

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Limerick Generating Station, Unit 1										DOCKET NUMBER (2) 0 5 0 0 0 3 5 2										PAGE (3) 1 OF 0 8																													
TITLE (4) 'A' Loop of the Emergency Service Water system was inoperable as a result of an equipment failure and personnel errors.																																																	
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 (3)												
																											Limerick, Unit 2										0 5 0 0 0 3 5 3												
1 0			2 5			9 1			9 1			0 2			4			0 1			0 2			0 8			9 3													0 5 0 0 0 1 1									
OPERATING MODE (9) 1										THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5. (Check one or more of the following) (11)																																							
POWER LEVEL (10) 1 0 0										20.402(b)										20.405(e)										50.73(a)(2)(iv)										73.71(b)									
										20.405(a)(1)(i)										50.38(a)(1)										X 50.73(a)(2)(v)										73.71(c)									
										20.405(a)(1)(ii)										50.38(a)(2)										50.73(a)(2)(vi)										OTHER (Specify in Abstract below and in Text, NRC Form 368a)									
										20.405(a)(1)(iii)										X 50.73(a)(2)(i)										50.73(a)(2)(vii)(A)																			
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LICENSEE CONTACT FOR THIS LER (12)																																																	
NAME G. J. Madsen, Regulatory Engineer, Limerick Generating Station																				TELEPHONE NUMBER AREA CODE 2 1 1 5 3 2 7 1 - 1 2 0 0																													
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																																																	
CAUSE			SYSTEM			COMPONENT			MANUFACTURER			REPORTABLE TO NRC			CAUSE			SYSTEM			COMPONENT			MANUFACTURER			REPORTABLE TO NRC																						
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 October 25, 1991, an Emergency Service Water (ESW) system Surveillance Test (ST) procedure was performed for its normally scheduled quarterly performance by a non-licensed operator. The non-licensed operator observed pressurized flow through a check valve and noted this in the ST procedure. Main Control Room operations personnel reviewed the test and determined it was unsatisfactory due to the noted ST procedure step, but failed to declare equipment inoperable. On October 29, 1991, an evaluation of the ST procedure by the plant staff determined that the ESW system check valve failed to perform as designed and was therefore inoperable. The plant staff also determined that a condition prohibited by Technical Specifications existed. Corrective actions were immediately taken by operations personnel to address this condition. The actual consequences of this event were minimal in that no accident or operating transient occurred requiring operation of the affected safety systems. The causes of this event were an equipment failure and a failure to follow procedures due to 1) less than adequate training, 2) a misleading ST procedure note, and 3) a failure to initiate corrective actions. Corrective actions included repair of the ESW system check valve on November 19, 1991, letters from the plant manager to licensed operations personnel and senior plant staff members providing management expectations for when similar conditions occur, review and discussion at an operations shift supervision meeting, and training.

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APPROVED OMB NO. 3150-0104
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TEXT (If more space is required, use additional NRC Form 365A's) (12)

Unit Conditions Prior to the Event:

Unit 1 and Unit 2 were in Operational Condition 1 (Power Operation) operating at 100% power level.

In January, 1991, the Emergency Service Water (ESW; EIS:BI) system check valve (EIS:VLV), 11-0063 failed its quarterly Surveillance Test (ST) procedure performance due to corrosion product buildup. As a result of this identified failure, the valve was repaired and returned to service. In May 1991, the same check valve again failed its quarterly ST performance due to corrosion product buildup. Corrective actions resulted in the replacement of the check valve in kind.

Between October 25 and 29, 1991, the Unit 1 D14 Emergency Diesel Generator (EDG;EIS:EK) was out-of-service and declared inoperable to support scheduled EDG maintenance outage activities. As a result, the 'D' Core Spray system (EIS:BG) pump and the 'D' Low Pressure Coolant Injection (EIS:BO) pump would have been unavailable in the event of a transient with a loss of offsite power.

