UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

August 18, 1992

NRC INFORMATION NOTICE 92-59: HORIZONTALLY-INSTALLED MOTOR-OPERATED GATE VALVES

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to problems with the performance of motor-operated gate valves that are installed in a horizontal position. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

Three licensees recently informed the NRC staff that they had problems testing motor-operated valves (MOVs) that had been installed with the valve disc oriented horizontally.

On March 13, 1992, the Southern California Edison Company, licensee for the San Onofre Nuclear Generating Station, informed the NRC that two of four 4-inch gate MOVs in the high pressure coolant injection/low pressure coolant injection (HPCI/LPCI) combined miniflow line at Unit 3 failed to close during design-basis differential pressure and flow testing performed in response to Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance." The licensee adjusted the MOVs in the Unit 3 miniflow line to satisfy the thrust requirements demonstrated by the tests. Before testing the Unit 3 MOVs, the licensee had added new spring packs and provided higher gear ratios in these MOVs as part of its GL 89-10 program. However, the licensee did not modify the motor operators for the Unit 2 HPCI/LPCI miniflow MOVs, which remained sized and setup under the old assumptions of the licensee's program in response to NRC Bulletin 85-03, "Motor-Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings." Therefore, the licensee shut down Unit 2 as a safety precaution because of the concern that the Unit 2 miniflow MOVs would not be able to perform their safety function. The licensee then improved the Unit 2 miniflow MOVs with new spring

packs and higher gear ratios to allow the MOVs to satisfy the higher thrust requirements. The licensee tested the improved Unit 2 miniflow valves under design-basis differential pressure and flow conditions, and they performed satisfactorily. The licensee evaluated the Unit 2 test data and determined that its decision to shut down Unit 2 was appropriate because the test results revealed that the Unit 2 miniflow MOVs could not have operated in their old configuration under design-basis conditions. The licensee believed that the higher thrust requirements for these MOVs resulted from their horizontal orientation, which caused additional sliding friction on the valve discs.

During a midcycle outage in October 1991 at the Crystal River Plant, the Florida Power Corporation, the licensee, tested emergency feedwater (EFW) MOV EFV-14 from EFW pump EFP-1 to the "A" steam generator under differential pressure and flow conditions as part of its program in response to GL 89-10. During the test, the valve did not close electrically under the design-basis differential pressure conditions calculated by the Babcock & Wilcox Company (B&W) for Crystal River. The EFW system at Crystal River has four discharge isolation valves, one in each of the EFW supply lines to the once-through steam generators (OTSGs). The MOVs are required to close during a high-energy line break to isolate flow to the damaged OTSG thereby only supplying the undamaged OTSG. At that time, the licensee believed that the differential pressure calculated for EFV-14 by B&W was greater than the actual design-basis differential pressure. On April 28, 1992, the licensee notified the NRC staff that it had determined that the differential pressure calculated for EFV-14 was actually greater than the value calculated by B&W. Thus, the October 1991 test failure had properly revealed that EFV-14 could not perform its safety function to close under design-basis differential pressure. In its April 28 notification, the licensee indicated that it had closed EFV-14 and the parallel EFV-11 from EFP-2 to the "A" steam generator because of its similar design to EFV-14. The licensee reviewed the results of previous testing and concluded that the EFW control logic could open these MOVs if needed. Before the failed test, the licensee had set EFV-14 using assumptions more conservative than those of some other licensees, but EFV-14 nevertheless failed to operate under design-basis differential pressure conditions. After April 28, the licensee conducted differential pressure tests on the other three EFW MOVs (including EFV-11) and found those MOVs also to be incapable of closing under design-basis differential pressure and flow. All four of these MOVs are installed horizontally. The licensee attributed the failure of the EFW MOVs to their horizontal orientation. The licensee has modified the four EFW MOVs and successfully tested them under design-basis differential pressure conditions.

On April 14, 1992, the Power Authority of the State of New York, the licensee of the James A. FitzPatrick Nuclear Power Plant, notified the NRC staff that the double disc gate valves 10 MOV-16A and 10 MOV-16B in residual heat removal/low pressure coolant injection pump minimum flow lines might not be able to fully seat during closure because they do not include wedge springs.

After conducting MOV tests, the licensee had noted unusual valve behavior reviewing diagnostic traces and requested the valve manufacturer Anchor/Darling to explain the behavior of these valves. Anchor/Darling informed the licensee that it did not include "wedge springs" and "disc retainers" in its double disc gate valves manufactured before 1975 (such as 10 MOV-16A&B) when it believed that the valves were to be installed with the valve stem vertical and pointing upward. The wedge spring allows the valve to be installed in any orientation by maintaining separation of the discs and preventing wedging before the disc contacts the valve seat. The disc retainers improve performance during valve closure by limiting disc wobble.

