Omaha Public Power District

444 South 16th Street Mall
Omaha NE 68102-2247

October 3, 2005
LIC-05-0111

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, DC 20555

Reference: Docket No. 50-285

Subject: Licensee Event Report 2005-001 Revision 0 for the Fort Calhoun Station

Please find attached Licensee Event Report 2005-002, Revision 0, dated October 3, 2005. This report is being submitted pursuant to 10 CFR 50.73(a)(2)(i)(B). If you should have any questions, please contact me.

Sincerely,

D. J. Bannister
Manager – Fort Calhoun Station

DJB/EPM/epm

Attachment

c:
INPO Records Center

IE22

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMM

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 06/30/2007

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE

Inoperability of Pressurizer Power Operated Relief Block Valve Due to Human Error

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
08	02	2005	2005	- 002 -	00	10	03	2005	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE

1

10. POWER LEVEL

100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☒ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☐ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Stephen Miller, System Engineering Supervisor	402-533-6882

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
A	ED	52	GE	Yes					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

The circuit breaker providing power to the motor for one of the power operated relief valve (PORV) block valves (HCV-151) had an incorrect instantaneous overcurrent setting that led to an intermittent tripping problem. HCV-151 was inoperable from October 4, 2003, when the circuit breaker was set incorrectly to March 9, 2005, when the problem was discovered. The condition was identified during review of the incident, following completion of a plant refueling outage. While testing HCV-151 on March 9, 2005, to satisfy post-maintenance stroke time testing of the valve following stem lubrication, the circuit breaker feeding the valve tripped twice. The control room cycled the valve closed, then, on the open stroke, the circuit breaker tripped after minimal observed valve travel. After the circuit breaker was reset, the valve opened properly. When the valve was cycled closed, and the circuit breaker tripped again with no observable travel.

The root cause is that the system engineer provided incorrect information to a preventive maintenance task due to incomplete verification practices.

Following this event, the system engineering supervisor familiarized appropriate engineers, who supply critical data to maintenance groups, with this event, and provided expectations on the use of the most current data. The work instructions have been updated to include correct test and setting information.

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NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

BACKGROUND

Fort Calhoun Station (FCS) is a two loop, Combustion Engineering (CE) designed Pressurized Water Reactor (PWR). The Reactor Coolant System (RCS) is comprised of the following major components; reactor vessel, pressurizer, four reactor coolant pumps, two steam generators, quench tank, interconnecting piping and valves.

The pressurizer controls the RCS pressure to maintain the coolant above the saturation pressure (boiling point) for the existing reactor coolant temperature. In the pressurizer, steam and water are maintained in thermal equilibrium at a temperature higher than the coolant exiting the core (hot leg). Electric heaters maintain pressurizer water temperature to produce the desired pressure (2100 psia). Relatively cool water (i.e., subcooled) is sprayed into the pressurizer steam space to limit pressure increases. Backup heaters are energized to rapidly add energy to the pressurizer water to limit depressurization transients.

RCS overpressure protection is provided by two power-operated relief valves (PORVs) and two spring-loaded code safety valves. These valves relieve from the pressurizer steam space to the quench tank, where the steam is released under water to be condensed and cooled.

PORVs, PCV-102-1 and PCV-102-2, are provided to relieve sufficient pressurizer steam during abnormal transients to prevent opening of the RCS safety valves. Two motor-actuated block valves, HCV-150 and HCV-151, are provided upstream of each of the relief valves to permit isolating the PORVs in case of failure or leakage. The circuit breaker supplying the motor-actuated block valve is to remain closed during all postulated accidents and open during fault conditions to protect the power cable to the motor.

The presently recommended setting for the instantaneous current trip for the HCV-151 supply circuit breaker is approximately 38 amps, corresponding to an indicated setting of "HI". The recommended setting is derived in accordance with an accepted industry methodology which sets the trip at 1.73 times the motor's locked rotor current (LRC) to ensure that normal starting does not inadvertently trip the circuit breaker. The actual setting used during the previous operating cycle was 18 amps, corresponding to an indicated setting of "4". Vendor information for the motor currently installed on the operator for HCV-151 documents a LRC of 17.4 amps at 460 volts. Circuit breaker vendor information states that the circuit breaker trip settings have a 20% tolerance associated with them.

