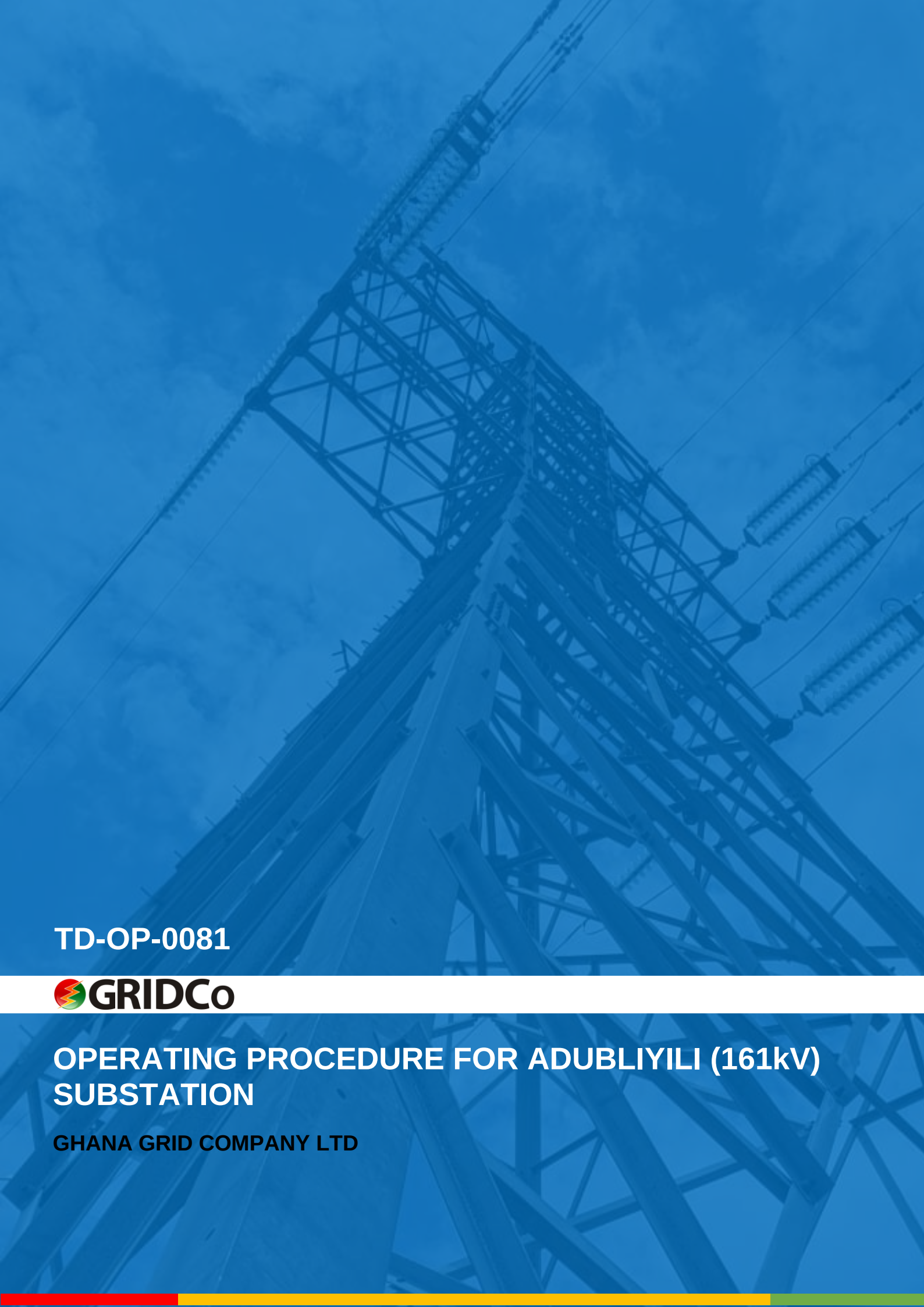

TD-OP-0081

GRIDCo

OPERATING PROCEDURE FOR ADUBLIYILI (161kV) SUBSTATION

GHANA GRID COMPANY LTD

Title:	OPERATING PROCEDURE FOR ADUBILIYILI SUBSTATION (AD81)		
Issued To:	Director, System Operations Director, NNS Manager, SCC Manager, Dispatch Operations Area Manager, Tamale Operating Staff, Tamale Area Maintenance Staff, Tamale Area Dispatch Staff, SCC	**Number:**	TD-OP-0081
		Subject Area:	Operating
		Issue Date:	Trial
		Origin:	Technical Services
Key Words:	Take Out, Isolate, Prepare, Energize, Restore, Automatic Outage		

CONTENTS

1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at AD81 Substation to service for planned and auto outages.

