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SVP-09-034

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

Quad Cities Nuclear Power Station, Unit 1
Renewed Facility Operating License No. DPR-29
NRC Docket No. 50-254

Subject: Licensee Event Report 254/09-001, "Magnesium Rotor Degradation Causes Failure of Unit 1 Reactor Recirculation Pump Discharge Motor Operated Valve to Close and Results in Loss of LPCI When in Loop Select Function"

Enclosed is Licensee Event Report (LER) 254/09-001, "Magnesium Rotor Degradation Causes Failure of Unit 1 Reactor Recirculation Pump Discharge Motor Operated Valve to Close and Results in Loss of LPCI When in Loop Select Function," for Quad Cities Nuclear Power Station, Unit 1.

This report is submitted in accordance with the requirements of the Code of Federal Regulations, Title 10, Part 50.73(a)(2)(v)(D), which requires reporting of any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this report, please contact Mr. W. J. Beck at (309) 227-2800.

Respectfully,

Timothy J. Tulon
Site Vice President
Quad Cities Nuclear Power Station

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Quad Cities Nuclear Power Station

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-10202, (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)

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Quad Cities Nuclear Power Station Unit 1	05000254	1 OF 7

4. TITLE Magnesium Rotor Degradation Causes Failure of Unit 1 Reactor Recirculation Pump Discharge Motor Operated Valve to Close and Results in Loss of LPCI When in Loop Select Function

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
									N/A	N/A
04	28	09	2009	- 001 -	00	06	26	2009	N/A	N/A

9. OPERATING MODE: 5

10. POWER LEVEL: 0%

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

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	■ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Wally Beck – Regulatory Assurance Manager	(309) 227-2800

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	AD	MO	R165	Y					

14. SUPPLEMENTAL REPORT EXPECTED		15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)*	■ NO		N/A	N/A	N/A

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

On April 28, 2009 while in refueling outage Q1R20, and while performing surveillance testing to stroke reactor recirculation system [AD] valves [V], the Unit 1 reactor recirculation pump [P] discharge motor operated valve [20] (MOV) 1-0202-5B, did not close when the control switch [HS] was taken to close.

Operations reported the control switch was taken to stop after approximately 100 seconds. Shortly afterwards, remote (control panel) light indication [IL] for 1-0202-5B was lost. Operators reported the breaker [BKR] was not tripped, and that local (MCC) light indication was also out.

MOV 1-0202-5B and the Low Pressure Coolant Injection (LPCI) [BO] mode of Residual Head Removal (RHR) [BO] were declared inoperable as of the time of discovery. Since the Unit was in Mode 5 for refueling outage Q1R20, LPCI was not required to be operable. Tech Spec 3.5.2, ECCS-Shutdown, was satisfied by two (2) operable core spray [BM] subsystems.

Initial troubleshooting indicated the supply breaker thermal overload had tripped, and the valve motor [MO] windings were shorted. MOV 1-202-5B was manually closed, which restored the LPCI system to operable status. The valve was being assessed for repairs when it was discovered the motor had been damaged, due to magnesium oxidation of the rotor assembly. The magnesium rotor motor for the valve operator [84] was subsequently replaced during Q1R20 and the valve was returned to operable status prior to Unit startup.

This issue was determined to be an event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident, and is therefore reportable per 10CFR50.73(a)(2)(v)(D).

NARRATIVE

PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor, 2957 Megawatts Thermal Rated Core Power
Energy Industry Identification System (EIIS) codes are identified in the text as [XX].

EVENT IDENTIFICATION

Magnesium Rotor Degradation Causes Failure of Unit 1 Reactor Recirculation Pump Discharge Motor Operated Valve to Close and Results in Loss of LPCI When in Loop Select Function. This is an event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident, and is therefore reportable per 10CFR50.73(a)(2)(v)(D).

A. CONDITION PRIOR TO EVENT

Unit: 1	Event Date: April 28, 2009	Event Time: 0444 hours
Reactor Mode: 5	Mode Name: Refueling	Power Level: 0%

B. DESCRIPTION OF EVENT

On April 28, 2009 at 0444 hours, while in refueling outage Q1R20, Inservice Testing Program (IST) procedure, "Reactor Recirculation Cold Shutdown Power Operated Valve Test," was performed. MOV 1-0202-5B did not close when the control switch was taken to close. Operations reported the control switch was taken to stop after approximately 100 seconds. Shortly afterwards the light indication for 1-0202-5B was lost.

