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Offsite Power 13.8kV Breaker Action Plan

Revision 2
Status as of 6/23/04

Purpose: This action plan outlines what activities are required to provide confidence in the reliability of the 13.8kV circuit breakers that are required to close to restore offsite power to the 4160V PB busses.

Plan

1. Perform Inspection/Teardown of 3ENANS05D breaker for as-found conditions. (Complete - Custodio)
   Relevant Findings:
   1) Control circuit male disconnect stab has arcing – potential poor contact for close circuit. Mating socket retrieved – no indication of arcing. This does not appear to be a contributing factor.
   2) Verify proper operation of CR relay in 3ENANS05D. This is a potential contributor to close failure. Relay tested satisfactory. Not a contributing factor.
   3) Control circuit male disconnect stab is positioned ~1/8" lower than adjacent stabs. Shop testing has demonstrated satisfactory performance due to approximately ½" wipe. This does not appear to be a contributing factor.
   4) Anti-pump relay circuit has high intermittent contact resistance – could have prevented breaker closure. Even with high resistance, breaker would close on demand in the shop.
   5) As-found Close function test data: circuit minimum voltage and close timing tests satisfactory.
   6) As-found Trip function test data: Unsatisfactory circuit minimum voltage (77Vdc vs. maximum of 70Vdc) and trip timing (77ms vs. maximum of 55ms). This is indicative of a hardened grease condition.
2. Perform test of oldest in-service alternate source breaker for as-found conditions (Pending replacement with overhauled breaker - Custodio)
3. Perform inspection of 1ENANS06K breaker for as-found conditions. (Pending Approval)
4. Work history (Overhaul & Install Date) on all affected breakers. (Complete-Custodio) See Attachment A
5. Representative as-found data from breakers in service for 3-4 years. (Not started - Custodio)
6. Failure history for all affected breakers (Complete - Schroeder) See Attachment B
7. Revise Position Paper to address above results (Not started – Holmes)

OPTIONAL FORM 99 (7-90)

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ATTACHMENT A

Maintenance History of Breakers Associated with Restoration of Offsite Power

Breaker ID	Status	Refurbishment Work Order Date	Installation Work Order Date	Comments
1ENANS05A	AC	WO 2627363 2/4/04	WO 2611671 4/29/04	S/N 269A7236-020
1ENANS05B	NC	WO 00901601 12/14/99	WO 00896473 4/2/00	S/N 288A3669-001 scheduled for OH, WO 2586992, 12/14/04
1ENANS05D	NO	WO 2589646 5/6/03	WO 2503899 6/16/03	S/N 269A7241-020
1ENANS03A	AC	WO 2627373 4/23/04	WO 2611670 4/29/04	S/N 269A7242-009
1ENANS06F	NO	WO 2376564 8/9/01	WO 2372704 8/14/01	S/N 269A7235-020
1ENANS06H	NC	WO 2376574 8/9/01	WO 2388117 12/17/01	S/N 269A7241-021
1ENANS06K	AC	WO 2414276 1/1/02	WO 2484968 11/18/02	S/N 269A7243-020
1ENANS04A	AC	WO 00870287 10/26/99	WO 00881785 10/26/99	S/N 269A7247-010 – Last breaker inspection and adjustment completed under WO 2484885 10/20/02
2ENANS05B	NO	WO 2365410 6/21/01	WO 2372930 8/2/01	S/N 269A7235-021
2ENANS05D	NC	WO 2552118 1/7/03	WO 2391131 1/16/03	S/N 269A7236-024
2ENANS03A	AC	WO 00923521 5/23/00	WO 00926621 10/24/00	S/N 269A7238-007
2ENANS06A	NO	WO 234021 8/4/00	WO 232447 8/18/00	S/N 269A7233-021
2ENANS06C	NC	WO 2342065 1/24/01	WO 2321950 1/29/01	S/N 269A7240-020
2ENANS04A	AC	WO 2414095 2/25/02	WO 2389492 4/2/02	S/N 288A3669-005
3ENANS05B	NO	WO 2489843 4/23/02	WO 2427319 7/2/02	S/N 269A7240-021
3ENANS05D	NC	WO 2552116 11/4/02	WO 2454572 12/24/02	S/N 269A7245-023
3ENANS03A	AC	WO 00907785 3/20/00	WO 00905830 4/18/00	S/N 269A7239-009 – Last breaker inspection and adjustment completed under WO 2508462 4/20/03
3ENANS06A	NO	WO 00720396 11/3/95	WO 00724618 11/3/95	S/N 269A7245-021 - scheduled for OH, WO 2391149, 6/14/04. Replacement reschedule required due to 3-unit trip.
3ENANS06C	NC	WO 2489844 3/12/03	WO 2391086 2/13/04	S/N 256A9814-001
3ENANS04A	AC	WO 00836718 6/30/98	WO 00838168 10/10/98	S/N 269A7239-003

