

DMB



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April 13, 1984

84-01 #2

Mr J G Keppler, Regional Administrator  
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Region III  
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MIDLAND ENERGY CENTER PROJECT  
DOCKET NOS 50-329 AND 50-330  
EXCESSIVE VOLTAGE DROP -  
AUXILIARY FEEDWATER VALVE ACTUATORS  
FILE: 0.4.9.88 SERIAL: 28088

Reference: J W Cook letter to J G Keppler, Same Subject, Serial 28001,  
dated February 3, 1984

This letter is an interim report of a 10CFR50.55(e) condition involving excessive voltage drop in power cables supplying auxiliary feedwater system DC valve actuators. The attachment to this letter describes the concern and summarizes the investigation and corrective action taking place. It has been determined that this condition, if it had remained uncorrected, would have affected the safety of operations at the Midland Plant.

Another report, either interim or final, will be sent on or before  
August 17, 1984

*James W. Cook*

JWC/AHB/lr

Attachments: (1) MCAR-80, Interim Report 2, dated March 26, 1984

CC: Document Control Desk, NRC  
Washington, DC

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3/14/84

# 146321 Bechtel Associates Professional Corporation

146370

SUBJECT: MCAR 80, Rev 1 (issued January 24, 1984)  
Auxiliary Feedwater DC Reversing Valve Actuator  
Excessive Power Cable Voltage Drop

## INTERIM REPORT 2

DATE: March 26, 1984

PROJECT: Consumers Power Company  
Midland Plant Units 1 and 2  
Bechtel Job 7220

### Introduction

This report provides the interim status and course of corrective action required pursuant to MCAR 80.

### Description of Concern

The voltage drop in the power cables for the auxiliary feedwater system dc reversing valve actuator motors is greater than the value considered when the cables were sized. The voltage drop has now been calculated [Calculation QPE-18(Q), approved December 21, 1983], and the results indicate that voltage at the associated motor-operated valves is below the allowable limits for proper operation.

### Probable Cause

Additional voltage drop resulting from the total circuit length between starting devices and actuator motor was not considered in the design of these specific items.

### Summary of Investigation and Historical Background

The investigation into the adequacy of dc reversing valve actuator circuits was initiated as a result of TPO Problem Alert 82-02, Revision 0 (DC Power Circuit Starters and Sizes of Cables for Motors and Valve Actuator Motors). The problem alert identified a voltage deficiency in these types of circuits at the Susquehanna Steam Electric Station, Units 1 and 2. During the investigation, 10 dc reversing valve actuators in the auxiliary feedwater system have been identified that will have voltage below the allowable limits for proper operation (see Attachment 1). Nonconformance Report (NCR) D-00007 has been written on the Midland project as a result of this investigation to identify concerns and track the corrective action.



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All Class 1E 120 V ac electrohydraulic actuators have been reviewed [reference Calculation QPE-14(Q)], and the voltage drop has been calculated to be unacceptable for proper operation of 29 valves. Nonconformance Report D-00008 has been initiated to document this nonconformance and track corrective action.

## Analysis of Safety Implications

The power cable voltage drop concerns associated with this MCAR have been determined to impact the safety of operations at the Midland plant.

## Corrective Action

The following corrective actions have been or will be initiated.

1. A design calculation [QPE-18(Q)] has been issued to provide the requirements for sizing power cables for dc reversing motor-operated valves (MOVs). All future Bechtel designs including rework will use these requirements for cable sizing. All design personnel in the Bechtel electrical group have been instructed regarding this requirement.
2. A detailed review of Class 1E power and control circuits at the various plant voltage levels is being performed to confirm circuit adequacy with regard to voltage drop. The scope of the review is provided in Attachment 2. A schedule for this review will be included in the next report.

As a result of this review, additional NCRs will be initiated as necessary to identify and track any nonconformances found, and appropriate corrective action will be implemented to preclude recurrence.

All Class 1E dc valve actuators have been reviewed [reference Calculation QPE-18(Q)]. There are no additional dc valve actuators other than the 10 identified in the MCAR (see Attachment 1).

3. To correct the voltage condition for the dc valve actuators, the power cables will be replaced with larger cables, and one of the starters will be relocated closer to the motor. This will reduce the voltage drop within acceptable limits as defined in Calculation QPE-18(Q). The new cable information has been issued for construction via Drawing 7220-E-158(Q), Rev 18, dated March 7, 1984; Drawing Change Notice 3 to Drawing 7220-E-153(Q), dated March 8, 1984; and Drawing Change Notice 10 to Drawing 7220-E-33(Q), dated March 21, 1984.

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4. Actions to be taken to correct the conditions on NCR D-00008 will be identified in a subsequent report.

Reportability

This deficiency was reported to the NRC by Consumers Power Company as potentially reportable on January 6, 1984.