EVENT DESCRIPTION

While testing PORV isolation valve HCV-151, to satisfy post-maintenance stroke time testing of the valve following stem lubrication, the circuit breaker feeding the valve tripped twice. The control room cycled the valve closed, then, on the open stroke, the circuit breaker tripped after minimal observed valve travel. After the circuit breaker was reset, the valve opened properly. Operations then attempted to cycle the valve closed and the circuit breaker tripped again with no observable travel.

It was found that the circuit breaker providing power to the motor for HCV-151 had an incorrect instantaneous overcurrent setting that led to intermittent tripping. The period of vulnerability for HCV-151 circuit breaker tripping has been determined to be October 4, 2003, when the circuit breaker was set incorrectly, to March 9, 2005, when the problem was discovered. During review of the incident, following completion of a plant refueling outage, it was determined that HCV-151 was inoperable for the entire period. On August 8, 2005, it was determined that this event was reportable per 10 CFR 50.73(a)(2)(i)(B). This report is being made per 10 CFR 50.73 (a)(2)(i)(B).

CHRONOLOGY

9/5/91 System engineering requested that circuit breaker ratings, adjustable trip settings and circuit breaker time current curves for each safety related molded case circuit breaker in the plant be provided. EAR 91-087 was initiated.

4/15/92 Motor replacement ECN 92-189 was approved to change the motors for HCV-150 and HCV-151 (7-1/2 ft-lb motor to 10 ft-lb motor).

4/17/92 Engineering recommended changing the molded case circuit breaker instantaneous trip setting to the maximum setting. There was no controlling document for the settings at this time.

10/29/92 Design engineering completed EAR 91-087.

2/6/93 A drawing revision was issued to document the settings for circuit breakers installed in motor control center (MCC) 4A1. The instantaneous overcurrent setting for MCC 4A1-C05 incorrectly listed as '3' rather than '6' based on a 1991 walkdown of all MCCs to document the instantaneous settings.

5/19/93 Motor replacement ECN 92-548 was issued to replace the motors in HCV-150 and HCV-151 (10 ft-lb motor to 15 ft-lb motor).

10/5/93 ECN 92-548 Rev. 1 issued to replace the circuit breakers for HCV-150 and HCV-151 (MCC-3B1-H02 and MCC-4A1-C05). Engineering form (GEI-60.2) shows the circuit breaker with an adjustable instantaneous setting of '3' (contrary to the 4/17/92 guidance) and the new circuit breaker with an adjustable instantaneous setting of '10' (corresponds to 26.4-39.6 amps). Circuit breakers were tested on 11/22/93.

6/16/94 Engineering calculation FC06234 determined that the instantaneous trip value for MCC-3B1-H02 and MCC-4A1-C05 circuit breakers is 165% of the Locked Rotor Amps for HCV-150/151 motors. The ideal trip value should be in excess of 173% of the locked rotor amps to prevent nuisance tripping. ECN 94-317 was initiated to revise the instantaneous settings.

7/13/94 Procurement engineering performs closure review for ECN 92-548 (this starts the document update process).

7/29/94 ECN 94-317 was issued to change instantaneous setting on MCC-3B1-H02 and MCC-4A1-C05 from '10' to 'HI' (30.4 to 45.6 amps). Work completed 4/6/95.

4/6/95 Calibration was completed on circuit breaker MCC-4A1-C05 per ECN 94-317.

5/23/95 Circuit breaker test values were issued by system engineering for development of periodic tests on MCC-3B1-H02 and MCC-4A1-C05. The test values provided were for a circuit breaker with an adjustable instantaneous setting of '6' based on information contained in EAR-91-087.

