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SUBJECT: LER 92-012-00:on 920902,inconsistent info on LPSW pump requirements between TS & FSAR discovered.Caused by mgt & design deficiency.Operational guidelines issued to require 3 pumps to be operable for units 1 & 2.W/921102 ltr.

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TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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RIDS/ADDS

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DUKE POWER

November 2, 1992

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Subject: Oconee Nuclear Site
Docket Nos. 50-269, -270, -287
LER 269/92-12

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report (LER) 269/92-12, concerning a deficient Technical Specification which lead to less than adequate Low Pressure Service Water System configuration.

This report is being submitted in accordance with 10 CFR 50.73 (a)(2)(v)(B). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

J. W. Hampton
Vice President

/ftr

Attachment

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NRC FORM 366 (5-92)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

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LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Oconee Nuclear Station, Unit 1	05000 269	1 OF 12

TITLE (4) Deficient Technical Specification Due To Management Deficiency And Design Deficiency Leads To Less Than Adequate Engineering Safeguards System Configuration

EVENT DATE (5)			LER NUMBER (6)			REPORT NUMBER (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									Oconee, Unit 2	05000 270
09	29	92	92	-- 12 --	00	11	02	92	Oconee, Unit 3	05000 287

OPERATING MODE (9)	N
POWER LEVEL (10)	100

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

	20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)
	20.405(a)(1)(i)		50.36(c)(1)	X	50.73(a)(2)(v)(B)		73.71(c)
	20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER
	20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 366A)
	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 (Include Area Code)
S. G. Benesole, Safety Review Manager	803-885-3299

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
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ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On September 2, 1992 at 1815 hours, Units 1 and 2 were at 100 percent Full Power and Unit 3 was in a refueling outage. At this time, it was recognized that inconsistent information on Low Pressure Service Water (LPSW) pump requirements existed between the Technical Specification (TS) and Final Safety Analysis Report (FSAR). The FSAR implies all three LPSW pumps for Units 1 and 2 must be operable to meet single failure criteria during a Loss of Coolant Accident (LOCA). TS states that only two LPSW pumps are required to be operable for Units 1 and 2. Subsequent calculations and testing indicated that specific equipment failures concurrent with a loss of instrument air could result in the inability to achieve desired flow to all safety related LPSW supplied components without operator action. The root causes of this event are classified as Management Deficiency and Design Deficiency. Administrative controls are now in place to maintain all three LPSW pumps operable for Units 1 and 2. Mechanical travel stops were installed on certain LPSW valves to limit flow through the LPI coolers in the event of a Loss Of Instrument Air.

BACKGROUND

The Low Pressure Service Water (LPSW) [EIIS:BI] system provides cooling for components in the Turbine Building [EIIS:NM], the Auxiliary Building (AB) [EIIS:NF] and Reactor Building (RB) [EIIS:NG]. Engineering Safeguards (ES) [EIIS:JE] equipment in the AB and the RB supplied by the LPSW system are the two Low Pressure Injection [EIIS:BP] (LPI) system coolers per unit located in the AB and the three Reactor Building Cooling Units [EIIS:BK] (RBCU) located in each unit's RB.

The LPI system is designed to remove heat from the RB environment and the decay heat from the core via sump recirculation for an extended period following a Loss Of Coolant Accident (LOCA). During normal unit shutdown, the LPI system is used to reduce Reactor Coolant System temperature and maintain this temperature for an extended period.

The RBCUs provide heat removal from the containment atmosphere during normal and postulated accidents to provide long term cooling and depressurization.

The Final Safety Analysis Report (FSAR) states that during normal and emergency operations, the cooling flow requirements of the LPSW system can be satisfied by one LPSW pump per unit. The spare pump is started by an ES actuation signal to provide redundancy in the event of a failure of one the pumps.

Technical Specification (TS) 3.3.7 requires that when the Reactor Coolant System, with fuel in the core, is in a condition with pressure equal to or greater than 350 psig or temperature equal to or greater than 250 degrees F: two LPSW pumps for the shared Unit 1 and 2 LPSW system and two LPSW pumps for Unit 3 LPSW system shall be operable. The bases further explains that one LPSW pump per unit is required for normal operation. The normal operating requirements of LPSW are greater than the emergency requirements following a LOCA.

