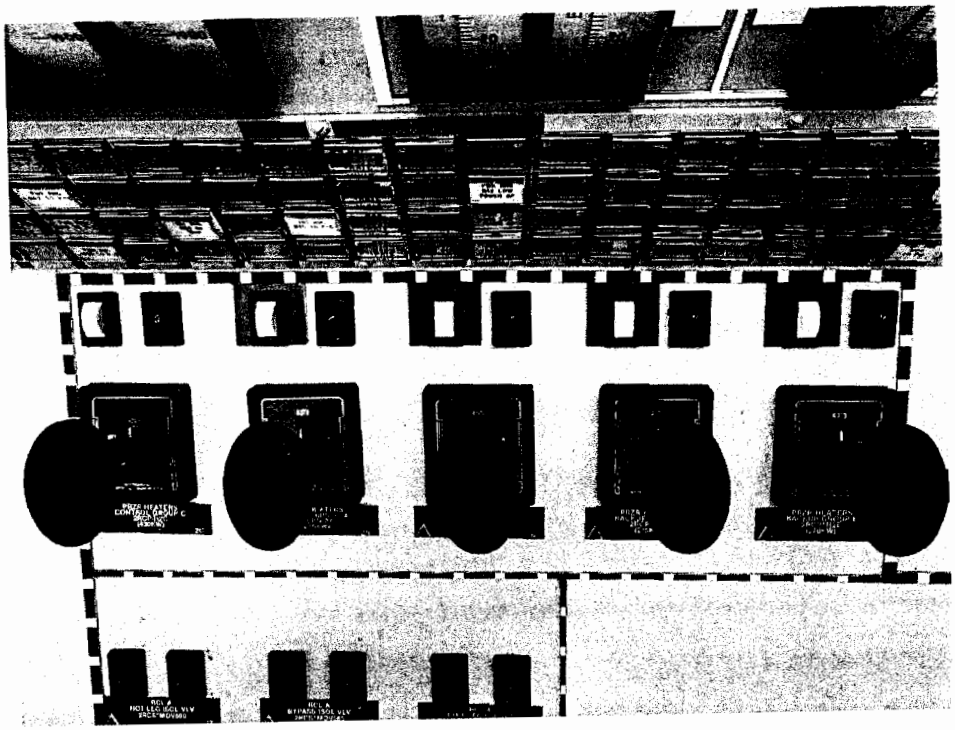
Given the plant conditions in the stem of the question (specifically the 8% PRZR level insurge), the Proportional heaters would remain ON and deenergized (benchboard red light illuminated but no output based on the 42% output of 2RCS-PK444) AND the Backup heaters would be ON and energized (benchboard red lights illuminated due to the 8% PRZR level insurge). See attached images reflecting NSA and conditions after the 8% PRZR level insurge.

If the candidate approached the question strictly focusing on the Proportional heaters still being ON, then answer "B" is correct.

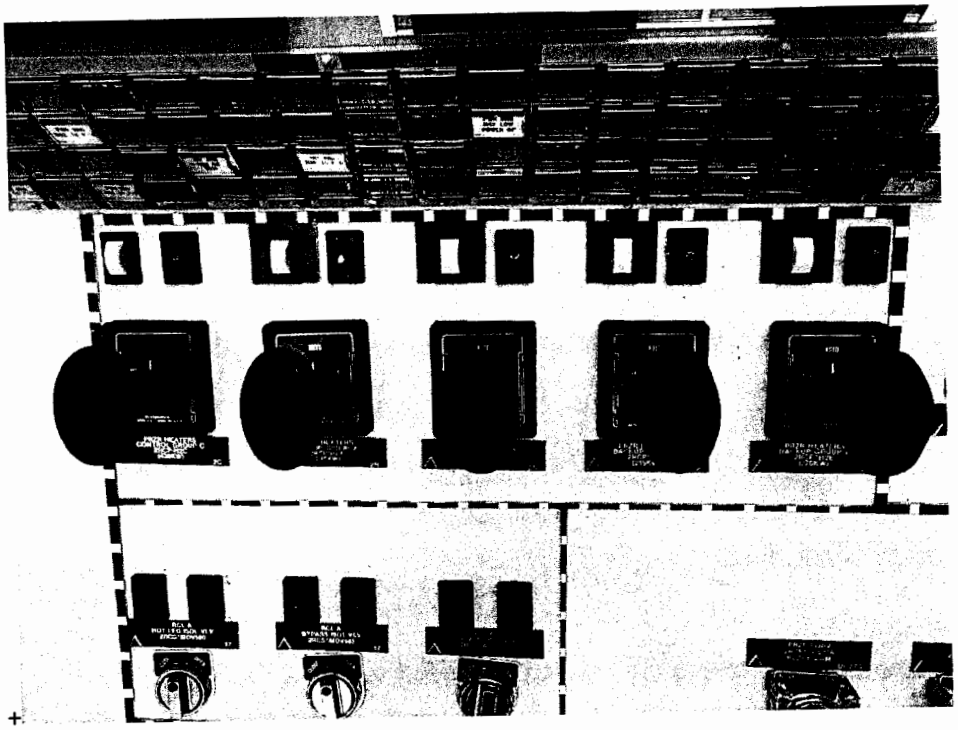
If the candidate approached the question focusing on which heaters were energized, then "C" is still a correct answer.

