CENTERIOR ENERGY

PERRY NUCLEAR POWER PLANT
10 CENTER ROAD
PERRY, OHIO 44081
(216) 259-3737

Mail Address:
P.O. BOX 97
PERRY, OHIO 44081

Robert A. Stratman
VICE PRESIDENT - NUCLEAR

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

Perry Nuclear Power Plant
Docket No. 50-440
LER 94-014-00

Gentlemen:

Enclosed is Licensee Event Report 94-014-00 concerning the Failure to Perform Adequate Main Steam Isolation Valve Leak Rate Testing.

If you have questions or require additional information, please contact Mr. James D. Kloosterman, Manager - Regulatory Affairs, at (216) 280-5833.

Very truly yours,

Robert A. Stratman

RAS:DAH:sc

Enclosure: LER 94-014-00

cc: NRC Project Manager
NRC Resident Inspector Office
NRC Region III

270049

Operating Companies
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IE22

NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Perry Nuclear Power Plant, Unit 1	05000 440	1 OF 7

TITLE (4)
Failure to Perform Adequate Main Steam Isolation Valve Leak Rate Testing

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
05	24	94	94	-- 014 --	00	06	23	94		05000
									FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9)	5
POWER LEVEL (10)	000

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)		50.73(a)(2)(v)	73.71(c)
20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)	OTHER
20.405(a)(1)(iii)	X	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)
Denzel A. Housley, Compliance Engineer	(216) 280-5520

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		09	26	94

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

During the investigation of local leak rate testing (LLRT) results on the main steam line (MSL) containment penetrations, it was determined that the testing methodology utilized was not representative of design basis accident conditions. Therefore, the LLRT testing did not satisfy the surveillance requirements of Technical Specifications. Additionally, excessive seat leakage was identified on three main steam isolation valves (MSIV).

The root cause of the nonrepresentative testing of the MSIVs has been attributed to inadequate procedures. The procedures for the LLRTs allowed nonconservative testing in that additional seating force was allowed to be applied to the MSIVs by non-safety related instrument air. The cause of the MSIV leakage is still under investigation.

A design modification is being implemented to provide a safety related air supply to the outboard MSIVs. Additionally, the MSIVs with excessive seat leakage have been reworked.

Following the determination of the root cause of the MSIV leakage, this LER will be revised.

I. Introduction

During the investigation of local leak rate testing (LLRT) results on the main steam line (MSL) containment penetrations, it was determined that the testing methodology utilized was not representative of design basis accident conditions. LLRTs of the MSLs were performed with instrument air applied to the main steam isolation valve (MSIV) actuators; however, instrument air cannot be assumed to be available following a design basis accident (refer to NRC Information Notice 89-26). Therefore, LLRT testing for the MSLs did not satisfy the surveillance requirements of Technical Specification 3.6.1.2. At the time of discovery of this event, the plant was in Operational Condition 5 (Refueling) during the fourth refueling outage.

This condition is being reported pursuant to the requirement of 10CFR50.73(a)(2)(i)(B), Operation Prohibited by Technical Specifications.

II. Description of Event

System Description

The main steam system [SB] conveys steam from the reactor vessel [AD] through four MSLs denoted A, B, C, and D. Each MSL contains two MSIVs [ISV] which serve as containment isolation valves. The inboard MSIVs are located just inside the primary containment barrier (drywell). The outboard MSIVs are located outside the primary containment barrier in the steam tunnel. The containment penetration boundary for the MSLs also includes valves for the MSL drains and the MSIV leakage control system [BD].

The combination of two MSIVs in each steam line provides a highly reliable means of isolating the reactor vessel to minimize the loss of reactor coolant inventory and to limit the release of radioactive materials. The basic design of all eight MSIVs is identical. The valves are 26-inch angled globe valves of the Y configuration manufactured by Atwood and Morrill Co., Inc. (Manufacturer code A585). The cup-shaped poppet of the main disc moves on a centerline that is 45 degrees upward from the horizontal centerline of the piping run.

Attached to the upper end of the stem is an air actuator that opens and closes the valve. The MSIV closing motive force is a combination of springs and instrument air [LD]. In the case of a loss of the non-safety related instrument air, an air accumulator for each MSIV supplies air to assist spring force in closing the valve. The accumulator is sized and utilizes check valves to ensure sufficient volume to close each MSIV.

Testing Methodology

LLRTs of the MSL containment penetrations are usually accomplished once every 18 months during refueling outages. This testing consists of pressurizing the volume between the isolation valves on each main steam line to peak accident pressure (P_a) and measuring the leakage out of this volume. This method combines the leakage paths for the main steam line (MSIVs, drain line isolation valves, and MSIV leakage control system isolation valves).

By applying the test pressure between the MSIVs during LLRTs, the inboard MSIVs are tested in the reverse flow direction. This testing methodology results in the test pressure being applied to the bottom side of the poppets on the inboard MSIVs which opposes some of the the closing forces for the valve.

Technical Specification 3.6.1.2 requires that the leakage through the isolation valves of each main steam line be limited to less than 25 standard cubic feet per hour (scfh). If the LLRT on a main steam line fails to meet this requirement, additional testing can be performed to identify which leakage path(s) is excessive.

Sequence of Events

During the fourth refueling outage (RF04), the initial as-found LLRTs for MSL containment penetrations indicated that all four MSLs exceeded the 25 scfh limit of Technical Specification 3.6.1.2. During troubleshooting to identify the leakage paths on the MSLs, it was identified that the instrument air to the actuators of the MSIVs had been inadvertently isolated during the initial as-found LLRTs.

