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175 Carter Ave., San Jose, CA 95123*

January 23, 1998
98-01NRC.DOC
MFN 011-98

Document Control Desk
United States Nuclear Regulatory Commission
Washington, DC 20535

Subject: Spring Return Binding in GE Type SBM Control Switches

This letter provides information concerning the possible failure of certain GE Type SBM Control Switches with the spring return function to reset properly after operation. While the failure mode has been identified as an interference between the rear bearing and its support, the root cause has not yet been determined and the total extent of the problem is not fully known. Until more definitive information is available, GE Nuclear Energy (GE-NE) is conservatively assuming that SBM Control Switches with the spring return function manufactured since March 1996 may be subject to this failure mode. GE-NE is undertaking a test program to determine the root cause failure mechanism and appropriate remedial action(s), but the results of the investigation may not be complete for several weeks. Additional information will be provided when it is available.

GE Type SBM Control Switches are manufactured by GE Electrical Distribution and Control (GE-ED&C) Power Management, Malvern, PA as commercial grade items. GE-NE has dedicated these switches and supplied them to several licensees as basic components for unspecified, safety related applications. Since the specific applications and associated safety functions of the switches are not known to GE-NE, we have transferred information pursuant to 10 CFR Part 21.21(b) to those licensees known to be affected. However, since additional licensees may have obtained these devices through other dedicating entities, we cannot assure ourselves that all end-users have been notified. We are therefore providing this information to the NRC for appropriate action.

On January 6, 1998, GE-NE was advised by a licensee that a safety related SBM Control Switch with the spring return function had failed to reset (return to normal position) properly. The switch (model 16SBMB3A02S1S2P1) was returned to GE-NE for evaluation with the support of GE-ED&C Relay Product Engineering.

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The most probable failure mode was determined to be binding caused by interference between the rear brass bearing and the phenolic rear bearing support. Subsequently, a second failed switch was returned, and examination confirmed the same failure mode. In addition, there have been at least nine more switches identified by the licensee as failing to reset properly after operating correctly for approximately one year.

Based on the preliminary investigation, the root cause is suspected to be "post mold cure" shrinkage of the phenolic material used to construct some of the switch components. The failed devices have been examined and, in each instance, the bearing support hole was found to be undersized and the bearing was at, or near, its maximum allowable diameter. Devices with bearings that are at their nominal diameter function properly, even when the support hole is undersized. Consequently, the failure is not seen in every switch. The failure is most likely preceded by a gradual increase in the force required to operate the device and a sluggish return.

Although the interference can exist in any SBM Control Switch, binding is primarily an issue in those devices that have the spring return function. In spring return switches, the reset spring does not generate enough torque on the operating shaft to overcome the friction resulting from the interference. Thus, the operating handle, and consequently the contacts, will not reset when the handle is released. The switch contacts will function when the switch is operated ^{fail}id, if the switch is manually returned to the reset (normal) position, the contacts will also return to their normal configuration. "Maintain position" SBM Control switches may also have the interference, but the force required to overcome the friction resulting from the interference is not great enough to prevent proper function. Nonetheless, it is considered good practice to assure that these switches are in the proper position, as indicated by the switch pointer, before releasing the handle.

A loss of torque in the tie bolts that secure the switch components has been observed in conjunction with the spring return binding. The loss of bolt torque is also postulated to be the result of the post mold cure shrinkage and, although it has been noted in those devices that have failed, it is not the cause of the binding and does not indicate impending failure.

All of the failed switches identified to date were manufactured in the period November 1996 through February 1997. There have been no reports of spring return binding in earlier SBM Control Switches, despite the fact that these switches have been widely used in a variety of applications for many years. Until more definitive information is available concerning the root cause, GE-NE is conservatively assuming that SBM Control Switches with the spring return function manufactured since March 1996 may be subject to this failure mode. The affected

date codes are PL, RL, SL, TL, UL, VL, WL, XL, YL, ZL, NM, OM, PM, RM, SM, UM, VM, WM, XM, YM, ZM, and NN.

There are two safety concerns with regard to spring return binding: (1) possible damage to control circuitry caused by the circuit being maintained in the energized state for a prolonged period; and (2) the possibility that control circuits will be prevented from performing their proper function by the failure of the switch contacts to return to their reset (normal) configuration.

The consequences of the loss of torque in the tie bolts that secure the switch components, and the resulting effect on the switch qualification, have been evaluated. The evaluation determined that the loss of torque will not prevent proper operation or degrade the device qualification.