Description of the Event:

On October 25, 1991, during the afternoon shift, Surveillance Test (ST) procedure ST-6-011-231-0, "A Loop Emergency Service Water Pump, Valve, and Flow Test," was being performed for its normally scheduled quarterly performance by a non-licensed operator. This ST procedure contains an Inservice Inspection (I) step (step 6.4.40) that verifies proper operation of the safety related ESW system check valve, 11-0063. This check valve provides one isolation point between the non-safety related Service Water (SW) system and the ESW system. This check valve ensures ESW system piping integrity under accident conditions and allows the SW system to supply cooling water to the Unit 2 Reactor Core Isolation Cooling (RCIC;EIS:BN) system room coolers (EIS:CLR) during normal operating conditions (See Figure 1).

The purpose of ST procedure step 6.4.40 is to ensure the valve checks flow by verifying that no pressurized flow exists from the ESW system line to the SW system line. Proper operation of the check valve is verified by opening drain valve 11-2075 and observing no pressurized water flow with valve 11-2013 closed. The non-licensed operator properly performed this ST procedure step; however, he observed that pressurized flow did exist from the drain valve. The licensed Operations Floor Supervisor was immediately made aware of this condition by the non-licensed operator as required by the ST procedure. The non-licensed operator was then instructed by the Operations Floor Supervisor to place a note in the ST procedure identifying this discrepancy in accordance with the procedure. A note was placed in the ST procedure stating that, "pressurized flow exists from valve 11-2075 as it did the last time the ST was performed." However, the non-licensed operator was referring to the last time he had performed the ST procedure in May 1991, at which time the check valve was replaced in kind. The non-licensed operator then informed the Main Control Room

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(MCR) Chief Operator (CO), a licensed operator, that the drain valve had pressurized flow. The non-licensed operator completed the ST procedure and returned it to the MCR CO. The MCR CO signed the ST procedure as unsatisfactory at 2310 hours and left the Independent Verification of Restoration (IVOR) section of the ST procedure to be completed by the licensed MCR CO on midnight shift.

On October 26, 1991, during the midnight shift, the MCR CO had the IVOR section of the ST procedure completed, and gave the failed ST procedure to the licensed MCR Shift Supervisor for review. The licensed MCR Shift Supervisor reviewed the ST procedure and then discussed the results with the licensed MCR Shift Manager and Shift Technical Advisor (STA). They could not be certain whether the check valve had failed or the SW system manual isolation valve 11-2013 was leaking. SW valve 11-2013 was closed during performance of ST procedure step 6.4.40. As a result of the non-licensed operator's note, the MCR Shift Manager, MCR Shift Supervisor, and STA assumed that corrective actions and an operability determination were previously addressed. However, the MCR personnel did not verify that adequate corrective actions were previously initiated. They also discussed that the failed ST procedure step was an (I) step, not an asterisk (*) step. The asterisk step denotes association with maintaining Technical Specifications (TS) requirements. Therefore, MCR personnel determined that there was no immediate operability concern.

The Shift Manager reported the failed ST procedure to the on duty Senior Plant Staff member on October 26, 1991. However, the ST procedure was not signed off by the Senior Plant Staff member at that time because questions arose regarding a separate plant issue which required immediate attention. On October 28, 1991, at 0830 hours, the ST procedure was signed off as unsatisfactory by the Senior Plant Staff member. On October 29, 1991, during routine review of failed ST procedures, a plant Technical Staff member noted that the check valve had failed. The Technical Staff member determined that, since the valve serves as a boundary between the ESW and SW systems, reverse leakage through the valve would render the 'A' Loop of the ESW system inoperable. Based on this determination, the Technical Staff member immediately notified the licensed MCR Shift Supervisor. At 1430 hours, further troubleshooting was performed and the system engineer verified that the leakage through the check valve was above the Inservice Test (IST) program limit of 10 gpm. Following the troubleshooting, operations personnel closed manual valve 11-2070 at 1600 hours and isolated the SW to ESW system interface (See Figure 1). This restored the 'A' Loop of the ESW system and associated equipment to an operable status.