EVENT DESCRIPTION

On December 29, 1970, The NRC issued a Safety Evaluation Report (SER) for Oconee Unit 1 operating license. Section 10.3 (Service Water System) of that report addresses the evaluation performed on the Low Pressure Service Water (LPSW) system for all three Oconee Units. In that evaluation for Units 1 and 2, it is stated that "Two pumps (LPSW) are sufficient to provide all LPSW system performance requirements following a Loss Of

Coolant Accident (LOCA). The third pump provides protection against loss of a pump due to a single failure under accident conditions."

In the July 30, 1971 version of the Final Safety Analysis Report (FSAR), the single failure analysis for the Reactor Building Cooling Unit (RBCU) system addresses the single failure of a LPSW pump and states that the two remaining pumps will provide adequate LPSW flow to all safety related components.

On February 6, 1973, Oconee's Technical Specification (TS) was issued. That TS has remained unchanged and required that two LPSW pumps be operable for Units 1 and 2.

In May of 1973, Babcock and Wilcox notified Duke Power Company (DPC) that there was a potential to experience excessive flow-rates through the shell (LPSW) side of the Low Pressure Injection (LPI) coolers during Engineering Safeguards actuation. To resolve the potential for excessive flow-rates, DPC initiated system modifications which changed the LPSW system piping, and added more precise flow control valves with automatic high flow runback control circuitry.

By June 6, 1973 for Unit 1 and August 23, 1973 for Unit 2, administrative guidance was in place to procedurally set the LPI Cooler Outlet Control Valves at 50 percent open. Operator action was required to mitigate the consequences of an accident concurrent with a Loss of Instrument Air (LOIA) to these valves.

A internal Self-Initiated Technical Audit (SITA), 87-01, was initiated on September 18, 1987 to review the adequacy of the LPSW system. This audit did not address the FSAR versus TS issue (the number of LPSW pumps required). However, it did find that inadequate verification of system performance existed; e.g., flow testing/verification for the LPSW system was inadequate to insure that the system would function as required during an accident and that heat exchanger performance was a concern; e.g., fouling and adequacy of the testing. To address these findings, a test was performed during the next Unit 1 refueling outage, to verify acceptable LPSW flows to the RBCUs and LPI coolers. This test did not address all the possible worst case single failures concurrent with a LOIA. Shortly after the SITA, Oconee Engineering (OE) began developing a hydraulic flow model of the LPSW system to address normal and worst case operating modes.

In 1988, there were three events related to excessive LPSW flow to the LPI coolers. A design study was initiated to analyze various options to prevent the recurrence of these types of events.

On July 18, 1989, Generic Letter 89-13 (Service Water System Problems Affecting Safety-Related Equipment) identified several service water related issues. One concern in this letter was the effect of biofouling on service water system flow. To address this concern, actual flow and pressure measurements were taken at different points on the LPSW system. This information was input into the LPSW system flow calculations that was initiated as a result of the earlier SITA finding.

In July 1991, an NSM was initiated to replace the LPI Cooler Outlet Control Valves due to valve body wear. These valves were to be equipped with travel stops to address earlier excessive flow concerns.

On June 18, 1992, preliminary OE calculations were performed concerning flow within the LPSW system and the review/approval process of the calculation began. The preliminary calculation assumptions were consistent with the one pump per unit requirement stated in the FSAR. However, these calculations indicated operator action would be required in order to balance LPSW flow to achieve approximately 1400 gpm to the RBCUs. These calculations were based on representative cases for benchmarking, but did not necessarily address the LPSW design bases. However, as part of an overall Design Bases Document (DBD) program, a DBD for the LPSW system is being developed.

On July 12, 1992 at 0405 hours, the '1B' LPSW pump was removed from service for disassembly, inspection, refurbishment and rebuilding. No LCO was entered due to this equipment removal from service. This left one LPSW pump per unit in service, thus satisfying the requirements of TS. The pump was tested on July 18th at 1024 hours and returned to service on July 20th.

On September 2, 1992, the NRC resident identified to OE that an apparent inconsistency existed between the OE calculations which assumed two LPSW pumps to be operating following an event and TS which requires only two to be operable at all times, therefore providing no protection against pump failure.

