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UNION ELECTRIC COMPANY

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ST. LOUIS, MISSOURI  
May 17, 1984

DONALD F. SCHNELL  
VICE PRESIDENT

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Mr. James G. Keppler  
Regional Administrator  
U.S. Nuclear Regulatory Commission  
Region III  
799 Roosevelt Road  
Glen Ellyn, IL 60137

Dear Mr. Keppler:

ULNRC-828

FINAL 10CFR50.55(e)/PART 21 REPORT:  
LIMITORQUE OPERATOR MOTOR PINION/WORM SHAFT  
CLUTCH GEAR FAILURE, U-64

Ref: ULNRC-769 dated March 20, 1984  
Enc: Examination Findings

On October 17, 1983, Union Electric informed the NRC Region III office of a potential 10CFR50.55(e)/10CFR21 regarding Limitorque operators for valves BN-HV-8812 A&B. On March 20, 1984, a final report, ULNRC-769, was written, concluding that the gear failures experienced were due to improperly installed motor pinion gears. This improper installation was attributed to site maintenance activities. After the report was issued, various activities were initiated to implement the corrective action. Included in these activities was a review of past maintenance records and inspection of previously damaged operators. One of these inspections revealed motor pinion/worm shaft clutch gear damage in a SB-2-80 type operator with a properly installed and oriented motor pinion gear, thus invalidating the conclusions reached in the referenced report. Therefore, on April 10, 1984, Union Electric notified the NRC that ULNRC-769 should be considered an interim report and that further investigations were underway to determine and fix the problem.

Union Electric contacted Westinghouse requesting further assistance in assessing the situation and resolving the problem. On April 12, 1984, with representatives from both Westinghouse Electro-Mechanical Division (EMD) and Limitorque on site, seven operators of the SB-2-80 type were examined. The results of the examination are described in the enclosure, "Examination Findings". Additional gear failures were found including the failure of a Unit 2 spare operator which was received from Westinghouse and had not been installed in the plant. This information indicated that the SB-2-80 actuators on valves EJ-HV-8811 A and B needed to be evaluated. Because of the failure of the spare operator, Union Electric contacted the NRC on April 18,

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1984 informing them that Union Electric considered the above failure a 10CFR Part 21 issue.

Westinghouse and Limitorque mobilized additional resources to address this issue. This effort consisted of tests and reviews of past operating history. Tests were run at the Limitorque shop and Callaway site from April 20 until April 28, 1984. Limitorque, working in their shop using a test stand, ran a series of tests and was not able to duplicate the failures which were occurring on site. After these inconclusive shop tests, Union Electric, Limitorque, and Westinghouse decided additional tests were needed in the field. Westinghouse ran a series of tests in the field to evaluate alternate key material and obtained failures similar to the ones previously encountered. While the testing was going on, Westinghouse and Limitorque reviewed their records of the operating histories of the SB-2-80 type operators and data concerning other failures similar to the ones at the Callaway site. It was their opinion that this problem was limited to SB-2-80 type operators at the Callaway site. This information suggested a second course of action. Concurrent with the testing program, Union Electric and Westinghouse pursued acquisition of a replacement for the SB-2-80 type operator. SB-1-60 operators were selected based on their use in similar applications. The SB-1-60 type operator also provided direct interchangeability with the SB-2-80 type operator and met all the valve design requirements. After the additional site testing of the SB-2-80 proved inconclusive, the decision was made to install and test a SB-1-60 type operator at the BN-HV-8812A location. If this test proved successful, all SB-2-80 type actuators would be replaced with SB-1-60 type actuators.

Prior to installation of the new operators on valve BN-HV-8812A, the valve internals, seat, and disk were inspected by Union Electric and Westinghouse EMD personnel. The valve was found to be in good condition with no unusual wear. The first SB-1-60 type operator was then installed and tested at the BN-HV-8812A location on May 4, 1984. The test, which was developed by Westinghouse EMD and is consistent in scope with earlier tests that had induced gear failure, consisted of stroking the valve twenty-five times and then disassembling the actuator to inspect the motor pinion and worm shaft clutch gear. After completion of the test and disassembly, the gears were found to be undamaged, the keyways exhibited normal wear, setscrews were tight, and there were no signs of stress. Based on these facts, Westinghouse and Union Electric declared the test successful.

