



Commonwealth Edison  
Dresden Nuclear Power Station  
R.R. #1  
Morris, Illinois 60450  
Telephone 815/942-2920

February 5, 1992

CWS LTR #92-072

U.S. Nuclear Regulatory Commission  
Document Control Desk  
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Licensee Event Report #91-023-1, Docket #050237 is being submitted as required by Technical Specification 6.6, NUREG 1022, 10 CFR 50.73(a)(2)(v), and 10CFR21. This revised report is submitted to provide the results of further review, which has concluded that this event is reportable per the requirements of 10CFR21. Further clarification is also provided concerning prior evaluation of certain diagnostic test data for 2A Recirculation Pump Discharge Motor Operated Valve 2-0202-5A.

*L. J. Hemen 2/5/92*

C. W. Schroeder  
Station Manager  
Dresden Nuclear Power Station

CWS/slp

Enclosure

cc: A. Bert Davis, Regional Administrator, Region III  
File/NRC  
File/Numerical

(ZDVR/473)

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LICENSEE EVENT REPORT (LER)

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Facility Name (1) Dresden Nuclear Power Station, Unit 2 Docket Number (2) 0 15 10 10 10 12 13 17 Page (3) 1 of 0 9

Title (4) 2A Recirculation Pump Discharge Motor-Operated Valve Failure to Close  
Due to Torque Switch Setting Problem

Event Date (5)			LER Number (6)				Report Date (7)			Other Facilities Involved (8)												
Month	Day	Year	Year	Sequential Number	Revision Number	Month	Day	Year	Facility Names	Docket Number(s)												
0	8	0	7	9	1	9	1	---	0	2	3	---	0	1	0	9	0	14	9	1	N/A	

OPERATING MODE (9) N

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)

<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(a)(1)(i)	<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 20.405(a)(1)(iii)	<input type="checkbox"/> 20.405(a)(1)(iv)	<input type="checkbox"/> 20.405(a)(1)(v)	<input type="checkbox"/> 20.405(c)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	<input type="checkbox"/> 50.73(a)(2)(x)	<input type="checkbox"/> 73.71(b)	<input type="checkbox"/> 73.71(c)	<input checked="" type="checkbox"/> Other (Specify in Abstract below and in Text)
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POWER LEVEL (10) 0 3 7

LICENSEE CONTACT FOR THIS LER (12)

Name Diego Estrella, Technical Staff System Engineer Ext. 2354 TELEPHONE NUMBER 8 1 5 9 4 2 - 2 9 2 0

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS
X	A	D	2	0	L	2	10	10	Y

SUPPLEMENTAL REPORT EXPECTED (14)

Yes (If yes, complete EXPECTED SUBMISSION DATE)  NO

Expected Submission Date (15) \_\_\_\_\_

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On August 7, 1991 at 0215 hours, with Unit 2 at 37% power, while attempting to start the 2A Recirculation pump, the pump discharge motor-operated valve (MOV) 2-0202-5A would not close. Troubleshooting revealed that the closing power contactor for the motor was dropping out shortly after close signal initiation. The Low Pressure Coolant Injection (LPCI) System was declared inoperable because this MOV is included in LPCI initiation logic. The Electrical Maintenance Department analyzed strip chart recorder motor current traces of the MOV and determined that the close torque switch was causing the MOV to trip early. Maintenance personnel made a primary containment entry to temporarily bypass the open-to-close torque switch for 77% of valve closing stroke by installing jumpers at the limit switch assembly. Analysis by the Nuclear Engineering Department (NED) revealed an incorrect torque switch setting for MOV 2-0202-5A. This problem was attributed to incorrect determination of the force-axis zero coordinate due to invalid test data obtained during a previous valve diagnostic test. On August 10, 1991, the torque switch bypass limit switch was returned to normal and the torque switch setting was raised per NED instructions. The safety significance for this event was mitigated by the availability of the Core Spray Subsystems. The use of invalid data obtained during valve diagnostic testing is reportable per 10CFR21. Corrective actions included review of all other MOV VOTES tests performed during the recent refuel outage and enhancements to the diagnostic testing review process.



