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May 3, 1990
JAFP-90-0378

United States Nuclear Regulatory Commission
Document Control Desk
Mail Station P1-137
Washington, D.C. 20555

SUBJECT: DOCKET NO. 50-333
LICENSEE EVENT REPORT: 90-012-00
Service Water Check Valves

Dear Sir:

This Licensee Event Report is submitted in accordance with 10 CFR 50.73(a)(2)(ii)(B).

Questions concerning this report may be addressed to Mr. Hamilton Fish at (315) 349-6013.

Very truly yours,

R. Lisero by direction

WILLIAM FERNANDEZ

WF:HCF:lar

Enclosure

cc: USNRC, Region I
USNRC Resident Inspector
INPO Records Center
American Nuclear Insurers

Cert No P301926047

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NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

# LICENSEE EVENT REPORT (LER)

| FACILITY NAME (1) | DOCKET NUMBER (2) | PAGE (3) |
|---|---|---|
| JAMES A. FITZPATRICK NUCLEAR POWER PLANT | 0 5 0 0 0 3 3 3 | 1 OF 0 5 |

TITLE (4) Normal and Emergency Service Water Check Valves Inoperable due to Build-up of Corrosion Products and Lake Water Silt

| 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(S) |
| 0 4 | 0 4 | 9 0 | 9 0 | 0 1 2 | 0 0 | 0 5 | 0 3 | 9 0 | | 0 5 0 0 0 |
| | | | | | | | | | | 0 5 0 0 0 |

| OPERATING MODE (9) | N | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11) | | | |
|---|---|---|---|---|---|
| POWER LEVEL (10) 0 0 0 | | 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 (Specify in Abstract below and in Text, NRC Form 366A) |
| | | 20.405(a)(1)(iii) | 50.73(a)(2)(i) | 50.73(a)(2)(viii)(A) | |
| | | 20.405(a)(1)(iv) | X 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 |
|---|---|
| Hamilton C. Fish | AREA CODE 3 1 5 — 3 4 9 — 6 0 1 3 |

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 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | B I | V | V 0 8 5 | Y | | X | K G | V | V 0 8 5 | | |
| X | C C | V | V 0 8 5 | | | | | | | | |

SUPPLEMENTAL REPORT EXPECTED (14)

| | | EXPECTED SUBMISSION DATE (15) | MONTH | DAY | YEAR |
|---|---|---|---|---|---|
| X YES (If yes, complete EXPECTED SUBMISSION DATE) | NO | | 0 7 | 0 1 | 9 0 |

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


EIIS Codes are in [] - Interim Report

During a refueling outage 31 check valves were inspected as part of the ASME Section XI In-Service Testing (IST) program. From April 4, to 21, 1990 a total of 15 valves supplying safety-related loads were found to be potentially inoperable due to silt accumulation or corrosion product build-up on operating surfaces. Silt and rust blocked open four 3" swing check valves which supply normal service water (SWS) [KG] to 4 area ventilation unit coolers for part of the safety-related 4 KV [EA] and 600 VAC [ED] systems and prevent reverse flow of ESW during an SWS failure. Eight Emergency Service Water (ESW) [BI] 2" piston check valves were blocked closed. They would supply the same area ventilation coolers if SWS failed. Three 1.5" piston check valves failed. Two supply alternate ESW to 2 of 4 coolers for Residual He Removal (RHR) [BO] pump shaft seal cooling if the Reactor Building Closed Loop Cooling (RBC) [CC] failed. The other supplies normal RbC to a third pump cooler. Because the inspection and evaluation of these problems is incomplete, the safety significance cannot be fully assessed at this time. This assessment will be reported in a follow-up report.

Valves were cleaned and restored to service. Intake bays are being cleaned. Additional valves and piping are being inspected. A task force has been established to address corrective actions required to restore the cooling system to full operability and develop a long-term plan for maintaining cooling system operability.

LERs 88-005, 88-009, and 89-015 are related.

EIIS Codes are in [] - Interim Report

Description

The plant was shutdown for a scheduled refueling and maintenance outage on March 31, 1990. Forty-nine check valves were scheduled for performance of ASME Section XI In-Service Testing (IST) in accordance with procedures MP-59.12, "Maintenance Procedure for Swing Check Valves without Operators (IST)", and MP-59.45, "Maintenance Procedure for Piston Check Valves (IST)". This inspection program is also part of the response to INPO Significant Operating Event Report (SOER) 86-3, "Check Valve Failure or Deterioration". Fifteen of the thirty-one check valves inspected from April 4 through the 21st were considered to be inoperable.

Excessive accumulation of silt and corrosion products blocked open four 3" swing check valves in the service water system (SWS) [KG] which supply the normal cooling water to four area ventilation unit coolers. These coolers are designed to remove the heat load from two rooms containing both safety-related and non-safety-related 4 KV [EA] and 600 VAC [ED] switchgear in addition to the uninterruptible (UPS) [EF] and reactor protection system (RPS) [JC] power supplies.

Back-up cooling water to these same coolers is provided through eight spring assisted piston type check valves. Corrosion product accumulation on the cylinder surface of the pistons could have potentially prevented them from opening to supply Emergency Service Water (ESW) [BI] if the normal service water system had failed. In the spring of 1987 these same ESW valves were found to have silt and corrosion products interfering with valve operation (LER-88-005).

