TD-OP-0081

GRIDCo

OPERATING PROCEDURE FOR ADUBLIYILI 330kV 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 Techiman Operating Area and System Control Center (SCC) for operation of equipment at AD81 Substation.

3. Procedure

3.1. To take AD2NY line out of service

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

- Open 81PL2 and 81L2T1 breakers

SCC shall carry out (or advise the NY82 Operator to carry out) the following:

- Open 82L2T1 and 82L2E breakers
- Check for no potential on AD2NY line

3.2. To take out, isolate and de-energize AD2NY line for work

- AD81 Operator shall request for Station Guarantee from NY82

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

- Open 81PL2 and 81L2T1 breakers

SCC shall carry out (or advise the NY82 Operator to carry out) the following:

- Open 82L2T1 and 82L2E breakers
- Check for no potential on AD2NY line

SCC shall advise NY82 Operator to carry out the following:

- Open 82L2T1-L2 and 82L2E-L2 disconnect switches and turn off 125Vdc supply
- Close 82AD2NY-G ground disconnect switch

SCC shall advise AD81 operator to carry out the following:

- Open 81PL2-L2 and 81L2T1-L2 disconnect switches and turn off 125Vdc supply

- Close 81AD2NY-G ground disconnect switch

3.3. To restore AD2NY line to service after work

3.3.1. Prepare AD2NY 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 AD2NY line

SCC shall advise NY82 Operator to carry out the following:

- Check opened 82L2T1 and 82L2E breakers
- Open 82AD2NY-G ground disconnect switch
- Turn on 125Vdc supply and close 82L2T1-L2 and 82L2E-L2 disconnect switches

SCC shall advise AD81 Operator to carry out the following:

- Check opened 81PL2 and 81L2T1 breakers
- Open 81AD2NY-G ground disconnect switch
- Turn on 125Vdc supply and close 81PL2-L2 and 81L2T1-L2 disconnect switches

3.3.2. Restoration of AD2NY line to service:

SCC shall:

- Advise the NY82 and BP55 Operators of readiness to restore AD2NY line to service
- Close (or advise the AD81 Operator to close) 81PL2 and 81L2T1 breakers
- Close (or advise the NY82 Operator to close) 82L2T1 and 82L2E breakers

3.4. To restore AD2NY line to service after automatic outage

If AD2NY 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 NY82 Operator to energize) the line **ONCE** by closing 82L2T1 and 82L2E breakers
- Close (or advise the AD81 Operator to close) 81PL2 and 81L2T1breakers

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 KP6AD line out of service

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

- Open 81L6E and 81L6T2 breakers

SCC shall carry out (or advise the KP56 Operator to carry out) the following:

- Open 56L6E and 56L6T3 breakers
- Check for no potential on KP6AD line

3.6. To take out, isolate and de-energize KP6AD line for work

AD81 Operator shall request for Station Guarantee from KP56

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

- Open 81L6E and 81L6T2 breakers
- Open 81L6R1 breaker

SCC shall carry out (or advise the KP56 Operator to carry out) the following:

- Open 56L6E and 56L6T3 breakers
- Check for no potential on KP6AD line

SCC shall advise KP56 Operator to carry out the following:

- Open 56L6E-L6 and 56L6T3-L6 disconnect switches and turn off 125Vdc supply
- Close AD816AD-G ground disconnect switch

SCC shall advise AD81 Operator to carry out the following:

- Open 81L6E-L6 and 81L6T2-L6 disconnect switches and turn off 125Vdc supply
- Open 81L6R1-L6 disconnect switches and turn off its 125Vdc supply
- Close 81KP6AD-G ground disconnect switch

3.7. To restore KP6AD line to service after work

3.7.1. Prepare KP6AD 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 KP6AD line

SCC shall advise KP56 Operator to carry out the following:

- Check opened 56L6E and 56L6T3 breakers
- Open 56KP6AD-G ground disconnect switch
- Turn on 125Vdc supply and close 56L6E-L6 and 56L6T3-L6 disconnect switches

SCC shall advise AD81 Operator to carry out the following:

- Check opened 81L6E and 81L6T2 breakers
- Check opened 81L6R1 breaker
- Open 81KP6AD-G ground disconnect switch
- Turn on 125Vdc supply and close 81L6E-L6 and 81L6T2-L6 disconnect switches
- Turn on 125Vdc supply and close 81L6R1-L6 disconnect switch

3.7.2. Restoration of KP6AD line to service:

SCC shall:

- Advise the KP56 and AD81 Operators of readiness to restore KP6AD line to service
    - Close (or advise the KP56 Operator to close) 56L6E and 56L6T3 breakers
    - Close (or advise the AD81 Operator to close) 81L6E and 81L6T2 breakers

3.8. To restore KP6AD line to service after automatic outage

If KP6AD line trips auto due to fault on the line:

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:

- Close (or advise the KP56 Operator to close) 56L6E and 56L6T3 breakers
- Energize (or advise the AD81 Operator to energize) the line **ONCE** by closing 81L6E and 81L6T2 breakers

KP56 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 isolate 81T1 Bank for work

SCC shall advise AD81 Operator to carry out the following:

- Inform Customer about readiness to take off 81T1 bank
- Request Customer on 81T1 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 81T1 transformer auxiliaries

- If the station service is on 81T1 transfer supply to 81T2 by switching from AC1 to AC2

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

- Open 81AT1 and 81L4T1 breakers
- Open 81ET1 and 81L2T1 breakers
- Check for no potential on 81T1 Bank
- Open 81AT1-T1 and 81L4T1-T1 disconnect switches and turn off 125vdc supply
- Open 81ET1-T1 and 81L2T1-T1 disconnect switches and turn off 125vdc supply
- Open 81T1-TSS1 disconnect switch
- Open AC control MCB to 81T1 auxiliaries
- Open 125V DC breaker to 81T1 primary and secondary protection and tag with PC13
-

3.10. To restore 81T1 Bank to service after work

3.10.1. 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-TSS1disconnect 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 125V DC breaker to 81T1 primary and secondary protection and remove tag PC13
- Advise SCC of readiness to restore 81T1 Bank to service

3.10.2. Restoration of 81T1 bank to service:

- SCC shall close (or advise AD81 Operator to close) the 81ET1 and 81L2T1 breakers (330kV)

- SCC shall close (or advise AD81 Operator to close) the 81AT1 and 81L4T1 breakers to tie to 161kV Bus

3.11. 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 transformer **ONCE** by closing 81ET1 and 81L2T1breakers (330kV)

-

AD81 Operator shall:

- Check for potential on 81T1 and advice SCC

SCC shall:

- Energize (or advise the AD81 Operator to energize) the transformer **ONCE** by closing 81AT1 and 81L4T1breakers to tie to 161kV Bus

AD81 Operator shall:

- Advise the Supervisor/Area Manager and SCC of item above

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

3.12. 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 AC2 Contactor/MCB to take off supply to 81T2 transformer auxiliaries

- If the station service is on 81T2 transfer supply to 81T1 by switching from AC2 to

AC1

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

- 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 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
- Open 125Vdc MCB to 81T2 primary and secondary protection and tag with PC13

3.13. To restore 81T2 Bank to service after work

3.13.1. 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
- Close 81T2-TSS2 disconnect switch
- Turn on 125Vdc supply and 81DT2-T2 and close 81L1T2-T2 disconnect switch
- Turn on 125Vdc supply and 81PT2-T2 and close 81L6T2-T2 disconnect switch
- 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

3.13.2. Restoration of 81T2 bank to service:

- SCC shall close (or advise AD81Operator to close) the 81PT2 and 8IL6T2 breakers
- SCC shall close (or advise AD81 Operator to close) the 81DT2 and 81L1T2 breakers

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

If 81T2 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 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 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.

3.15. To Isolate 81R1 Shunt Reactor for work

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

- Open 81L6R1 breaker
- Check for no potential on 81R1 Shunt Reactor

SCC shall advise AD81 Operator to carry out the following:

- Open 81L6R1-L6 disconnect switch and turn off its125Vdc supply
- Close 81L6R1-G disconnect switch and turn off its125Vdc supply

3.16. To restore 81R1 Shunt Reactor to service after work

3.16.1. Prepare 81R1 Shunt Reactor for restoration:

AD81 Operator shall:

- Advise SCC when work on the 81R1 Shunt Reactor has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 81R1 Shunt Reactor and temporary grounds removed
- Check open 81L6R1 breaker
- Turn on 125Vdc supply open 81L6R1-G disconnect switch
- Turn on 125Vdc supply and close 81L6R1-L6 disconnect switch
- Advise SCC of readiness to restore 81R1 Shunt Reactor to service

3.16.2. Restoration of 81R1 Shunt Reactor to service:

SCC shall close (or advise AD81 Operator to close) the 81L6R1 breaker, if system voltage is high (340kV).

3.17. To Isolate 81R2 Shunt Reactor for work

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

- Open 81L2R2 breaker
- Check for no potential on 81R2 Shunt Reactor

SCC shall advise AD81 Operator to carry out the following:

- Open 81L2R2-L2 disconnect switch and turn off 125Vdc supply
- Close 81L2R2-G disconnect switch and turn off 125Vdc supply

3.18. To restore 81R2 Shunt Reactor to service after work

3.18.1. Prepare 81R1 Shunt Reactor for restoration:

AD81 Operator shall:

- Advise SCC when work on the 81R2 Shunt Reactor has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 81R2 Shunt Reactor and temporary grounds removed
- Check open 81L2R2 breaker
- Turn on 125Vdc supply open 81L2R2-G disconnect switch
- Turn on 125Vdc supply and close 81L2R2-L2 disconnect switch
- Advise SCC of readiness to restore 81R2 Shunt Reactor to service

3.18.2. Restoration of 81R1 Shunt Reactor to service:

SCC shall close (or advise AD81 Operator to close) the 81L2R2 breaker if system voltage is high (340kV).

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 330kV buses. The main 'E' and 'P' buses, a breaker and half configuration provides the normal points of supply to all circuits/equipment such as KP6AD, 81T1,81T2 transformers,81R1 and 81R2 Shunt Reactors.

5. Approval

.....

Director, TSD