3/15/96 Drawing revision sheet for circuit breaker MCC-4A1-C05 shows an adjustable instantaneous setting of '3' (correct model, incorrect setting). Drawing was drawn and checked by design drafting.

3/26/96 Drawing revision issued showing the revised data for circuit breaker MCC-4A1-C05 per ECN 92-548 with an adjustable instantaneous setting of '3' (correct model, incorrect setting-should be '10'). Drawing was drawn and checked by design drafting.

4/12/96 ECN 94-317 approved for closure by system engineering and procurement engineering.

6/27/96 Drawing revision updated per ECN 94-317, now shows for MCC-4A1-C05 the correct model, incorrect setting-still '3', and should be 'HI' and erroneously put the correct information for the HCV-151 circuit breaker in the line entry for MCC-4A1-C04 (HCV-1041C). Drawing was drawn by design drafting and checked by configuration control.

2/11/98 Drawing revision was issued to update drawing per ECN 98-18 which corrected the MCC-4A1-C04 (HCV-1041C) and MCC-4A1-C05 entries.

NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

10/30/99 HCV-151 circuit breaker tripped when valve was cycled for stroke time testing. Condition report (CR) 199902368 indicates that the apparent cause of the event was a pinched wire in the limit switch compartment of the valve operator. Troubleshooting performed indicated that the circuit breaker was found out of calibration and was replaced. Circuit breaker was subsequently cycled 2 times without circuit breaker tripping.

4/00 The configuration control supervisor recalls that plant procedures specify a 90 day goal for completing document updates for substitute replacement item ECN's following completion of field work as of this date.

7/2/03 Planning changed the model number of the molded case circuit breakers, MCC-3B1-H02 and MCC-4A1-C05, on the cover of the work orders without changing the associated test values.

10/4/03 System Engineering hand-corrected the test values in the work order for MCC-4A1-C05 to correspond to a circuit breaker with an instantaneous setting of '6' (the correct drawing was not referenced as the work order showed the circuit breaker with a setting of 'HI' at this time). The test values for MCC-3B1-H02 were not changed in the work Order and still reflected a circuit breaker with a setting of '6'. The as-found setting for HCV-151 circuit breaker was 'HI', desired was '6' and as-left was '4'. The HCV-150 circuit breaker would not trip during instantaneous testing and was replaced with another circuit breaker and as-left setting was '6'.

3/5/05 Circuit breaker MCC-4A1-C05 tripped twice following HCV-151 stem inspection. (CR 200501209)

3/9/05 Electrical maintenance calibrated MCC-4A1-C05 circuit breaker and changed setting from '4' to 'HI' based on test values provided by system engineering. System engineering's review of molded case circuit breaker test set operating manual found that in the parallel configuration the test set has an output of 0-7.5 VAC. When the test set is configured in a series connection the test set has an output of 0-15 VAC. For smaller molded case circuit breakers, the impedance is higher, and a higher output voltage from the test device is necessary to drive the current through the contacts. The test set was reconfigured for series connection and the circuit breaker was reliably calibrated.

5/19/05 Circuit breaker MCC-3B1-H02 for HCV-150 motor was calibrated. As left setting was "HI".

ANALYSIS

A review of the timeline results in the following scenario that occurred over a period of 13 years:

The PORV block valve motors were changed out twice with successively larger motors to ensure that the motors generated adequate thrust for successful closure of the valves during design basis accidents. The second time (1993) that the motor was changed to a larger size, it was determined that the molded case circuit breaker supplying power to the motor would also need to be replaced with a larger capacity circuit breaker to accommodate the larger current draw for the new motor.

