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November 13, 2007
JAFP-07-0127

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

Subject: **Docket No. 50-333**
LICENSEE EVENT REPORT: LER-07-002 (CR-JAF-2007-03202)

Manual Reactor Scram due to Blocked Circulating Water Intake Screens

Dear Sir or Madam:

This report is submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A), "Any event or condition that resulted in manual or automatic actuation of any of the systems listed in (a)(2)(iv)(B), including the Reactor Protection System and general containment isolation signals affecting isolation valves in more than one system (Group 2 isolation).

There are no commitments contained in this report.

Questions concerning this report may be addressed to Mr. Jim Costedio at (315) 349-6358.

Very truly yours,

Pete Dietrich

PD:tp
Enclosure

cc: USNRC, Region 1
USNRC, Project Directorate
USNRC Resident Inspector
INPO Records Center

IE22

NRR

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES: 08/31/2010

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-I0202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose 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.

LICENSEE EVENT REPORT (LER)

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4. TITLE
Manual Reactor Scram due to Blocked Circulating Water Intake Screens

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV. NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
09	12	2007	2007-	002	- 00	11	13	07	N/A	05000
									FACILITY NAME: N/A	DOCKET NUMBER: 05000

9. OPERATING MODE
1

10. POWER LEVEL
100 %

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☐ 50.73(A)(2)(I)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☒ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER *(Include Area Code)*
Mr. Darren Deretz, Sr. Licensing Specialist	(315) 349-6851

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
C	KE	SCN	J033	Y	C	SJ	FCV	M120	Y

14. SUPPLEMENTAL REPORT EXPECTED
☒ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☐ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR
12	27	2007

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

On September 12, 2007, while the plant was operating at 100 percent power, operators inserted a manual reactor scram due to low intake flow caused by traveling water screen (TWS) blockage. All equipment responded as expected and the plant condition was stable in MODE 3, Hot Shutdown. While transitioning to Mode 4, the Reactor Protection System (RPS) automatically actuated when Reactor Pressure Vessel (RPV) level decreased to less than 177 inches above top of active fuel (TAV). This event was reported as NRC Event 43635 pursuant to 10CFR50.72(b)(2)(iv)(B) for RPS actuation (manual scram) (4 hour report) and 10CFR50.72(b)(3)(iv)(A) for specified system actuation (Group 2 PCIS isolations) (8 hour report).

The cause of the manual scram was determined to be due to environmental debris overloading of the traveling screens, and the cause of the RPS signal was determined to be sluggish operation of the feed water startup flow control valve. The safety significance of this event is considered low and did not decrease the effectiveness of plant barriers from providing safety to the public.

On October 28, 2007, while the root cause evaluation was in progress for the TWS blockage event, a similar event involving TWS screen blockage occurred that resulted in a manual scram (NRC Event 43752). Following completion of the root cause analysis this LER will be updated to address both events.

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

SYSTEM DESCRIPTIONS:

The Circulating Water System [EIIS=KE] uses water taken from Lake Ontario. Water passes through trash racks and then through traveling water screens (TWS) [EIIS=SCN]. A major portion (approximately 91 percent) of the flow is directed to the circulating water pumps that deliver water to the main condenser. A small portion (approximately 9 percent) of the water is used by the service water pumps. The discharge from the main condenser and from the Service Water System is returned via the discharge tunnel to the lake. The trash rack installed in front of the traveling water screens retains pieces of debris larger than 3 1/8 inches. The traveling water screens retain particles 3/8 of an inch and larger.

The Service Water (NSW) pumps (46P-1A, B and C), Emergency Service Water (ESW) pumps (46P-2A and B) and Residual Heat Removal Service Water (RHRSW) pumps (10P-1A, B, C, and D) require a minimum water elevation of 235'.

The Feed Water System [EIIS=SJ] supplies water from the condensate system to the Reactor Pressure Vessel (RPV). At low power levels the Reactor Feed Pump (RFP) supplies water to the RPV via reactor feed water startup flow control valve [EIIS=FCV] 34FCV-137. The reactor feed water startup flow control valve can be operated in manual or automatic. In the automatic mode of operation the valve receives a signal based on RPV Level.

EVENT DESCRIPTION:

On September 12, 2007 the plant experienced an environmentally initiated event. During adverse weather conditions an algae intrusion occurred into the circulating water intake. This caused an overload condition to the traveling screen system which resulted in lowering intake level. Operators responded appropriately by reducing reactor power, inserting a manual scram and placed the plant in a stable condition. In order to restore the traveling screen system to service it was necessary to cooldown and depressurize the plant. During the cooldown, the feed water startup flow control valve operated sluggishly. Reactor level lowered to the scram initiation setpoint. Reactor level was subsequently restored and the cooldown completed satisfactorily.