At 1815 hours, station management confirmed that TS 3.3.7.a(1) was inadequate and administrative controls were put in place to require three LPSW pumps on Units 1 and 2 to be operable or enter a 24 hour Limiting Condition for Operation (LCO). At 1917 hours, a four hour non-emergency call was made to the NRC per 10CFR50.72 to report these findings. At the time the reportability determination was made, Units 1 and 2 were at 100 percent full power and Unit 3 was at refueling shutdown.

On September 4, 1992, an independent internal engineering assessment of the LPSW system operability was performed. This assessment concluded that some of the operator actions assumed in the calculations could not be supported by current Operations procedures and practices. Therefore, the LPSW calculation was performed assuming no credit for operator action. This calculation resulted in approximately 1000 gpm to the RBCUs. An evaluation for the RBCUs concluded that they were operable and capable of performing their accident mitigation function for all power levels.

On September 4, 1992, a TS Interpretation for TS 3.3.7 applicable to Units 1 and 2 was approved and issued to require all three LPSW pumps for Units 1 and 2 to be operable when Reactor Coolant System (RCS) temperature of either unit is equal to or greater than 250 F or RCS pressure is equal to or greater than 350 psig.

On September 9, 1992, OE realized that flow to the RBCUs could be affected by cavitation at their discharge. The calculation was performed again and resulted in flow predictions of approximately 900 gpm to the RBCUs. A conservative value of 800 gpm was input into an Operability Evaluation for the RBCUs. This evaluation indicated that the RBCUs remained operable and capable of performing their accident mitigation function for all power levels.

On September 12, 1992, Unit 3's LPSW system was subjected to a system flow test. This test was performed to gather data on the LPSW system and measure flow rates to the various safety related and non-safety related components. Data was gathered on several system configurations, normal and emergency modes. Due to valve problems the test was delayed. On September 14, 1992, the testing was completed. Results of the testing confirmed that adequate flow (approximately 900 gpm) to the RBCUs could be achieved. However, a question was subsequently raised as to the potential for excessive flows to the LPI coolers if different component failures are assumed.

On September 17, 1992, a new test procedure was written and performed. One of the test configurations was to determine the flow through one LPI cooler during a valve failure with the following conditions: '3A' and '3B' LPSW pumps running, flow through two RBCUs, '3A' LPI Cooler Outlet Control Valve was failed open, and no flow through the Main Turbine Oil Tank. It was expected that flow would increase to equal to or less than 7500 gpm; however, flow through the '3A' LPI cooler increased to approximately 7900 gpm. This flow rate exceeded the manufacturer's suggested maximum flow through the cooler. The test was immediately suspended and OE began an evaluation of the LPI coolers. The manufacturer was called to verify cooler design maximum capacity. At 1630 hours, the manufacturer reported

that the LPI coolers can support a one time flow rate of 7900 gpm for up to 10 hours. The manufacturer was then asked to continue the flow evaluation and to determine the safe maximum flow rate that can be tolerated through one cooler.

On September 18, 1992, the manufacturer confirmed the following limitations on the LPI coolers:

For continuous operation - equal to or less than 7500 gpm,
Less than ten hours (one time) - 7900 gpm,
Less than two hours (one time) - equal to or less than 8800 gpm,
Never exceed - 9500 gpm

These limitations bound the operational conditions the system will experience.

At 1745 hours, on September 18, 1992, a review of Unit 1 and 2 LPSW calculations resulted in the determination that a LOCA/LOOP with a LOIA concurrent with a single failure of either "A" or "B" LPI Cooler Shell Outlet Valve (LPSW-4 or LPSW-5) (to open) could result in the loss of both trains of LPI. This failure scenario results in one train being isolated by failure of one of the LPI Cooler Shell Outlet Valves and the other train being subject to excessive flow. This was reported to the NRC pursuant to 10CFR50.72. A 24 hour LCO was entered based on TS 3.3.2.a(2). Changes were made to the Emergency Operating Procedures for units 1 and 2 to secure one of the operating LPSW pumps if all three pumps start, to prevent excessive flow following an ES actuation. At 2345 hours, the LCO was exited.

On September 19, 1992, a Minor Modification was initiated to resolve the excessive flow problem on Unit 3. Per this change on September 20, 1992, travel stops were installed on both '3A' and '3B' LPI Cooler LPSW Outlet Control Valves to limit the flow to equal to or less than 7500 gpm per cooler. The travel stops were tested individually and adequate flows were achieved through each cooler in all failure modes.

