PGE Portland General Electric Company

May 18, 1979

Trojan Nuclear Plant
Docket 50-344
License NPF-1

Director of Nuclear Reactor Regulation
ATTN: Mr. A. Schwencer, Chief
Operating Reactors Branch #1
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Sir:

Attached are our responses to your requests for information from Westinghouse Corporation which we were requested to supply and that you telecopied to us on May 9, 1979. This information is provided for your evaluation of the Trojan Nuclear Plant Main Feedwater and Auxiliary Feedwater Systems.

Sincerely,

C. Goodwin, Jr.

C. Goodwin, Jr.
Assistant Vice President
Thermal Plant Operation and
Maintenance

CG/GAZ/4sb9B20
Attachment

c: Mr. Lynn Frank, Director
State of Oregon
Department of Energy

Mr. L. R. Cunningham, Manager
Western and Far East Region
Westinghouse Electric Corporation
Nuclear Services Division

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TROJAN NUCLEAR PLANT
Response to NRC Questions Asked of Westinghouse
Resulting from TMI-2 Accident, Received May 9, 1979

I. 1. Pressurizer Heaters:

Pressurizer heaters are powered from non-Class IE 480-V a-c Load Centers B09 and B10. Non-Class IE Load Center B10 is the backup heater power source.

2. Backup Heaters:

On setpoints: 2210 psig. Off setpoints: 2218 psig. The heaters will also turn on when pressurizer level is more than 5 percent greater than the programmed level.

3. Variable Heater Transfer Function:

a. Pressure controller PC-455A is a rate-reset feedback circuit with the following transfer function:

$$\text{Output} = \frac{1}{PB}\left(1 + \frac{1}{\tau_1 s} + \tau_2 s\right) \text{Input}$$

τ_1 = 900 sec (reset time constant or integral gain)

τ_2 = 2 sec (rate time constant or derivative gain)

PB = Proportional Band

b. A proportional controller provides a linear gain of -3.33 percent per psi.

4. Spray Valve Transfer Function:

a. Pressure controller PC-455A also provides rate-reset feedback control to the spray valves (see response to Item 3 above).

b. A proportional gain in percent of spray valve lift per psi is 2 percent per psi.

5. Power Operated Relief Valve (PORV) No. 2:

a. Open setpoint: 2335 psig. Close setpoint: 2318 psig.

b. Controller transfer function:

Pressure controller PC-455A also provides rate-reset feedback control to the variable signal for Power Operated Relief Valve No. 2 (see response to Item 3 above).

c. Proportional gain for PORV No. 2 is 5 psi per psi.

II. There have been three reactor trips resulting from a loss of feedwater. The information requested on these events is provided below:

Date	Power Level	Description
November 27, 1976	100%	One main feedwater pump tripped due to overspeed and, before turbine or reactor power could be reduced, the reactor tripped due to low steam generator water level in coincidence with steam flow/feedwater flow mismatch (low feedwater flow). Auxiliary feedwater flow was automatically initiated, steam generator water levels were returned to normal, and the Plant returned to power in a short period of time.
December 6, 1976	35%	Reactor power had been rapidly reduced due to the loss of one main feedwater pump which had tripped due to overspeed. Subsequent oscillations of the heater drain pump flow control valve resulted in the second main feedwater pump tripping. This caused a reactor trip due to low steam generator water level in coincidence with steam flow/feedwater flow mismatch (low feedwater flow). Auxiliary feedwater flow was automatically initiated, steam generator water level was returned to normal, and the Plant was returned to power within a few hours. After this trip, modifications were made to the main feedwater pump controllers and subsequently there have been no problems with these controllers.
June 21, 1977	60%	The single main feedwater pump in operation at that time tripped due to low suction pressure causing a low-low steam generator water level reactor trip. Auxiliary feedwater flow was automatically initiated, restoring steam generator water level, and the Plant recovered in 2-3 hr.

III. A schematic diagram of the steam generator is provided as Figure 5.5-4 in the Trojan Nuclear Plant FSAR. Important characteristics are identified on that figure. Table 5.5-3 of the Trojan FSAR provides various steam generator design data. Normal liquid level with the Plant at 100 percent operation is 44 percent, which corresponds to an inventory of 99,000 lbm of water. The no-load water level is 33 percent, which corresponds to a water inventory of 165,600 lbm. The low water level trip setpoint in coincidence with steam flow/ feedwater flow mismatch is 25 percent, which corresponds to a water inventory of approximately 89,200 lbm. The bases for the steam generator water level control setpoints are as follows:

a. Low program level (33 percent) is based on steamline break at hot shutdown. The reactor will go critical, but only to approximately 25 percent power. The break does not cause a high Containment pressure.

b. High program level (44 percent) is based on a 50 percent load rejection and the resulting shrink will not cause a low-low steam generator level reactor trip.