NRC FORM 366 (6-89) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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 6

TITLE (4): Inadequate Original Design of Control Room Emergency Ventilation System Coolers Results in Plant Operation in an Unanalyzed Condition

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)
									NA	0 5 0 0 0
0 5	1 6	9 0	9 0	0 1 5	0 1	1 0	1 5	9 0		0 5 0 0 0

OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
	5	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10)	0 1 0 0	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)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	X 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	
E. W. Ford, Compliance Engineer	5 0 3	5 5 6 - 5 5 7 7

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)

		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

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

On May 16, 1990, the Trojan Nuclear Plant was in the 1990 refueling outage. During a design review of the Control Room Emergency Ventilation System, it was discovered that the system's calculated cooling capacity was not adequate, and that Control Room temperature could exceed the design limit of 110 degrees F during a design basis accident when offsite power remained available. The Control Room heat load is higher when offsite power is available than when it is lost because more equipment and lighting in the Control Room remain energized. This condition was the result of an inadequate original design. Corrective Actions: The Control Room supplemental cooling system was upgraded to meet safety related, Seismic Category I criteria in 1990; it is now considered a required portion of the Control Room Emergency Ventilation System. (Note: Portions of the system located on the Control Buliding roof are not designed to withstand tornado wind loadings or missiles. A Probabilistic Risk Assessment which shows these are not credible hazards was submitted to the NRC December 21, 1989.) Conservative Control Room heat up calculations, using actual plant data were performed. The results show the Control Room temperature would have increased and exceeded 110 degrees F about seven days following onset of an accident. However, this is considered unlikely in view of the conservative nature of the calculations.

EVENT DESCRIPTION

On May 16, 1990, the Trojan Nuclear Plant was in Mode 5 (Cold Shutdown). The 1990 refueling and maintenance outage was in progress. During a design review of the Control Room Emergency Ventilation System, it was discovered that the system's calculated cooling capacity was not adequate, and that Control Room temperature could exceed the design limit of 110 degrees F during a design basis accident when offsite power remained available. The Control Room heat load is higher when offsite power is available than when it is lost because more equipment and lighting in the Control Room remain energized. The Trojan Final Safety Analysis Report, Section 9.4.1, Control Room Area Ventilation System, states, in part, the Control Room Emergency Ventilation System will provide minimum ventilation requirements under any postulated abnormal conditions or accident conditions (this includes accident conditions when offsite power remains available).

The Control Room Emergency Ventilation System is relied upon to maintain the habitability envelope and to maintain the Control Room temperature within analyzed limits under accident conditions or a toxic chemical release. The Control Room Emergency Ventilation System's ability to perform its design cooling function could not be confirmed under the current analytical assumptions, therefore the plant was considered to be in an unanalyzed condition. This report is submitted to fulfill the requirements of 10 CFR 50.73 (a)(2)(ii)(A). This condition was also reported to the NRC via the Emergency Notification System on May 18, 1990, in accordance with the requirements of 10 CFR 50.72.

CAUSE

This condition was the result of an inadequate original design.

According to the Trojan Nuclear Plant Architect-Engineer, a design basis accident without a loss of offsite power was not considered in sizing of the Control Room Emergency Ventilation System coolers. This resulted in under-estimating the heat load the coolers were required to remove.

CORRECTIVE ACTIONS

In 1988, a supplemental cooling system was installed to help the Control Room Emergency Ventilation System maintain lower Control Room temperatures. This was done to enhance equipment reliability and Control Room habitability. During the 1990 refueling outage, the supplemental cooling system was upgraded to meet safety related, Seismic Category I criteria. It is now considered a required portion of the Control Room Emergency Ventilation System. (Note: Portions of the supplemental cooling system located on the Control Buliding roof are not designed to withstand tornado wind loadings or missiles. A Probabilistic Risk Assessment which shows these are not credible hazards was submitted to the NRC December 21, 1989.) Operation of the supplemental cooling system, in conjunction with the Control Room Emergency Ventilation System, provides sufficient cooling capacity to maintain Control Room temperature within design limits under accident conditions.

New calculations, based upon actual measured capacity of the Control Room Emergency Ventilation System coolers, and upon the actual measured Control Room heat load have been issued. These calculations are the point of reference for design questions regarding the Control Room Ventilation Systems' heat removal capabilities.

The assessment that the Control Room temperature would exceed its design limit under accident conditions, with offsite power available, was based upon preliminary calculations. Subsequent to the original submittal of this report, tests were conducted to determine the actual cooling capacity of the Control Room Emergency Ventilation System and the actual Control Room heat load during normal plant operation. The results of these tests were factored into refined Control Room heat up calculations. The results of the calculations show, that under design basis conditions, with offsite power available, the Control Room Emergency Ventilation System would have maintained Control Room temperature at or below 110 degrees for at least seven days following the initiation of an accident. The calculation was performed assuming worst case ambient conditions and a Control Room temperature of 75 degrees at the onset of the accident.

SAFETY SIGNIFICANCE

The calculation related to the Control Room temperatures under accident conditions includes several conservative assumptions. These assumptions and an evaluation of their effect upon Control Room temperature are discussed below.

Assumption: Service Water temperature is 75 degrees F.

