PRIORITY ATTENTION REQUIRED MORNING REPORT - REGION 4 JULY 28, 199

Licensee/Facility:

Philadelphia Electric Co.
Peach Bottom
Philadelphia,Pennsylvania

Notification:

MR Number: H-94-0067
Date: 07/27/94

Subject: MIS-OPERATION OF DC MOTOR STARTING RELAYS

Reportable Event Number: N/A

Discussion:

The following text is reprinted from Region I Technical Issue Summary

RI-94-06, issued on June 22, 1994.

Problem: A poorly designed direct-current (dc) motor starting resistance relay led to several instances where the high pressure coolant injection (HPCI) systems for both Peach Bottom units would have been made

inoperable. The time armature (TA) relay inserts and then removes steps of resistance to limit the armature starting current on dc motors.

Mis-operation of an auxiliary contact on these dc relays caused HPCI

system components (motor operated valves and pumps) to fail on demand.

This would have prevented the HPCI system from performing its design

function. Previous modifications removed the starting resistance

function from these relays. However, the auxiliary contacts were left in motor circuits and were still needed to successfully start the motors.

Also, the licensee had not evaluated the effect of dc motor starting

currents on battery loads, with and without starting resistance.

Evaluation: The TA relays in question are Cutler-Hammer model #583 and 687, installed in the Cutler-Hammer, NEMA 2, 250 Vdc motor controllers and in the starting circuits of the HPCI and reactor core isolation cooling (RCIC) systems motors. The relays have one or two contacts which open to place starting resistances into the circuit and close to remove the resistances. In addition, each relay has an auxiliary contact to verify that the TA relay has positioned to put the resistances in the circuit before a motor start. This auxiliary contact must be closed for the motor to start. The resistance bypass contacts on the TA relay are physically independent of the auxiliary contact function.

The TA relay auxiliary contact design is poor and has contributed to increased HPCI and RCIC out-of-service times. Peach Bottom experienced four events in which HPCI TA relay auxiliary contacts became misaligned on the contactor. This misalignment occurred when the auxiliary contact plate became loose from a stationary alignment pin and was then free to rotate around the center pivot post. These events have resulted in two auxiliary oil pump (AOP) failures to start on demand and in the failure of two motor-operated valves to operate as required.

A modification to the dc control circuits, which removed the starting resistance, left the TA relay auxiliary contact in the circuit for valves

on each unit, MO-14 (steam admission, normally closed), MO-20 (outboar
d
injection, normally open), and MO-19 (inboard injection, normally

closed). For these valves, the TA relay was only functioning to close

its auxiliary contact to energize the motor. The modification was

required as the valve actuators did not develop sufficient thrust and

torque to perform their required safety function under worst case dc

power distribution and environmental conditions.

Modifications and temporary modifications to dc circuits were not

adequately evaluated with respect to dc bus loads. To resolve the TA

auxiliary contact failures, PECO initially jumpered out the TA relay

auxiliary contact on the Unit 3 AOP. This allowed the motor to start w
ith
the resistance in the circuit but without the verification of the

auxiliary contact closure. This temporary modification was subsequent
ly
removed when questions of its adequacy with respect to overall battery

load were raised (i.e., What would be the effect if the TA relay

mis-functioned and the starting resistances were not inserted?).

PECO completed an evaluation of dc battery loading and motor starter

resistance requirements. PECO determined that the starting resistance
s
are not required for MOVs with maximum torque less than 150 ft-lbs

(recommendation from Limitorque). Based on this, temporary modificati

ons
were prepared to jumper the auxiliary contacts on all MOV breakers, ev
en
if starting resistances were still installed. Battery loading

calculations now assume that the starting resistances are not in any M
OV
circuits.

For the auxiliary oil pumps, PECO determined that the starting

resistances should be left in the circuit to protect the motor, with t
he
TA auxiliary contact jumpered. In this case, PECO determined that,

because the TA auxiliary contacts was not enduring that the resistance
s
were in the circuit, the battery loading needed to be evaluated as if
the
resistances were not there. This resulted in a situation where under
the
worst case situation (i.e., starting the system with the normally open

MO-20 shut and needing to open) the loading would be unacceptable. To

prevent this scenario, PECO has taken administrative actions to ensure

that the auxiliary oil pump is taken to pull-to-lock when MO-20 is clo
sed
for surveillance testing, with an operator standing by to open MO-20 a
nd
start the AOP if needed in an accident situation.

Licensee Action: PECO completed modifications that removed the TA rela
ys
and starting resistances from all HPCI MOVs at both units. PECO plans
a
modification to replace the AOP motor controller with a newer design.

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References: NRC Inspection Reports 50-277 & 50-278/92-27, 93-01, 93-05, 93-25

Regional Action:

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