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USNRC REGION II
ATLANTA, GEORGIA

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Georgia Power

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United States Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region II - Suite 3100
101 Marietta Street
Atlanta, Georgia 30303

File: X7BG03-M30
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Reference: Vogtle Electric Generating Plant - Units 1 and 2
50-424, 50-425; Limitorque Motor Operators Pinion Keys

Attention: Mr. James P. O'Reilly

Gentlemen:

On August 27, 1982, Mr. C. W. Hayes of Georgia Power Company informed Mr. John Rogge of the USNRC of a potential reportable condition concerning the use of defective material for pinion keys in Limitorque Motor Operators. Georgia Power Company also submitted several interim reports advising the NRC of changes in the scheduled submittal date for this concern.

Georgia Power Company has concluded its evaluation and determined that this concern is reportable under Part 10CFR50.55(e) and Part 10CFR21. This item was previously reported as a Part 10CFR21, therefore, Georgia Power Company is reporting this concern under 10CFR50.55(e) to avoid duplicate reporting. Enclosed is Georgia Power Company's evaluation of this concern.

This report contains no proprietary information and may be placed in the NRC Public Document Room upon receipt.

Very truly yours,

D. O. Foster
D. O. Foster

DOF/CWH/jr

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EVALUATION FOR A SUBSTANTIAL SAFETY HAZARD
EVALUATION FOR A SIGNIFICANT DEFICIENCY

Sheared Pinion Keys in Limitorque Motor Operators

Initial Report:

On August 27, 1982, Mr. C. W. Hayes of Georgia Power Company informed Mr. John Rogge of the USNRC of a potentially reportable condition concerning the use of defective material for pinion keys in Limitorque motor operators.

Background Information:

On two separate occasions, failed pinion keys have been found in Limitorque valve operators. In the course of performing field modifications/inspections on Westinghouse-supplied valves with Limitorque model SB-0-25 motor operators, sheared pinion keys were also discovered on Limitorque model SMB-4 motor operators. Because of the lack of specific information as to the adequacy of materials of pinion keys in motor operators supplied by Limitorque, Westinghouse concluded that the potential for sheared pinion keys in Limitorque valve operators constituted a substantial safety hazard. This was reported to the NRC by Westinghouse on August 6, 1982, in their letter NS-EPR-2637.

Westinghouse letter NS-EPR-2637 also referenced I & E Information Notice 81-08, Repetitive Failures of Limitorque Operator SMB-4 Motor-to-Shaft Key. This information notice distributed the following information to utilities:

Description of Circumstances:

During normal surveillance testing of motor-operated valves at the Cooper Nuclear Station, it was discovered that the RHR "B" loop suppression pool cooling inboard throttle valve would not operate. The valve did not operate because the key between the motor pinion gear and the motor shaft had failed. The operator for the valve has been identified as being Limitorque model SMB-4. Analysis of the failed key revealed that a standard type 1018 steel key had been installed instead of the required special type 4140 steel key.

Further review of the problem established that similar failures with motor-to-shaft keys had also taken place at the Pilgrim, Hatch, and Fitzpatrick nuclear power facilities.

Limitorque Company has performed an evaluation of the problem, and they have concluded that the problem is confined to operators having a torque rating in excess of 100 ft/lb. The standard type 1018 steel possesses adequate strength to accommodate motor operators having a torque rating that is less than 100 ft/lb.

Recommended Action for Holders of Operating Licenses and Construction Permits:

It is recommended that licensees having Limitorque Operator SMB-4 installed in their facilities verify that the special type 4140 steel keys have been used. This can be easily accomplished by performing a hardness check of the motor-to-shaft key during the next scheduled surveillance testing.

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Note: The use of Model SMB-4 Limatorque Motor Operators was investigated for Vogtle Electric Generating Station-Units 1 and 2. Bechtel and Westinghouse determined that SMB-4 operators had not been specified for use on any valves used in a safety-related service.

Engineering Evaluation:

Numerous valves in both safety and non-safety related systems are equipped with Limatorque valve operators to provide proper position of the valve on demand (either automatic or manual). The pinion keys secure the pinion gear to the motor shaft which transmits torque to the operator. If the pinion key fails, the operator may become inoperable and remote positioning of the valve is no longer possible.

Westinghouse has also furnished the following information on this subject:

- (1) Design calculations confirmed by stall testing justify the key design and the selection of AISI 1018 key material. This conclusion is supported by Limatorque's past years of experience without other reported key failures in this type operator.
- (2) Although the exact cause is not known, several factors contributed to the failures:
 - a. The keys that failed were made from 1113 series resulfurized carbon steel material.
 - b. The resulfurized keys exhibited an instantaneous failure mode when shear tested, indicating a reduced capacity for withstanding impact loading.
 - c. The nonspecified keys have a smaller shear area than the standard keys resulting in a 17 percent higher shear stress.
 - d. The keys were exposed to a stall load test at 1.5 to 2.0 times greater than the maximum operating loads.
- (3) The nonspecified resulfurized carbon steel key material has been found in 12 operators at three different sites. Eight of the 12 keys had been sheared into two pieces. These operators had been manufactured over a three-year time span.
- (4) The scope of the problem is limited to the SB-0 operators even though the SB-00 operators use the same key design because:
 - a. No failed keys have ever been discovered in the SB-00 model.
 - b. The SB-00 operators are equipped with motors having only 60 percent of the output thrust of the motors supplied with SB-0 units. This reduces the applied stall load by

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However, Westinghouse has decided to replace the pinion keys of the following valves.