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TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

C. APPARENT CAUSE OF EVENT:

This report is submitted in accordance with 10CFR50.73(a)(2)(v)(D), which requires the reporting of any event or condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident. Upon further review of this event with Corporate Regulatory Assurance and NED, it was concluded on February 4, 1992 that this event is also reportable per 10CFR21.21.1.(b), 21.3.a.(3), and 21.3.d.(4).

During the previous Unit 2 refuel outage, D2R12, a VOTES test was performed on both M02-0202-5 valves. The VOTES trace for M02-0202-5A, however, was observed to be different from those the MOV coordinator normally encountered. The Station MOV Coordinator verbally contacted NED for guidance in evaluating the VOTES trace for M02-0202-5A. NED recommended contacting Babcock and Wilcox Nuclear Services (BWNS), who had previously performed VOTES trace evaluations, for an evaluation of the VOTES trace. A telephone conversation between the Station MOV coordinator and BWNS then took place. During this conversation the Station MOV Coordinator and BWNS evaluated the trace and determined that the VOTES trace for M02-0202-5A had been appropriately interpreted with the correct zero force reference point.

Re-evaluation of the VOTES testing data obtained during the D2R12 refuel outage indicates that the determination of the zero reference point on a force -versus- time VOTES trace was incorrect due to invalid test data. The most important item to note concerns the stem nut tension to compression transition area. This point is also known as the VOTES trace ZERO due to the zero forces between the stem and stem nut. All other valve trace events have their force co-ordinates referenced to this ZERO. VOTES computer software version 1.1 was used during the D2R12 refuel outage to perform VOTES analyses. All VOTES diagnostic testing at the Station is overseen by the Station MOV Coordinator in accordance with Dresden Electrical Procedure (DEP) 0040-10, VOTES Diagnostic MOV Testing. The Station MOV Coordinator, who has received specialized training in this type of testing, ensures that appropriate torque switch settings are established to comply with closing thrust windows provided by NED. In this particular case, the Station MOV Coordinator received assistance in the trace evaluation from BWNS. However, interpretation of the trace and establishment of the zero force reference point was made difficult due to the unique trace characteristics. On August 9, 1991, NED re-analyzed the D2R12 VOTES trace for M02-0202-5A. This evaluation determined that the zero force reference point had not been correctly located and was offset high by approximately 30,000 pounds force. The zero force reference point is normally located at the first zero force transition in the valve closing portion of the trace. This is where the Station MOV Coordinator, with assistance from BWNS, located the zero force reference point. During the NED review, it was recognized through evaluation of the valve opening portion of the trace, that the zero reference point that occurs during valve opening was not at the same force level as in the zero reference point established in the closing portion of the trace. This difference is caused by normal movement of the valve yoke due to the size of the valve and motor operator. This movement of the yoke is recognized by the VOTES force sensor, which monitors valve yoke strain, resulting in the uncharacteristic VOTES trace. See the attached 10CFR21 Notification for further clarification of the misinterpretation of the zero force reference for M02-0202-5A. NED also reviewed the valve's spring pack curve and the forces due to valve inertia. As a result, NED recommended that a higher torque switch setting be used for M02-0202-5A.

Although a search of the Total Job Management (TJM) database indicated previous instances involving MOV torque switch setting problems, subsequent development and implementation of a comprehensive MOV testing and preventative maintenance improvement program has resulted in excellent MOV performance overall. This is the first event involving misinterpretation of diagnostic valve testing data resulting in an inappropriate torque switch setting. The Station MOV Coordinator maintains control of MOV torque switch settings. Through diagnostic valve testing, MOV torque switch settings are verified to meet actuator thrust requirements established by NED. Improved diagnostic testing technology and MOV trending will better aid the Station MOV Coordinator in maintaining proper torque switch settings.