The service water system is supplied from the Columbia River. A review of the weekly average temperature of the river for the years 1987-1989 was performed. During that time period, the temperature ranged from a low of 34.9 degrees to a high of 71.4 degrees. (The time period was chosen based upon the availability of data, but is considered to be representative.) Additional reviews of the daily river water temperatures for previous years indicate that temperatures were generally below 72 degrees. One occasion was found (August 17, 1977) where the recorded river water temperature reached the design temperature of 75 degrees.

River water temperatures less than 75 degrees would increase the cooling capacity of the Control Room Emergency Ventilation System and result in lower Control Room temperatures.

Assumption: Outdoor air temperature is a constant 91 degrees F.

This temperature is used because it is higher than temperatures achieved 99 percent of the time during the summer months. The calculation conservatively assumes 91 degree outside air temperature around the clock. No credit is taken for nocturnal temperature reductions. Outdoor air temperatures lower than 91 degrees F would improve the ability of the building to transfer heat to the environment and reduce Control Room temperatures. In addition, the Control Room Emergency Ventilation System draws approximately 18 percent of its total flow from outside air for Control Room pressurization. Additional cooling would result from drawing outside makeup air at temperatures below 91 degrees F.

Assumption: Spaces (rooms) adjacent to the Control Room are at their peak design temperatures.

The calculation conservatively assumes that the spaces adjacent to the Control Room which do not have safety related cooling or ventilation systems, are at their design temperature of 104 degrees F at the onset of, and throughout an accident. These spaces are normally maintained below this temperature. With lower temperatures in these spaces at the onset of an accident, the amount of heat transfer from the Control Room would exceed the value assumed in the calculations and extend the amount of time to reach the design temperature of 110 degrees F.

Trojan Technical Specification 4.7.6.1, Control Room Emergency Ventilation System, requires each train of the system to be tested every 31 days. In order for the surveillance requirements to be satisfied, the Control Room temperature must remain less than or equal to 110 degrees F for the ten hour duration of the test. Records of testing performed to fulfill this surveillance requirement for the summer months of 1986 and 1987 (prior to installation of the supplemental cooling system) were reviewed. The highest Control Room temperature achieved during these tests was 87 degrees F. The Control Room heat loads would not vary significantly between accident conditions or normal operations. The results of the periodic testing confirm the conservatism in the design calculations and provide reasonable assurance that the Control Room Emergency Ventilation System would have performed its function and maintained Control Room temperature within design limits.

Even if it is assumed that the Control Room Emergency Ventilation System had insufficient cooling capacity, it is unlikely that temperatures would have been allowed to get as high as 110 degrees F. The operators in the Control Room would have noticed the increasing temperature and could have taken action to restart the Normal Ventilation System, start up supplemental cooling systems, or shut down unnecessary equipment to reduce the Control Room heat load.

Based upon the results of the refined calculation, and in consideration of its conservative assumptions, it is considered unlikely that this condition affected the ability of the Control Room Emergency Ventilation System to maintain temperatures within 110 degree limit under design basis accident conditions when offsite power remained available. Additionally, the system was never challenged under accident conditions. Therefore, this event had no effect upon the health and safety of the public.

PREVIOUS SIMILAR EVENTS

Two previous Licensee Event Reports regarding deficiencies with the design of the Control Room Emergency Ventilation System were identified. The numbers and titles of those reports are listed below.

LER #	Title
86-02	Control Room Emergency Ventilation System Degradation due to Equipment Failure and Design Deficiency

Trojan Technical Specification 4.7.6.1, Control Room Emergency Ventilation System, requires each train of the system to be tested every 31 days. In order for the surveillance requirements to be satisfied, the Control Room temperature must remain less than or equal to 110 degrees F for the ten hour duration of the test. Records of testing performed to fulfill this surveillance requirement for the summer months of 1986 and 1987 (prior to installation of the supplemental cooling system) were reviewed. The highest Control Room temperature achieved during these tests was 87 degrees F. The Control Room heat loads would not vary significantly between accident conditions or normal operations. The results of the periodic testing confirm the conservatism in the design calculations and provide reasonable assurance that the Control Room Emergency Ventilation System would have performed its function and maintained Control Room temperature within design limits.

Even if it is assumed that the Control Room Emergency Ventilation System had insufficient cooling capacity, it is unlikely that temperatures would have been allowed to get as high as 110 degrees F. The operators in the Control Room would have noticed the increasing temperature and could have taken action to restart the Normal Ventilation System, start up supplemental cooling systems, or shut down unnecessary equipment to reduce the Control Room heat load.

Based upon the results of the refined calculation, and in consideration of its conservative assumptions, it is considered unlikely that this condition affected the ability of the Control Room Emergency Ventilation System to maintain temperatures within 110 degree limit under design basis accident conditions when offsite power remained available. Additionally, the system was never challenged under accident conditions. Therefore, this event had no effect upon the health and safety of the public.

PREVIOUS SIMILAR EVENTS

Two previous Licensee Event Reports regarding deficiencies with the design of the Control Room Emergency Ventilation System were identified. The numbers and titles of those reports are listed below.

LER #	Title
86-02	Control Room Emergency Ventilation System Degradation due to Equipment Failure and Design Deficiency

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Trojan Nuclear Plant	0 5 0 0 0 3 4 4	9 0	— 0 1 5	— 0 1	0 6 OF 0 6

TEXT (If more space is required, use additional NRC Form 366A's) (17)

88-18 Excessive Unfiltered In-leakage Could Have Prevented Control Room Emergency Ventilation System From Performing Safety Function