Unit 1:

<u>Valve S/N</u>	<u>Operator Type</u>	<u>Operator S/N</u>	<u>Valve ID</u>	<u>Valve Location</u>
10001GM92FBH01016S740004	SMB-0-15	286826	10-GM72FBH	9002B
10001GM92FBH01016S740003	SMB-0-15	286827	10-GM72FBH	9002A
10001GM92FBB00016S740004	SMB-0-15	295690	10-GM72FB	9003B
10001GM92FBB00016S740003	SMB-0-15	295691	10-GM72FB	9003A
10001GM92FBB00016S740005	SMB-0-15	300552	10-GM72FBH	9017A
10001GM92FBB00016S740006	SMB-0-15		10-GM72FBH	9017B

Unit 2:

10001GM92FBH01016S740002	SMB-0-15	285119	10-GM72FBH	9002B
10001GM92FBH01016S740001	SMB-0-15	285120	10-GM72FBH	9002A
10001GM92FBB01016S740001	SMB-0-15	289120	10-GM72FBH	9017A
10001GM92FBB01016S740002	SMB-0-15	289121	10-GM72FBH	9017B
10001GM92FBB00016S740001	SMB-0-15	295693	10-GM72FB	9003A
10001GM92FBB00016S740002	SMB-0-15	295694	10-GM72FB	9003B

These valves are located in the containment spray system and can be seen in the attached Figure A-1. Valves 9017 A & B are normally open and located on the suction line from the RWST to the containment spray pumps. Valves 9002 A & B and 9003 A & B are located in the suction lines from the sumps to the containment spray pumps and are normally closed. The function of the Containment Spray System is to limit the peak pressure in the containment to less than design pressure during initial blowdown following a LOCA or steam line break accident inside containment. The system also removes iodine release on a break of fuel cladding following a loss-of-coolant accident.

Failure of these containment spray system valves to open or close could lead to over-pressurization of the containment or could also cause Part 10 CFR 100 offsite dose limits to be exceeded due to increased iodine concentration in the containment.

Georgia Power Company investigation revealed that the resulfurized steel pinion keys could have been used in the following Limitorque model numbers: SB-0, SB-00, SMB-0, and SMB-00. There are approximately 50 operators with these model numbers at Plant Vogtle. If the pinion keys of the above series of motor operators are replaced, the potential for pinion key failure should be reduced.

Review for Reportability Under Part 10 CFR 21 and 10 CFR 50.55(e):

Part 10 CFR 50.55(e) requires that the holder of a construction permit shall notify the Commission of each deficiency found in design and construction which, were it to have remained uncorrected, could have affected adversely the safety of operations of the nuclear power plant at any time throughout the expected lifetime of the plant.

Guidance in G. S. Spencer's letter of August 27, 1980, also states that "could does not imply that it would absolutely adversely affect safe operations, it implies a probability that safe operations may be adversely affected if the proper conditions existed. At any time means all service and accident conditions of operation must be considered."

The possibility of the failure of the pinion keys in the valves for the containment spray system could occur; therefore these potential failures could have affected adversely the safety of operations of the unit. Also, based upon the Westinghouse letters submitted to the NRC, a quality assurance program breakdown may exist at Limitorque Corporation.

Westinghouse's August 6, 1982, letter to the NRC stated there was a "lack of specific information on pinion key materials." This could indicate an improper identification system for safety-related materials and may indicate a breakdown with regard to Criterion VIII, Identification and Control of Material, Parts, and Components, and Criterion XVIII, Quality Assurance Records.

Also, a significant deviation from performance specifications could exist, since if the Limitorque motor operators failed in service the containment spray system and other systems could not perform their intended safety function.

A substantial safety hazard could exist since the general public could have moderate exposure to licensed material due to the failure of the containment spray operators. Failure of operators and others could provide a major reduction in the degree of protection provided to public health and safety and could also challenge the ability of a containment system to perform its designated safety function.

Conclusion:

Georgia Power Company has concluded a significant deficiency and a substantial safety hazard does exist and is reporting this to the Commission under 10 CFR 50.55(e) and under Part 10 CFR 21.

Corrective Action:

Limitorque now procurs the barstock materials for the subvendor that manufacturers pinion keys. The material is procured with certified mill test reports. All material at the subvendor, who only works for Limitorque, has been checked and the subvendor is using material that has CMTR's.)

New pinion keys will be furnished for Limitorque motor operator models SB-0, SB-00, SMB-0 and SMB-00. It is anticipated that these pinion keys will be replaced no later than June 30, 1984. The pinion keys will be replaced with material for which Limitorque has received certified mill test reports. Mr. W. R. Evans, Mechanical Section Supervisor, is responsible for the corrective action.