On September 29, 1992 at 1510 hours, a review of Unit 1 and 2 LPSW pump test data indicated that the LPSW pumps could provide greater flow than the manufacturer's data assumed in previous flow calculations. A revised system flow calculation indicated that in the event of a postulated LOCA with a LOIA, concurrent with a single failure (failure to open) of one of the LPSW valves supplying the LPI coolers, both LPI coolers would be in danger of exceeding their maximum one time flow rate of 9500 gpm. Securing of one of the three running LPSW pumps during an accident, as previously analyzed, could not be performed in time to prevent exceeding the maximum flow rate of 9500 gpm. It was concluded that travel stops would be

required and that actual system flow testing was necessary to establish travel stop positions. It was determined that this test could not be performed with the unit on-line. At this point TS 3.3.2.a(2) was again entered due to excessive LPI cooler flow concerns. This was reported to the NRC pursuant to 10CFR50.72.

On September 30, 1992, at 1300 hours, Duke Power Management requested a waiver of compliance from TS 3.3.2.a(2) (LPI System). In part, TS 3.3.7.a(2) reads that if the LPI system is not restored to requirements of TS 3.3.2.a(1) within 24 hours, the reactor shall be placed in hot shutdown within 12 hours. The requested waiver allowed for placing the reactors in a hot shutdown condition to be extended to 84 hours for Units 1 and 2 and to restrict power level to equal to or less than 10 percent full power. This plant condition would provide sufficient time to perform the tests without maneuvering the units. This precluded doing the tests at a point where the only method of decay heat removal is with the LPI coolers.

At 1418 hours, Unit 1 shutdown began and at 1600 hours, Unit 2 began a shutdown. This action was taken in response to the LPI cooler inoperability and to the 24 hour LCO entered on September 29, 1992 at 1510 hours. The initiation of a unit shutdown required by TS was reportable to the NRC as a non-emergency one hour reportable event. At 1610 hours, an Emergency Notification per RP/O/B/1000/01 (Emergency Classification, enclosure 4.1.10.3 (Loss of ES Features) was made declaring an Unusual Event for Units 1 and 2. South Carolina and Oconee and Pickens County agencies and the NRC were notified.

Prior to the expiration of the TS action statement, the waiver of compliance on TS 3.3.2.a(2) was granted. This allowed continued power operation until 0310 hours on October 4, 1992.

On October 1, 1992 at approximately 0230 hours, Unit 1 and 2's power levels were stabilized at approximately 8 percent power.

On October 2, 1992 at 0119 hours, the testing of the Unit 1 and 2's LPSW system began in order to determine the proper position of the travel stops on the LPI Cooler Outlet Flow Control Valves. During this testing, it was recognized that a potential for high pump flow and inadequate Net Positive Suction Head (NPSH) existed any time all four LPI coolers are in service.

At 0810 hours on October 3, 1992, Unit 1 reactor tripped due to a Reactor Protective System anticipatory trip signal. (Reference Licensee Event Report # 269/92-15) This event was unrelated to the LPSW problems. It was agreed that Unit 1 would not return to power operations until the resolution of the LPSW problems.

At 1715 hours, the travel stop installation was completed on Unit 1 and Unit 2's LPI Cooler LPSW Outlet Control Valves.

On October 4, 1992 at 0014 hours, the LPSW system testing to verify adequacy of the travel stop positions was completed and the LPI coolers were declared operable. The NRC gave concurrence for a restart of Unit 1 and escalation of power of Unit 2. The LCO was exited.

Unit 2 reached 100 percent power on October 4, 1992 at 2258 hours and Unit 1 on October 6, 1992 at 0203 hours.

On October 10, 1992, calculations were performed to analyze LPSW performance at greater flow rates and NPSH requirements than previously analyzed. An operability evaluation was performed and the LPSW system was evaluated as operable.

CONCLUSIONS

A summary of the two flow related events discovered during the investigation and testing of the Low Pressure Service Water (LPSW) system are as follows:

1) Contrary to what is allowed in the Technical Specification (TS) prior to this event, the combination of two LPSW pumps on Unit 1 and 2 was not adequate to provide appropriate flows to the Loss Of Coolant Accident (LOCA) unit and the unit in hot shutdown, if one of the pumps should experience a failure.

