DMB

To: Files
From: Region 3

Nov 5, 1981

American Electric Power Service Corporation
D. C. Cook 1, 2 (50-315, 50-316)

Cincinnati Gas and Electric Company
Zimmer (50-358)

The Cleveland Electric Illuminating Company
Perry 1, 2 (50-440, 50-441)

Commonwealth Edison Company
Braidwood 1, 2 (50-456, 50-457)
Byron 1, 2 (50-454, 50-455)
Dresden 1, 2, 3 (50-10, 50-237, 50-249)
La Salle 1, 2 (50-373, 50-374)
Quad-Cities 1, 2 (50-254, 50-265)
Zion 1, 2 (50-295, 50-304)

Consumers Power Company
Big Rock Point (50-155)
Palisades (50-255)
Midland 1, 2 (50-329, 50-330)

Dairyland Power Corporation
LACBWR (50-409)

The Detroit Edison Company
Fermi 2 (50-341)

Illinois Power Company
Clinton 1, 2 (50-461, 50-462)

Iowa Electric Light and Power Company
Duane Arnold (50-331)

Northern Indiana Public Service Company
Bailly (50-367)

Northern States Power Company
Monticello (50-263)
Prairie Island 1, 2 (50-282, 50-306)

Public Service of Indiana
Marble Hill 1, 2 (50-546, 50-547)

Toledo Edison Company
Davis-Besse 1 (50-346)

Union Electric Company
Callaway 1, 2 (40-483, 50-486)

Wisconsin Electric Power Company
Point Beach 1, 2 (50-266, 50-301)

Wisconsin Public Service Corporation
Kewaunee (50-305)

Illinois Department of Nuclear Safety
Gary N. Wright, Manager, Nuclear Facility Safety

IE31 S1/1

SSINS No.: 6835
Accession No.:
8107230037
IEC 81-14

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

November 5, 1981

IE CIRCULAR NO. 81-14: MAIN STEAM ISOLATION VALVE FAILURES TO CLOSE

Description of Circumstances:

Based on data available in Licensee Event Report (LER) files, the failure rate of main steam isolation valves (MSIVs) closing has ranged from a ten-year low of three to fourteen in 1980. Recent failures, similar to those occurring over the last ten years, are primarily related to the following two causes: (1) poor quality control air to the pilot valves and (2) binding of the MSIV valve stems with the valve stem packing. (Refer to IE Information Notice 80-16 for additional details.) These two failure modes contributed to about 85% of the MSIV failure to close events. Both causes also represent common-mode failure mechanisms of which two examples occurred in 1980: (1) two valves failed to close at Nine Mile Point Unit 1 because of rust in the pilot solenoid valves, and (2) three valves failed to close at Trojan Unit 1 because of stem binding.

These two failure modes are significant in that; (1) they identify mechanisms by which more than one MSIV may fail to close at the same time thus leading to conditions which have not been considered in the plant's safety analyses,* and (2) they are continuing to occur even though corrective actions reported in the LERs indicate that the technology is available to prevent such failures.

It was noted that more than half of the current operating reactor units have not reported any failure of an MSIV to close in ten years, whereas the 28 reporting units experienced at least 90 failures (from all causes). This indicates that major differences may exist in MSIV reliability and in the quality of support systems and operational controls that affect the MSIV reliability.

Data from the LER files is attached to show trends, recent history, and detailed data showing licensee experience:

Table 1 - MSIV Failures To Close Per Year, shows the ten-year history of all reported failures by three categories: solenoid or pilot valve related, stem binding, and other. The first two categories account for 92% of the failures. (The 85% for the two causes stated in the first paragraph of this circular was obtained by disregarding what appeared to be truly isolated solenoid or solenoid installation failures not related to control fluid quality.)

*Note: The potential for poor quality air leading to multiple valve control failures in other safety-related systems is currently under evaluation by NRC.

Table 2 - MSIV Failures To Close, by Plant, for 1979 and 1980, shows failure experiences by plant for the last two years.

Table 3 - LER Data, by Plant, on MSIV Failures To Close (1970-1980), is an extraction of all the LER data from 1970 to 1980 that show details of each plants experience. Tables 1 and 2 were developed from data in this table.

Recommended Actions for Holders of Operating Licenses:

1. Review MSIV operating experience for problems that are causing failure to close events or are causing equipment degradation that requires other than routine maintenance to prevent a failure to close.

2. Evaluate corrective action identified in maintenance records, LERs, etc., for adequacy in addressing the root cause of problems and develop plans for additional corrective action as necessary.

3. Where control air quality is suspected of contributing to problems:

   a. Review the air system(s) to ensure that measures have or will be taken to prevent air quality degradation in the future.

   b. Consider monitoring and/or alarms (such as dew point alarms) to warn of air quality degradation.

4. When stem binding is contributing to problems, maintenance procedures should be reviewed to ensure that they:

   a. Include precautions against detrimental affects such as over tightening packing glands or using inappropriate lubricants.

   b. Require tests to demonstrate that the valves will perform under operating conditions before being placed in service.