AC = Always closed NC = Normally closed NO = Normally open

Attachment B
Offsite Power Circuit Breaker Failures

Cause: Degraded Lubrication and Dust				
Location	**Failure**	**Date**	**Corrective Act. Doc.**	**Corrective Action**
1ENANS05A	No remote/local elect open/trip	7/6/1988	EER 88-NA-021	To maintain PMs
1ENANS05A	No remote/local elect open/trip	3/5/1989	EER 89-NA-012	GE - 2 yr CB lube cycle
1ENANS05D	No remote elect open/trip	10/7/1998	CRDR 1-8-0494	Revised PM – cycle bkrs
3ENANS06A	No remote elect close	4/21/2004	CRDR 2700714	Under evaluation

Cause: To be Determined				
Location	**Failure**	**Date**	**Corrective Act. Doc.**	**Corrective Action**
1ENANS06K	No remote elect close	6/14/2004	CRDR 2716019	Under evaluation
3ENANS05D	No remote elect close	6/14/2004	CRDR 2716019	Under evaluation

Cause: Degraded Contacts (oxidation and carbon)				
Location	**Failure**	**Date**	**Corrective Act. Doc.**	**Corrective Action**
1ENANS05B	No remote elect close	10/27/1992	CRDR 1-2-0543	Maint Proc revision

Cause: Trip Coil Mechanism Binding (coil misalignment and dust)				
Location	**Failure**	**Date**	**Corrective Act. Doc.**	**Corrective Action**
2ENANS05D	No remote elect open/trip	10/22/1992	CRDR 2-2-0325	Maint Proc revision

Cause: Circuit Breaker Not Racked Up Completely				
Location	**Failure**	**Date**	**Corrective Act. Doc.**	**Corrective Action**
2ENANS06A	No remote elect close	11/16/1998	CRDR 2-8-0290	Operator training

BREAKER 3ENANS05D FAILURE TO CLOSE
EQUIPMENT ROOT CAUSE OF FAILURE INVESTIGATION PLAN
WO 2717143

POTENTIAL CAUSES:

1. Breaker problem - mechanical, alignment, close latch wipe & lubrication issue

REFERENCES:

1. 03-E-NAB-0001
2. 32MT-9ZZ33, Maintenance of Medium Voltage Circuit Breakers Type AM-13.8-1000
3. 32MT-9ZZ37, Overhaul of AM-13.8-1000 Magne-blast Circuit Breakers

PLANT IMPACTS:

None – This investigation is being performed on an Out-Of-Service equipment.

INSTRUCTIONS:

Breaker 3ENANS05D failed to close from the control room on 6/14/04. Electrician at the switchgear distinctly heard the closing coil attempting to pick up when Operations tried to close the breaker. The breaker was racked down, placed in TEST position and successfully cycled twice. The breaker was then racked up and was satisfactorily closed from the control room. Due to the emergent condition of the plant at the time, neither detailed troubleshooting plan nor a follow-up plan was issued until now.

This plan entails troubleshooting, overhaul and maintenance of the breaker only. The transfer of power from the normal supply to the alternate supply is a normal Operations activity and will not be covered by this plan.

The breaker replacement and breaker alignment are normal maintenance actions and will not be covered under this plan.

1. Verify breaker S/N and transport the breaker to the shop.
2. Before any overhaul or maintenance is done on the breaker perform the following:
   a. Visually inspect the breaker. Look for signs of excessive dust and dirt build up.
   b. Visually inspect the closing and tripping linkages for any signs of binding or misalignment that could cause breaker failure to close or open.
   c. Check that the close latch & roller and the trip latch & roller are rotating freely and no hardened lubricant is present on the surface.

d. Perform step 4.21 "Closing Latch Wipe" check per procedure 32MT-9ZZ33 then perform a main contact closing time test.
e. Perform a main contact opening time test.
f. Repeat step 2.d for spring release coil pickup voltage test.
g. Repeat step 2.e trip coil pickup voltage test.
h. Repeat steps 2.d thru 2.h a minimum of three times.

3. Perform breaker overhaul & maintenance per procedures 32MT-9ZZ33 & 32MT-9ZZ37. Using clean rags wipe, bag & tag the lubricant from bearings.

4. Steps in this plan may be performed out of sequence at the discretion of the Maintenance Engineer. The engineer may add, delete, or modify steps to accomplish the troubleshooting task. All additions, deletions, or modifications will be recorded in the troubleshooting work order continuation sheet. The additional steps may require lifting and landing leads.

TEST EQUIPMENT:

No special test equipment is required for this ERCFA investigation. Required M&TE are contained in procedure 32MT-9ZZ33 & 32MT-9ZZ37.

RETEST

Functionally test breaker per procedure 32MT-9ZZ33.

Engineering contact(s) for this action plan is (are):

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