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D. SAFETY ANALYSIS OF EVENT:

At the time of this event the Operations Department was in the process of returning the 2A Recirculation pump to service after a Recirculation Pump Motor-Generator set trip. The 2A Recirculation Pump Discharge valve MO2-0202-5A is closed prior to pump start-up and then opened following pump start-up. During a postulated 2B Recirculation Loop Loss Of Coolant Accident (LOCA), LPCI initiation logic will select the 2A Recirculation Loop as the injection loop and will require MO2-0202-5A to close. LPCI can thus inject into the vessel quickly enough to assure fuel clad integrity.

In order to permit power operation with the LPCI injection function inoperable, Technical Specification 3.5.A.5 requires that both Core Spray [BM] Subsystems, the Containment Cooling Subsystem (including two LPCI pumps) and the Unit 2 and 2/3 Diesel Generators [EK] be operable and establishes a seven day LCO. If any of the above-mentioned support equipment should subsequently become inoperable, further power operation beyond 24 hours is prohibited. Because investigation concluded that the degraded LPCI System condition had existed since startup from the previous refuel outage, a comprehensive review was performed concerning the operability status of the above-mentioned redundant safety and support equipment during this time period. This review concluded that during all periods of power operation, the required redundant safety and support equipment was operable except for an approximate 11 hour period during which the 2B Core Spray Subsystem was inoperable. Also, at least two low pressure emergency core cooling system pumps were operable (including appropriate emergency power supplies and suction piping, etc.) at all times while the Unit was in cold shutdown or refuel conditions as required by Technical Specification 3.5.F.2.

E. CORRECTIVE ACTIONS:

As immediate corrective action WR 02916 and a temporary alteration safety evaluation was issued to adjust the open-to-close torque switch bypass limit switch setting and to lower the open limit switch setting. The Station MOV Coordinator requested NED re-evaluation of the torque switch setting. NED re-analyzed the VOTES trace for MO2-0202-5A using VOTES software version 2.1. Consequently, a new ZERO coordinate was established for the force-axis of MO2-0202-5A's VOTES trace. This new ZERO marker allowed for a higher torque switch setting than previously analyzed. As a result, MO2-0202-5A's torque switch was raised under WR 02948. Due to primary containment conditions while at power, a post-maintenance VOTES test was not performed at this time. WR 02977 was issued to diagnostically test the valve at the next available opportunity. The valve was then returned to service and the 7-day LCO was terminated.

On October 30, 1991, during an outage, another VOTES test was performed on MO2-202-5A to verify proper thrusting requirements. Using a CECO Thrust Window of 34,700 lbs to 46,000 lbs as acceptance criteria, the Station MOV Coordinator set the torque switch trip point to 44,711 lbs. The VOTES system calibrator was attached to the stem for the whole valve stroke and used as the force sensor to eliminate the affects of valve yoke movement. A representative of the Nuclear Engineering Department Mechanical & Structural (NED M&S) Group reviewed the final "as-left" VOTES test and interpreted the results to show a possible bent stem. Upon further review with NED M&S, Maintenance and Technical Staff personnel performed a stem inspection. The results of this inspection did not substantiate the VOTES interpretation.