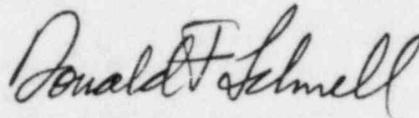
Based upon the successful test, replacement of all remaining SB-2-80 type actuators with SB-1-60 type actuators commenced. A total of four valve operators were affected, those at the BN-HV-8812A&B and EJ-HV-8811A&B locations. It should be noted that after installation each operator was subjected to a generic test to assure correct installation and set-up. No problems were

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encountered. Based on the replacement of SB-2-80 actuators, the valve inspection program discussed in ULNRC-769 will not be implemented.

Union Electric considers this our final report on this item since we have replaced all SB-2-80 type operators on site. Although this closes out Union Electric's action regarding this problem, these failures may impact other facilities, including the SNUPPS unit at Wolf Creek. Therefore, SNUPPS will follow-up with a formal response to the generic implications of this problem in regard to the Wolf Creek site. Included in this report will be further discussions of the ongoing test program being conducted by Westinghouse.

Very truly yours,



Donald F. Schnell

WBB/glp

cc: W. L. Forney, NRC Region III  
Richard DeYoung, Director I&E  
NRC Resident Inspectors, Callaway Plant (2)  
Missouri Public Service Commission

STATE OF MISSOURI )  
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CITY OF ST. LOUIS )

Donald F. Schnell, of lawful age, being first duly sworn upon oath says that he is Vice President-Nuclear and an officer of Union Electric Company; that he has read the foregoing document and knows the content thereof; that he has executed the same for and on behalf of said company with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By Donald F. Schnell  
Donald F. Schnell  
Vice President  
Nuclear

SUBSCRIBED and sworn to before me this 21st day of May, 1984

Barbara J. Pfaff  
BARBARA J. PFAFF  
NOTARY PUBLIC, STATE OF MISSOURI  
MY COMMISSION EXPIRES APRIL 22, 1985  
ST. LOUIS COUNTY

## EXAMINATION FINDINGS

OPERATOR SERIAL NUMBER	LOCATION	FINDINGS
1. 244650	Installed in the plant at BN-HV-8812A	1. No gear damage 2. Key for motor pinion gear deformed at center 3. Motor pinion setscrew bent (See Note 3)
2. 244651	Installed in the plant at BN-HV-8812B	1. Extensive motor pinion/worn shaft clutch gear damage 2. Key sheared 3. Setscrew sheared
3. 244653	Warehouse (See Note 1) Previously installed in the plant at BN-HV-8812A	1. Broken teeth on motor pinion and worn shaft clutch gear. 2. Key deformed at center 3. Setscrew sheared
4. 247211	Warehouse (See Note 1) Previously installed in the plant at BN-HV-8812B	1. No gear damage 2. Key deformed at center 3. Setscrew loose
5. 208987	Installed in the plant at EJ-HV-8811B	1. No gear damage 2. Extensive key deformation at center 3. Setscrew loose
6. 249009	Warehouse (See Note 2)	1. Slight motor pinion/worn shaft clutch gear damage 2. Key deformed at center 3. Setscrew loose
7. 249010	Warehouse (See Note 2)	1. No gear damage 2. Key deformed at center 3. Setscrew tight

## Notes

1. Operator previously installed in the plant as a temporary alteration and is in the process of being sent off-site for refurbishment and requalification.
2. Unit 2 spare. No previous history of operation at Callaway.
3. Westinghouse conducted a series of additional tests on this valve operator with various key materials (see below) but using the same gear train. However, Westinghouse failed to perform a surface examination of the gear train prior to the second test making it uncertain whether the gear damage found after the second test can be attributed to the key material or some other mechanism for gear damage.

### Test 1 - 1018 (Certified) Key

1. No gear damage
2. Key deformed at center
3. Setscrew loose

### Test 2 - 4140 Key

1. Motor pinion/worm shaft clutch gear damage
2. No key damage
3. Setscrew tight