Initial troubleshooting indicated the supply breaker thermal overload had tripped, and the valve motor windings were shorted. MOV 1-202-5B was manually closed, which restored the LPCI system to operable status. Troubleshooting revealed the "right side" thermal overload was open. The "right side" motor lead was meggered and found to be zero (0) ohms to ground. The valve was being assessed for repairs via borescope examination when it was discovered the motor driver (inboard) end had been damaged, due to magnesium oxidation of the rotor assembly. The rotor fins were missing and the rotor end ring was slagged down. The magnesium rotor motor for the valve operator was subsequently replaced during Q1R20 and the valve was returned to operable status prior to Unit startup.

MOV 1-0202-5B and the LPCI mode of RHR were declared inoperable as of the time of discovery (April 28. 2009 at 0444 hours). LPCI was not required to be operable at the time of the event. Tech Spec 3.5.2, ECCS-Shutdown, was satisfied by two (2) operable core spray subsystems.

C. CAUSE OF EVENT

The cause of this event is attributed to valve motor operator magnesium rotor degradation (MRD), the same failure mechanism as was seen on U-1 HPCI [BJ] Inboard Steam Supply MOV 1-2301-4 on September 4, 2007. This HPCI valve issue was addressed under a site investigation in 2007. MRD is based on the current understanding within the industry that certain conditions (high heat, high humidity, and age in-service) are necessary to accelerate the degradation process of the magnesium material. To accurately confirm that MRD can be attributed to the actual cause of the rotor failure for the motor on MOV 1-0202-5B, it was disassembled on-site for an examination, and a failure analysis report is scheduled to be issued by Exelon Power Labs by the end of June 2009. If this failure analysis identifies any new or unexpected additional failure modes beyond MRD, a supplemental LER will be issued.

Magnesium Rotor Degradation History at Quad Cities Nuclear Power Station (QCNPS)

During Q1R19 (May 2007), Motor Power Monitor testing was performed on the MOV 1-0202-5B valve motor. Engineering evaluated the results of this test and determined a negative trend existed. Based on this negative trend, the MOV 1-0202-5B valve motor was identified for replacement during the Q1R20 outage.

During the Unit 1 forced outage, Q1F58 (September 4, 2007), the HPCI MOV 1-2301-4 valve motor failed due to MRD and the motor was replaced. This valve operator motor is similar to the MOV 1-0202-5B valve operator motor in both size and construction (magnesium rotor assembly.) As part of an "Extent of Condition" review from the HPCI valve failure, the MOV 1-0202-5B valve operator motor underwent boroscopic inspection. The boroscopic inspection revealed that magnesium rotor was beginning to degrade within the valve operator motor. At that time it was determined that the results of the boroscopic inspection met the acceptance criteria of station procedures which were based on current NRC and industry guidance with respect to MRD. It should be noted that these station procedures have since been revised three (3) times (since May 2007) to incorporate increasingly rigorous testing and improved acceptance criteria based on improved industry knowledge of this failure mode as MRD experience has continued to evolve. The current guidance for examining and dispositioning borescope results has changed significantly since the Q1F58 borescope inspection of the 1-0202-5B. The guidance now includes specific photographic examples of actual rotor degradation with corresponding, detailed failure criteria. Previous guidance was less detailed and did not include some of the criterion that exists today (previous failure criteria checked for four conditions; existing failure criteria currently checks for ten conditions).

While MRD was determined to be the failure mechanism in 2007 for the motor on MOV 1-2301-4, the station at that time was using a different method to detect the presence of MRD. At that time the station was performing Motor Control Center (MCC) based electrical testing, while newer methods consisted of performing boroscopic inspections. Both methods were acceptable per station MOV Programmatic Maintenance and Testing Guidelines at that time. Additional MRD failures at QCNPS (1995 and 1989) are described in the "Previous Occurrences" section of this LER. MRD continues to be an ongoing industry issue.

D. SAFETY ANALYSIS

The Unit 1 reactor recirculation pump discharge motor operated valve (MOV) 1-0202-5B is a normally open valve to allow the reactor recirculation pumps to provide forced convection cooling of the reactor core during normal power operation. When the recirculation pumps are started, the recirculation pump discharge valve is jogged open to slowly introduce water into the core. The jogging circuitry in the recirculation pump discharge valve opening logic provides for automatic 1-second and 1/2-second opening jogs which prevent sudden increases in reactor [AC] coolant flow when starting the recirculation system. During operation, a recirculation pump trips if its discharge valve is closed more than 10% from the full open position. The open function is not required for safe shutdown or accident mitigation.

