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Three Mile Island Unit 1
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An Exelon/British Energy Company

April 13, 2001
5928-01-20112

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

Dear Sir or Madam:

SUBJECT: THREE MILE ISLAND NUCLEAR STATION, UNIT 1 (TMI-1)
OPERATING LICENSE NO. DPR-50
DOCKET NO. 50-289
LER NO. 2001-001-00, "EMERGENCY FEEDWATER PUMP 2A INOPERABLE
GREATER THAN THE TECHNICAL SPECIFICATION ALLOWABLE OUTAGE TIME
DUE TO AN INCORRECT OPERABILITY DETERMINATION"

This letter transmits Licensee Event Report (LER) number 2001-001-00, regarding the discovery of a condition prohibited by the Technical Specifications. The long-term corrective actions that will prevent recurrence of this event are still being developed. They will be provided in a supplement to this LER, which is expected to be submitted by June 1, 2001. For a complete description of the evaluated condition, refer to the text of the report provided on Forms 366 and 366A.

This condition did not adversely affect the health and safety of the public. For additional information regarding this LER contact Mr. Adam Miller of TMI Unit 1 Regulatory Assurance at (717) 948-8128.

Sincerely,



George H. Gellrich
Plant Manager

GHG/awm

cc: TMI Senior Resident Inspector
Administrator, Region I
TMI-1 Senior Project Manager
File No. 01036

IE22

LICENSEE EVENT REPORT (LER)

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

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), 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. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)

Three Mile Island, Unit 1

DOCKET NUMBER (2)

05000289

PAGE (3)

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TITLE (4)

Emergency Feedwater Pump 2A Inoperable Greater than the Technical Specification Allowable Outage Time Due to an Incorrect Operability Determination

| 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 |
| 02 | 01 | 2001 | 2001 | - 001 | -- 00 | 04 | 13 | 2001 | FACILITY NAME | DOCKET NUMBER |
| 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) | | X | 50.73(a)(2)(i) | | 50.73(a)(2)(viii) |
| | | | 20.2203(a)(1) | | 20.2203(a)(3)(i) | | | 50.73(a)(2)(ii) | | 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) | | 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

Adam W. Miller of TMI-1 Regulatory Assurance

TELEPHONE NUMBER (Include Area Code)

(717) 948-8128

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIX | CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIX |
|-------|--------|-----------|--------------|--------------------|-------|--------|-----------|--------------|--------------------|
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SUPPLEMENTAL REPORT EXPECTED (14)

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|---|---|----|-------------------------------|-------|-----|------|
| X | YES (If yes, complete EXPECTED SUBMISSION DATE). | NO | EXPECTED SUBMISSION DATE (15) | MONTH | DAY | YEAR |
| | | | | 06 | 01 | 2001 |

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

On April 2, 2001, it was determined that EF-P-2A had been inoperable from February 1, 2001 through February 14, 2001. Technical Specifications provides a 72-hour allowable outage time, thus this event is reportable as a condition prohibited by Technical Specifications. It has been determined that the bolts fastening a cover of the outboard bearing housing had loosened sufficiently on February 1, 2001 to impact operability. EF-P-2A may not have been able to perform its intended safety function, due to oil leakage and shaft vibration concerns, until the bolts were tightened on February 14, 2001. Operability determinations regarding the oil leakage and vibration conditions made previous to April 2, 2001 concluded incorrectly that EF-P-2A remained operable. The root cause of the incorrect operability determination was a failure to consider all the available information regarding the status of the component against its design basis requirements. Immediate corrective actions include: (1) procedure for operability determination revised, (2) initiated briefings for operating crews, (3) verified that the bearing housing bolts on all three emergency feedwater pumps were tight, and (4) reviewed the status of all safety related pumps and verified no similar concerns. The long-term corrective actions that will prevent recurrence of this event are still being developed. They will be provided in the supplemental report, which is expected to be submitted by June 1, 2001. There were no adverse safety consequences from this event, and the event did not affect the health and safety of the public.

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I. Plant Operating Conditions Before The Event:

TMI Unit 1 was operating at 100% power at the time of the event.

II. Status of Structures, Components, or Systems That Were Inoperable At The Start Of The Event And That Contributed To The Event:

None.

III. Event Description:

On April 2, 2001 CAP T2001-0305 was generated to document that EF-P-2A *[BA/P] had been inoperable from February 1, 2001 through February 14, 2001. This condition is reportable under 10 CFR 50.73(a)(2)(i)(b) as a condition prohibited by Technical Specifications (TS). TS 3.4.1.1.a (1) prohibits having any one of the three Emergency Feedwater Pumps inoperable for greater than 72 hours. The other two Emergency Feedwater Pumps, EF-P-2B and EF-P-1, were operable during the time-period of February 1, 2001 through February 14, 2001.