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As further corrective actions, NED used the new VOTES Software Version 2.2 to perform a reanalysis of the remaining 38 safety related MOVs which were diagnostically tested during D2R12 with VOTES Software Version 1.1. One of the main improvements of Version 2.2 is that the force axis may be expanded to provide greater resolution of force changes which improves the accuracy of determination of the zero force reference point. Eighteen diagnostic tests were re-ZEROED. Of these eighteen, five MOVs had torque switch settings that resulted in actuator thrust outside of the target thrust window provided by NED. The target thrust windows given to the station were a tighter band than the design thrust windows determined by NED. Four of the valves had thrust values which were higher than the target thrust window, but were still within the design thrust window. The fifth valve, M02-1301-1, which is a Primary Containment Isolation [JM] Valve for the steam supply to the Isolation Condenser [BL], had a torque switch setting which resulted in a thrust value of 223 pounds force less than the design thrust window. The NRC had been previously notified of the deficiency of M02-1301-1 in a letter from D. J. Chrzanowski (CECo Nuclear Licensing) to T. E. Murley (NRR) dated September 5, 1991. This letter was CECo's response to Generic Letter 89-10, Supplement 3. To improve the thrust capabilities of M02-1301-1 the motor gear set of the actuator was replaced during a recent outage. Although the new gear set will improve the thrust capabilities of the actuator, during the next refuel outage the M02-1301-1 actuator will be replaced to enhance thrust capability (237-104-89-010S31). BWNS has recently trained Commonwealth Edison Station MOV Coordinators to use the new VOTES software. The Station MOV Coordinator will perform future static and operating system pressure diagnostic tests with VOTES 2.1. However, due to the importance of maintaining MOV torque switch settings, should any uncertainty in data interpretation exist, the Station MOV Coordinator will immediately contact NED for proper disposition. Furthermore, in order to provide further control over review of diagnostic test data, the Station MOV Coordinator will obtain independent review of all VOTES diagnostic analyses prior to startup from each refuel outage, beginning with the current Unit 3 D3R12 outage. This independent review will be documented in the startup On-Site Reviews performed prior to startup from each refuel outage. The Station MOV Coordinator has implemented a surveillance tracking program (GSRV) item to control this requirement. The Station MOV Coordinator will also revise Dresden Maintenance Procedure (DEP) 0040-10, VOTES System Operating Procedure, to include enhanced independent review requirements and thrust window acceptance criteria by June 13, 1992 (237-200-91-13403).

F. PREVIOUS OCCURENCES:

Review of maintenance and system history files for the past five years did not indicate similar occurrences of this type on the Recirculation System. However, the following are non-reportable station deviation reports (DVR's) involving torque switch setting problems.

DVR Number      Title

12-3-89-044      Core Spray Test Valve M03-1402-4A Failure to Close Due to Incorrect Torque Switch Settings Caused by Personnel Error

While performing a monthly operating surveillance, Core Spray Test Return Valve M03-1402-4A would not fully close under system pressure. Investigation revealed that the torque switch setting was incorrect. Safety significance was minimal because the valve was able to be manually positioned closed. Furthermore, M03-1402-4A is not required to support Core Spray injection under LOCA conditions. The cause of this event was attributed to EMD personnel error due to improper adherence to work instructions. Under Work Request 85045, the EMD correctly set the torque switch. The EMD was required to review this event and stress the importance of properly set torque switches with its personnel.

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DVR Number      Title

12-2-87-075      Failure of MO2-1402-38B Due to Personnel Error

While performing a monthly operating surveillance, with Unit 2 in the Shutdown mode, the 2B Core Spray Loop Minimum Flow Valve, MO2-1402-38B, was observed to have abnormal valve indication. EMD investigation revealed that the valve actuator had become detached from the valve body. The root cause of this event was determined to be over-thrusting of the MOV due to EMD personnel error upon setting the torque switch. Safety significance for this event was considered minimal due to the availability of the redundant Core Spray Loop and the LPCI System. The EMD Foremen reviewed this event at a weekly staff meeting. This event was not a recurring problem, therefore no further corrective actions were deemed necessary.

Other corrective actions implemented to prevent torque switch adjustment problems included inclusion of an improved configuration diagram in the EMD MOV maintenance procedure, establishment of the Station MOV Coordinator to oversee all aspects of the MOV program, implementation of routine diagnostic testing to establish torque switch settings within NED-approved thrust windows, and establishment of an aggressive MOV preventative maintenance program.

G. COMPONENT FAILURE DATA:

<u>Manufacturer</u>	<u>Nomenclature</u>	<u>Model Number</u>	<u>Mfg. Part Number</u>
Limiterque Corp.	Valve Operator	SMB-3-13	SMB-3-13

An industry wide NPRDS data base search under torque switch setting revealed 295 records. A similar searches under "VOTES" and "diagnostic testing" revealed no record of an event attributed to incorrect ZEROING of a diagnostic VOTES test.