The closure function of the (MOV) 1-0202-5B is to prevent loss of LPCI flow through the idle recirculation pump into the downcomer during a LOCA. This valve closes automatically by the LPCI loop selection logic signal. Closure of the valve is only required if the associated loop is selected by the logic for injection. The automatic closure function of the recirculation pump discharge valve allows a low pressure coolant injection supply of water to the reactor core after the reactor pressure has been reduced to less than the RHR system discharge pressure following a LOCA. The automatic closure of the discharge valve in the idle loop by the LPCI loop selection logic will prevent the loss of low-pressure coolant injection flow through the idle recirculation pump into the downcomer during a postulated accident.

NARRATIVE

During normal plant operations when Shutdown Cooling [BO] is desired on the idle recirculation loop, (MOV) 1-0202-5A/B, Reactor Recirculation Pump Discharge Valve, on the idle loop must be closed to prevent short cycling of cooling water flow through the pump.

The last stroked closure of the 1-0202-5B valve was on May 20, 2007, coming out of Q1R19. During Q1F58 (September 2007), a borescope inspection was performed on the 1-0202-5B valve and per the station MOV Programmatic Maintenance and Testing Guidelines criteria at that time, the motor was determined to be acceptable for continued use until replacement in Q1R20. Although at no time did this valve fail to close while in Modes 1, 2, or 3, this valve would however likely have failed to close had it been demanded to close during the time period from May 20, 2007 to April 28, 2009.

Since the (MOV) 1-0202-5B failure occurred when the unit was shutdown and LPCI was not required operable due to two operable core spray subsystems, the failure of the 1-0202-5B valve could have resulted in a LPCI function failure had it been required to operate while the unit was at power. The MRD failure mechanism is believed to have occurred over time during the operating cycle preceding Q1R20 and therefore had likely occurred to a degree sufficient enough to have caused the 1-0202-5B valve to fail to operate upon demand, therefore rendering the LPCI loop select function inoperable while in Modes 1, 2 or 3.

It should be noted that the (MOV) 1-0202-4B, reactor recirculation pump 1B suction valve was electrically closed during refueling outage Q1R20. This demonstrated that remote manual isolation of the B-loop could have been accomplished had a LOCA occurred on the 1A recirculation loop, thus mitigating the loss of LPCI flow through the idle recirculation pump into the downcomer.

A risk assessment was performed on this event. Both the recirculation pump discharge valve, 1-0202-5B, and the suction valve, 1-0202-4B, are modeled in the PRA. Both valves must fail to close in order for the 1B LPCI loop to fail in the case of a break in the 1A recirculation loop. For the design basis break in the 1A recirculation loop, the LPCI Loop Select Logic will cause the 1-0202-5B valve to close and injection to be lined up to the 1B recirculation loop. This is the only LOCA scenario in which the position of the 1-0202-5B valve has an effect.

In the case of a break in the 1B recirculation loop, the 1-0202-5A valve will shut and LPCI injection will align to the 1A recirculation loop. In this case, the position of the 1-0202-5B valve has no effect. It likewise has no effect on other LOCA scenarios.

The overall risk significance of the 1-0202-5B valve is very small due to the large number of available injection systems and the low probability of the specific scenario on which it has any impact.

The risk impact of the failure to close of the 1B recirculation pump discharge valve 1-0202-5B (that is the increase in Core Damage Frequency) was determined to be 4.8 E-09, which is well below the incremental change limit of 1.0E-06 (non-risk significance criterion).

In addition, the low risk significance is reflected in the LOCA evaluations required for each operating cycle. In a recent QCNPS letter to the USNRC, dated May 7, 2008, titled, "10 CFR 50.46, Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors, Annual Report," notes the Westinghouse analysis limiting single failure is the LPCI injection valve (that is no LPCI flow) for Q1C20. All 10 CFR 50.46 criteria are met under these conditions.

Based on the above, the overall safety significance of this event is minimal.

NARRATIVE

E. CORRECTIVE ACTIONS

Immediate Actions:

1. MOV 1-202-5B was manually closed, which restored the LPCI system to operable status.
2. The magnesium rotor motor for the valve operator was replaced during Q1R20 and the valve was returned to operable status prior to Unit startup.