Following the replacement of the circuit breaker in 1993 there was a significant time lag until the update of the design drawings detailing the circuit breaker model and instantaneous overcurrent settings was completed. During the period when the design drawings did not reflect the actual configuration, a preventive maintenance task was initiated to periodically test the molded case circuit breaker. This preventive maintenance task specifies the circuit breaker model, required overcurrent settings and test current values. The system engineer developing the maintenance task used incorrect information contained in an engineering assistance request controlling circuit breaker settings to develop the molded case circuit breaker test criteria. The drawings that were available at the time that the preventive maintenance task was being developed were also not correct. The preventive maintenance instruction was developed for a General Electric model THEF136M1003 circuit breaker with an adjustable instantaneous setting of '6' (corresponding to a range of 12-14 Amps) instead of a General Electric model TEC36003 circuit breaker with an adjustable instantaneous setting of 'HI' (30-45.6 amps). This error was not immediately revealed due to the ten year scheduled interval for performing the testing of the molded case circuit breakers. The first scheduled performance of the preventive maintenance task was in 2003.

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NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

When the circuit breaker was scheduled to be tested in 2003, a preventive maintenance planner realized that the circuit breaker model number listed in the work order was incorrect. The planner hand-corrected the circuit breaker model number listed on the front of the preventive maintenance work order, but did not change the circuit breaker settings or the test values listed in the work instructions. A step in the work instructions advised the electrical maintenance craft to verify the correct model number and settings and advise the system engineer if the model number was not correct.

When the task was being performed (October 2003), the system engineer was involved with revising the preventive maintenance task instructions. The system engineer did not change the instantaneous overcurrent setting specified in the work instructions, but did change the test values to reflect a TEC36003 circuit breaker with a setting of '6' (18-28 amps). (If the revision had been performed correctly, the circuit breaker instantaneous overcurrent setting would be changed to "HI" and the prescribed test values would be 30-45.6 amps.)

Electrical maintenance then proceeded to calibrate the circuit breaker in accordance with the revised test values. Due to allowances within procedure EM-PM-EX-0203; "Molded Case Circuit Breaker Inspection and Test," adjustments were made to the circuit breaker to "calibrate" the circuit breaker to trip within the prescribed range of 18-28 amps, resulting in the circuit breaker having an As-left setting of '4' (14.4-21.6 amps). The circuit breaker was placed in service, with HCV-151 being stroke tested successfully. A subsequent review of the completed maintenance task by the system engineer failed to raise any concern related to the as-left setting being '4' rather than the stated desired value of '6'. This is not an unexpected condition due to the allowed "calibration" of the circuit breakers to meet required test current ranges.

The circuit breaker and HCV-151 operated successfully for a full plant operating cycle with quarterly stroke test of HCV-151 revealing no indications of the problem. During the next refueling outage (2005) the HCV-151 circuit breaker experienced intermittent tripping as described in this LER.

CONCLUSION

A root cause and extent of condition analysis of this event was performed and the following conclusions were reached:

Root Cause – The System Engineer provided incorrect information to a preventive maintenance task due to incomplete verification practices.

Contributing Causes included the following:

1. From 1993 to 1998, design engineering failed to maintain configuration control of design drawings associated with the circuit breaker model and the instantaneous overcurrent setting for the HCV-151 circuit breaker.
2. Timeliness expectations for design documents following completion of substitute replacement item engineering changes had not been established at the time of the circuit breaker replacement.
3. Verification guidance provided in the preventive maintenance instruction is vague.

Extent of Condition

1. The parallel block valve, HCV-150, was found to have a similar incorrect calibration setting applied to its circuit breaker.
2. A review of molded case circuit breaker preventive maintenance work order instructions has identified other cases in which the preventive maintenance instructions do not contain accurate information for the circuit breakers currently installed.
3. A sampling of work orders was reviewed and it was discovered that there are other circuit breakers with "desired" instantaneous overcurrent settings different from the as-left settings.

4. All molded case circuit breaker functional testing work instructions implemented through the preventive maintenance program contain the same boilerplate instructions. The human factors concern related to the wording of the verification step associated with the circuit breaker model number exists in each instruction. Another tool that might help in the verification process would be to include the design drawing that shows the circuit breaker information with the preventive maintenance work instruction package.
5. Engineering changes that occurred between 1991 and 1994 could have introduced changes that were not properly incorporated into the motor control center data sheets since ECN 92-239 was being implemented during this period were evaluated.
6. The Air Operated Valve (AOV) component program is vulnerable to this same root cause. Information regarding instrument air filter regulator and valve settings is developed by the component engineer and then placed in preventive maintenance task instructions without formal verification practices.

