NRC Form 366 (4-95)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

(See reverse for number of digits/characters for each block)

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98

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TITLE (4)
Service Water System Single Failure Vulnerability

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 NAME	DOCKET NUMBER
									N/A	05000
07	01	97	97	011	01	09	30	97	FACILITY NAME N/A	DOCKET NUMBER 05000

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (Check one or more) (11)			
POWER LEVEL (10)	100	20.2201 (b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
		22.2203(a)(1)	20.2203(a)(3)(i)	X 50.73(a)(2)(ii)(B)	50.73(a)(2)(x)
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
		20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	OTHER
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v) (D)	Specify in Abstract below or in NRC Form 366A
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Jeffrey W. Keene - Regulatory Affairs Department Manager	508-830-7876

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
X	YES (If yes, complete EXPECTED SUBMISSION DATE)	NO		12	01	97

The Pilgrim Station design basis includes a requirement for redundant and independent Salt Service Water (SSW) system trains such that no single active failure can prevent the SSW system from fulfilling its safety objective (i.e., to provide cooling water to the reactor building closed cooling water (RBCCW) system). The design basis of the SSW system also includes the requirement for the normally cross-connected SSW trains to be automatically isolated upon loss of the preferred AC power source. During a Service Water Operational Performance Inspection (SWOPI) follow-up NRC inspection, a single failure vulnerability was identified which placed the unit in a condition thought to be outside the design basis. Specifically, a single failure of a 125 vdc battery, under certain conditions, would compromise the redundancy and independence of the SSW system and potentially lead to a SSW pump cavitation condition.

It had been determined that a single failure of a 125 vdc battery might defeat the SSW loop independence and redundancy if the SSW swing pump was selected for dedication to the opposite safety train and a loss of off-site power occurred. Such a DC failure would disable the associated diesel generator and one of the SSW discharge header division valves. As a result, the SSW loops would remain cross-connected, and one SSW pump would supply both loops of SSW for a short time, potentially in a cavitating condition.

A temporary modification was implemented that required closing one of the division valves in the common SSW discharge header to effect redundant and independent cooling water loops and to preclude the potential pump cavitation condition. The condition posed no threat to public health and safety.

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

REASON FOR THE SUPPLEMENT

This report is submitted in accordance with our commitment to supplement the initial report.

DESCRIPTION OF THE EVENT

On June 6, 1997, during a Service Water Operational Performance Inspection (SWOPI) follow-up NRC inspection, a single failure was identified which was believed to have placed the plant in a condition outside the design basis. Specifically, a single failure of a 125 vdc battery, under certain conditions, would compromise the redundancy and independence of the SSW system and potentially lead to a SSW pump cavitation condition. Problem Reports 97.2040, 9408 and 9413 were written in response to the problem. The initial problem report (PR 97.2040) was written on June 6, 1997. The initial operability assessment was made on June 6, 1997. A formal operability evaluation was issued on June 27, 1997. The operability evaluation concluded that the affected systems, Salt Service Water (SSW) and Reactor Building Closed Cooling Water (RBCCW), were operable. Based on the operability evaluation, the reportability evaluation (completed on July 3, 1997) concluded that the problem addressed in PR 97.2040 was not reportable.

The potential single failure was evaluated in problem reports 97.9408 (July 1, 1997) and 97.9413 (July 3, 1997). The reportability evaluations for problem reports 97.9408 and 97.9413 were completed on July 18, 1997, and it was concluded that the problems were reportable under 10 CFR 50.72 and 50.73 because the condition was outside the design basis of the plant. The NRC Operations Center was notified in accordance with 10 CFR 50.72 on July 18, 1997 (Reportable Event # 32649).

The SSW system draws cooling water from Cape Cod Bay, which is the ultimate heat sink for Pilgrim Station. Pilgrim has five (5) SSW pumps. The pumps discharge to a common header from which independent piping supplies two cooling loops. Two normally open, 125 vdc powered division valves are included in the common header to effect loop separation when needed. When the loops are isolated, two pumps are aligned to the 'A' loop and two are aligned to the 'B' loop. The fifth SSW pump (swing pump) can be aligned to either loop depending on the alignment of the two division valves. The control room operator pre-selects, via a control switch, the loop to which this pump is automatically aligned if a loss of preferred AC power occurs.

Upon loss of the preferred AC power source, automatic closure of one division valve separates the common header into two loops. The two salt service water pumps on loop A are powered by diesel generator A, and the two pumps on loop B are powered by diesel generator B. The fifth pump is powered by a common emergency service bus which can be powered from either diesel generator. Following a LOCA and loss-of-offsite power, one and only one SSW pump will automatically start in each loop.