Interim Actions Taken Based on Extent of Condition:

1. Prior to this April 2009 event, a plan was developed and implemented to address magnesium rotor degradation following the September 2007 (Q1F58) HPCI valve failure. A motor replacement effort was established to prioritize motor inspections and replacements. The following Priority 1 MOV motors (are defined as – located in the drywell, steam tunnel, or containment) were replaced as follows:
   a. 1-0202-5A (Recirc pump discharge), replaced Q1R20 with new mag rotor
   b. 1-0202-5B (Recirc pump discharge), replaced Q1R20 with new mag rotor
   c. 1-1001-50 (Shutdown CLG Suct HDR Upstream VLV), replaced Q1R20 with new mag rotor
   d. 1-2301-4 (HPCI Main Steam Supply VLV), replaced Q1F58 with new mag rotor*
   e. 2-0202-5A (Recirc pump discharge), replaced Q2R19 with new mag rotor
   f. 2-0202-5B (Recirc pump discharge), replaced Q2R19 with new mag rotor
   g. 2-1001-50 (Shutdown CLG Suct HDR Upstream VLV), replaced Q2R19 with new mag rotor
   h. 2-2301-4 (HPCI Main Steam Supply VLV), replaced Q2R19 with new mag rotor
   * 1-2301-4 motor was inspected Q1R20 which resulted in potential indications of minor corrosion of the collector end ring and cooling fin tip corrosion. The indications are in the infant stages and do not pose an immediate threat to the operation of the motor. This issue is a borderline degradation with current actions pending further collaboration within Engineering.
2. The current guidance for examining and dispositioning borescope results has changed significantly since the Q1F58 borescope inspection of the 1-0202-5B. The guidance now includes specific photographic examples of actual rotor degradation with corresponding, detailed failure criteria. Previous guidance was less detailed and did not include some of the criterion that exists today (previous failure criteria checked for four conditions; existing failure criteria currently checks for ten conditions).
3. Priority 2 MOV motors are defined as – located outside the drywell or containment that meet any of the following: motor is exposed to temperatures greater than 120F, or motor is/has been exposed to a steam leak within 15 feet, or has been stalled, or motor has exceeded its duty cycle, or has been subjected to excessive electrical stroking. QCNPS does not have Priority 2 MOV motors.
4. Priority 3 MOV motors are defined as - located outside the drywell or containment and not meeting criteria for Priority 1 and 2, and shall be inspected at least every ten years. QCNPS Station has 14 Priority 3 MOVs per Unit. All Unit 1 Priority 3 MOVs with an outage related PM frequency have been inspected and accepted, or replaced during Q1R20.
5. The "as left" condition of all Unit 1 Priority 1 and 3 motors that were in scope for Q1R20 currently meet the station MOV Programmatic Maintenance and Testing Guidelines.
6. All Priority 1 motors in Unit 2 were replaced during refueling outage Q2R19 (March 2008).
7. All remaining Unit 1 and Unit 2 Priority 3 motors are scheduled for inspection in appropriate work windows and inspections will be completed by June 2010.
8. An Adverse Trend has been initiated to capture administrative recommendations for lessons learned during the motor borescope inspections performed during Q1R20.
9. Corporate review of inspection/replacement activities performed during Q1R20 determined no immediate changes to the MRD management strategy are warranted.

NARRATIVE

Follow-up Actions:

1. Perform a failure analysis of the MOV 1-0202-5B motor and provide a report (expected end of June 2009).
2. Perform Equipment Apparent Cause Evaluation on the MOV 1-0202-5B motor failure. Address previous corrective actions and borescope inspection methods for potential enhancements.
3. Review station procedure, "GL 96-05 Program MOV Maintenance & Testing Guidelines," for potential enhancements.

F. PREVIOUS OCCURRENCES

The station event database, LERs, EPIX, and NPRDS were reviewed for similar events. Based on the event causes and associated corrective actions, the events listed below, although similar in topic and cause, are not considered significant station experiences that would have directly prevented this event (for which this event is attributed to valve operator motor magnesium rotor degradation (MRD)). The complexity of MRD and variability of MRD failure rates continues to be an evolving issue for the industry and hence as inspection techniques improve and as new data is trended, solutions will become increasingly effective. Although the QCNPS MOV program utilized the currently available methods to identify rotor degradation, enhanced methods and criteria will improve identification of degradation prior to an in-service failure.