2. Scope

The directive will be used by Operators at Tamale Operating Area and System Control Center (SCC) for operation of equipment at AD81 Substation.

3. Procedure

3.1. To take BP1AD line out of service

SCC shall carry out (or advise the AD81 Operator to carry out) the following:

- Open 81L1A and 81L1T2 breakers

SCC shall carry out (or advise the BP55 Operator to carry out) the following:

- Open 55L1L3 and 55L1D breakers
- Check for no potential on BP1AD line

3.2. To take out, isolate and de-energize BP1AD line for work

- AD81 Operator request for Station Guarantee from BP55

SCC shall carry out (or advise the AD81 Operator to carry out) the following:

- Open 81L1A and 81L1T2 breakers

SCC shall carry out (or advise BP55 Operator to carry out) the following:

- Open 55L1L3 and 55L1D breakers
- Check for no potential on BP1AD line

SCC shall advise BP55 Operator to carry out the following:

- Open 55L1L3-L1 and 55L1D-LI disconnect switches and turn off 125Vdc supply
- Close 55BP1AD-G ground disconnect switch
- SCC shall advise AD81 Operator to carry out the following:

- Open 81L1A-L1 and 81L1T2-L1 disconnect switches and turn off 125Vdc supply

- Close 81BP1AD-G ground disconnect switch

3.3. To restore BP1AD line to service after work

3.3.1. Prepare BP1AD line for restoration:

AD81 Operator shall:

- Advise SCC when work on the line has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on BP1AD line

SCC shall advise BP55 Operator to carry out the following:

- Check opened 55L1L3 and 55L1D breakers

- Open 55BP1AD-G ground disconnect switch

- Turn on 125Vdc supply and close 55L1L3-L1 and 55L1D-LI disconnect switches

SCC shall advise AD81 Operator to carry out the following:

- Check opened 81L1A and 81L1T2 breakers

- Open 81BP1AD-G ground disconnect switch

- Turn on 125Vdc supply and close 81L1A-L1 and 81L1T2 disconnect switches

3.3.2. Restoration of BP1AD line to service:

SCC shall:

- Advise the AD81 and BP55 Operators of readiness to restore BP1AD line to service

- Close (or advise the BP55 Operator to close) 55L1L3 and 55L1D breakers

- Close (or advise the AD81 Operator to close) 81L1A and 81L1T2 breakers

3.4. To restore BP1AD line to service after automatic outage

If BP1AD line trips auto due to fault:

AD81 Operator shall:

- Advise SCC about the outage
- Acknowledge all alarms and record relay operation details
- Reset relay targets
- Report relay operation details to SCC

SCC shall:

- Energize (or advise the BP55 Operator to energize) the line **ONCE** by closing 55L1L3 and 55L1D breakers
- Close (or advise the AD81 Operator to close) 81L1A and 81L1T2 breakers

AD81 Operator shall:

- Advise the Supervisor/Area Manager of operation above
- Advise maintenance men to patrol the line if the operation above is not successful

3.5. To take AD4TM line out of service

SCC shall carry out (or advise the AD81 Operator to carry out) the following:

- Open 81DL4 and 81L4T1breakers

SCC shall carry out (or advise the TM28 Operator to carry out) the following:

- Open 28L4A and 28L4R1 breakers
- Check for no potential on AD4TM line

3.6. To take out, isolate and de-energize AD4TM line for work

- AD81 Operator request for Station Guarantee from TM28

SCC shall carry out (or advise the AD81 Operator to carry out) the following:

- Open 81DL4 and 81L4T1 breakers

SCC shall carry out (or advise TM28 Operator to carry out) the following:

- Open 28L4A and 28L4R1 breakers
- Check for no potential on AD4TM line

SCC shall advise TM28 Operator to carry out the following:

Verify opened 28L4-D disconnect switch and turn-off 125Vdc supply

- Open 28L4A-L4 and 28L4R1-L4 disconnect switches and turn off125Vdc supply
- Close 28AD4TM-G ground disconnect switch

SCC shall advise AD81 Operator to carry out the following:

- Open 81DL4-L4 and 81L4T1-L4 disconnect switches and turn off 125Vdc supply
- Close 81AD4TM -G ground disconnect switch

3.7. To restore AD4TM line to service after work

3.7.1. Prepare AD4TM line for restoration:

AD81 Operator shall:

- Advise SCC when work on the line has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on AD4TM line

SCC shall advise TM28 Operator to carry out the following:

- Check opened 28L4-D disconnect switch and turn-on 125Vdc supply
- Check opened 28L4A and 28L4R1 breakers
- Open 28AD4TM -G ground disconnect switch
- Turn on 125Vdc supply and close 28L4A-L4 and 28L4R1-L4 disconnect switches

SCC shall advise AD81 Operator to carry out the following:

- Check opened 81DL4 and 81L4T1 breakers
- Open 81AD4TM -G ground disconnect switch
- Turn on 125Vdc supply and close 81DL4-L4 and 81L4T1-L4 disconnect switches

3.7.2. Restoration of AD4TM line to service:

SCC shall:

- Advise the AD81 and TM28 Operators of readiness to restore AD4TM line to service

- Close (or advise the AD81 Operator to close) 81DL4 and 81L4T1 breakers

- Close (or advise the TM28 Operator to close) 28L4A breaker

- Close (or advise the TM28 Operator to close) 28L4R1 breaker, if system voltage is high (170kV).

3.8. To restore AD4TM line to service after automatic outage

If AD4TM **line** trips auto due to fault:

AD81 Operator shall:

- Advise SCC about the outage

- Acknowledge all alarms and record relay operation details

- Reset relay targets

- Report relay operation details to SCC

SCC shall:

- Energize (or advise the AD81 Operator to energize) the line **ONCE** by closing 81DL4 and 81L4T1breakers

- Close (or advise the TM28 Operator to close) 28L4A breaker

- Close (or advise the TM28 Operator to close) 28L4R1 breaker if system voltage is high (170kV).

AD81 Operator shall:

- Advise the Supervisor/Area Manager of operation above

- Advise maintenance men to patrol the line if the operation above is not successful

3.9. To take AD5TM line out of service

SCC shall carry out (or advise the AD81 Operator to carry out) the following:

- Open 81AL5 and 81DL5 breakers

SCC shall carry out (or advise the TM28 Operator to carry out) the following:

- Open 28L5A breaker
- Check for no potential on AD5TM line

3.10. To take out, isolate and de-energize AD5TM line for work

- AD81 Operator request for Station Guarantee from TM28

SCC shall carry out (or advise the AD81 Operator to carry out) the following:

- Open 81AL5 and 81DL5 breakers

SCC shall carry out (or advise TM28 Operator to carry out) the following:

- Open 28L5A breaker
- Check for no potential on AD5TM line

SCC shall advise TM28 Operator to carry out the following:

- Verify opened 28L5-D disconnect switch and turn off its 125Vdc supply
- Open 28L5A-L5 disconnect switch and turn off its 125Vdc supply
- Close 28AD5TM-G ground disconnect switch

SCC shall advise AD81 Operator to carry out the following:

- Open 81AL5-L5 and 81DL5-L5 disconnect switches and turn off 125Vdc supply
- Close 81AD5TM-G ground disconnect switch

3.11. To restore AD5TM line to service after work

3.11.1. Prepare AD5TM line for restoration:

AD81 Operator shall:

- Advise SCC when work on the line has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on AD5TM line

SCC shall advise TM28 Operator to carry out the following:

- Check opened 28L4-D disconnect switch and turn on its 125Vdc supply
- Check opened 28L5A breaker
- Open 28AD5TM -G ground disconnect switch

- Turn on 125Vdc supply and close 28L4A-L4 disconnect switch

SCC shall advise AD81 Operator to carry out the following:

- Check opened 81AL5 and 81DL5 breakers
- Open 81AD5TM-G ground disconnect switch
- Turn on 125Vdc supply and close 81AL5-L5 and 81DL5-L5 disconnect switches

3.11.2. Restoration of AD5TM line to service:

SCC shall:

- Advise the AD81 and TM28 Operators of readiness to restore AD5TM line to service
- Close (or advise the AD81 Operator to close) 81DL4 and 81L4T1 breakers
- Close (or advise the TM28 Operator to close) 28L5A breaker

3.12. To restore AD5TM line to service after automatic outage

If AD5TM line trips auto due to fault:

AD81 Operator shall:

- Advise SCC about the outage
- Acknowledge all alarms and record relay operation details
- Reset relay targets
- Report relay operation details to SCC

SCC shall:

- Energize (or advise the AD81 Operator to energize) the line **ONCE** by closing 81AL5 and 81DL5 breakers
- Close (or advise the TM28 Operator to close) 28L5A breaker

AD81 Operator shall:

- Advise the Supervisor/Area Manager of operation above
- Advise maintenance men to patrol the line if the operation above is not successful

3.13. To isolate 81T1 Transformer for work

SCC shall advise AD81 Operator to carry out the following:

- Open AC1 Contactor/MCB to take off supply to 81T1 transformer auxiliaries
- Transfer Station Service from AC1 to AC2, if Station Service is on 81T1 bank

SCC shall carry out (or advise AD81 Operator to carry out) the following:

- Open 81T1F1breaker
- Open 81AT1 and 81L4T1 breakers
- Open 81ET1 and 81L2T1 breakers
- Check for no potential on 81T1 Bank

SCC shall advise AD81 Operator to carry out the following:

- Open 81AT1-T1 and 81L4T1-T1 disconnect switches and turn-off 125v DC supply
- Open 81ET1-T1 and 81L2T1-T1 disconnect switches and turn off 125Vdc supply
- Open 81T1F1-T1 disconnect switch
- Open 81T1-TSS1 disconnect switch
- Open AC control MCB to 81T1 auxiliaries
- Open 125Vdc MCB to 81T1 primary and secondary protection and tag with PC13

3.14. To restore 81T1 Bank to service after work

3.14.1. Prepare 81T1 bank for restoration:

AD81 Operator shall:

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 81T1 Bank and temporary grounds removed
- Close 81T1-TSS1 disconnect switch

- Close 81T1F1-T1 disconnect switch
- Turn on 125Vdc supply and close 81AT1-T1 and 81L4T1-T1 disconnect switches
- Turn on 125Vdc supply and close 81ET1-T1 and 81L2T1-T1 disconnect switches
- Close AC control MCB to 81T1 auxiliaries
- Close 125Vdc MCB to 81T1 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 81T1 Bank to service

3.14.2. Restoration of 81T1 bank to service:

- SCC shall close (or advise AD81 Operator to close) the 81ET1 and 81L2T1 breakers
- SCC shall close (or advise AD81 Operator to close) the 81AT1 and 81L4T1 breakers
- AD81 Operator shall advise Customer of readiness to restore 81F1feeder to service
- Close 81T1F1breaker.

3.15. To restore 81T1 Bank to service after automatic outage

If 81T1 bank trips auto due to fault:

AD81 Operator shall:

- Advise SCC about the outage
- Acknowledge all alarms and record relay operation details
- Reset relay targets
- Report relay operation details to SCC

SCC shall energize (or advise the AD81 Operator to energize) the bank **ONCE** by closing 81ET1 and 81L2T1 breakers

SCC shall energize (or advise the AD81 Operator to energize) the bank **ONCE** by closing 81AT1 and 81L4T1 breakers

AD81 Operator shall advise Customer of readiness to restore 81F1breaker to service

AD81 Operator shall:

- Advise the Supervisor/Area Manager of item above
- Isolate the Transformer for maintenance men to work on the equipment if the operation above is not successful. See explanation.

3.16. To isolate 81T2 Transformer for work

SCC shall advise AD81 Operator to carry out the following:

- Inform Customer about readiness to take off 81T2 bank
- Request Customer on 81T2 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 81T2 transformer auxiliaries
- If the station service is on 81T2 transfer supply to 81T1 by switching from AC1 to AC2

SCC shall carry out (or advise AD81 Operator to carry out) the following:

- Open 81T2F2 breaker
- Open 81DT2 and 81L1T2 breakers
- Open 81PT2 and 81L6T2 breakers
- Check for no potential on 81T2 Bank

SCC shall advise AD81 Operator to carry out the following:

- Open 81T2F2-F2 disconnect switch and turn off 125Vdc supply
- Open 81T2-TSS2 disconnect switch
- Open 81DT2-T2 and 81L1T2-T2 disconnect switches and turn off 125Vdc supply
- Open 81PT2-T2 and 81L6T2-T2 disconnect switches and turn off 125Vdc supply
- Open AC control MCB to 81T2 auxiliaries and tag
- Open 125Vdc MCB to 81T2 primary and secondary protection and tag with PC13

