

10 CFR 50.73

Pilgrim Nuclear Power Station Rocky Hill Road Plymouth, Massachusetts 02360

E. T. Boulette, PhD Senior Vice President - Nuclear

December 4, 1995 BECo Ltr. #95-120

U.S. Nuclear Regulatory Commission Attn: Document Control Desk Washington, D.C. 20555

> Docket No. 50-293 License No. DPR-35

The enclosed Licensee Event Report (LER) 95-010-00, "Individual Salt Service Water System - Pumps Failure to Meet Surveillance Requirement", is submitted in accordance with 10 CFR Part 50.73.

Corrective actions associated with this report are complete and, therefore, this report contains no commitments.

Please do not hesitate to contact me if there are any questions regarding this report.

ETBouli

E.T. Boulette, PhD

DWE/dmc/9501000

cc: Mr. Thomas T. Martin Regional Administrator, Region I U.S. Nuclear Regulatory Commission 475 Allendale Road King of Prussia, PA 19406

Sr. NRC Resident Inspector - Pilgrim Station

Standard BECo LER Distribution

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

On November 3, 1995, it was concluded the plant was not operated in accordance with Technical Specification 3/4.5.B on certain dates in 1991 and 1992. Specifically, the 72 hour limiting condition for operation was not complied with during certain periods in 1991 and 1992 because the individual recorded Inservice Test Program flow test data in 1991 - 1992 for two of the five Salt Service Water (SSW) System pumps was less than necessary to meet the specification of 55 feet total dynamic head (TDH) at 2700 GPM. The condition was first identified in November 1994 following a review of the SSW system design basis. In November 1994, it was discovered that 87.5 feet TDH, as measured at the pump impeller, at 2700 GPM. The most recent flow test results for October and November 1994 were greater than 87.5 feet TDH.

The cause of not complying with Technical Specification 3/4.5.B during certain periods in 1991 and 1992 was the failure to correctly translate the basis of the specification of 55 feet TDH to the acceptance criteria in the associated test procedure. The root cause was that no direct documentation existed for the 55 feet TDH at 2700 GPM requirement until a November 1994 calculation identified the value 87 5 feet TDH at the pump impeller necessary to meet the Technical Specification of 55 feet TDH (at the pump discharge). Corrective action taken included the issuance of the new calculation, a 10 CFR 50.59 safety evaluation, revision of procedures involving SSW System pump testing, and changes to the Final Safety Analysis Report. During the periods of plant operation not in compliance with Technical Specification 3/4.5.B, reactor startups occurred, operation occurred at various reactor power levels, and shut downs occurred when two SSW pumps in each loop had combined performance that exceeded the minimum pump head necessary for the SSW System to fulfill its safety function. The condition posed no threat to the public health and safety.

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# BACKGROUND

The safety objective of the Salt Service Water (SSW) System is to provide a heat sink for the Reactor Building Closed Cooling Water (RBCCW) System under transient and accident conditions. The power generation objective of the SSW System is to provide a heat sink to the RBCCW and Turbine Building Closed Cooling Water (TBCCW) Systems during planned operations in all operating states. The SSW System consists of five service water pumps, and associated piping, valving, and instrumentation. The pumps discharge to a common header from which independent piping supplies each of the two cooling water loops, 'A' and 'B', with each loop consisting of one RBCCW heat exchanger and one TBCCW heat exchanger. Two division valves are included in the common discharge header to permit the SSW System to be operated as two independent loops. SSW pumps 'A' and 'B' are connected to ioop 'A' and pumps 'D' and 'E' are connected to loop 'B'. The two division valves, MO-3808 and MO-3813, are arranged to permit SSW pump 'C' to supply water to either or both SSW loops. Normally, the division valves are in the open position with sufficient pumps in service depending upon heat load and seawater temperature. The SSW System pumps are unique in that the pumps are vertical turbine, single stage, type 12 X 16 DHLC pumps manufactured by Goulds Pumps Inc.

The RBCCW System consists of two independent closed loops, 'A' and 'B', that can be interconnected through two cross-ties. Each loop consists of one RBCCW heat exchanger, three pumps, associated piping, valving, and instrumentation. Either loop has sufficient capacity with two RBCCW pumps operating to transfer the design heat load during postulated transient or accident conditions. Normally, one pump in each loop is in operation. The Final Safety Analysis Report (FSAR) identifies the design of the RBCCW heat exchangers to be capable of removing 65E+06 BTU/Hr from the RBCCW System during postulated transients and accidents.