- **EPIX - QCNPS Unit 1 - Failure Number: 852, 09/04/2007** - On 09/04/07, QCNPS Unit 1 High Pressure Coolant Injection (HPCI) Primary Containment Isolation (PCI) [BD] Steam Supply Inboard PCI valve 1-2301-4 tripped its power supply circuit breaker during positioning to support an on-line maintenance activity. As part of a detailed troubleshooting plan, a boroscopic inspection of the motor was performed. The result of this inspection appeared to reveal some preliminary evidence of Magnesium Rotor Degradation (MRD). MRD is a process whereby MOV AC induction motor rotors are susceptible to degradation and failure under certain conditions. Premature failure of the rotor can result due to high humidity and temperature environments, high running load conditions, extended periods at locked rotor conditions or exceeding the motor's duty cycle by frequent starts or multiple valve stroking. Previous industry experience has shown that prolonged exposure to high heat and moisture (due to packing leaks, pressure seal ring leakage, etc.) can significantly accelerate the degradation. Although this event is similar to the subject of this LER, the scope of corrective actions for this event was limited due to the rotor inspection guidance at that time was less detailed and did not include some of the criterion that exists today (previous failure criteria checked for four conditions; existing failure criteria currently checks for ten conditions). Current inspection criteria now includes specific photographic examples of actual rotor degradation with corresponding, detailed failure criteria.

- **NPRDS - QCNPS Unit 1, 10/25/1995** – "B" reactor recirculation pump discharge valve 1-0202-5B failed to meet its IST stroke time and was declared inoperable. A visual inspection of the valve operator motor rotor found cracked rotor bars and the rotor bar shorting ring had separated from the rotor. Motor was replaced like for like, functionally tested, and VOTES tested to verify operation within required limits. The subject valve rotor is made from a magnesium alloy. Similar problems have been reported in other magnesium rotor valves prior to this event. Certain magnesium alloys are susceptible to corrosion in high temperature, high humidity environments such as the drywell. [WR 95010445501, PIF 95 – 2716] Although this event is similar to the subject of this LER, the scope of corrective actions for this event was limited due to the rotor inspection guidance at that time was less detailed and did not include some of the criterion that exists today (previous failure criteria checked for four conditions; existing failure criteria currently checks for ten conditions). Current inspection criteria now includes specific photographic examples of actual rotor degradation with corresponding, detailed failure criteria.

NARRATIVE

- **Station Event Database, 07/10/1989** - Start-up of Unit 1 was delayed due to an inoperative motor operated valve 1-0202-4B, "B" reactor recirculation pump suction valve. A strip chart taken by electrical maintenance showed the motor was running, but the Limitorque would not drive the 28" gate [20] valve (CRANE/CHAPMAN). The motor was disassembled and the shorting ring (Magnesium end piece) on the rotor was found separated from the rotor assembly. Investigation of that incident concluded that failure was due to environmental conditions, (i.e. high temperature and humidity) resulted in chronic motor rotor degradation and subsequent inability of the valve to stroke. The motor had extensive rotor corrosion at the iron core stack lamination interface with the magnesium end (shorting) ring. The galvanic potential between magnesium and iron (1.9 volts), combined with the brittle structure of magnesium, high heat and humidity was determined to have accelerated the corrosion. This QCNPS incident was one of the original industry occurrences that identified the potential for MRD. An Engineering analysis concluded the failure was due to inter-granular corrosion facilitated by the environment (i.e. high humidity and high temperature). Inspections were recommended at various intervals from 5 to 10 years. The recommended methods of inspection included utilization of a borescope and visual inspection via disassembly. Based on the limited nuclear industry experience with and the limited understanding of MRD and it's implications available at the time, the determination was made at QCNPS to forego the visual inspections and disassembly recommendations, and proceed with the MCC-based electrical testing method as a means to save man-hours and radiological dose. Although this event is similar to the subject of this LER, the scope of corrective actions for this event was limited due to the rotor inspection guidance at that time was less detailed and did not include some of the criterion that exists today (previous failure criteria checked for four conditions; existing failure criteria currently checks for ten conditions). Current inspection criteria now includes specific photographic examples of actual rotor degradation with corresponding, detailed failure criteria.

- LER – No relevant Station LERs were identified.

F. COMPONENT FAILURE DATA

This event has been reported to EPIX as Failure No. 968.

The failed valve (MOV 1-0202-5B) has a Limitorque operator. Model / Part Number: Limitorque SMB-3-100 with Reliance motor (magnesium alloy rotor), Frame size 256TY, 13 HP, 3400 RPM, 100 ft-lb starting torque.