CORRECTIVE ACTIONS

The system engineering supervisor has familiarized appropriate engineers who supply data with this event and provided expectations on the use of the most current data. The work instructions have been updated to include correct functional test criteria and setting information for the HCV-150 and HCV-151 circuit breakers.

1. Review Preventive Maintenance work instructions for the testing of molded case circuit breakers to ensure the accuracy of circuit breaker settings and functional test criteria and human factors wording for verification steps. This action item is for those procedures that will be accomplished in 2006. This will be completed by November 30, 2005.
2. Review Preventive Maintenance work instructions for the testing of molded case circuit breakers to ensure the accuracy of circuit breaker settings and functional test criteria and human factors wording for verification steps. This action item is for those procedures that will be accomplished after 2006. This will be completed by July 15, 2006.
3. Provide definitive verification guidance in the preventive maintenance instruction and remove note from procedure EM-PM-EX-0203 "Molded Case Circuit Breaker Inspection and Test" that allows adjustment of the instantaneous over current setting. This will be completed by December 15, 2005.

Additional actions are documented in the corrective action system.

SAFETY SIGNIFICANCE

Power Operated Relief valves PCV-102-1 and PCV-102-2 are provided to relieve sufficient pressurizer steam during abnormal transients to prevent opening of the RCS safety valves. The motor-actuated block valves, HCV-150 and HCV-151 are provided upstream of the relief valves to permit isolating the Power Operated Relief Valves in case of failure or leakage.

The circuit breaker supplying the motor-actuated block valve is to remain closed during all postulated accidents and open during fault conditions to protect the power cable to the motor.

This event provides an indication that the HCV-151 PORV block valve may not have closed when a "Close" signal was provided by the operator.

The failure of a PORV to close is a design basis scenario. This scenario can result in a loss of RCS inventory and subsequent uncontrolled RCS depressurization. The inability to isolate the failed PORV is consistent with assumptions made in the analyses which address a loss of coolant accident (USAR Section 14.15) and an RCS depressurization event caused by a failed PORV (USAR Section 14.22). Consequently, the scenario in which a block valve fails to operate does not result in an event which is outside the design basis of the plant.

As detailed in the chronology, it was found that the molded case circuit breaker providing power to the motor for HCV-151 had an incorrect instantaneous overcurrent setting that led to the intermittent tripping problem described. The period of vulnerability for the HCV-151 circuit breaker tripping has been determined to be from October 4, 2003, when the circuit breaker was set incorrectly to March 9, 2005, when the problem was discovered. Although it is reasonable to consider HCV-151 inoperable for the entire period, it is likely that the circuit breaker would have operated successfully had there been an actual demand situation. This is because the likelihood of tripping is largely dependent on the actual voltage available to operate the valve.

The power supplied to the HCV-151 motor operated valve is from 480 volt motor control center MCC-4A1 via MCC-4A1-C05 cubicle. This cubicle houses a full voltage reversing starter unit that contains a molded case circuit breaker and two contactors (one contactor is provided to open and one to close the valve). When the plant is operating in Mode 1, the voltage at MCC-4A1 is lower due to plant bus loading than during lightly loaded periods such as during refueling outages. A known characteristic of motors such as the one for the HCV-151 operator is that the locked rotor amps delivered to the motor increase with increasing voltage levels. Normal voltage levels experienced during Mode 1 are less likely to result in the HCV-151 circuit breaker tripping during motor start than higher voltages which are seen during refueling outages. It is likely that HCV-151 would have operated during most accident conditions. Therefore, this event had no impact on the health and safety of the public.

SAFETY SYSTEM FUNCTIONAL FAILURE

This event did not result in a safety system functional failure in accordance with NEI-99-02.

PREVIOUS SIMILAR EVENTS

There have not been any other instances of a similar nature that have occurred at the Fort Calhoun Station.