Technical Specification 3/4.5.B governs the containment cooling system that consists of two independent loops, 'A' and 'B'. To be operable, a loop requires one Residual Heat Removal (RHR)/LPCI pump, two RBCCW pumps, and two SSW pumps. Each loop has the capability to perform its design function (i.e., heat removal), even with some system degradation. If one loop is out of service, reactor operation is permitted for 72 hours. With some components or systems out of service, overall core and containment cooling reliability is maintained by the operability of the remaining cooling equipment. Until the installation and calibration of ultrasonic flow meters, the configuration of the SSW flow measuring instrumentation did not permit flow testing of an individual SSW pump during normal operation. Pump operability is demonstrated quarterly. The testing is performed in accordance the Inservice Code Testing Program (IST) for pumps and valves.

The IST Program for pumps and valves is described and implemented in accordance with approved procedures. The IST Program for pumps and valves is described in procedure 8.I.1.1, "Inservice Pump and Valve Testing Program". The program includes static head and flow tests of the SSW pumps. In part, the current IST Program was developed as a result of Generic Letter 89-04, "Guidance on Developing Acceptable Inservice Test Programs". Subsequent licensing correspondence with the NRC regarding the Pilgrim IST Program included letters to the NRC on January 4, 1990 (letter 90-001), October 25, 1990 (letter 90-127), and October 30, 1992 (letter 92-126).

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PILGRIM NUCLEAR POWER STATION

Letter 90-001 included a commitment to conduct individual SSW pump flow tests each refueling outage. Letter 92-126 submitted proposed Technical Specifications changes that resulted in the incorporation of ASME Section XI Inservice Code Testing into Technical Specifications as license amendment number 149, dated September 28, 1993.

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Procedure 8.5.3.2, "Salt Service Water System Pump and Valve Operability Tests", is performed during normal plant operations when individual pump flow tests cannot be conducted. The procedure implements a portion of the IST Program including the SSW pumps shutoff head tests. Procedure 8.I.11.20, "Cold Shutdown Operability Test of Salt Service Water System Pumps and Valves", is performed while the plant is shut down. The procedure implements a portice of the IST Program including the SSW pumps flow tests. The testing methodology in these procedures is in accordance with the IST Program for SSW pumps testing (relief request RP-1). The procedures are tracked and scheduled in accordance with procedure 1.8, "Master Surveillance Tracking Program".

In part, Technical Specification 4.5.B.1.a specifies that when tested in accordance the IST Program, each SSW pump is to deliver 2700 GPM at 55 feet TDH (total dynamic head). In September 1994, Problem Report 94.9385 was written to document a discrepancy between the Technical Specification 4.5.B.1.a requirement for SSW pump head (2700 GPM at 55 feet TDH) and a hydraulic calculation (S&L 89-218a dated 3/5/90) that included the RBCCW System and SSW System. The problem was identified as part of actions related to Problem Report (PR) 94.9297 that involved SSW System/seawater inlet temperature.

Engineering evaluation of PR 94.9385 included a licensing basis and design basis review of the SSW System and a new calculation (M630 Rev. 0). Calculation M630 concluded that for flow testing, an individual SSW pump should deliver 2700 GPM at 87.5 feet TDH, as measured at the pump impeller, to meet Technical Specification 4.5.B.1 of 2700 GPM at 55 feet TDH, as measured at the pump discharge. Calculation M630 also concluded that a minimum SSW System flowrate of 4500 GPM to the respective RBCCW heat exchanger will be maintained if the combined head of the two SSW pumps in the loop is greater than 153.0 feet TDH.

The engineering evaluation of PR 94.9385 also resulted in the issuance of a 10 CFR 50.59 safety evaluation (# 2892) that supported a decrease in the FSAR minimum required SSW System flowrate from 5000 GPM to 4500 GPM (i.e., one SSW loop with two SSW pumps) to the respective RBCCW heat exchanger for heat removal during accident conditions.