The instrument air to the actuators for the MSIVs was restored and the as-found LLRTs for the MSLs were reperformed. The results of the LLRTs showed a decrease in the leakage rates for each MSL. Packing leaks on several MSL boundary valves (non-MSIV) were identified during the LLRTs. These packing leaks were repaired, and additional testing was performed to quantify leakage attributed to isolation valve seat leakages.

The results of the as-found LLRTs (in scfh) were as follows:

MSL	LLRT with Air Isolated	LLRT with Air Applied	LLRT with Air & Packing Repairs
A	51	16	15
B	1038	102	102
C	1271	517	14
D	404	70	70

During the initial as-found LLRTs and troubleshooting testing, a NRC inspector raised a concern regarding the application of a non-safety related air supply during the LLRTs. As a result of this concern, an investigation of the requirements for testing of the MSIVs was initiated.

MSIV Seat Leakage

Troubleshooting of the leakage paths for the MSLs identified that both MSIVs on MSL B (1B21-F022B & 1B21-F028B) and the inboard MSIV on line D (1B21-F022D) exhibited excessive seat leakage. These MSIVs were reworked during the current refueling outage to improve their leak tightness.

Additionally, modifications to enhance proper seating of both the MSIVs in MSL C (1B21-F022C & 1B21-F028C) were completed during the current refueling outage. These modifications had been planned for the current refueling outage and provide enhancements that were performed earlier on the other MSIVs (see Similar Events).

Investigation of Instrument Air Use

Investigation of the MSIV LLRT requirements determined that the design of the MSIVs and instrument air would not ensure that additional seating force from the instrument air would be available throughout a design basis event. The accumulators for the MSIVs are safety related and designed to provide the motive force to initially close the MSIVs as required. However, the instrument air supply to the accumulators is not safety related and credit cannot be taken for this supply being available during design basis events. Therefore, the LLRTs which had been performed did not ensure that the design

basis MSL leakage was determined. Past LLRTs for the MSLs have also been performed with instrument air providing additional seating force for the MSIVs. On May 24, 1994, this condition was reported to the NRC resident inspector.

Design documentation from General Electric (GE), the Nuclear Steam Supply System designer, indicates that the spring force alone is not enough to ensure the leak tightness of the MSIVs. However, the original design criteria of the instrument air supply did not require a safety related instrument air supply that would be available during design basis events. Additional testing performed during this refueling outage indicates that the MSIV leakage rates increase without the added seating force provided by instrument air.

During the present refueling outage, a design change is being implemented to provide a safety related air supply to the outboard MSIVs. Technical Specification surveillance requirement limits will be met by only taking credit for a safety related air supply on the outboard MSIVs.

III. Cause of Event

The root cause of the nonrepresentative testing of the MSIVs has been attributed to inadequate procedures. The procedures for the LLRTs performed on the MSLs allowed nonconservative testing of the MSIVs in that additional seating force was allowed to be applied to the MSIVs by non-safety related instrument air. Contributing to this problem was the inadequate design considerations utilized in the containment isolation system for the MSIVs. Although the seating force from the instrument air was required to ensure the leak tightness of the MSIVs, the instrument air supply was not designed to be available during design basis events.

The cause of the excessive leakage of the MSIVs identified during this outage and the cause of the packing leaks on the MSIV leakage control system valves is still under evaluation. A revision to this LER will be submitted to detail the results of this evaluation.

IV. Safety Analysis

Primary containment integrity ensures that the release of radioactive materials from the containment atmosphere will be restricted to those leakage paths and associated leakage rates at the peak pressure of 11.31 psig (P_a) assumed in the Updated Safety Analysis Report accident analyses, thereby limiting the site boundary radiation doses to within the limits of 10CFR100.

All previous cycle LLRT results have been based on the added seating force applied by the non-safety related instrument air to the MSIV actuators. The amount by which MSIV leakage rates are affected by removing the additional seating force applied by the instrument air system on the MSIV actuator cannot be quantified, although it is likely that the leakage rates would increase. This condition would result in non-conservative results in previous LLRTs and, thus, non-conservative assumptions in the accident analyses. Due to the possibility that 10CFR100 limits could have been exceeded during a postulated accident, this event is considered to be safety significant.

V. Similar Events

Six previous LERs have been submitted to report MSL penetration leak rate test failures. These events were reported in LERs 87-051, 87-067, 89-006, 90-025, 92-006, and 93-003. In the first five instances, seat leakage from the MSIVs or leakage from other MSL boundary isolation valves was determined to be the cause. Prior to the third refueling outage (RF03) the majority of the corrective maintenance performed involved the lapping of seating surfaces. A modification was performed during RF03 for the six MSIVs in MSLs A, B, and D which had exhibited excessive seat leakage during testing. The respective MSIVs were successfully tested following modification and repair. Similar modifications for the MSIVs in MSL C were performed during the current refueling outage.

LLRTs were performed during a mid-cycle outage in January 1993 (see LER 93-003). These LLRTs identified excessive leakage on MSLs A, B, and D. It was determined that the six MSIVs which were modified during the third refueling outage had indications of leakage around the body to bonnet flanges. The leakage was determined to result from a combination of factors which included incorrect gasket dimensional sizing, an inadequate tensioning procedure used during previous valve reassembly, and a lack of metal to metal contact on the valve body to cover plate gap.

VI. Corrective Actions

The following corrective actions have been, or will be, performed.

1. The MSIVs with identified excessive seat leakage and the identified packing leaks have been reworked to reduce this leakage.

2. An evaluation of the root cause of the excessive MSIV and packing leakage is being performed and will be completed by 08/01/94.

3. A design change will be implemented during the current refueling outage to provide a safety related air supply to the actuators for the outboard MSIVs.

4. Following the determination of the root cause of the MSIV and packing leakage, this LER will be revised by 09/26/94 to reflect the results of the evaluation.

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].