TS Section 3.7.1.2 for ESW requires that with 1 ESW system loop inoperable, all the equipment aligned to the inoperable loop must be declared inoperable and to restore the inoperable loop to operable status within 72 hours or be in hot shutdown within the next 12 hours and cold shutdown in the following 24 hours. The 'A' Loop of the ESW system was inoperable from 2310 hours on October 25, 1991 until 1600 hours on October 29, 1991 (88 hours, 50 minutes). The equipment served by the 'A' Loop of the ESW system was also inoperable for that time

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period. The 'A' Loop of the ESW system provides cooling water to the following equipment:

- o the four heat exchangers for the Unit 1 and Unit 2 EDGs aligned to the 'A' Loop of the ESW system (D11, D13, D21, D23),
- o the RCIC system pump compartment room coolers for Unit 1 and Unit 2,
- o the common 'A' Control Enclosure Chiller (EIIS:VI),
- o the 'A' and 'C' Core Spray system pump compartment room coolers for both Unit 1 and Unit 2,
- o the 'A' and 'C' Residual Heat Removal (RHR) system pump compartment room coolers for both Unit 1 and Unit 2, and
- o the 'A' and 'C' RHR pump motor oil coolers and seal coolers for both Unit 1 and Unit 2.

When the 'A' Loop of the ESW system became inoperable on October 25, 1991, at 2310 hours, the equipment serviced by the 'A' Loop was not declared inoperable since the MCR operators did not recognize the significance of the failed ST procedure step. This resulted in a failure to comply with the TS ACTION statements of Unit 1 and Unit 2 TS Section 3.7.1.2.a.3 in the specified time period. This event also resulted in a failure to comply with the TS ACTION statements of Unit 1 and Unit 2 TS Section 3.8.1.1.c and 3.8.1.1.e (i.e., EDGs) which require actions to be taken within 1 and 2 hours and a plant shutdown in 12 hours.

A four (4) hour notification was made to the NRC in accordance with the requirements of 10 CFR 50.72(b)(2)(iii) on October 29, 1991, at 1829 hours, since the failed check valve, coincident with the D14 EDG inoperability resulted in a condition that alone could have prevented the D11, D13, and D14 EDGs and their associated systems from fulfilling their safety functions. This event resulted in a condition prohibited by TS because the required TS ACTIONS were not taken in the specified time period. Additionally, this event involved a single condition that caused two independent trains in a single safety system to become inoperable. Therefore, this report is being submitted in accordance with the requirements of 10 CFR 50.73(a)(2)(v), 10 CFR 50.73(a)(2)(vii), and 10 CFR 50.73(a)(2)(i)(B).

Analysis of the Event:

The actual consequences of this event were minimal in that no accident or operating transient occurred requiring operation of the affected ECCS and EDGs. There was no release of radioactive material to the environment as a result of this event.

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Under normal operating conditions, cooling water to the affected ESW system equipment is provided by the non-safety related SW system except for the EDGs. The EDGs only receive cooling water flow from the ESW system when they are in operation. During the time that the 'A' Loop of the ESW system was inoperable, the SW system was available to provide cooling water to all of the affected equipment except for the EDGs.

Had an event occurred in which the 'A' Loop of the ESW system was called upon to perform its required design function and the 'A' ESW Loop check valve, 11-0063, failed to close, the 'A' Loop ESW system flow could leak into the SW system piping or to the surrounding area if the SW line were to break off on the SW side of the check valve. However, an evaluation of the ESW system leakage estimated that the diverted ESW system water flow through the opened check valve to the SW system would have reduced the 'A' Loop of ESW cooling water flow rates to individual components other than the RCIC system pump compartment room coolers by less than 2%. This condition would result in rendering the Unit 2 RCIC system room coolers inoperable and cause a small flow rate reduction to the remaining system loads of the 'A' Loop of the ESW system. Based upon engineering judgement, we believe the small flow rate reduction would not seriously affect the ability of the 'A' Loop of the ESW system to cool the associated equipment. If the 'A' Loop of the ESW system was significantly degraded, high temperatures associated with the heat exchangers for the affected EDGs could have been observed locally by the plant operators located at the EDGs during EDG operation. If needed, System Operating procedure S11.0.A, "Abnormal Operation of ESW System", would have been used to swap a Unit 1 EDG serviced by the 'A' Loop of the ESW system to the operable 'B' Loop. Additionally, through the use of the emergency operating procedures, training, and operator actions, a success path to mitigate the consequences of the event, shutdown both units and maintain them in a safe shutdown condition could have been accomplished by MCR operations personnel.

Cause of the Event:

The primary cause of this event resulted from an equipment failure of the 'A' Loop ESW system check valve 11-0063 due to corrosion product buildup resulting from normal SW system piping corrosion.