If SBM Control Switches with the spring return function, and manufactured since March 1996, have been installed in safety related applications, it is suggested that station personnel who operate these switches be advised to return the operating handle to the normal position after operation. This will preclude any control circuit difficulties. It should be noted that all of the switches identified to date as failing to reset properly had previously operated correctly for approximately one year.

Additional information will be made available when GE-NE has completed the test program to determine the root cause failure mechanism and appropriate remedial action(s).

If you have any questions, please call me at (408) 925-1019.

Sincerely,



Michael A. Smith, Program Manager
Safety Evaluations

cc: S. D. Alexander (NRC-NRR/DISP/PSIB)
G. C. Cwalina (NRC-NRR/DISP/PSIB)
J. F. Quirk (GE-NE)
H. J. Neems (GE-NE)
G. W. Sanders (GE-NE)
J. A. Steininger (GE-NE)
J. Teague (GE-ED&C/Malvern)
GE-NE PRC File



GE Nuclear Energy

10 CFR Part 21 Notification

SC98-01

January 23, 1998

To: **BWR and PWR Utilities (per Attachment 1)**

Subject: **Spring Return Binding in GE Type SBM Control Switches**

Reportable Condition [21.21(d)]

60 Day Interim Report [21.21(a)(2)]

Transfer of Information [21.21(b)]

Safety Information Communication


Summary:

This Notification provides information concerning the possible failure of certain GE Type SBM Control Switches with the spring return function to reset properly after operation. While the failure mode has been identified as an interference between the rear bearing and its support, the root cause has not yet been determined and the total extent of the problem is not fully known. Until more definitive information is available, GE Nuclear Energy is conservatively assuming that SBM Control Switches with the spring return function manufactured since March 1996 may be subject to this failure mode.

GE Type SBM Control Switches are manufactured by GE Electrical Distribution and Control (GE-ED&C) Power Management, Malvern, PA as commercial grade items. GE Nuclear Energy (GE-NE) has dedicated these switches and supplied them to several nuclear power plants for unspecified, safety related applications. Since the specific applications and associated safety functions of the switches are not known, it is not possible for GE-NE to evaluate the safety significance of possible failures to determine if a defect exists in the context of 10CFR Part 21. We are therefore transferring the available information to the known affected utilities for evaluation.

GE-NE is undertaking a test program to determine the root cause failure mechanism and appropriate remedial action(s), but the results of the investigation may not be complete for several weeks. A supplement or revision to this 10CFR Part 21 Notification will be issued when additional information is available.

Issued by:


 M. A. Smith, Program Manager
 Safety Evaluations
 GE Nuclear Energy, M/C 187
 175 Curtner Avenue, San Jose, CA 95125
 (408) 925-1019

Notice: This 10 CFR Part 21 Notification pertains only to the plants or facilities specifically indicated as being affected. GE Nuclear Energy (GE-NE) is not considered or intended to be responsible, if any, for the applicability of this information to any plants or facilities other than those specifically indicated as being affected and for which GE-NE supplied the equipment or services addressed in the Notification. Determination of applicability of this information to a particular plant or facility, and the decision of whether or not to take action based on the Notification, are the responsibilities of the Owner of that plant or facility.

SC98-01***Background***

GE Type SBM Control Switches are manufactured by GE-ED&C Power Management, Malvern, PA as commercial grade items. GE-NE dedicates these switches and supplies them to nuclear power plants as basic components for safety related applications.

On January 6, 1998, GE-NE was advised by a licensee that a safety related SBM Control Switch with the spring return function had failed to reset (return to normal position) properly. The switch (model 16SBMB3A02S1S2P1) was returned to GE-NE for evaluation with the support of GE-ED&C Relay Product Engineering.

The most probable failure mode was determined to be binding caused by interference between the rear brass bearing and the phenolic rear bearing support. Subsequently, a second failed switch was returned, and examination confirmed the same failure mode. In addition, there have been at least nine more switches identified by the licensee as failing to reset properly after operating correctly for approximately one year.

Based on the preliminary investigation, the root cause is suspected to be "post mold cure" shrinkage of the phenolic material used to construct some of the switch components. The failed devices have been examined and, in each instance, the bearing support hole was found to be undersized and the bearing was at, or near, its maximum allowable diameter. Devices with bearings that are at their nominal diameter function properly, even when the support hole is undersized. Consequently, the failure is not seen in every switch. The failure is most likely preceded by a gradual increase in the force required to operate the device and a sluggish return.