Recommended Action for Holders of Construction Permits:

1. Evaluate MSIV control air system designs in light of both successful and unsuccessful industry experience.

2. Consider design changes where appropriate to ensure high reliability and to minimize or eliminate the common-mode failure potential present in current designs.

No written response to this circular is required. If you desire additional information regarding these matters, please contact the Director of the appropriate NRC Regional Office.

Attachments:
1. Tables I, II, III
2. Recently issued IE Circulars

Attachment 1

TABLE 1

Year	Pilot Valve Related	Stem Binding	Other	Total
1970	9			9
71	2		1	3
72	3			3
73	1	1	1	3
74	8 (7)			8 (7)
75	5 (1)		1	6 (1)
76	4 (1)	3	2	9 (1)
77	4 (1)	1		5 (1)
78	5	2		7
79	3 (4)	5	1	9 (4)
80	7	6	1	14
Ten-Year Total	65 (14)	18	7	90 (14)

Sites reporting failures: 22
Reactor units involved: 28

Numbers in parentheses represent failures listed in the LERs as previous occurrences but not found reported in other LERs in the file.

TABLE 2

Year	Pilot Valve Related	Stem Binding	Other	Total
1979				
Point Beach 2		3		3
Quad Cities 1	1			1
Trojan 1		2		2
Vermont Yankee			1	1
Zion 1	1			1
Zion 2	1			1
Total	3	5	1	9
1980				
E. I. Hatch 2	1			1
Nine Mile Point 1	2			2
Quad Cities 1	3			3
Trojan 1		4		4
Big Rock Point		1		1
Monticello	1			1
North Anna 1			1	1
Point Beach 2		1		1
Total	7	6	1	14

Table 3

LER DATA, PLANT, ON MSIV FAILURES TO CLOSE (1970-1980)

Plant (Note 1*)	Event Date	Number of Failures (Notes 2-4*)		Nature of Failures (Note 5*)	Manufacturer
Beaver Valley 1	09-19-76	1	c	Unknown	Schutte & Koerting Co.
Big Rock Point	09-06-78	1	b	Packing/binding stem	Wm. Powell Co.
"	03-03-73	1	b	Packing/binding stem	Wm. Powell Co.
"	11-01-80	1	b	Packing/binding stem	Wm. Powell Co.
Dresden 1	04-11-73	1	c	Unknown	Not listed
Dresden 2	01-22-71	1	a	Air pilot valve/residue	Not listed
"	05-08-70	4	a	Pilot valve/clearance	Not listed
"	12-04-70	4	a	Pilot valve/thin film	Not listed
E. I. Hatch 1	04-17-75	1	a	Pilot solenoid/stuck	Atwood & Morrill Co.
"	06-15-75	1(+1)	a	Solenoid/debris buildup	Automatic Valve Corp,
"	07-07-75	3	a	Solenoid/operated improperly/ air filters cleaned	Model 443B12 "
E. I. Hatch 2	05-21-80	1	a	Solenoid/faulty o-ring	ASCO
H. B. Robinson 2	12-17-78	1	b	Packing gland/misadjusted	Schutte & Koerting Co.
Haddam Neck 1	01-22-76	1	a	Solenoid Valve/frozen moisture	Schutte & Koerting Co.
"	09-16-77	1	b	Packing gland/too tight	"
Indian Point 3	12-17-76	2	b	Packing gland/shaft binding	Atwood & Morrill Co.
La Crosse BWR	07-02-71	1	a	Pilot valve/residue buildup	Not listed

*See footnotes on last page of table.

TABLE 3 (continued)

Plant (Note 1*)	Event Date	Number of Failures (Notes 2-4*)	Nature of Failures (Note 5*)	Manufacturer
Millstone 1	11-19-70	1 a	Slide valve/failed to vent air	Not listed
"	11-04-74	1(+3)a	Pilot valve/crud buildup	Numatics
"	11-15-74	1 a	Air slide valve/foreign material	Numatics
Monticello 1	02-16-74	2 a	Solenoid Valves/metal shavings	Automatic Valve Corp.
"	08-17-80	1 a	in air manifold/Solenoid/particulate in solenoid plunger	Atwood & Morrill Co.,Inc.
Nine Mile Point 1	03-03-80	2 a	Pilot valves/rust buildup	Numatics
North Anna 1	01-10-80	1 c	Auxiliary relay/open	Westinghouse Electric Corp.
Oyster Creek 1	04-23-77	1 a	Solenoid valves/deformed gasket	Not listed
"	01-16-74	1 a	Pilot valve/residue	Numatics
"	12-29-72	1 a	Pilot valve/fine dust	Not listed
"	11-16-71	1 c	Dashpot piston/iron cushion spool failure	Not listed
Peach Bottom 2	11-18-76	1 b	Backseat/gouging stem	Atwood & Morrill Co.
Peach Bottom 3	01-02-76	1 a	Solenoid valve/seat damaged	Allied Control Co.
"	07-22-77	1 a	Solenoid valve/winding failure	Automatic Valve Corp.
Pilgrim 1	11-16-73	1 a	Activator/small foreign particle	Not listed
"	11-29-72	1 a	Pilot valve/stuck	Not listed
"	07-25-74	1 a	Spool piece/containment build-up (air system)	Not listed
Point Beach 2	02-19-79	2 b	Valve Shaft/binding	Atwood & Morrill Co.
"	02-29-79	1 b	Packing/binding shaft	"
"	09-12-80	1 b	Packing/binding shaft	"