On October 28, 2007 while experiencing adverse weather conditions, a second algae intrusion event occurred which required a manual reactor scram due to lowering intake level. Operators again took appropriate action and placed the plant in a stable condition. Operators had been briefed, following the September 12 event, concerning the slower response of the feed water startup flow control valve, however during restoration activities reactor level lowered to the scram initiation setpoint. The startup Feedwater regulating valve had an identified air leak, parts were on expedited order and the valve was scheduled to be repaired the next work week. Following receipt of the reactor low level scram signal, reactor level was restored to normal shutdown level band. A cooldown was initiated to recover the traveling water screen system.

On September 12, 2007, while the plant was operating at 100 percent power, operators noted a lowering intake level. As directed by procedure a rapid power reduction to approximately 65% power was initiated in order to remove a circulating water pump from service and reduce intake flow. Intake level continued to lower resulting in operators inserting a manual scram. During plant cool down RPV level lowered to 177 inches above Top of Active Fuel (TAF) which resulted in a valid Reactor Protection System (RPS) actuation and a Primary Containment Isolation System (PCIS) Group 2 Isolation signal.

Event Timeline

At the time of the event a severe weather front was moving through the area. Winds were approximately 40 MPH and the lake was turbulent. The TWS had been placed in continuous mode of operation and operators were monitoring intake conditions.

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

EVENT DESCRIPTION: (continued)

0520; the NPO noted incoming debris at the intake and fish basket cleaning was required. The debris consisted mostly of Cladophora algae with some silt, fish and mussel shells.

0630; the NPO reported that the three TWS were not moving and intake level was lowering due to the influx of debris. The Shift Nuclear Operator (SNO) entered the Abnormal Operating Procedure (AOP) for low intake level and commenced a rapid power reduction.

0635; with intake level at 240 feet, the SNO inserted a manual scram and entered the appropriate AOP and Emergency Operating Procedure (EOP). Reactor Vessel (RV) level decreased to less than 177 inches above the top of active fuel (TAF) resulting in a Primary Containment Isolation System (PCIS) Group 2 isolation signal. The PCIS Group 2 isolation resulted in a valid signal to close PCIS valves in the Drywell Floor Drain System, the Drywell Equipment Drain System, the Residual Heat Removal (RHR) System, the Traversing In-core Probe (TIP) System, the Containment Atmosphere Dilution (CAD) System, and the Reactor Water Clean-up (RWCU) System.

As a result of the power reduction, the operators were able to maintain reactor vessel level above the actuation setpoint for the High Pressure Coolant Injection (HPCI) System and the Reactor Core Isolation Cooling (RCIC) Systems and these systems were not required to operate.

0640; the Scram was reset.

0710; the Group 2 PCIS Isolation was verified.

0729; the Group 2 PCIS Isolation was reset.

All equipment responded as expected during the rapid power reduction and subsequent manual scram. All rods were inserted and the plant was stable in MODE 3, Hot Shutdown. Intake water level was restored to above 240 feet and stable.

1023; Commenced normal RPV Cool down using main turbine bypass valves in order to remove additional circulating water pump(s) from service to reduce intake flow.

1034; With the reactor shutdown and a cooldown in progress, RPV level lowered to less than 177 inches above the TAF resulting in an RPS Scram signal and PCIS Group 2 isolation signal. All systems responded as expected. RPV level remained above the actuation set-point for HPCI and RCIC which were not required to operate. RPV Level was restored by jogging open feed water pump discharge valve 34MOV-100B and the Scram was reset.

This event was reported as NRC Event Number 43635 pursuant to 10CFR50.72(b)(2)(iv)(B) for RPS actuation (manual scram - 4 hour report) and 10CFR50.72(b)(3)(iv)(A) for specified system actuation (Group 2 PCIS isolations - 8 hour report). The subsequent automatic Scram signal and PCIS Group 2 signals notifications were provided to the NRC as an update to the original report at 1205 on 09/12/07.

On October 28, 2007, again during severe weather conditions, the TWS again became blocked resulting in operators inserting a manual scram. The root cause evaluation from the September 12th event was still in progress at the time of this event. As a result the root cause evaluation is being updated and will include the data and input from both events. After the root cause evaluation is completed, this LER will be updated and any new or revised corrective actions will be reported. During the October 28th event, while transitioning from Mode 3 to Mode 4, the Reactor Protection System (RPS) automatically actuated when Reactor Pressure Vessel (RPV) level decreased to less than 177 inches above TAV. Parts required to resolve the sluggish operation of the feed water startup flow control valve were not available during the outage following the September 12th event. They were placed on order and the valve was scheduled for repair during the work week beginning November 5th. The valve was repaired during the outage following the October 28th event.

CAUSES:

The mechanistic cause of the TWS blockage resulted in appropriate actions to manually scram the reactor due to environmental debris (algae, silt, mussels) overloading the TWS beyond the design capacity (shear pin) of the system. The TWSs did not have alignment guide rails, allowing TWS deflection (downstream) during high differential pressure conditions. The environmental debris overloading of the TWS created a high differential pressure across the submerged buckets, causing the buckets to impact the adjacent concrete structure, thereby increasing the rotation resistance which contributed to shear pin failure.

