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SUBJECT: Forwards LER 99-018-00 re refueling water storage tank suction motor operated valves inoperable,due to inadequate design.Listed commitments were identified in LER.

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July 29, 1999

United States Nuclear Regulatory Commission
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Washington, DC 20555

Operating License DPR-58
Docket No. 50-315

Document Control Manager:

In accordance with the criteria established by 10 CFR 50.73 entitled Licensee Event Report System, the following report is being submitted:

LER 315/99-018-00, "Refueling Water Storage Tank Suction Motor Operated Valves Inoperable Due to Inadequate Design".

The following commitments were identified in this LER.

- A permanent modification will be made to the RWST to CCP suction MOVs for both Units to replace the valve yokes with different yokes capable of withstanding the combined loads associated with actuator closure and a seismic event prior to Mode 4.

- Necessary corrective actions or analyses to establish operability for safety-related Limitorque MOVs in Modes 1-4 will be performed prior to entering Mode 4.

Sincerely,

M. W. Rencheck
Vice President – Nuclear Engineering

/lrb
Attachment

c: J. E. Dyer, Region III
R. P. Powers
P. A. Barrett
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1/1

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NRC FORM 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

# LICENSEE EVENT REPORT (LER)

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

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

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TITLE (4) Refueling Water Storage Tank Suction Motor Operated Valves Inoperable Due to Inadequate Design

| 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 |
| 06 | 29 | 1999 | 1999 | 018 | 00 | 07 | 29 | 1999 | Cook Nuclear Plant Unit 2 | 05000-316 |
| | | | | | | | | | FACILITY NAME | DOCKET NUMBER |

| OPERATING MODE (9) | 5 |
|---|---|
| POWER LEVEL (10) | 0% |

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

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|---|---|---|---|---|---|---|---|
| | 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) | X | 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 | TELEPHONE NUMBER (Include Area Code) |
|---|---|
| Lyle R. Berry, Regulatory Compliance Engineer | (616) 465-5901 X1623 |

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| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIX | CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO EPIX |
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| SUPPLEMENTAL REPORT EXPECTED (14) | | | | EXPECTED | MONTH | DAY | YEAR |
|---|---|---|---|---|---|---|---|
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ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On June 29,1999, during a review of a stress calculation for the Refueling Water Storage Tank (RWST) motor-operated (MOV) suction valves to the centrifugal charging pumps (CCPs), it was determined that the valve yokes may yield under the combined stress of a seismic event and the static, valve closed, stem thrust. Based upon discussions with Engineering personnel, Operations declared the MOVs inoperable at 1540 hours, June 29,1999. Since these MOVs were considered to be incapable of opening during a postulated seismic event, this condition is reportable pursuant to the requirements of 10CFR50.73(a)(2)(ii) as an event that resulted in the nuclear power plant being in a condition that was outside the design basis of the plant. Technical Specifications (TS) require one boron injection path from the RWST to the Reactor Coolant System (RCS) to be operable in Modes 5-6 and two boron injection flow paths in Modes 1-4. Since these valves were determined to be inoperable in those modes, this condition is also reportable pursuant to the requirements of 10CFR50.73(a)(2)(i) as an operation or condition prohibited by TS. The apparent cause for this event was inadequate design of the MOVs. This event is applicable to both Units. Compensatory action for the RWST to CCP MOVs for both Units has been taken via a temporary modification to restore operability in anticipation of changing from Mode 5 to Mode 6 to allow removal of fuel from the vessel. Evaluation of the extent of this condition has identified that a change in the method of calculating torque/thrust available from the actuator, initiated by Limitorque Technical Update 98-01, may also impact the operability of the RWST to CCP suction MOVs and other Limitorque MOVs. Operability determinations were performed for those valves required for core offload and reload to establish operability in Modes 5 and 6. Necessary corrective actions or analyses to establish operability for safety-related Limitorque MOVs in Modes 1-4 will be performed prior to entering Mode 4. Based upon the proceduralized capability to establish an ECCS boration flowpath, should the RWST to CCP suction MOVs fail to open on demand, this event had minimal impact on the health and safety of the public.

## Conditions Prior To Event

Unit 1 was in Mode 5, Cold Shutdown
Unit 2 was in Mode 5, Cold Shutdown

## Description Of The Event

On June 29,1999, during a review of a stress calculation for the Refueling Water Storage Tank (RWST) motor-operated (MOV) suction isolation valves (BQ/ISV) to the centrifugal charging pumps (CCPs), it was determined that the valve yokes may yield under the combined stress of a seismic event and the static, valve closed, stem thrust. A preliminary MOV weak-link calculation for 2-IMO-910 and 2-IMO-911 was performed by Altran Corporation to include stem thrust as an additional load on the valve yoke, since this had not been addressed in previous calculations. These calculations indicate the valves cannot be considered operable if the MOVs are closed with seating thrusts exceeding designated closing thrust values. The Altran analyses indicate the electrically closed valves may not successfully maintain valve yoke structural integrity during a seismic event. Based upon discussions with Engineering personnel, the Operations Shift Manager declared the MOVs inoperable at 1540 hours. This event is applicable to both Units.

Evaluation of the extent of this condition has identified that a change in the method of calculating torque/thrust available from the actuator to open or close Limotorque MOVs, initiated by Limitorque Technical Update 98-01, may also impact the operability of the RWST to CCP suction MOVs and other Limitorque MOVs.