Because 10 MOV-16A and 10 MOV-16B are installed horizontally, the licensee determined that premature wedging could prevent these valves from closing when required for containment isolation. The licensee has installed wedge springs in the valves to correct the problem.

Discussion

Many nuclear power plant licensees have begun testing MOVs as part of their programs in response to GL 89-10. Some licensees have found that the thrust required to operate MOVs under differential pressure and flow conditions is greater than predicted by the valve vendor using the industry's standard equations and valve factors. Some licensees have believed that the higher thrust would be required only under blowdown conditions. However, licensees have found more thrust than predicted is required to operate some MOVs under pumped flow conditions. Although higher-than-predicted thrust requirements have been observed for MOVs in various installed orientations, MOVs in horizontal positions may be especially susceptible to performance problems, including higher thrust requirements.

Installing an MOV in a horizontal orientation can also lead to maintenance and performance problems other than those caused by the friction or binding of the disc. For example, either the actuator spring pack or motor is at the lowest point of an MOV in a horizontal orientation. If the spring pack is at the lowest point, excessive grease in the spring pack might cause hydraulic lock, which would prevent the torque switch from tripping and might overstress the MOV or cause the motor to burn out. If the motor is at the lowest point, the gasket between the motor and actuator might allow grease to fill the motor and cause it to fail.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

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Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
92-58	Uranium Hexafluoride Cylinders - Deviations in Coupling Welds	08/12/92	All Fuel Cycle Licensees.
92-57	Radial Cracking of Shroud Support Access Hole Cover Welds	08/11/92	All holders of OLs or CPs for boiling water reactors (BWRs).
92-56	Counterfeit Valves in the Commercial Grade Supply System	08/06/92	All holders of OLs or CPs for nuclear power reactors.
92-55	Current Fire Endurance Test Results for Thermo-Lag Fire Barrier Material	07/27/92	All holders of OLs or CPs for nuclear power reactors.
92-54	Level Instrumentation Inaccuracies Caused by Rapid Depressurization	07/24/92	All holders of OLs or CPs for nuclear power reactors.
92-53	Potential Failure of Emergency Diesel Generators due to Excessive Rate of Loading	07/29/92	All holders of OLs or CPs for nuclear power reactors.
91-52, Supp. 1	Nonconservative Errors in Overtemperature Delta-Temperature (OTΔT) Setpoint Caused by Improper Gain Settings	07/16/92	All holders of OLs or CPs for Westinghouse (W)-designed nuclear power reactors.
92-52	Barriers and Seals Between Mild and Harsh Environments	07/15/92	All holders of OLs or CPs for nuclear power reactors.
92-51	Misapplication and Inadequate Testing of Molded-Case Circuit Breakers	07/09/92	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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Original Signed By
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Document Name: 92-59.IN
*SEE PREVIOUS CONCURRENCES

*C/OGCB:DOEA:NRR	*RPB:ADM	*RESINSP:RV	*D/DRS:RII	D/DOEA:NRR
CHBerlinger	TechEd	CMyers	AFGibson	CERossi
08/10/92	07/21/92	08/04/92	08/ /92	08/13/92
*OGCB:DOEA:NRR	*EMEB:DET:NRR	*C/EMEB:DET:NRR	*D/DET:NRR	
RJKiessel	TGScarbrough	JANorberg	JERichardson	
07/20/92	08/04/92	08/04/92	08/05/92	

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Document Name: MOVGATE.IN

*SEE PREVIOUS CONCURRENCES

D/DOEA:NRR				
CERossi				
08/ /92				
C/OGCB:DOEA:NRR	*RPB:ADM	RESINSP:RV	D/DRS:RII	C/EB:DRS:RII
CHBerlinger for CHB	TechEd	CMyers	AFGibson	CJulian
08/10/92	07/21/92	08/ /92	08/ /92	08/ /92
*OGCB:DOEA:NRR	EMEB:DET:NRR	C/EMEB:DET:NRR	D/DET:NRR	EB:DRS:RII
RJKiessel	TGScarbrough	JANorberg	JERichardson	MThomas
07/20/92	08/4/92	08/4/92	08/5/92	08/ /92

OGC for EJS 8-4-92

In addition to problems with MOV performance caused by valve disc friction or binding, the installation of an MOV in a horizontal orientation can lead to other types of maintenance and performance problems. For example, an MOV in a horizontal orientation can have either the actuator spring pack or motor as the lowest point of the MOV. If the spring pack is the lowest point, excessive grease in the spring pack might cause hydraulic lock which would prevent torque switch trip and might overstress the MOV or result in motor burnout. If the motor is the lowest point, the gasket between the motor and actuator might allow grease to fill the motor and cause MOV failure.

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C/OGCB:DOEA:NRR	RPB:ADM	RESINSP:RV	D/DRS:RII	C/EB:DRS:RII
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07/ /92	07/21/92	07/ /92	07/ /92	07/ /92
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