Based on this discussion, the facility is recommending 2 correct answers be accepted for question 57 (B and C).

NSA Position Control Group On / Backup Heaters in Auto



Heater Indication with greater than a 5% In-surge



4. Bus undervoltage
5. Electrical protection trip
6. Safety injection signal Train A

Refer to Figure 6-41, which illustrates the operation of Group C (Control Group) pressurizer heaters.

Pressurizer heaters Group C will be energized provided all of the following conditions are met:

1. Control switch for Group C heaters in ON
2. No bus undervoltage
3. No electrical protection trip
4. No pressurizer low level

Group C pressurizer heaters are controlled by a proportional control signal developed from operating pressure (refer to Figures 6-36 and 6-41).

Pressurizer heaters Group C will be de-energized provided any of the following conditions exist:

1. Control switch for Group C heaters in OFF
2. Pressurizer low level signal
3. Bus undervoltage
4. Electrical protection trip

Pressurizer Temperature - [2RCS-TE454, 453]

Refer to Figure 6-42

There are two temperature detectors in the pressurizer, one in the steam space and one in the liquid space. Both detector supply signals to temperature indicators and high temperature alarms. The steam space detector, located near the top of the vessel, is used during startup to determine water temperature when the pressurizer is completely filled with water. The liquid space detector, located at an elevation near the center of the heaters, is used during cooldown when the steam space detector response is slow due to poor heat transfer.

Surge Line Temperature [2RCS-TE450]

Refer to Figure 6-42

This detector supplies a signal for a temperature indicator and a low temperature alarm.

Annunciator Window A4-2G:
Knife switch [147] Ann Bay 8

Computer Point [Y3510D]
Knife switch 2474 Ann Bay 27

Pressurizer Control Group Heaters [2RCP-H2C] (1)_____/_____
(2)_____/_____

Control Group Heaters Supply Breaker 480V Bus 2C
Cub 2C

Heater Element Breaker C1, C2, C3, C4, C5, C6, C7, and C8 (1)_____/_____
[PNL-2RCP-H2C] Cable Vault (2)_____/_____

[2CAB-RCPBP-03] Bkrs F1A, F1B, F2A, F2B, F3A, F3B,
F4A, and F4B.

Control Switch [2RCP-H2C] - Benchboard-Section B OFF SU_____/_____
AFTER-ON NSA_____/_____

Manual-Automatic Station [PK-444A] NSA_____/_____
- Benchboard-Section B SU_____/_____
Automatic Pushbutton - LIGHTED
Manual Pushbutton - LIGHTED

Control Power (CKT RCPNM) - 125 VDC at _____/_____
480 VAC Bus 2C Cub 2C

Annunciator Window A4-1G:
Knife switch [3531] Ann Bay 38

Knife switch [3532] Ann Bay 38

Knife switch [3533] Ann Bay 38

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Given the plant conditions in the stem of the question (specifically the 8% PRZR level insurge), the Proportional heaters would remain ON and deenergized (benchboard red light illuminated but no output based on the 42% output of 2RCS-PK444) AND the Backup heaters would be ON and energized (benchboard red lights illuminated due to the 8% PRZR level insurge). See attached images reflecting NSA and conditions after the 8% PRZR level insurge.

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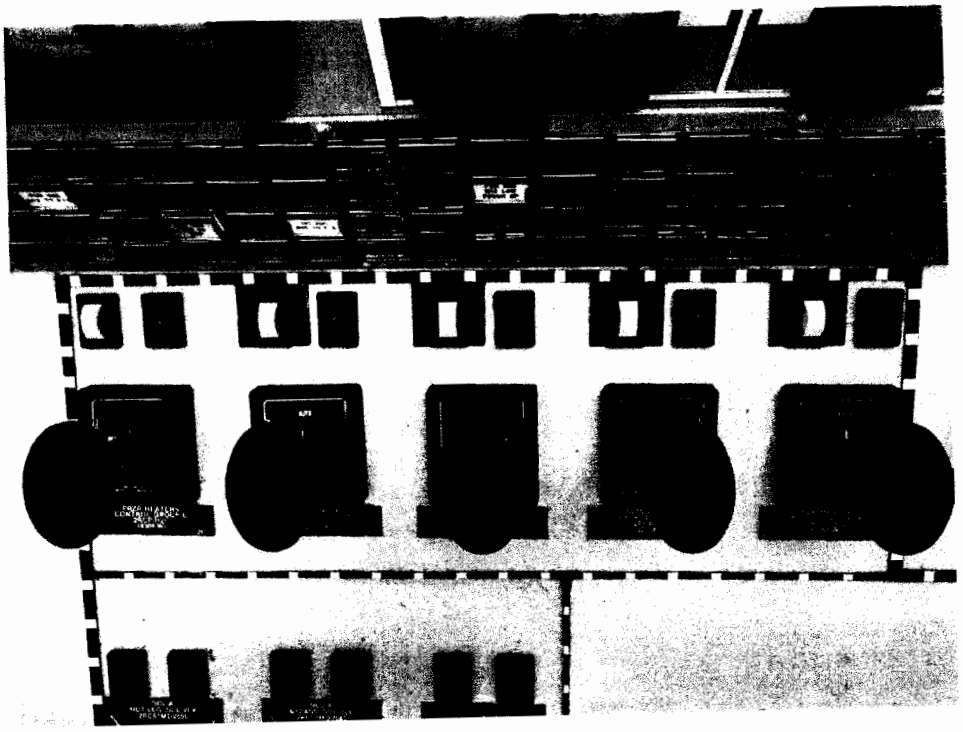