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	POWI	0	FUMP		PUMP	5		
	Pump 'A'	Pump 'B'	Pump 'C'	Pump	D'	Pump 'E'		
	89.5	71.7'	92.1	86.8		92.1'		
	(7/30/91)	(7/30/91)	(7/31/91)	(8/01/	91)	(7/31/91)		
	rebuild (2/11/92)		rebuild (1/14/92)	rebuild (11/91				
	90.5′ (2/11/92)	81' (4/02/92)	100.5' (4/02/92)	95.4' (4/03/9	92)	84.5' (4/03/92)		
						rebuild (10/22/92)		
	88.5	76.3	93'	88'		97'		
	(10/30/92)	(10/29/92)	(10/30/92)	(10/30	/92)	(10/30/92)		
		rebuild (2/18/93)						
	88.3' (5/11/93)		97.3' (5/11/93)	93.3' (4/26/9	93)	98.3' (4/28/93)		
		(2/18/93) 96.2'						

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	91.9' (4/24/95)	94.5' (4/24/95)	94.8' (4/25/95)		02' 5/24/95	)	95.5' 4/11/95)		

Please note the IST program includes trending and actions when test results indicate performance variance. Please also note that for instances when the flow test for an individual pump was less than 87.5 feet, the combined head for the two pumps in the respective loop was greater than 153.0 feet.

A 10 CFR 50.73 reportability evaluation of PR 94.9385 was subsequently conducted and completed on December 22, 1994. The evaluation concluded the flow test data (i.e., less than 87.5 feet TDH) for pumps 'B', 'D, and 'E', was not reportable. The conclusion was based, in part, on SSW pumps recorded shut off head test data, SSW pumps recorded flow test data, IST history of the SSW pumps, and engineering judgment.

A self-assessment of service water system operational performance was conducted in January-February, 1995. The self-assessment report identified actions that are being tracked. The self-assessment was the subject of NRC Inspection Report 95-01.

An NRC Engineering inspection was conducted during the period October 23, 1995 - November 3, 1995. During the inspection, the inspector reviewed the PR 94.9385 reportability evaluation and questioned the conclusion of the evaluation. Problem Report 95.9572 was written to document the potential erroneous reportability conclusion for PR 94.9385. The 10 CFR 50.73 reportability evaluation of PR 95.9572 concluded, on November 3, 1995, that the SSW pumps 'B', 'D', and 'E' recorded flow test data, in conjunction with plant operations during certain periods of operation in 1991 and 1992, meant that plant operation was not in compliance with Technical Specification 3.5.B on certain dates.

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# EVENT DESCRIPTION

On November 3, 1995, it was concluded that plant operation was not in compliance with Technical Specification 3.5.B on certain dates in 1991 and 1992. Specifically, a reactor startup occurred on 8/11/91 (following refueling outage number 8) with operation until a shut down on 10/30/91, a reactor startup occurred on 11/21/91 with operation until a shut down on 3/26/92, a reactor startup occurred on 4/9/92 with operation until a shut down on 4/10/92, and a reactor startup occurred on 4/12/92 with operation until a shut down on 10/24/92 (mid-cycle 8 outage). During those periods, and based upon the recorded IST flow test data of the SSW pumps that were individually less than 87.5' TDH, the 72 hour LCO of Technical Specification 3.5.B was not followed on or about 8/14/91, on or about 11/24/91, on or about 4/9/92, and on or about 4/15/92. The LCO was not entered at that time because the existing acceptance criteria had been met.

Problem Report 95.9572 was written to document the problem including the erroneous 10 CFR 50.73 reportability evaluation for PR 94.9385.

### CAUSE

The cause of not complying with Technical Specification 3.5.B on or about the dates identified was the failure to correctly translate the basis of the Technical Specification of 55 feet TDH (at 2700 GPM) to the acceptance criteria in the associated IST test. The direct cause of the discrepancy between Technical Specification 4.5.B.1.a and the hydraulic calculation (S&L 89-218a) was insufficient documentation of the basis of the Technical Specification (S&L 89-218a) was insufficient documentation of the basis of the Technical Specification requirement of 55 TDH (at 2700 GPM). The new information obtained during the engineering evaluation for PR 94.9385, including the generation of calculation M630, meant the pump dynamic head criterion for SSW pump flow incorporated into the procedures implementing the IST Program for the SSW pumps needed to be changed to 87.5 TDH from 55 feet TDH.