2) Calculations and testing indicated that conditions could exist where the LPSW system could provide excessive flows through the LPI coolers, exceeding the manufacturer's recommendations.

The discrepancy between the TS and the Final Safety Analysis Report (FSAR) concerns only Oconee Nuclear Station Units 1 and 2. As a result, the potential for inadequate flow to safety-related components could have existed without being in violation of the TS. The inconsistent information between TS LPSW requirements and the FSAR has existed since their initial issuance without being recognized as a problem. A review of past operational conditions indicate that there have been occasions where only two LPSW pump were operable. The station has been operated based on this TS requirement since its start up in 1973. If an adequate review of the requirements of TS and the LPSW system had been addressed prior to the initial start-up of Unit 2, the required number of operable LPSW pumps would not be an issue in this report. Therefore, the TS versus FSAR issue

is considered a Management Deficiency (Procedure Control Process). Corrective action for an interim period included placing administrative controls on the operation of the LPSW pumps to require three pumps operable at all times. For the long term, the TS will be revised to adequately indicate the appropriate LPSW system requirements. No documentation existed that could have verified that the LPSW system can deliver acceptable flow to all safety-related LPSW loads during accident conditions. The Design Basis Document should address and resolve any conflicts between licensing documents.

Once the three pump requirement was established, a calculation was performed to verify that the three LPSW pumps for Units 1 and 2 would be adequate. This calculation indicated that there was less than desired flow to the Reactor Building Cooling Units (RBCU). This calculated flow rate was evaluated and determined to be acceptable. Additionally, to provide further assurance that the system would perform as indicated by the calculation, a flow test was performed on Unit 3. This test verified the validity of the these calculations. The result of these calculations and testing verified that the LPSW system for Units 1, 2 and 3 are capable of supplying their safety related components in all design bases scenarios.

As a result of the testing performed, an additional concern was identified. In the event of a Loss of Instrument Air concurrent with a LOCA, a condition could exist where the Low Pressure Injection (LPI) coolers could experience high flow that would exceed the manufacturer's limits for the cooler operability. The original design of the LPSW system apparently assumed operator action to mitigate the affects of excessive flow due to a valve failing open. The current evaluation shows that there is inadequate time for operator response prior to LPI cooler damage. This assumption should have been identified and compensated for in the system design so that there was adequate time for operator action. Therefore, the root cause of the LPI cooler excessive flow issue is considered a Design Deficiency, (Functional Design Deficiency - Mechanical). The corrective action to resolve this issue was to install travel stops on all LPI Cooler Outlet Control Valves.

There have been previous events at Oconee where high flow was experienced through the LPI coolers. These were times that the high flow problem could have been detected. The significance of these events was not adequately determined and adequate priority was not given to the corrective actions and evaluation of these events. At the time of the event addressed by this Licensee Event Report (LER), there were existing plans to replace the LPI Cooler Outlet Control Valve with ones that included travel stops. Had these excessive flow events been properly addressed, the high flow problem addressed by this LER would not have been encountered. Therefore, an

additional cause of this event is Management Deficiency. The corrective action program has been significantly enhanced since 1988. The new Problem Investigation Program includes a management review of all unresolved problems that exceed a 30 day limit. This process should address problems of this type in a more timely manner.

A review of past Problem Investigation Reports (PIR) indicate three similar events occurred in 1988. One event was documented as a PIR on Unit 1, and the other two were reported as Unit 3 Station Incidents Reports. In the Unit 1 event, the '1A' LPI Cooler Outlet Flow Control Valve failed open and the Control Room LPSW instrumentation was over ranged (greater than 6000 gpm). In the separate Unit 3 events, the control air tubing supplying '3A' or '3B' LPI Cooler Outlet Flow Control Valves was found broken. Upon loss of control air, the valves failed open. In both events, the flow through the coolers was controlled at less than 5500 gpm. Thus, this part of the event is considered recurring.

There were no releases of radioactive material, radiation overexposures, or personnel injuries associated with these events. No equipment failures are associated with this event, therefore, this event is not considered NPRDS reportable.

CORRECTIVE ACTIONS

Immediate

1. Operational guidelines were issued to require three LPSW pumps to be operable for Units 1 and 2.

Subsequent

1) Operations personnel were instructed to maintain all three pumps operable, or to enter the applicable Limiting Condition for Operation, pending completion of the calculations.