## Cause Of The Event

The apparent cause of this event was inadequate design of the associated MOVs. A contributing causal factor was the failure of the MOV Program to adequately address industry information for applicability at D.C. Cook. The significance of MOV actuator loads on the seismic capability of MOVs 1/2-IMO-910, and 1/2-IMO-911 in the closed position was not identified and resolved in a timely manner.

## Analysis of the Event

Since the RWST to CCP suction MOVs were considered to be incapable of opening during a postulated seismic event, this was determined to be reportable pursuant to the requirements of 10CFR50.73(a)(2)(ii) as an event that resulted in the nuclear power plant being in a condition that was outside the design basis of the plant. Technical Specifications (TS) require one boron injection path from the RWST to the Reactor Coolant System (RCS) to be operable in Modes 5-6 and two boron injection flow paths in Modes 1-4. Since these valves were determined to be inoperable in those modes, this condition is also reportable pursuant to the requirements of 10CFR50.73(a)(2)(i) as an operation or condition prohibited by TS.

The RWST to CCP suction isolation valves are normally closed 8-inch valves arranged in a parallel configuration in the supply piping from the RWST to the charging pump suction header. The safety function of these valves is to open on a Volume Control Tank (VCT) LOW-LOW level signal or on a safety injection signal to provide an ECCS boration flowpath to the RCS. These valves can be remotely opened and closed during normal and emergency conditions.

From a structural standpoint, the capability of the RWST to CCP suction MOV yokes to withstand simultaneous seismic loading combined with the actuator induced thrust and torque operating loads cannot be shown to meet operability criteria.

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

This combination of actuator operating loads with seismic loads would occur if a postulated design basis seismic event were to occur with the MOV in a closed position. With the MOV in the open position (but not power back-seated), actuator operating loads are such that the valve yoke structure has the capability to withstand the seismic loading alone. Therefore, if the valve were open during a seismic event, the ability of the valve to close during or after the event would not be compromised. With the MOV in the closed position (normal operating condition), actuator loads combined with the postulated seismic loads may have prevented opening of the valve in response to a SI signal resulting in failure to align the CCP to the RWST.

During power operation, CCP suction is supplied from the VCT through the normally open MOVs 1/2-QMO-451 and 1/2-QMO–452. MOVs 1/2-QMO-451 and 1/2-QMO–452 automatically close once RWST to CCP suction MOVs (1/2-IMO-910, and 1/2-IMO-911) complete opening. The volume in the VCT is not sufficient to satisfy SI requirements, nor does it contain sufficient borated water, which is required to control reactivity changes in the Reactor Coolant System (RCS). If the RWST to CCP suction MOVs for each Unit both failed to open upon receipt of a safety-injection (SI) signal, the normal design flow path for borated water from the RWST to the RCS would not be available.

In the event of a small break loss of coolant accident (SBLOCA) without SI, CCP suction from the VCT will be the source of borated makeup. The Emergency Operating Procedures (EOPs) require the operator to verify at least one CCP is running and control charging flow from the VCT as necessary to maintain pressurizer level.

For a SBLOCA with SI, or a large break LOCA (LBLOCA), the EOPs require verification that SI is actuated and that the RWST to CCP suction MOVs open. Plant operator(s) would be dispatched to attempt to manually open the valves if they did not open. The Safety Injection pumps also provide borated water from the RWST to the RCS. If the flowpath from RWST via the charging pumps cannot be manually established, SI pump flow is verified (or established, if the pumps are not running and/or appropriate valves are not aligned) once the requisite lower RCS pressure of 1630 psig is achieved. Therefore, regardless of the size of the break, a boration flowpath can be established. Based upon the proceduralized capability to establish an ECCS boration flowpath, this event had minimal impact on the health and safety of the public.

## CORRECTIVE ACTIONS

Upon discovery of the identified condition, the RWST to CCP suction MOVs were declared inoperable. A temporary modification was completed to lower the torque/thrust settings for the RWST to CCP suction MOVs on Unit 2 and Unit 1, in anticipation of changing from Mode 5 to Mode 6 to allow removal of fuel from the vessel. These temporary modifications were completed and the boration flowpath from the RWST to RCS declared operable on July 8, 1999 and July 11, 1999, for Unit 2 and Unit 1, respectively. A permanent modification will be made to the RWST to CCP suction MOVs for both Units to replace the valve yokes with different yokes capable of withstanding the combined loads associated with actuator closure and a seismic event prior to Mode 4.

Operability determinations were performed for those valves required for core offload and reload to establish operability in Modes 5 and 6. Necessary corrective actions or analyses to establish operability for safety-related Limitorque MOVs in Modes 1-4 will be performed prior to entering Mode 4.

This condition was discovered as a part of the programmatic review of safety related MOVs for design, testing, and potential operability concerns in support of the closure of outstanding Generic Letter 89-10 Program issues. This review of the MOV Program is scheduled for completion by December 1, 1999. Resolution of identified deficiencies will be addressed and tracked to completion via the Corrective Action Program. Significant changes to the cause of event, extent of condition, safety significance or corrective actions, identified during the review, will be addressed in a supplement to this LER.

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As part of the Cook Nuclear Plant Restart Plan, a Programmatic Readiness Review will be performed to assess the MOV Program and address improvements necessary to support the restart effort and establish a basis for continued improvement in CNP performance beyond plant restart.

**SIMILAR EVENTS**

315/96-006-00 315/98-059-00