The basis of 55 feet TDH (at 2700 GPM) was determined by correcting an architect engineer design calculation (M-E-1 dated 12/69) of the SSW System's minimum required SSW pump head of 95 feet (including margin) during a postulated loss of coolant accident. The correction was for a tide level of -8.3 feet and the approximately 40 feet vertical difference between the SSW pump impeller and pump discharge. Calculation M630 (Rev. 0) was approved on 11/14/94. At the time when M630 was approved, the most recently recorded IST Program flow test data for the SSW pumps was satisfactory. The reportability evaluation of PR 94.9385 included a retrospective review of recorded IST Program flow and shut off head test data of the SSW pumps previously conducted in the 1991 - 1994 time frame.

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The root cause of the erroneous 10 CFR 50.73 reportability evaluation of PR 94.9385 was utility non-licensed personnel error (i.e., Regulatory Affairs Department (RAD) Engineer). Specifically, the Engineer's 10 CFR 50.73 reportability evaluation included review of Technical Specifications 3/4.5.B, the updated Final Safety Analysis Report section 10.7 (SSW System), the engineering evaluation of PR 94.9385, recorded IST flow and static test data, control room logbooks on or about the dates the flow tests were less than 87.5 feet, and engineering judgment. The IST pump history, the recorded dynamic head (flow) test data and static head (shut off) test data indicated to the RAD Engineer that the performance of SSW pumps 'B', 'D', and 'E' was not significantly degraded because the static head data for each of the pumps was greater than 148 feet and, therefore, the pumps' performance was not reportable.

Another factor was the RAD Engineer's participation in the review of the SSW System licensing basis that included some design basis document review in November - December 1994. The document review was related to PR 94.9385 and part of preparations for the self-assessment of service water system operational performance. The review included retrieval of historical licensing and design documents including the SSW pump test data and pump curves from the pump manufacturer. The manufacturer's test data and curves indicate the pump head is approximately 150 feet at shut off (static head). The insight gained from the licensing basis and design review, in conjunction with the engineering evaluation of PR 94.9385 that included the results of calculation M630, the SSW pumps' curves, the IST pump history and recorded flow test data and static head data contributed to the RAD Engineer's judgment that the performance (i.e., recorded flow test results) of SSW pumps 'B', 'D', and 'E' was not significantly degraded and, therefore, not reportable.

# CORRECTIVE ACTION

Calculation M630 (Rev. 0) was approved on November 14, 1994. The calculation included the basis for the new value (87.5 feet TDH) needed to meet the value of 55 feet TDH (Technical Specification 4.5.B.1.a) and the value (153.0 feet TDH) for the combined head of two SSW pumps in a loop that is necessary for SSW System operability. A 10 CFR 50.59 evaluation (#2892) was written to decrease the FSAR minimum SSW System flowrate from 5000 GPM to 4500 GPM to the respective RBCCW heat exchanger for heat removal during accident conditions.

FSAR sections 10.5 (RBCCW), 10.7 (SSW System ), and 14.5 (accident conditions) were changed to reflect safety evaluation 2892.

Action items resulted from the engineering evaluation of PR 94.9385. The action items are summarized as follows:

The five SSW pumps were flow tested while shut down during the August - November 1994 outage. The flow tests in October-November 1994 (i.e., prior to startup on November 29, 1994) for each SSW pump were greater than 87.5 feet TDH.

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Procedures were revised as a result of the engineering evaluation of PR 94.9385 and/or safety evaluation #2892. The procedures included:

- Procedure 8.5.3.2 was revised (from Rev. 34 to Rev. 35) and approved on January 31, 1995. The focus
  of the revision was to change the shutoff head acceptance criteria to greater than 136 feet from 110 feet.
- Procedure 8.I.11.20 was revised (from Rev. 2 to Rev. 3) and approved on January 31, 1995. The focus
  of the revision of procedure 8.I.11.20 was to change the acceptance criteria to 87.5 feet TDH, at 2700
  GPM, from 55 feet TDH, at 2700 GPM.

