NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	1 OF 0 4

TITLE (4): Service Water System Flow Rate Problems

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
1 0	1 1	8 4	8 4	0 2 1	0 1	0 7	0 1	8 5	n/a	0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9): 1

POWER LEVEL (10): 0 9 7

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

[ ] 20.402(b)	[ ] 20.405(c)	[ ] 50.73(a)(2)(iv)	[ ] 73.71(b)
[ ] 20.405(a)(1)(i)	[ ] 50.36(c)(1)	[ ] 50.73(a)(2)(v)	[ ] 73.71(c)
[ ] 20.405(a)(1)(ii)	[ ] 50.36(c)(2)	[ ] 50.73(a)(2)(vii)	[X] OTHER (Specify in Abstract below and in Text, NRC Form 366A) Voluntary Report
[ ] 20.405(a)(1)(iii)	[ ] 50.73(a)(2)(i)	[ ] 50.73(a)(2)(viii)(A)	
[ ] 20.405(a)(1)(iv)	[ ] 50.73(a)(2)(ii)	[ ] 50.73(a)(2)(viii)(B)	
[ ] 20.405(a)(1)(v)	[ ] 50.73(a)(2)(iii)	[ ] 50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (AREA CODE)	
Scott A. Bauer, Onsite Regulation Engineer	5 0 3	5 5 6 - 3 7 1 3

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS
n/a									

SUPPLEMENTAL REPORT EXPECTED (14)

[ ] YES (If yes, complete EXPECTED SUBMISSION DATE) [X] NO

EXPECTED SUBMISSION DATE (15): MONTH | DAY | YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On October 11, 1984 the plant was operating at 97% power when suspended material from the Columbia River caused the partial plugging of both the train 'A' and 'B' service water strainers. Both service water trains experienced reduced flow conditions (30 minutes for train 'A' and 15 minutes for train 'B'). There were no abnormal temperatures observed in systems or components cooled by the service water system. Subsequent investigation of the effect of service water strainer high differential pressures on service water flow rates revealed that the valves which control service water flow through the component cooling water heat exchangers were positioned such that service water flow to each component cooling water heat exchanger was less than the value listed in the updated FSAR (17,500 gpm). These valves have since been repositioned to provide increased service water flow to the component cooling water heat exchangers. These events are being reported as items of interest to the NRC. Although initially reported by phone pursuant to 10 CFR 50.72(b)(1)(ii)(B), subsequent consideration concluded that operation was not outside the design basis of the plant.

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Description of Event

On October 11, 1984 the plant was operating at 97% power. At 0325 a large, fast-moving cargo ship passed by the intake structure. High service water strainer differential pressure alarms were received on both service water trains. Also received were component cooling water heat exchanger service water low pressure alarms. The 'A' train service water pressure at the inlet to the component cooling water heat exchanger then dropped to 0 psig with a resultant decrease in 'A' train service water flow for 30 minutes. The 'A' and 'C' service water booster pumps (both are on the 'A' service water train) were stopped at 0345 when the operator reported that the 'C' pump was cavitating.

The 'B' train service water pressure dropped to 5 psig (normal service water booster pump suction pressure is 10 - 15 psig) and then returned to normal in 15 minutes. Both service water strainers have a backwash system which automatically cleaned the strainers allowing normal service water flow to be restored. The component cooling water temperatures were monitored throughout the service water transient with no significant increases noted.

Cause of Occurrence

The cause of the service water strainer plugging was suspended mud, silt, and organic material (wood fiber) entering the service water intake structure due to the wake from a passing ship. The ship was observed to be moving at an excessive speed creating a greater than normal wake. The US Coast Guard was immediately informed of the incident. The plugged service water strainers caused the degradation in service water flow.

Corrective Action

Immediate corrective action was to monitor the temperatures of systems and components cooled by the service water system while at the same time allowing the automatic backwash system to reduce the service water strainer differential pressure. The river bottom in front of the intake structure was dredged of mud and silt between October 17 and November 13, 1984, and will be dredged on an as-needed basis. Dredging will also tend to reduce the concentration of the organic material (wood fiber). The strainer mesh size for both the 'A' and 'B' service water trains has been increased from 10 mils to 20 mils to reduce the tendancy for strainer plugging. Surveillance of system components is being increased to check for possible increased fouling due to the increase in mesh size.

A plant test was performed on November 14, 1984 to verify adequate service water flow to the component cooling water heat exchangers (17,500 gpm service water flow is listed in Table 9.2-1 of the Trojan

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updated FSAR). Test results revealed service water flows were approximately 15,000 and 12,000 gpm to the 'A' and 'B' train component cooling water heat exchangers, respectively, The service water flow through the component cooling water heat exchangers is controlled by the position of a service water throttle valve downstream of each component cooling water heat exchanger. The service water system throttle valves had been in the throttled position (about 30% open) since initial plant startup in May 1975.

Although the original system design specified that the valves be kept full open, they were throttled to improve suction pressure conditions for the service water booster pumps and to reduce the likelihood of air pockets being formed in the component cooling water heat exchangers. The basis for establishing the exact throttled position of the valves apparently was not documented. The service water throttle valves have now been opened further to increase the service water flow to the component cooling water heat exchangers.

An analysis was done to determine the service water flow that must be provided to each component cooling water heat exchanger to remove the heat loads assumed in the Trojan updated FSAR. The original FSAR flow rate of 17,500 gpm was based upon an assumption of maximum river inlet temperature of 75°F. The actual river temperature is typically cooler which would allow a reduction in service water flow to each component cooling water heat exchanger.

Further review of the system design bases identified that operation of the service water system with reduced flow through the CCW heat exchangers could be justified by reducing the fouling factors specified in Table 9.2-12 of the FSAR. A Plant test was performed to measure the CCW heat exchanger effectiveness. Analysis of the data showed that the actual fouling factor of the CCW heat exchanger was less than half of the design value. Allowing for instrument uncertainties and the possibility of increased fouling, the service water side fouling factor can be reduced by 17.5 percent (from .002 to .00165) which permits the design flow to be reduced from 17,500 gpm to 13,750 gpm with a 75°F river temperature.

In addition to the analyses to assure that the CCW heat removal safety function is maintained, additional studies and tests were performed to assure that adequate flows to other components will exist under design basis accident conditions. A computer model of the service water system has been developed to predict system flow rates and pressure drops under normal, ESF, and test lineups. The computer model allows criteria to be setup for the test condition with assurance that full ESF demand will be met without actually putting river water into the steam generators. Flow verification of the model and instrument calibration has been performed to assure that the system will meet its functional requirements.

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In summary, analyses and tests on the service water system have demonstrated that there is an ample margin in the system heat removal capability to allow for a reduction in the design flow rates. The analyses and tests show that the safety functions have not been impaired. The applicable licensing documents will be revised accordingly to reflect the results of the tests and analyses.

Significance of Occurrence

This event had no effect on plant or public safety. The plant has conducted numerous cool-downs using the service water and component cooling water systems with the service water valves throttled. Should there have been a need to increase service water cooling capabilities, the service water throttle valves could have been opened further.

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July 1, 1985
WSO-437-85

US Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Gentlemen:

Licensee Event Report No. 84-21, Rev. 1 is attached.

The supplemental information contained in this report is located in the final three paragraphs of the corrective action section.

Sincerely,

W. S. Orser
General Manager

WSO/DRK/SAB:pat

Attachment

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File: 93.24a

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