Additionally, this event resulted from personnel errors in that operations personnel failed to follow procedures as a result of the following:

- o Less than adequate training associated with the IST program relevant to implementation of ST procedures regarding (I) versus (*) steps,
- o A misleading notation on the ST procedure made by the non-licensed operator led MCR personnel to assume that corrective actions and an operability determination were previously addressed, and
- o Failure to initiate corrective actions or verify that corrective actions were initiated.

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Corrective Actions:

- o The ESW system check valve, 11-0063, was repaired on November 19, 1991.
- o As a result of raw water corrosion problems at Limerick Generating Station (LGS), a task force was established. The Raw Water Task Force is developing a comprehensive program that is addressing raw water corrosion problems in LGS systems, including the ESW system. The comprehensive program is expected to be fully developed by June, 1993. The Raw Water Task Force has already identified changes to programs and systems to eliminate raw water corrosion problems in LGS systems. The Raw Water Task Force will manage the implementation of these comprehensive changes over the next several years.
- o The LGS check valve program has been used to identify other check valves in similar applications. Valve 11-0036 was identified and is scheduled to be disassembled and inspected for corrosion buildup during the second refueling outage of LGS Unit 2. Additionally, testing has been increased to a monthly frequency on check valve 11-0063 until a solution to the corrosion buildup is determined.
- o On October 30, 1991, shift night orders included a notice to inform operations personnel of this event and clearly state that, "If an (I) step fails, a determination of the operability of the component and the system must be made and appropriate corrective actions taken."
- o On October 30, 1991, a recorded phone message was generated providing more detailed information on the significance of this event and included the importance of promptly initiating corrective actions. This message was distributed to all shift supervision and the STAs.
- o On November 4, 1991, a For Your Information (FYI) notice (FYI-18) was developed and distributed to first line supervision. This FYI notice provided a clear and concise set of written management expectations regarding the immediate actions required to promptly identify equipment deficiencies and initiate corrective actions. First line supervision then disseminated the expectations of management in FYI-18 to appropriate station personnel to heighten their awareness of the requirements and management's expectations.
- o On November 4, 1991, a letter from the Plant Manager to all Senior Plant Staff members on-call was issued to: 1) describe this event which resulted in levels of review failing to ensure appropriate actions were taken, and 2) highlight the need for immediate operability determinations for failed (I) steps.
- o On November 4, 1991, a letter from the Plant Manager to all licensed Senior Reactor Operator operations personnel was issued reiterating management's expectations of initial response to equipment malfunction. This letter

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stated that: 1) equipment deficiencies must immediately be captured in a corrective action process which assures that an appropriate response is taken, 2) notations concerning equipment problems on ST procedures are not adequate corrective actions, 3) failed (I) steps require that an immediate operability determination be made, and 4) with TS equipment operable, when an operability determination is in process, the operations organization is responsible to assure that the evaluation is done as quickly as possible.

- o On November 5, 1991, an Operations Shift Supervision meeting was held to review this event and discuss the reasons why actions were not taken in a timely manner. This meeting emphasized the failed levels of review, and management's expectations (i.e., to declare the equipment inoperable and to initiate immediate corrective actions) regarding this type of event.
- o A presentation was provided to the licensed operators on management's expectations regarding timely operability determinations and corrective actions associated with failed (I) procedure steps.
- o Licensed operator initial and requalification training was revised to incorporate training associated with the IST program relevant to implementation of ST procedures.
- o The need to clearly communicate and accurately document test results was discussed with the non-licensed operator and was presented to all licensed and non-licensed operators via an operations section memo.
- o The previous failures of the ESW system check valves were evaluated for reportability and have been determined to be not reportable since in both previous known failures (January, 1991 and May, 1991), all EDGs were operable. In the event of an accident procedures were in place to properly realign the ESW system to the Unit 1 EDGs, providing sufficient cooling.

Previous Similar Occurrences:

LER 1-90-011 also reported a condition where one loop of the ESW system was inoperable as a result of a personnel error associated with the repair of a check valve. However, this event did not result from procedure non-compliance or a lack of attention to detail. Therefore, the corrective actions taken in LER 1-90-011 would not have prevented this event.

Tracking Codes: A - Personnel Error
A2 - Failure to Follow Implementing Procedures
B17 - Deficient Equipment

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