A similar corrosion product build-up could have potentially prevented the opening and closing of one 1.5" spring assisted piston type check valves which interface between the ESW system and the Reactor Building Closed Loop Cooling (RBC) [CC] system. RBC is the normal source of cooling water to the shaft seal coolers for the four Residual Heat Removal (RHR) [BO] pump seals. If the RBC system fails, the two 1.5" piston check valves would admit ESW to continue cooling of the RHR pump seals.

The four valves used for to supply ESW to the RHR pump seals are identified as 46ESW-18A,B,C,D. Valves B and D were found to be clean during this inspection. Valves A and C were found to be coated with corrosion products on the RBC system side of the valve (which is also the spring side) and judged to be potentially inoperable during the current inspection. A third valve of the same type, 15RBC-35B, is the normal RBC supply check valve to the cooler for RHR pump B. The valve seat was found to be cut and heavily corroded.

All fifteen of the valves were disassembled, cleaned, and restored to service. Samples of the silt and corrosion products were taken and analyzed to assist in determining long-term corrective actions.

Cause

The immediate cause of the potential inoperability of the valves was the excessive build-up of corrosion on valve surfaces and accumulation of silt. Both the emergency service water and the service water systems draw water from Lake Ontario. The lake water suspended solids appear to settle in stagnant areas of the service water system. These areas include the corners of the service water pump inlet bays, the short lengths of pipe between normally flowing lines and the isolation check valves of branch lines, and in main headers with low flows. A detailed review of the causes will be provided in a supplemental report after a complete investigation of the system conditions.

Analysis

This event is reported under the provisions of 10CFR50.73(a)(2)(ii)(B) as a condition that resulted in portions of the nuclear plant being outside of the design basis as discussed in the Final Safety Analysis Report (FSAR). Because the inspection and evaluation of these problems is incomplete, the safety significance cannot be fully assessed at this time. This assessment will be provided in a follow-up report.

Inoperable SWS 3" Swing Check Valves

These four valves in the SWS were operable to supply adequate cooling water flow to the electric bay area ventilation unit coolers. However, they may not have closed on reverse flow. If the service water pressure failed, the ESW system if actuated by other signals, would normally inject into these coolers through eight other check valves. The four SWS swing check valves would then be required to close to maintain ESW flow through the unit coolers. The failure of these valves to close would result in ESW flow diversion into the normal SWS. The ESW is not designed to have sufficient pumping capacity to supply both systems. Therefore, the ability of the ESW system to remove heat from components it is designed to supply would be reduced until the SWS supply lines to the unit coolers could be isolated by closing local manual valves 46SWS-61A&B, 92, and 100. These valves are in an accessible portion of the turbine building.

Inoperable ESW 2" Piston Check Valves

As noted above, these eight ESW supply check valves would only be expected to operate when Normal Service Water [KG] pressure is lower than ESW [BI] pressure and ESW injection has been initiated. ESW

injection would be automatically initiated due to a low pressure condition in the Reactor Building Cooling (RBC) [CC] system due to system failures such as rupture, pump failures, or loss of electric power to RBC pumps.

Events which result in automatic ESW injection also result in large load reductions of the normal 4KV [EA] and safety-related 600V AC systems. These load reductions, in turn, reduce the need for cooling to a low level. The only significant electric bay heat load during these events is a safety-related 4 KV/600V [EA/ED] transformer.

Inoperable ESW and RBC 1.5" Piston Check Valves

The RHR system is divided into two independent subsystems, each capable of performing the heat removal task required to maintain plant safety. The two ESW check valves which were found to be inoperable served two RHR pump shaft seal coolers in the same subsystem. The one RBC check valve provided normal RBC water to one pump shaft seal cooler in the other subsystem.

The RHR pump shaft seals are cooled by recirculating a small flow from the pump discharge through an individual heat exchanger (cooler) for each pump back to the shaft seal. This flow is always present during pump operation. RBC supplies the normal cooling water to the shaft seal coolers. If RBC pressure fails, ESW would normally be supplied through these two check valves.

If the two ESW check valves failed to open, there would be no heat removal from the seal water flow. If the one RBC check valve failed to close some of the cooling flow to the B RHR pump shaft seal cooler would be diverted by reverse flow.

Corrective Actions

1. All inoperable valves were cleaned and restored to service.

2. The scope of the inspection program during the current outage was expanded to include additional valves.

3. Divers and underwater vacuum equipment are being used during the current outage to remove silt from intake structures serving the SWS and ESW systems.

4. A service water system task force was established to address concerns with this system. Included will be examinations of system conditions (silting, check valves, pipes, components); testing; design (including design basis, heat loads, safety evaluation reports, and final safety analysis); potential need for system design changes and modifications; and applicability of USNRC Generic Letter 89-13 concerns.

## Additional Information

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|---|---|
| Failed Components: | 3" Swing Check Valves<br>2" Spring Assisted Piston Check Valves<br>1.5" Spring Assisted Piston Check Valves<br>All Bolted Bonnet |
| Valve Manufacturer: | Velan Valve Corporation |
| Manufacturer NPRD Code: | V085 |
| Valve Model Numbers: | B10-0. 4B-2T<br>W7-234B-2TY<br>W8-234B-2TY |

## Similar Events

LERs 88-005 and 88-009 reported similar events in which check valves in the service water flow path were not operable due to accumulation of sediment and corrosion of valve parts. LER-89-015 reports similar problems with air operated piston in cage valves in the reactor building closed loop cooling system.

## Supplemental Reports

A supplemental report will be submitted within 30 days after the end of the 1990 Refueling Outage identifying any additional inoperable valves discovered during this outage.

This supplemental report will also address service water task force findings related to cause, further corrective actions, and the safety significance of these findings.