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ATTACHMENT

10 CFR 21 NOTIFICATION

VOTES 100 System Training

APPLICABILITY:

This notification is submitted in accordance with the requirements of 10CFR21, Section 21.1.(b), 21.3.a.(3), and 21.3.d.(4).

IDENTIFICATION OF FACILITY AND COMPONENT:

This notification concerns the training provided on the interpretation of test data on the VOTES 100 System. The VOTES System was utilized to set the torque switch on the Dresden Unit 2 reactor recirculation pump discharge motor-operated valve. On August 7, 1991 this valve failed to close, rendering the Low Pressure Coolant Injection (LPCI) System inoperable. Failure of this valve could lead to diversion of LPCI flow during a design basis Loss Of Coolant Accident (LOCA).

IDENTIFICATION OF COMPONENT MANUFACTURER:

VOTES 100 was developed and supplied by:

Liberty Technologies  
 555 North Lane  
 Conshohocken, PA  
 (215) 834-0330

Commonwealth Edison Company (CECo) training on the VOTES system was provided by B&W Nuclear Service Co. as agents of Liberty Technologies.

NATURE OF DEFECT:

After a thorough review of the events leading to the failure of the Dresden Unit 2 reactor recirculation pump discharge valve, CECo has concluded that the valve failure was due to an improper torque switch setting. The torque switch was set using VOTES 100 equipment on December 4, 1990.

In the process of performing the diagnostic test, mechanical problems with the valve (possibly due to the valve disk dragging on the guide), coupled with the flexibility of the valve yoke led to an unusual VOTES trace. Upon observation of the unusual trace, CECo requested that B&W review the trace to confirm the interpretation of the zero reference point. B&W reviewed the VOTES trace and although they concurred that the trace was unusual, they did not identify, at that time, that the data was invalid. They confirmed the selection of the zero reference point. It should be noted that valve mechanical problems normally result in an unusual trace, but not necessarily an invalid trace.



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ATTACHMENT (Cont.)

On August 9, 1991 the VOTES trace was reviewed, following the valve failure, and found to be improperly interpreted. It was later concluded that the test data used in December 1990 was invalid. As traces of this nature had not been previously observed, the training provided for the VOTES 100 system did not include specific methods to identify the trace as invalid.

SAFETY SIGNIFICANCE:

Improper setting of the torque switch may prevent a valve from fully stroking and may render it inoperable if the setting is too low, or result in damage to the valve or valve operator if the setting is too high.

CORRECTIVE ACTIONS:

Both CECo and Liberty Technologies have reviewed this event and are implementing corrective actions to prevent recurrence of this event. These corrective actions are described below:

**Liberty Technologies**

- Liberty has reviewed the traces from the reactor recirculation pump discharge valve and identified several actions which can be used to verify the validity of the test data. Liberty has issued a Customer Service Bulletin (CSB-018) to distribute this information to all VOTES users.

**Commonwealth Edison (CECo)**

- All traces performed during the fall 1990 Dresden Unit 2 outage were reviewed to determine if there were additional traces of this nature. The review was completed on August 20, 1991, with no additional invalid traces identified.
- CECo will review the applicable valves in our Generic Letter 89-10 program at each site in light of this information. This review with the appropriate corrective actions will be complete by June 1, 1992.
- CECo will develop a checklist in accordance with the Liberty Customer Service Bulletin of actions to be taken to ensure that future VOTES traces are properly interpreted. This checklist will be issued to the six CECo Nuclear Power Stations by February 15, 1992. This checklist will be incorporated into the appropriate station procedures.

LOCATION OF COMPONENT:

VOTES is used at all of CECo's Nuclear Power Stations: Braidwood, Byron, Dresden, LaSalle, Quad Cities, and Zion Stations.

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ATTACHMENT (Cont.)

CONTACTS:

Questions pertaining to this notification should be addressed to:

Robert Ungeran  
 Nuclear Engineering Department  
 Commonwealth Edison Company  
 1400 Opus Place, Suite 400  
 Downers Grove, IL 60515  
 (708) 515-7368