A recommendation was identified for a detailed model of the RBCCW System, similar to that generated for the SSW System in calculation M630. The RBCCW System hydraulic model was completed and subsequently approved in April 1995.

The erroneous 10 CFR 50.73 reportability evaluation was discussed during a Regulatory Affairs Department (RAD) meeting. The meeting included the RAD Engineers who perform 10 CFR 50.73 evaluations and the RAD Engineer who performed the reportability evaluation of PR 94.9385. The discussion included the engineering judgment that concluded the problem was not reportable and the reason for the error.

Instructions for performing and documenting 10 CFR 50.73 reportability evaluations are contained in Work Instruction 3.06-01. The instruction includes a checklist of the subparts of 10 CFR 50.73. The instruction was revised (from Rev. 5 to Rev. 6) to strengthen the checklist pertaining to 10 CFR 50.73 subpart (a)(2)(i)(B), the criterion for reporting plant operation prohibited by Technical Specifications. The focus of the revision was to add a caution to indicate that safety significance is not to be considered when determining compliance with a Technical Specification.

A review was performed of 10 CFR 50.73 reportability evaluations conducted in the July 1994 to June 1995 time frame. The review consisted of approximately 25 percent of the evaluations conducted during that period. The review was performed by the RAD Engineers responsible for 10 CFR 50.73 evaluations. The review was independent in that the reviewers did not review reportability evaluations they had conducted. The review identified no other instance of a reportable event or condition for which the reportability evaluation concluded the event or condition was not reportable.

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

### OTHER ACTION

Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment", was issued on July 18, 1989. Letter 90-047 (dated 4/2/90) was the first of two required responses to GL89-13. The second required response to GL£0-13 is pending the completion or resolution of actions resulting from the January-February 1995 self-assessment of service water system operational performance.

#### SAFETY CONSEQUENCES

The condition of not complying with Technical Specification 3/4.5.B posed no threat to the public health and safety.

The IST pump history and recorded flow test data for the SSW pumps indicate that from 7/30/91 to 2/18/93 when it was rebuilt, the dynamic head for SSW pump 'B' was less than 87.5 feet. The pump was rebuilt on 2/18/93 and the recorded dynamic head was approximately 96.2 feet when it was next tested on 5/12/93 while shut down. During the period 7/30/91 to 2/18/93, the recorded dynamic head for SSW pump 'A' was greater than 87.5 feet TDH, the recorded dynamic head for SSW pump 'C' was greater than 87.5 feet TDH, the recorded dynamic head for SSW pump 'D' was less than 87.5 feet TDH (i.e., approximately 86.8 feet TDH) from 8/1/91 until it was rebuilt in November 1991, and the recorded dynamic head for SSW pump 'E' was less than 87.5 feet TDH (i.e., approximately 84.5 feet TDH) from 4/3/92 until it was rebuilt on 10/22/92. Hence, based on the IST pump history and recorded flow test data during that period, there were a maximum of two SSW pumps that were individually not capable of providing 87.5 feet TDH and, consequently, not in compliance with Technical Specification 4.5.8.1.

Calculation M630, however, concluded that 4500 GPM will be provided to the respective RBCCW heat exchanger if the combined head of two SSW pumps in the same SSW loop exceeds 153.0 feet TDH. The 153.0 feet TDH is based on the combined performance of two SSW pumps in parallel. Based on the recorded dynamic test data, and for the 1991 - 1993 period, the combined head of two SSW pumps in either loop was greater than 153.0 feet TDH. Therefore, both SSW System loops were capable of performing their safety function during the period when the recorded flow test data for pumps 'B', 'D', and 'E' were individually less than 87.5 feet TDH.

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compliance with Tech section of this report. SIMILARITY TO PRE A review was conduct focused on LERs sub analysis problem. Th C'. The review ident ENERGY INDUSTRY		B on certain dates licensee Event Rep with 10 CFR 50.73( R 91-002-00 that inv s problem. STEM (EIIS) CODE	as sumi orts (LE a)(2)(i) ii volved a	Rs) submitted since	NT DESCRI	PTION review nilar
COMPONENTS		CODE				
Pump (SSW Pumps)		P				
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Essential Service Wa Ultimate Heat Sink S	ater System (RBCCW) ystem (SSW)	BI BS				

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