3.17. To restore 81T2 Bank to service after work

3.17.1. Prepare 81T2 bank for restoration:

AD81 Operator shall:

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 81T2 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 81T2F2-F2 disconnect switch
- Close 81T2-TSS2 disconnect switch
- Turn on 125Vdc supply and 81DT2-T2 and 81L1T2-T2 disconnect switches
- Turn on 125Vdc supply and 81PT2-T2 and 81L6T2-T2 disconnect switches
- Close AC control MCB to 81T2 auxiliaries
- Close 125Vdc MCB to 81T2 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 81T2 Bank to service

3.17.2. Restoration of 81T2 bank to service:

- SCC shall close (or advise AD81 Operator to close) the 81DT2 and 81L1T2 breakers
- SCC shall close (or advise AD81 Operator to close) the 81PT2 and 81L6T2 breakers
- AD81 Operator shall advise Customer of readiness to restore 81F2 feeder to service
- SCC shall close (or advise AD81 Operator to close) 81T2F2 breaker

3.18. To restore 81T2 Bank to service after automatic outage

If 81T2 bank trips auto due to fault:

BP55 Operator shall:

- Advise SCC about the outage
- Acknowledge all alarms and record relay operation details

- Reset relay targets

- Report relay operation details to SCC

SCC shall energize (or advise the AD81 Operator to energize) the bank **ONCE** by closing 81DT2 and 81L1T2 breakers

SCC shall energize (or advise the AD81 Operator to energize) the bank **ONCE** by closing 81PT2 and 81L6T2 breakers

AD81 Operator shall advise Customer of readiness to restore 81F2 feeder to service

SCC shall close (or advise AD81 Operator to close) 81T2F2 breaker

AD81 Operator shall:

- Advise the Supervisor/Area Manager of item above

- Isolate the Transformer for maintenance men to work on the equipment if the operation above is not successful. See explanation.

4. Explanation

Transformer and Bus automatic outages may be caused by the following relay operations:

- Transformer differential lockout relay-86T

- Transformer Bucholtz relay or high temperature lockout relay-86G

- Transformer overcurrent back up relays

a. If 86T operates, the breakers which have opened auto, cannot be reclosed until the lockout relay has been reset or the lockout feature has been by-passed.

   - Carry out thorough inspection of the Transformer and the 34kV and 11kV
     Structures looking for oil leakage, shattered insulators on the structures and dead birds or reptiles

b. 86T can be reset manually immediately after an automatic outage if the station is attended.

c. 86G cannot be reset unless transformer gas and / or temperature conditions are normal or the MCB to the transformer protective relays is off.

NOTE:

I. If it has been necessary to restore the MCB to the transformer relay in order to reset 86G and restore a healthy bank to service, they shall not be restored until the gas and /or temperature conditions on the faulted bank is rectified.

II. Operation of 86T or 86G lockout relays may be due to major transformer faults hence No attempt should be made to re-energize the bank until Electrical Maintenance staff have inspected and meggered the Transformer.

ISOLATION AND DE-ENERGIZING

1. Open the necessary breaker(s) to take the line off potential.
2. Check all three phases off potential using the Multifunction meter or Analog Voltmeter or for Pole discrepancies on the panel.
3. Open the necessary disconnect switches or MODS to isolate the line from all sources of supply.
4. Close the Grounding Switch.
5. Report completion of the isolation and de-energizing at all assisting stations, to the where the Protection Guarantee is to be issued and to System Control Centre.
6. Issue Work or Work and Test Permit to the workman.

ORDER TO OPERATE

1. An O.TO. (Order-To-Operate) to isolate a line is as follows:
    a. Line Voltage - Check all three phases off potential
    b. Line Breaker - Check Open
    c. Line Disconnect Switches - Open, lock and Tag (MCB to MOD Turn-off)
2. Due to communication difficulties arising when grounds are placed on a line it is necessary to issue a Protection Guarantee on the line before grounds are placed. A work and Test Permit allows for closing and opening permanent grounds switches while the Permit is in effect.
3. If work is to be done a permanent ground switches a PC 14 to close the ground switch is not required.

The station has two 161kV buses. The main 'A' and 'D' buses have a breaker and half configuration which provides the normal points of supply to all circuits/equipment such as BP1AD, AD2NY and AD4TM lines, 81T1, 81T2 Transformers.

5. Approval

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Director, TSD