Although the interference can exist in any SBM Control Switch, binding is primarily an issue in those devices that have the spring return function. In spring return switches, the reset spring does not generate enough torque on the operating shaft to overcome the friction resulting from the interference. Thus, the operating handle, and consequently the contacts, will not reset when the handle is released. The switch contacts will function when the switch is operated and, if the switch is manually returned to the reset (normal) position, the contacts will also return to their normal configuration. "Maintain position" SBM Control Switches may also have the interference, but the force required to overcome the friction resulting from the interference is not great enough to prevent proper function. Nonetheless, it is considered good practice to assure that these switches are in the proper position, as indicated by the switch pointer, before releasing the handle.

A loss of torque in the tie bolts that secure the switch components has been observed in conjunction with the spring return binding. The loss of bolt torque is also postulated to be the result of the post mold cure shrinkage and, although it has been noted in those devices that have failed, it is not the cause of the binding and does not indicate impending failure.

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All of the failed switches identified to date were manufactured in the period November 1996 through February 1997. There have been no reports of spring return binding in earlier SBM Control Switches, despite the fact that these switches have been widely used in a variety of applications for many years. Until more definitive information is available concerning the root cause, GE-NE is conservatively assuming that SBM Control Switches with the spring return function manufactured since March 1996 may be subject to this failure mode. The affected date codes are PL, RL, SL, TL, UL, VL, WL, XL, YL, ZL, NM, OM, PM, RM, SM, TM, UM, VM, WM, XM, YM, ZM, and NN.

Safety Basis

There are two safety concerns with regard to spring return binding: (1) possible damage to control circuitry caused by the circuit being maintained in the energized state for a prolonged period; and (2) the possibility that control circuits will be prevented from performing their proper function by the failure of the switch contacts to return to their reset (normal) configuration.

The consequences of the loss of torque in the tie bolts that secure the switch components, and the resulting effect on the switch qualification, have been evaluated. The evaluation determined that the loss of torque will not prevent proper operation or degrade the device qualification.

Corrective Actions and Preventive Measures

If SBM Control Switches with the spring return function, and manufactured since March 1996, have been installed in safety related applications, it is suggested that station personnel who operate these switches be advised to return the operating handle to the normal position after operation. This will preclude any control circuit difficulties.

It should be noted that all of the switches identified to date as failing to reset properly had previously operated correctly for approximately one year.

Additional information will be made available when GE-NE has completed the test program to determine the root cause failure mechanism and appropriate remedial action(s).

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Attachment 1 - Affected Plants

	<u>Utility</u>	<u>Plant</u>
<u> </u>	Boston Edison Co.	Pilgrim
<u> </u>	Carolina Power & Light Co.	Brunswick 1
<u> </u>	Carolina Power & Light Co.	Brunswick 2
<u> </u>	Centerior Energy	Ferry 1
<u> </u>	ComEd	CRIT Facility
<u> </u>	ComEd	Dresden 2
<u> </u>	ComEd	Dresden 3
<u> </u>	ComEd	LaSalle 1
<u> </u>	ComEd	LaSalle 2
<u> </u>	ComEd	Quad Cities 1
<u> </u>	ComEd	Quad Cities 2
<u> </u>	Consumers Power Co.	Big Rock Point
<u> </u>	DTE Energy	Fermi 2
<u> </u>	Entergy Operations, Inc.	Grand Gulf
<u> </u>	Entergy Operations, Inc.	River Bend
<u> </u>	GPU Nuclear Corp.	Oyster Creek
<u> </u>	IES Utilities, Inc.	Duane Arnold
<u> </u>	Illinois Power Co.	Clinton
<u> </u>	Nebraska Public Power District	Cooper
<u> </u>	New York Power Authority	FitzPatrick
<u> </u>	Niagara Mohawk Power Corp.	Nine Mile Point 1
<u> </u>	Niagara Mohawk Power Corp.	Nine Mile Point 2
<u> </u>	Northeast Utilities	Millstone 1
<u> </u>	Northern States Power Co.	Mondocello
<u> </u>	PECO Energy Co.	Limerick 1
<u> </u>	PECO Energy Co.	Limerick 2
<u> </u>	PECO Energy Co.	Peach Bottom 2
<u> </u>	PECO Energy Co.	Peach Bottom 3
<u> </u>	Pennsylvania Power & Light Co.	Susquehanna 1
<u> </u>	Pennsylvania Power & Light Co.	Susquehanna 2
<u> </u>	Pooled Equipment Inventory Co.	FIB
<u> </u>	Public Service Electric & Gas Co.	Hope Creek
<u> </u>	Southern Nuclear Operating Co.	Hatch 1
<u> </u>	Southern Nuclear Operating Co.	Hatch 2
<u> </u>	Tennessee Valley Authority	Browns Ferry 1
<u> </u>	Tennessee Valley Authority	Browns Ferry 2
<u> </u>	Tennessee Valley Authority	Browns Ferry 3
<u> </u>	Vermont Yankee Nuclear Power Corp.	Vermont Yankee
<u> </u>	Washington Public Power Supply System	WNP-2