2) An independent internal engineering assessment was performed to review the assumptions and information which were the basis for continued operation of Units 1 and 2.

3) Technical Specifications Interpretation was issued on LPSW pump requirements and Low Pressure Injection coolers and Reactor Building Cooling Units operability.

4) Operability Evaluations were performed on LPSW pump requirements and Low Pressure Injection coolers and Reactor Building Cooling Units operability.

5) LPSW full flow test was performed on Unit 3.

6) LPSW flow test was performed on Units 1 and 2

7) Travel stops were installed on the LPI Cooler Outlet Control Valves for all three units.

Planned

1) The LPSW Design Bases Document will be completed.

2) Revise Technical Specification to adequately reflect the appropriate LPSW operability requirements.

3) Appropriate periodic LPSW system flow testing will be implemented.

SAFETY ANALYSIS

An engineering analysis concluded that a design basis failure mode (Loss Of Coolant Accident/Loss Of Offsite Power (LOCA/LOOP) concurrent with a Loss Of Instrument Air (LOIA) and LPI cooler Outlet Valve failure) can deliver excessive flows to the Low Pressure Service Water (LPSW) side of the cooler (assuming that all three LPSW pump are running and no operator action). This could exceed the design (6000 gpm) and maximum (7500 gpm) limit for continuous flow through the Low Pressure Injection (LPI) coolers, thus causing the cooler to fail until the damaged cooler is isolated. One consequence of an LPI cooler failure would be a release of Reactor Coolant System fluid to the atmosphere and/or the lake. However, the probability of these events occurring simultaneously is very low. Conservatisms are calculated into the LPSW system engineering calculations which reduce the probability that the actual maximum flow rate where the cooler would fail will be reached. An analysis by the cooler manufacturer concluded the cooler can withstand a flow rate of less than 9500 gpm without experiencing an immediate catastrophic failure. Fatigue induced damage is possible if the cooler tubes are exposed to flow rates between 7500 to 9500 gpm for an extended period. The potential for fatigue induced damage is negligible if a flow of 8800 gpm is maintained for less than two hours. To prevent this failure from occurring, travel stops were installed on all three unit's LPI Cooler Outlet Control Valves.

In the extreme case, should mechanical damage to an LPI cooler occur (due to excessive LPSW flow) and operator action is unable to establish flow through the inoperable cooler, core cooling capability could eventually be lost. From a core damage accident precursor perspective, considering the frequency of postulated LOCA events, and the conditional random LOOP or LOIA initiated failure probability of the LPSW flow control valve, the core damage probability is on the order of 2 X 10E-7 per year. For some LOCA events, the potential exists for isolating the damaged cooler and recovering the initially inoperable LPI cooler. Considering the recovery potential, the core damage probability would be smaller than the value calculated above.

TS 3.3.7 requires two of three LPSW pumps to be operable for Units 1 and 2. A single failure of one LPSW pump during a LOCA/LOOP scenario would result in reduced RBCU and LPI Cooler heat removal capability due to low LPSW flow. The effect of reduced LPSW capacity, due to less than one LPSW pump per unit, on accident mitigation is reduced Reactor Building Cooling Unit (RBCU) and LPI cooler heat removal capability. While no analysis exist to determine the affect of RB spray by itself, it is reasonable to assume that RB spray will maintain RB pressure and temperature within the Environmental Qualification (EQ) envelope while taking suction on the cool Borated Water Storage Tank (BWST). Once the BWST supply is exhausted and sump recirculation is established, the core cooling will be maintained by LPI injection. With inadequate LPSW flow to LPI coolers and RBCUs, it is possible that the RB EQ envelope could be exceeded. This could render RB equipment inoperable although the effects of exceeding the EQ envelope is uncertain. In retrospect, there have only been a few incidents where the LPSW pump availability of unit 1 and 2's LPSW pumps has been reduced to less than three pumps and these occasions were only for short periods. The likelihood of a single failure of one of the LPSW pump occurring during those periods is remote.

As a result of this event, the health and safety of the public could have been affected if the LPI cooler failure had occurred, however, due to the low probability of these events occurring the risk to the health and safety of the public was minimal.