Based on a review of the design of the SSW and 125 vdc power system, completed on July 18, 1997, it was initially determined that the Pilgrim Station design was vulnerable to a single failure of a 125 vdc battery that had the potential to defeat the SSW system independence and redundancy. Coincident with a loss of offsite power, such a failure would disable the associated diesel generator and the respective SSW pumps and discharge header division valve. If the SSW swing pump was selected to the other safety train, both SSW discharge header division valves would remain open. In this situation, one SSW pump would supply both loops, potentially in a runout condition, until operator action was taken to isolate the loops.

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Based on subsequent research and review of the PNPS design basis, the following conclusion was made. The design basis of the SSW system per FSAR section 10.7.2 is that no single active failure can prevent the SSW system from achieving its safety objective (i.e., "to provide a heat sink for the RBCCW system under transient and accident conditions"). However, the battery failure alluded to above meets the FSAR definition of a passive failure and is, therefore, outside the bounds of the SSW system design basis as it pertains to single failure analysis requirements.

Although the battery failure scenario des[illegible] is beyond the design basis of the SSW system, single active failures do exist that could leave the SS[illegible]ystem in a configuration with one pump serving both SSW trains. The question currently being evaluated is whether this configuration is an acceptable result (i.e., within the design basis) of the single failures evaluated. If so, this LER would be redesignated as voluntary.

Another related concern was identified while working on this subject. The August 25, 1971, safety evaluation report states in section 7.4 (SSW system) that the SSW "loops are automatically isolated by redundant valves" on loss of AC power. This is inconsistent with the physical layout description of the SSW system provided in the FSAR which matches the actual plant configuration. The FSAR describes that on loss of offsite power, only one cross-connect valve closes; the other valve remains open to allow the swing pump to be aligned to a pre-determined loop. It also states two independent, full capacity loops are provided. This discrepancy is only mentioned as a related point of information and will be the subject of separate correspondence with the NRC.

The plant was operating at 100 percent reactor power when the problem was identified. The reactor mode selector switch was in the RUN position. The reactor vessel pressure was approximately 1035 psig with the reactor water at the saturation temperature for that pressure.

CAUSE

After researching this subject, it has been concluded that the specific battery failure concern is beyond the PNPS design basis. However, evaluation of the general subject (single active failures that result in a 'one SSW pump for two loops' configuration) continues. If the stated configuration is an unacceptable result of a single active failure, the age of the design error (original design circa 1968-1971) suggests that a root cause analysis would yield little insight with respect to current policies, processes and culture. Should the design be found flawed, efforts will concentrate on comprehensive corrective action rather than conduct of a root cause analysis.

This LER will be supplemented upon completion of the evaluation.

CORRECTIVE ACTION

Temporary modification TM #97-44 (reference Safety Evaluation 3110) was implemented on July 18, 1997. The temporary modification provides for the closure of one of the division valves in the SSW common discharge header, thus, establishing isolated cooling water loops. It was conservatively decided to place the system in this configuration pending resolution of the single failure evaluation and discrepancy in the August 25, 1971, safety evaluation report.

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SAFETY CONSEQUENCES

The condition posed no threat to public health and safety.

The condition did not prevent the manual closing of the affected division valve using its local handwheel, nor would the condition have prevented the manual start of additional SSW pumps. Based upon information supplied by the SSW pump vendor, it was determined that a SSW pump could cavitate for ten minutes and still be able to subsequently perform its safety function. Operator action to resolve a SSW pump cavitating condition is assumed to occur ten minutes after event initiation. This action is consistent with the Pilgrim Station licensing basis. Therefore, the system was considered operable and capable of performing its safety function even if SSW loop isolation was not achieved during the first ten minutes of the limiting design basis event.

SIMILARITY TO PREVIOUS EVENTS

A review was conducted of LERs or 10 CFR Part 21 reports submitted since January 1984. The focus of the review was a problem(s) involving a single failure of a system(s) including the SSW system. The review identified a Part 21 report (RHR minimum flow single failure) that was submitted on May 23, 1986, and LER 86-021-01 (standby gas treatment system single failure) that was submitted on November 25, 1986.

ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) CODES

The EIIS codes for this report are:

COMPONENTS	CODES
Battery	BTRY
Pump	P
Valve	V

SYSTEMS

Salt Service Water	BI
DC Power System - Class 1E	EJ