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Attachment 1 - Affected Plants (continued)

<u>Utility</u>	<u>Plant</u>
<u>X</u> Consumers Power Co.	Palisades
<u>X</u> Entergy Operations, Inc.	Arkansas Nuclear One 1
<u>X</u> Entergy Operations, Inc.	Arkansas Nuclear One 2
<u>X</u> Florida Power & Light Co.	Turkey Point 3
<u>X</u> Florida Power & Light Co.	Turkey Point 4
<u>X</u> Florida Power Corp.	Crystal River 3
<u>X</u> Maine Yankee Atomic Power Co.	Maine Yankee
<u>X</u> New York Power Authority	Indian Point 3
<u>X</u> North Atlantic Energy Service Corp.	Seabrook
<u>X</u> Omaha Public Power District	Fort Calhoun
<u>X</u> Public Service Electric & Gas Co.	Salem 1
<u>X</u> Public Service Electric & Gas Co.	Salem 2
<u>X</u> Southern Nuclear Operating Co.	Vogtle 1
<u>X</u> Southern Nuclear Operating Co.	Vogtle 2

SC98-01**Attachment 2 - 10 CFR Part 21 Notifications for 1997/98**

The following is a list of 10 CFR Part 21 Notifications that GE Nuclear Energy has provided to affected licenses in 1997 and 1998 as Reportable Conditions (RC), Transfers of Information (TI), Safety Information Communications (SC) or 60 Day Interim Reports (60 Day).

<u>Number</u>	<u>Ref.</u>	<u>Subject</u>	<u>Date</u>
SC97-01	PRC 96-82	Possible Failure of GE Model AMH 478-950 Circuit Breakers to Latch Closed (TI)	2/4/97
SC97-02	PRC 96-34	Possible Failure of Hex Head Set Screws in Older GE Type AK-15 and AK-25 Circuit Breakers (TI)	2/17/97
SC97-03	PRC 97-10	Test Select Resistors in Rosemount Model 710UOCL Trip Calibrator - Public Service Electric & Gas Co. (SC)	7/10/97
SC97-03 Revision 1	PRC 97-10	Test Select Resistors in Rosemount Model 710UOCL Trip Calibrator - Public Service Electric & Gas Co. (SC)	7/17/97
SC97-04	PRC 97-15	Suppression Pool Bypass Leakage due to Postulated Standby Gas Treatment System Failure (TI)	10/15/97
SC97-04 Revision 1	PRC 97-15	Suppression Pool Bypass Leakage due to Postulated Standby Gas Treatment System Failure (TI)	12/15/97
SC98-01	PRC 98-01	Spring Return Binding in GE Type SBM Control Switches (TI)	1/23/98



33917

1400 OPUS Place
Downers Grove, IL 60515

TRANSMITTAL SHEET

DATE: 3/18/98

TO: NRC Operations Center

Organization / Station / Departments _____

FROM: Gina Dizon

Department: NUCLEAR LICENSING

Telephone Number: (630) 663-7352

Transmittal Sheet Plus 16 Page(s)

Telecopy Number: 1-301-816-5151

If you have any problems receiving your telecopy, please call (630) 663-7332

NOTES

Faxed by _____
Time: _____
Confirmed _____

GENERAL INFORMATION or OTHER

EVENT NUMBER: 33917

LICENSEE: COMMONWEALTH EDISON CITY: DOWNERS GROVE COUNTY: LICENSE#: DOCKET: REGION: 3 STATE: IL AGREEMENT: Y	NOTIFICATION DATE: 03/18/98 NOTIFICATION TIME: 16:37 [ET] EVENT DATE: 03/16/98 EVENT TIME: 00:00 [CST] LAST UPDATE DATE: 03/18/98
	NOTIFICATIONS
	MELVYN LEACH, REG 3 RDO VERN HODGE NRR RICHARD BARKLEY R1DO THOMAS JOHNSON R2DO LAWRENCE YANDELL R4DO
NRC NOTIFIED BY: GINA DISON HQ OPS OFFICER: LEIGH TROCINE	
EMERGENCY CLASS: NOT APPLICABLE 10 CFR SECTION: CCCC 21.21 UNSPECIFIED PARAGRAPH	

EVENT TEXT

10CFR PART 21 NOTIFICATION REGARDING SPRING RETURN BINDING IN GENERAL ELECTRIC (GE) TYPE SBM CONTROL SWITCHES AT DRESDEN, LASALLE, AND QUAD CITIES.