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- Attachments: 1. List of DC Valve Actuators  
2. MCAR 80 Resolution Plan

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LIST OF DC VALVE ACTUATORS

<u>Valve Number</u>	<u>Cable Number Dist. Panel to Local Station</u>	<u>Local Control Station Number (Starter)</u>	<u>Cable Number Local Station To Actuator Motor</u>
1M03177A	1BD2114A	1NM03177A	1BFW081 R, S, T, U
1M03177B	1BD2115A	1NM03177B	1BFW082 R, S, T, U
2M03277A	2BD2114A	2NM03277A	2BFW081 R, S, T, U
2M03277B	2BD2115A	2NM03277B	2BFW082 R, S, T, U
1M03865A	1AD1114A	1NM03865A	1AFW082 AG, H
1M03865B	1BD2116A	1NM03865B	1BFW083 AG, H
2M03965A	2AD1114A	2NM03965A	2AFW082 AG, H
2M03965B	2BD2116A	2NM03965B	2BFW083 AG, H
1M03831 (1NG05)	1BD2117A	1C266	1BFW088 AC, AF
2M03931 (2NG05)	2BD2117A	2C266	2BFW088 AC, AF

NOTES:

1. 1M03177A-2M03965B [E-158(Q)] are steam generator auxiliary feedwater isolation valves.
2. 1M03831-2M03931 [E-153(Q)] are auxiliary feedwater turbine 1/2G05 stop valves.

Scope

A detailed review of Class 1E power and control circuits at the various plant voltage levels will be performed using the following guidelines. This review is being performed to confirm the circuit adequacy with regard to voltage drop.

Medium Voltage

Cables at this voltage level are sized in accordance with the short circuit ampacities required. The criteria is well defined and documented in Bechtel Calculation QPE-4(Q). A maximum voltage drop of 0.5% is allowed. A sample verification is to be made to confirm the adequacy of the cables using scheduled lengths.

Low-Voltage Power

## 1. 480 V Load Center Feeders

The requirement for sizing these cables is in Bechtel Design Guide E-2.11.2.1, which allows a voltage drop of 1.5%. A sample verification is to be made to confirm the adequacy with regard to voltage drop using scheduled lengths.

## 2. 460 V Motor Control Center Feeders

The requirement for sizing these cables is in Calculation QPE-8(Q), which allows a voltage drop of 2.5%. The motor-operated valves procured under Specification 7220-G-9 are capable of operating at 80% voltage. Therefore, due to the additional margin available, no further verification is required. However, motors and power feeds to panels need to be checked to confirm the adequacy with regard to voltage drop using scheduled lengths.

## 3. Distribution Panel Feeders (120 V ac and 125 V dc)

The panel feeds were originally designed based on the ampacity provided in Calculation QPE-8(Q) and the voltage drop was determined by design engineering judgment.

Perform a detailed review to determine adequacy of cables with regard to voltage drop.

## 4. 125 V dc Motor-Operated Valves

A new calculation [Calculation QPE-18(Q)] has been issued to establish the requirement using a 2.5% voltage drop.



#### 5. 120 V ac Electrohydraulic Valve Actuators

Due to the permissive contacts used to operate these actuators, the need for a special calculation was realized and as a result Calculation QPE-14(Q) is being generated. The acceptability of existing configuration or rework if required will be identified upon finalization of this calculation.

#### Low-Voltage Control

##### 1. 120 V ac from Motor Control Transformers

The requirement for sizing and limitations of use are contained in Calculation QPE-17(Q). Verification of all issued circuits was made when this calculation was finalized. Any new circuits issued since are checked for the total length as specified in Calculation QPE-17(Q).

Note: Because revised data were obtained from the vendor in late 1983, this calculation is being revised. The net result is not expected to change the calculated data significantly. However, a review will be done upon finalization of the revised calculation.

##### 2. 125 V dc Control

Guidelines and procedures will be established for review of such circuits and verification will be performed.

#### Exclusions

The voltage drop requirements are well defined and appropriately implemented at voltage levels of 460, 480, and 4,160 V. Therefore, only verification of Channel 2A loads will be made for these voltage levels. If any discrepancies are found, verification will be expanded to other channel loads as well.

In addition, the following circuits will be excluded from the review and verification for the reasons stated.

1. Motor-operated valves (MOVs) at the 460 V level are procured under Specification 7220-G-9. This specification requires that these MOVs be capable of operating at 80% voltage at their terminals (i.e., allowance is made for 20% voltage drop). Bechtel Calculation QPE-8(Q) provides guidelines for sizing cables for a 2.5% voltage drop. Because an adequate margin is available between the requirement and the operating voltage limits of the MOVs, no review and/or verification is necessary. All MOVs shall have adequate voltage to operate within their stated limits.

146321. Resistive loads at all voltage levels need not be reviewed for voltage drop. All resistive loads will only provide less output (e.g., space heaters or indicating lights) and will not render these components inoperative.

3. The majority of the instrument circuits at Midland are low-current signals (i.e., 0-1 mA or 4-20 mA). These circuits are not subject to voltage drop concerns. In addition, the instruments in these circuits must be calibrated at the time of testing.

The majority of the current transformer circuits are used for indication and/or relaying purposes. All current transformer circuits are required to have a minimum cable size of 10 AWG. Therefore, these circuits need not be reviewed for voltage drop.