



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA ST., N.W., SUITE 3100
ATLANTA, GEORGIA 30303



Gentlemen:

The enclosed circular is forwarded for your appropriate action. No written response to this circular is required. If you have any questions related to this matter, please contact this office.

Sincerely,

James P. O'Reilly
Director

Enclosures:

1. IE Circular No. 81-14
2. List of Recently Issued
IE Circulars

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Distribution for IE Circular No. 81-14

(ACTION)

November 5, 1981

Addresses

In Reference To

- | | |
|--|--|
| 1. Alabama Power Company
Attn: R. P. McDonald
Vice President-Nuclear Generation
Post Office Box 2641
Birmingham, AL 35291 | 50-348 Farley Unit 1
50-364 Farley Unit 2 |
| 2. Carolina Power and Light Company
Attn: J. A. Jones
Senior Executive Vice President
and Chief Operating Officer
411 Fayetteville Street
Raleigh, NC 27602 | 50-325 Brunswick Unit 1
50-324 Brunswick Unit 2
50-400 Harris Unit 1
50-401 Harris Unit 2
50-402 Harris Unit 3
50-403 Harris Unit 4
50-261 Robinson Unit 2 |
| 3. Duke Power Company
Attn: L. C. Dail, Vice President
Design Engineering
P. O. Box 33189
Charlotte, NC 28242 | 50-491 Cherokee Unit 1
50-492 Cherokee Unit 2
50-493 Cherokee Unit 3
50-488 Perkins Unit 1
50-489 Perkins Unit 2
50-490 Perkins Unit 3 |
| 4. Duke Power Company
Attn: W. O. Parker, Jr.
Vice President, Steam Production
P. O. Box 2178
Charlotte, NC 28242 | 50-369 McGuire Unit 1
50-370 McGuire Unit 2
50-269 Oconee Unit 1
50-270 Oconee Unit 2
50-287 Oconee Unit 3
50-413 Catawba Unit 1
50-414 Catawba Unit 2 |
| 5. Florida Power and Light Company
Attn: R. E. Uhrig, Vice President
Advanced Systems and Technology
P. O. Box 529100
Miami, FL 33152 | 50-335 St. Lucie Unit 1
50-389 St. Lucie Unit 2
50-250 Turkey Point Unit 3
50-251 Turkey Point Unit 4 |
| 6. Florida Power Corporation
Attn: J. A. Hancock, Assistant
Vice President Nuclear Operations
P. O. Box 14042, Mail Stop C-4
St. Petersburg, FL 33733 | 50-302 Crystal River Unit 3 |

Addresses

In Reference To

- | | |
|---|--|
| 7. Georgia Power Company
Attn: J. H. Miller, Jr.
Executive Vice President
270 Peachtree Street
Atlanta, GA 30303 | 50-321 Hatch Unit 1
50-366 Hatch Unit 2
50-424 Vogtle Unit 1
50-425 Vogtle Unit 2 |
| 8. Mississippi Power and Light Company
Attn: N. L. Stampley
Vice President of Production
P. O. Box 1640
Jackson, MS 39205 | 50-416 Grand Gulf Unit 1
50-417 Grand Gulf Unit 2 |
| 9. Offshore Power Systems
Attn: A. R. Collier, President
P. O. Box 8000
Jacksonville, FL 32211 | 50-437 FNP 1-8 |
| 10. South Carolina Electric and Gas Company
Attn: T. C. Nichols, Jr., Vice President
Power Production and System
Operations
P. O. Box 764
Columbia, SC 29218 | 50-395 Summer Unit 1 |
| 11. Tennessee Valley Authority
Attn: H. G. Parris
Manager of Power
500A Chestnut Street Tower II
Chattanooga, TN 37401 | 50-438 Bellefonte Unit 1
50-439 Bellefonte Unit 2
50-259 Browns Ferry Unit 1
50-260 Browns Ferry Unit 2
50-296 Browns Ferry Unit 3
50-518 Hartsville Unit 1
50-519 Hartsville Unit 2
50-520 Hartsville Unit 3
50-521 Hartsville Unit 4
50-553 Phipps Bend Unit 1
50-554 Phipps Bend Unit 2
50-327 Sequoyah Unit 1
50-328 Sequoyah Unit 2
50-390 Watts Bar Unit 1
50-391 Watts Bar Unit 2
50-566 Yellow Creek Unit 1
50-567 Yellow Creek Unit 2 |
| 12. Virginia Electric and Power Company
Attn: R. H. Leasburg
Vice President Nuclear Operations
P. O. Box 26666
Richmond, VA 23261 | 50-338 North Anna Unit 1
50-339 North Anna Unit 2
50-404 North Anna Unit 3
50-280 Surry Unit 1
50-281 Surry Unit 2 |

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(ACTION)

Addresses

In Reference To

13. Institute of Nuclear Power Operation
Attn: R. W. Pack
Lakeside Complex
1820 Waterplace
Atlanta, GA 30339
14. Southern Company Services, Inc.
ATTN: O. Batum, Manager
Nuclear Safety & Licensing
Department
P. O. Box 2625
Birmingham, AL 35202
15. Department of Energy
Clinch River Breeder Reactor
Plant Project Office
ATTN: Chief, Quality Improvement
P. O. Box U
Oak Ridge, TN 37830
16. EDS, Nuclear, Inc.
ATTN: E. H. Verdery
330 Technology Park/Atlanta
Norcross, GA 30092

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

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
<u>1979</u>				
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
<u>1980</u>				
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 in air manifold/Solenoid/particulate in solenoid plunger	Automatic Valve Corp.
"	08-17-80	1		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 spud 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 fr 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/	Rexroth
"	05-23-79	1(+4)a	jammed hydraulic/DC solenoid/ stuck/hydraulic	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.

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 Curing 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 Milliamper 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