Investigation into the sluggish operation of 34FCV-137 found that there was an air leak on the actuator and the actuator stem required replacement. These factors affected the response of the valve.

ASSESSMENT OF SAFETY CONSEQUENCES:

There were no radiological issues associated with this event because the traveling water screens are outside the radiological controlled area. The risk profile for the traveling water screens was reviewed. With three screens in-service, the baseline CDF is 1.5E-6/ry. The event closely behaves like a normal plant transient with the power conversion system (main condenser) available, which is designated as a T3A initiator in the JAF Probabilistic Safety Assessment (PSA). The current CDF with a T3A initiator is 2.437E-6/ry.

As a result of this event, the plant experienced partial loss of the non-safety related Circulating Water System and main condenser (heat sink). The Service Water (NSW) pumps (46P-1A, B and C), Emergency Service Water (ESW) pumps (46P-2A and B) and Residual Heat Removal Service Water (RHRSW) pumps (10P-1A, B, C, and D) require a minimum intake water elevation of 235'. The intake water level remained above the minimum intake water elevation during both the September 12th and October 28th events, therefore these pumps remained capable of fulfilling their design safety functions.

As a result of the sluggish operation of 34FCV-137, RPV level lowered to less than the low level scram set point but did not reach a level that would actuate either of the high pressure injection systems.

The safety significance of both events is considered low and did not decrease the effectiveness of plant barriers providing safety to the public.

CORRECTIVE ACTIONS:

Corrective Actions/Enhancements Completed Prior to this Report:

Traveling water screens:

1. Installed chain guide rails on the downstream side of the traveling water screens.
2. Installed additional fish baskets increasing debris collection capacity.
3. Provided environmental conditions guidance to Operators thereby enhancing algae influx prediction capability.
4. Provided environmental condition downpower triggers to Operators thereby reducing the amount of cooling water intake required to support plant operations under these adverse conditions.
5. Lowered the traveling water screens differential level Hi-Hi alarm from 6 inches to 4 inches to alert the operators and trigger automatic traveling water screens operation sooner.
6. Increase water pressure of traveling water screensTWS spray nozzles by utilizing both TWS booster pumps concurrently.

CORRECTIVE ACTIONS: (continued)

Completed Corrective Actions

Feed water system

1. Completed repairs to 34FCV-137.
2. Revised procedures to specify placing the feedwater system low flow control flow element in service during plant cool down.

Open Corrective Actions

Traveling water screens:

1. Develop a lake algae prediction tool.

Feed water system:

1. Evaluate the effectiveness of the current preventive maintenance tasks for 34FCV-137
2. Prepare and install a design change to provide low range flow rate instrumentation for use during plant cool down.

SIMILAR EVENTS:

10/19/1990: LER 90-023-00, "Manual Reactor Scram Due to Blocked Circulating Water Intake Screens Due to Loss of Differential Pressure Signal due to Procedural Deficiency". This event occurred as a result of procedural deficiencies. These deficiencies were corrected.

12/15/1990: LER 90-027-00, "Reactor Scram During Start-Up Due to High Neutron Flux Due to Failed Operator Diaphragm on Low Flow Control Valve". This event occurred as a result of a failure of 34FCV-137 necessitating the use of a feedwater pump discharge to attempt to control RPV level. In this event, several slight jog open signals were applied to the discharge valve in an attempt to arrest a lowering trend in RPV level and the reactor scrammed on Start-up Mode high neutron flux (<15%). As stated in the LER-90-027, the causes of the scram were the inability to feed the reactor vessel at the proper flow rate through the low flow control valve due to a failed (leaking) valve diaphragm and air leakage from the operator valve stem packing gland.

01/23/1997: LER 97-001-01, "Manual Reactor Scram Due to Fouling of Circulating Water System Traveling Screens." This event occurred due to a large accumulation of small fish (sticklebacks) on the traveling screens and subsequent overloading that caused a shear pin to break. A contributing cause to this event was determined to be due to maintenance planning that had allowed two of the three screens to be protective tagged for the performance of preventative maintenance. Procedure enhancements were implemented that prevented the recurrence of this event.

FAILED COMPONENT IDENTIFICATION:

Traveling water screens:

Manufacturer:	Jeffrey Manufacturing Co.
NPRDS Manufacturer Code:	J033
NPRDS Component Code:	FILTER
Plant Component ID:	36TS-2A, -2B, -2C

Feedwater system:

Manufacturer:	Masoneilan International Inc.
NPRDS Manufacturer Code:	M120
NPRDS Component Code:	FLOW CONTROL VALVE
Plant Component ID:	34FCV-137

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

REFERENCES:

1. Post Transient Evaluation (PTE) No. 07-002, dated 9/12/2007.
2. INPO SER 6-03, "Cooling Water System Debris Intrusion"
3. INPO SER 84-04, "Reactor Trips Caused by Main Feedwater Control Problems"