THIS NOTIFICATION REFERENCED A GE NUCLEAR ENERGY TRANSFER OF INFORMATION DATED JANUARY 23, 1998, AND IT INVOLVES GE TYPE SBM CONTROL SWITCHES WITH THE SPRING RETURN FUNCTION MANUFACTURED SINCE MARCH 1996. THESE SWITCHES ARE SUSCEPTIBLE TO BINDING WHICH MAY PREVENT SPRING RETURN TO RESET (RETURN TO NORMAL POSITION). THE CAUSE OF THE BINDING WAS ATTRIBUTED TO FAILURE TO ACCOUNT FOR 'POST-MOLD CURE' SHRINKAGE IN THE DESIGN TOLERANCE OF THE CLEARANCE BETWEEN THE PHENOLIC REAR BEARING SUPPORT HOLE AND THE BEARING. THIS DESIGN ERROR DID NOT BECOME APPARENT UNTIL THE MOLDS EXPERIENCED WEAR TO THE EXTENT THAT RESULTING PARTS WERE AT THE EXTREMES OF DIMENSIONAL TOLERANCES. THE POST-MOLD CURE IS NORMAL FOR PHENOLIC MATERIAL AND HAS BEEN SHOWN TO TAKE PLACE OVER A PERIOD OF UP TO TWO YEARS AFTER MOLDING IS COMPLETED. CONSEQUENTLY, SWITCHES WHICH ARE CONSTRUCTED FROM COMPONENTS THAT ARE WITHIN SPECIFICATION AND FUNCTION FULLY DURING ACCEPTANCE TESTING MAY EXHIBIT SLUGGISH RETURN OR BINDING UP TO TWO YEARS AFTER ASSEMBLY. THIS ROOT CAUSE IS SUPPORTED THROUGH GE EXAMINATION OF FAILED SWITCHES WHICH, IN EACH INSTANCE, HAS FOUND THE BEARING SUPPORT HOLE TO BE UNDERSIZED (LESS THAN MINIMUM INSIDE DIAMETER) AND THE BEARING AT OR NEAR ITS MAXIMUM ALLOWABLE DIAMETER. GE TESTING HAS ALSO CONFIRMED THAT SWITCHES WITH BEARINGS THAT ARE AT THEIR NOMINAL DIAMETER WILL FUNCTION PROPERLY EVEN WHEN THE SUPPORT HOLE IS UNDERSIZED. CONSEQUENTLY, THE FAILURE IS NOT SEEN IN EVERY SWITCH.

COMMONWEALTH EDISON HAS DETERMINED THAT THE SUSPECT SBM SWITCHES ARE NOT INSTALLED AT ITS BRAIDWOOD, BYRON, OR ZION NUCLEAR GENERATING STATIONS.

(Continued on next page)

HOWEVER, COMMONWEALTH EDISON NUCLEAR GENERATING STATIONS WHICH HAVE THE SUSPECT SAFETY-RELATED SPRING RETURN SWITCHES INCLUDE DRESDEN, LASALLE, AND QUAD CITIES WITH 2, 246, AND 3 SWITCHES INSTALLED, RESPECTIVELY. LASALLE IS CURRENTLY EXPERIENCING BINDING IN 21 OF THESE SWITCHES.

THE FOLLOWING FACILITIES WERE ALSO REPORTED TO BE AFFECTED: PILGRIM; RIVER BEND; OYSTER CREEK; COOPER; FITZPATRICK; MILLSTONE UNIT 1; HATCH UNITS 1 AND 2; BROWNS FERRY UNITS 1, 2, AND 3; VERMONT YANKEE; PALISADES; ARKANSAS NUCLEAR ONE UNITS 1 AND 2; TURKEY POINT UNITS 3 AND 4; CRYSTAL RIVER UNIT 3; MAIN YANKEE; INDIAN POINT 3; SEABROOK; FORT CALHOUN; SALEM UNITS 1 AND 2; AND VOGTLE UNITS 1 AND 2.