TABLE 3 (continued)

Plant (Note 1*)	Event Date	Number of Failures (Notes 2-4*)		Nature of Failures (Note 5*)	Manufacturer
Quad Cities 1	09-14-79	1	a	Pilot valve/sticking	Automatic Valve Co.
"	02-24-80	1	a	Pilot valve/blockage	"
"	06-21-80	2	a	Pilot valve/exhaust restrictor	"
"	11-15-72	1	a	Pilot valve/dirt fm instrument air	Not listed
Quad Cities 2	03-19-76	1	a	Pilot assembly/foreign material	Automatic Valve Co.
"	09-22-77	1	a	Pilot valve/damaged o-ring	Automatic Valve Co.
Surry 2	02-04-76	1	c	Disc/binding against body	Schutte & Koerting Co.
Trojan 1	02-21-78	1	a	Solenoid valve/rust accumulation	Not listed
"	04-14-79	2	b	Packing/binding	Atwood & Morrill
"	04-11-80	3	b	Packing/binding	Atwood & Morrill
"	10-03-80	1	b	Component failure (binding of stem?)	Atwood & Morrill
Turkey Point 3	10-26-75	1	c	Unknown	Schutte & Koerting
Vermont Yankee 1	02-04-78	1	a	Pilot valve/foreign particle	Rockwell Mfg.
"	12-09-77	1(+1)	a	Pneumatic spool/foreign particle	Rockwell Mfg.
"	04-03-79	1	c	Spring/binding on guide shaft	Rockwell International
"	01-24-74	1	a	Pilot valve/sticking	Not listed
"	09-15-74	1(+4)	a	Pilot valve/failed to actuate	Numatics
Zion 1	05-06-78	1	a	4-way directional control valve/ jammed hydraulic/DC solenoid/ stuck/hydraulic	Rexroth
"	05-23-79	1(+4)	a		Teledyne

TABLE 3 (continued)

Plant (Note 1*)	Event Date	Number of Failures (Notes 2-4*)	Nature of Failures (Note 5*)	Manufacturer
Zion 2	06-03-76	1(+1)a	DC solenoid/corrosion/hydraulic	Teledyne
"	10-15-78	1 a	Solenoid valves/Failed to operate	"
"	02-05-78	1 a	Solenoid valves failed to operate	"
"	02-09-79	1 a	Solenoid valves/failure to operate/ hydraulic	"

Notes:
1) All data are extracted from the LER file.
2) Numbers in parentheses represent "other related failures" mentioned by the LER but not the subject of another LER in the file.
3) Numbers greater than one represent several failures being reported by the same LER which frequently, but not necessarily, represent simultaneous failures.
4) The letter "a" represents an input to Table I under "Pilot Valve Related" problems, "b" represents Stem Binding, and "c" represents "Other" on the table.
5) Some liberty was taken in interpreting the cause of failure where clear descriptions were not available.

Attachment 2
IEC 81-14
November 5, 1981

RECENTLY ISSUED
IE CIRCULARS

Circular No.	Subject	Date of Issue	Issued to
81-13	Torque Switch Electrical Bypass Circuit for Safeguards Service Valve Motors	9/25/81	All power reactor facilities with an OL or CP
81-12	Inadequate Periodic Test Procedure in PWR Protection System	7/22/81	All power reactor facilities with an OL or CP
81-11	Inadequate Decay Heat Removal	7/23/81	All BWR facilities with OL or CP
81-10	Steam Voiding in the Reactor Coolant System During Decay Heat Removal Cooldown	7/2/81	All power reactor facilities with an OL or CP
81-08	Foundation Materials	5/29/81	All power reactor facilities with an OL or CP
81-07	Control of Radioactively Contaminated Material	5/14/81	All power reactor facilities with an OL or CP
81-06	Potential Deficiency Affecting Certain Foxboro 20 to 50 Milliampere Transmitters	4/14/81	All power reactor facilities with an OL or CP
81-05	Self-Aligning Rod End Bushings for Pipe Supports	3/31/81	All power reactor facilities with an OL or CP
81-04	The Role of Shift Technical Advisors and Importance of Reporting Operational Events	4/30/81	All power reactor facilities with an OL or near-term OL
81-03	Inoperable Seismic Monitoring Instrumentation	3/2/81	All power reactor facilities with an OL or CP
81-02	Performance of NRC-Licensed Individuals While on Duty	2/9/81	All power reactor facilities (research & test) with an OL or CP

OL = Operating License
CP = Construction Permit