The operability determination was based on the effects of loose bolts fastening the cover of the inboard bearing housing. The bolts had loosened enough on February 1, 2001 to cause increased oil leakage and increased shaft vibration concerns of sufficient significance that EF-P-2A may not have been able to perform its intended safety function.

The Emergency Feedwater (EFW) system supplies feedwater to the Steam Generators, removing heat from the Reactor Coolant System to allow safe shutdown of the reactor. The system is not required for normal plant operations, normal startups or normal shutdowns. The system is used only during emergency conditions and periodic testing. There was no maintenance performed which would have caused or identified the loose bolt condition. Operators perform a visual inspection once per shift to verify no abnormal conditions exist, which include an oil level check. These visual inspections and any oil additions were documented on the Secondary Auxiliary Operators (AO) Log. There was no trending process in place to identify oil usage rate.

The following is a chronological description of the event.

An In-Service Test (IST) for EF-P-2A was performed on February 1, 2001 at which time, the pump axial vibration was found to be in the Alert Range. The oil addition rate increased from about once every two weeks before the test to once every two days after the test.

The plant staff did not initially relate the pump vibration to the oil leak. The plant staff focused upon the evaluation of the pump vibration readings, which were in the Alert Range. Since the vibration levels were below the Required Action Range (in which the pump is required to be declared inoperable) the pump was determined to be operable.

A work request to repair the oil leak on EF-P-2A was submitted on February 10, 2001 when an AO recognized the oil addition rate had increased. The AO was aware that the leak had been previously identified on November 15, 2000 and wanted to increase the priority for repair. Following a discussion

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of this work request at the 06:30 planning meeting on February 12, 2001, the site resident NRC inspector observed EF-P-2A and noticed that the outboard pump bearing oiler bulb was empty and notified the Control Room. The oiler was filled and CAP T2001-0160 was initiated to address the empty oiler bulb. At that time EF-P-2A was determined to be operable based on the level of oil in the standpipe from the oiler.

On February 14, 2001, the bolts on the bearing housing cover were tightened and the oil leak stopped. Tightening of the bolts corrected the pump vibrations. A more detailed evaluation of operability for the time-period of February 1, 2001 through February 14, 2001 was then prepared. This evaluation took credit for operator action to maintain the oil level in the pump and did not consider any further loosening of the bolts during emergency operation.

As a result of the investigation under CAP T2001-0160, a Plant Operations Review Committee (PORC) meeting was convened on March 28, 2001 to review operability during the time-period of February 1, 2001 through February 14, 2001. PORC requested additional information regarding the internal configuration of the pump and further information relative to procedurally mandated operator action. At the subsequent PORC meeting held on April 2, 2001, the credit for operator action and the failure to consider further loosening of the bolts was found to be inconsistent with GL 91-18 guidance. The PORC concurred with the Engineering recommendation that EF-P-2A was inoperable from February 1, 2001 through February 14, 2001 and made that recommendation to the Plant Manager. The Plant Manager concurred with the PORC recommendation.

IV. Assessment of Safety Consequences & Implications of the Event:

Since plant conditions did not require operation of EF-P-2A during the February 1, 2001 through February 14, 2001 time period, there were no actual safety consequences for this event. The two other emergency feedwater pumps, EF-P-2B and EF-P-1, were operable during this time-period. Additionally, a diverse method of providing core cooling via high-pressure injection was available.

To evaluate the potential safety significance of this event, a risk evaluation of this event was performed. AmerGen Calculation C-1101-424-E220-070, "EF-P-2A SDP Risk Evaluation for the February 2001 Event," evaluated the core damage frequency (CDF) risk significance of EF-P-2A out of service for 14 days during February 2001. The internal event contribution to CDF was calculated using the updated TMI PRA internal events model.

Because the TMI external events models have not been updated since the TMI Individual Plant Examination for External Events (IPEEE) was submitted to the NRC in 1994, these models can only be used to estimate the impact on external event risks. A CDF was evaluated for seismic impact using the TMI IPEEE seismic model. Since the TMI IPEEE Fire analysis is a bounding analysis and not a full PRA model, only dominant IPEEE sequences were reviewed and identified, but no total CDF impact due to fires can be calculated using the available model.

The internal event's (including internal flooding) impact on core damage is calculated to be less than $1.0E-6$ supporting a significance level of GREEN. No sequence recovery actions were assumed to obtain this CDF value. The seismic CDF impact is evaluated to have a minimal effect, much less than $1.0E-6$, which supports a significance level of GREEN.