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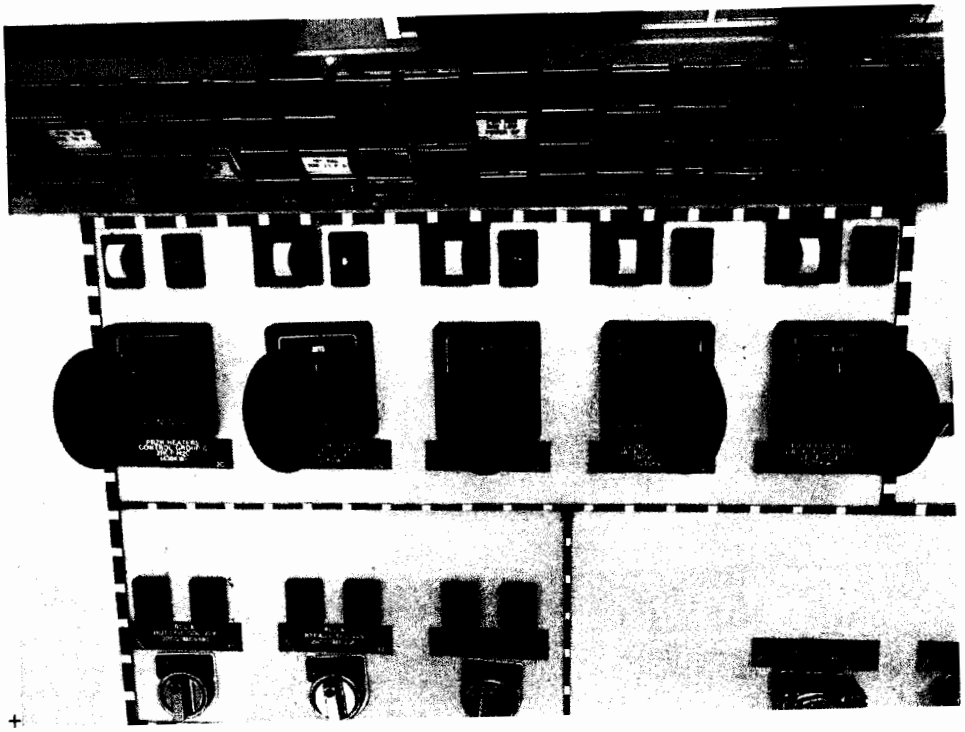

4. Bus undervoltage
5. Electrical protection trip
6. Safety injection signal Train A

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3. No electrical protection trip
4. No pressurizer low level

Group C pressurizer heaters are controlled by a proportional control signal developed from operating pressure (refer to Figures 6-36 and 6-41).

Pressurizer heaters Group C will be de-energized provided any of the following conditions exist:

1. Control switch for Group C heaters in OFF
2. Pressurizer low level signal
3. Bus undervoltage
4. Electrical protection trip

Pressurizer Temperature - [2RCS-TE454, 453]

Refer to Figure 6-42

There are two temperature detectors in the pressurizer, one in the steam space and one in the liquid space. Both detector supply signals to temperature indicators and high temperature alarms. The steam space detector, located near the top of the vessel, is used during startup to determine water temperature when the pressurizer is completely filled with water. The liquid space detector, located at an elevation near the center of the heaters, is used during cooldown when the steam space detector response is slow due to poor heat transfer.

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POWER SUPPLY AND CONTROL SWITCH LIST

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Pressurizer Control Group Heaters [2RCP-H2C] (1)_____/_____
(2)_____/_____

Control Group Heaters Supply Breaker 480V Bus 2C
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Heater Element Breaker C1, C2, C3, C4, C5, C6, C7, and C8 (1)_____/_____
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Annunciator Window A4-1G:
Knife switch [3531] Ann Bay 38

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