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If EF-P-2A had been required to operate in the degraded condition (loose bolts and oil leakage), it would have started. Based on oil leakage rate estimates, the looseness of the bolts, and the level of vibration; engineering judgement is that the pump would have operated at full capacity for at least several hours without operator action. Additionally, when the Emergency Feedwater system actuates, an AO is dispatched to the Emergency Feedwater flow control valves in accordance with procedure. The Emergency Feedwater flow control valves are within a few feet of EF-P-2A. Based on training and the scope of routine checks performed, it is reasonable to conclude that the AO would check EF-P-2A oil levels and add oil if required.

V. Previous Events & Extent of Condition:

There were two relevant previous events identified.

- LER 99-004 "Emergency Feedwater Pump Inoperable Longer Than Allowed by Technical Specifications Due to Lack of Lubrication Caused By A Loose Set Screw Resulting in Bearing Failure." The operability / reportability determination used during this event included an appropriate review of the available information regarding the component condition. The corrective actions addressed maintenance and the adequacy of monitoring of the equipment during testing. No weaknesses in the operability / reportability process were evident. Therefore, corrective actions for this event did not include any improvements to the operability / reportability process.
- LER 99-012 "Main Steam Isolation Valve, MS-V-1B, Valve Operator Motor Failure due to the Manufacturing Process." The initial operability / reportability determination used during this event involved a failure to utilize additional resources to support making the correct determination. During the MS-V-1B event, when additional resources were later involved, the correct determination was made. The corrective actions included revising the "Event Review and Reporting Requirements" procedure to provide direction to the Shift Manager to utilize all available resources when making operability / reportability determinations. These corrective actions were inadequate to prevent the current event involving EF-P-2A since both the Shift Manager and the additional resources failed to consider all the available information regarding the status of the component against its design basis requirements.

The following actions were completed to determine the extent of the condition:

The bearing housing bolts on the other two emergency feedwater pumps were checked for tightness. They were found acceptably tight.

Vibration data was reviewed for safety related pumps and rotating equipment. There were no indications of loose fasteners.

The current oil consumption rates were reviewed for all safety-related pumps to identify any oil consumption trends that could potentially impact operability. A significant oil leak was identified on a nuclear services closed cooling water pump; however, that leak was previously identified and the pump was already removed from service to repair the leak. There were no other cases that affected operability.

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All open corrective maintenance tasks and open Appendix B Corrective Action Program (CAP) issues for safety related SSCs were reviewed. There were no incorrect operability determinations identified.

VI. Identification of Root Cause

The root cause of the incorrect operability determination was a failure to consider all the available information regarding the status of the component against its design basis requirements. A second root cause was a lack of barrier(s) in place to detect or prevent inner cover bolt loosening.

VII. Corrective Actions:

Immediate & Short Term Actions:

1. The bolts on the bearing housing cover on EF-P-2A were tightened. This stopped the oil leak and returned vibration to normal levels.
2. The bearing housing bolts on the other two emergency feedwater pumps were checked for tightness. They were found acceptably tight.
3. Vibration data was reviewed for safety related pumps and rotating equipment. There were no indications of loose fasteners.
4. The "Conduct of Operations" procedure was revised to add improved guidance for performing operability determinations.
5. Initiated briefings for each on-coming operating crew to discuss the revisions to the "Conduct of Operations" procedure. The briefings cover recognition of degraded equipment, the importance of low oil levels and high oil consumption, proper operability determinations, safety function, and the acceptability of operator action for maintaining long-term emergency operation. These briefings will continue until all the operating crews have been briefed.
6. The operator logs were changed to require a minimum level band for oilers on safety related pumps.
7. Operations implemented trending of oil consumption rates on all safety related pumps.
8. Oil consumption rates were reviewed for all safety-related pumps to identify any oil consumption trends that could potentially impact operability. A significant oil leak was identified on a nuclear services closed cooling water pump; however, that leak was previously identified and the pump was already removed from service to repair the leak. There were no other cases that impacted operability.
9. All open corrective maintenance tasks and open Appendix B Corrective Action Program (CAP) issues for safety related SSCs were reviewed. There were no incorrect operability determinations identified.

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Long Term Corrective Actions:

The long-term corrective actions that will prevent recurrence of this event are still being developed. They will be provided in the supplemental report, which is expected to be submitted by June 1, 2001.

* The Energy Industry Identification System (EIIS), System Identification (SI) and Component Function Identification (CFI) Codes are included in brackets, [SI/CFI] where applicable, as required by 10 CFR 50.73 (b)(2)(ii)(F).