TD-OP-0023

GRIDCo

OPERATING PROCEDURE FOR HO SUBSTATION

GHANA GRID COMPANY LTD

Title:	**OPERATING PROCEDURE FOR HO SUBSTATION (H023)**		
Issued To:	Director, System Operations Director, SNS Manager, SCC Manager, Dispatch Operations Area Manager, Tema Operating Staff, Tema Area Maintenance Staff, Tema Area Dispatch Staff, SCC	**Number:**	TD-OP-0023
		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 HO23 Substation to service for planned and auto outages.

2. Scope

The directive will be used by Operators at Akosombo Operating Area and System Control Center (SCC) for operation of equipment at HO23 Substation.

3. Procedure

3.1. To take AP1HO line out of service

SCC shall carry out (or advise the AP22 Operator to carry out) the following:

- Verify opened 22AP1HO-S bypass disconnect switch
- Open 22AP1HO breaker

SCC shall carry out (or advise the HO23 Operator to carry out) the following:

- Check for no potential on AP1HO line

3.2. To take out, isolate and de-energize AP1HO line for work

HO23 Operator shall request for Station Guarantee from AP22

SCC shall carry out (or advise the AP22 Operator to carry out) the following:

- Check opened 22AP1HO-S bypass disconnect switch and turn off its 125Vdc supply
- Open 22AP1HO breaker

SCC shall carry out (or advise the HO23 Operator to carry out) the following:

- Check for no potential on AP1HO line

SCC shall advise the HO23 Operator to carry out the following:

- Open 23AP1HO–A disconnect switch and turn off 125Vdc supply
- Close 23AP1HO-G ground disconnect switch

SCC shall advise the AP22 Operator to carry out the following:

- Open 22AP1HO-L1 disconnect switch and turn off 125Vdc supply
- Close 22AP1HO-G ground disconnect switch

3.3. To restore AP1HO line to service after work

3.3.1. Prepare AP1HO line for restoration:

HO23 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 AP1HO line

SCC shall advise AP22 Operator to carry out the following:

- Check opened 22AP1HO-S bypass disconnect switch
- Open 22AP1HO-G ground disconnect switch
- Turn on 125Vdc supply and close 22AP1HO-L1 disconnect switch

SCC shall advise HO23 Operator to carry out the following:

- Open 23AP1HO-G disconnect switch
- Turn on 125Vdc supply and close 23AP1HO-A disconnect switch

Restoration of AP1HO line to service:

SCC shall:

- Advise the HO23 and AP22 Operators of readiness to restore AP1HO line to service
- Close (or advise AP22 Operator to close) 22AP1HO breaker

3.4. To restore AP1HO line to service after automatic outage

If AP1HO line trips auto due to fault:

HO23 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 AP22 Operator to energize) the line **ONCE** by closing 22AP1HO breaker

- Advise the Supervisor/Area Manager of operation above

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

3.5. To take HO2PE line out of service

SCC shall carry out (or advise the HO23 Operator to carry out) the following:

- Verify opened 23HO2PE-S bypass disconnect switch

- Open 23HO2PE breaker

SCC shall carry out (or advise the PE24 Operator to carry out) the following:

- Check for no potential on HO2PE line

3.6. To take out, isolate and de-energize HO2PE line for work

- HO23 Operator shall request for Station Guarantee from PE24

SCC shall carry out (or advise the HO23 Operator to carry out) the following:

- Verify opened 23HO2PE-S bypass disconnect switch and turn off its 125Vdc supply
- Open 23HO2PE breaker

SCC shall carry out (or advise the PE24 Operator to carry out) the following:

- Check for no potential on HO2PE line

SCC shall advise the HO23 Operator to carry out the following:

- Open 23HO2PE–L2 disconnect switch and turn off its 125Vdc supply
- Close 23HO2PE-G ground disconnect switch

SCC shall advise the PE24 Operator to carry out the following:

- Open 24H02PE-A disconnect switch and turn off its 125Vdc supply
- Close 24HO2PE-G ground disconnect switch

3.7. To restore HO2PE line to service after work

3.7.1. Prepare HO2PE line for restoration:

HO23 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 HO2PE line

SCC shall advise PE24 Operator to carry out the following:

- Open 24HO2PE-G ground disconnect switch

- Turn on 125Vdc supply and close 24HO2PE-L2 disconnect switch

SCC shall advise HO23 Operator to carry out the following:

- Check opened 23HO2PE-S bypass disconnect switch and turn off its 125Vdc supply

- Check opened 23HO2PE breaker

- Open 23HO2PE-G disconnect switch

- Turn on 125Vdc supply and close 23HO2PE-L2 disconnect switch

3.7.2. Restoration of HO2PE line to service:

SCC shall:

- Advise the HO23 and PE24 Operators of readiness to restore HO2PE line to service

- Close (or advise HO23 Operator to close) 23HO2PE breaker

3.8. To restore HO2PE line to service after automatic outage

If HO2PE line trips auto due to fault:

HO23 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 HO23 Operator to energize) the line **ONCE** by closing 23HO2PE breaker
- Advise the Supervisor/Area Manager of operation above
- Advise maintenance men to patrol the line if the above operation is not successful

3.9. To isolate 23T1 Transformer for work

- HO23 Operator shall request Station Guarantee from Customer on 23F1 Feeder

SCC shall carry out or advise HO23 Operator to carry out the following:

- Inform Customer about readiness to take off 23T1 Bank
- Request Customer on 23T1 Bank to take off their load

- Transfer Station Service from AC1 to AC2, if Station Service is on 23T1

- Open AC1 Contactor/MCB to take off supply to 23T1 transformer auxiliaries

SCC shall carry out (or advise HO23 Operator to carry out) the following:

- Verify opened 23AT1-S bypass disconnect switch and turn off its 125Vdc supply

- Open 23T1F1 breaker

- Open 23AT1 breaker

- Check for no potential on 23T1 Bank

- Open 23T1F1-T1 disconnect switch and turn off its 125Vdc supply

- Open 23AT1-T1 disconnect switch and turn off its 125Vdc supply

- Open AC control MCB to 23T1 auxiliaries and tag

- Open 125V DC MCB to 23T1 primary and secondary protection and tag with PC13

3.10. To restore 23T1 Bank to service after work

3.10.1. Prepare 23T1 Bank to service after work

HO23 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 23T1 Bank and temporary grounds removed

- Check opened 23AT1-S bypass disconnect switch and turn on its 125Vdc supply

- Close 23T1F1-T1 disconnect switch

- Turn on 125Vdc supply and close 23AT1-T1 disconnect switch

- Close AC control MCB to 23T1 auxiliaries and remove tag

- Close 125V DC MCB to 23T1 primary and secondary protection and remove PC13 tag

- Advise SCC of readiness to restore 23T1 Bank to service

3.10.2. Restoration of 23T1 Bank to service:

- SCC shall close (or advise HO23 Operator to close) 23AT1 breaker

- HO23 Operator shall advise Customer of readiness to restore 23F1 feeder to service

- SCC shall close (or advise HO23 Operator to close) 23T1F1 breaker

3.11. To restore 23T1 Bank to service after automatic outage

If 23T1 Bank trips auto due to fault:

HO23 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 HO23 Operator to energize) the bank ONCE by closing 23AT1 breaker

HO23 Operator shall advise Customer of readiness to restore 23T1 Bank to service

SCC shall close (or advise HO23 Operator to close) 23T1F1 breaker

HO23 Operator shall:

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

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

3.12. To isolate 23T2 Transformer for work

- HO23 Operator shall request Station Guarantee from Customer on 23F2 and 23F3 Feeders

SCC shall carry out or advise HO23 Operator to carry out the following:

- Inform Customer about readiness to take off 23T2 Bank

- Request Customer on 23T2 Bank to take off their load

- Transfer Station Service from AC2 to AC1, if Station Service is on 23T2

- Open AC1 Contactor/MCB to take off supply to 23T2 transformer auxiliaries

SCC shall carry out (or advise HO23 Operator to carry out) the following:

- Verify opened 23AT2-S bypass disconnect switch and turn off its 125Vdc supply

- Open 23T2F2 and 23T2F3 breakers
- Open 23AT2 breaker
- Check for no potential on 23T2 Bank
- Open 23T2F2-T2 and 23T2F3-T2 disconnect switches and turn off 125Vdc supply
- Open 23AT2-T2 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 23T2 auxiliaries and tag
- Open 125V DC MCB to 23T2 primary and secondary protection and tag with PC13

3.13. To restore 23T2 Bank to service after work

3.13.1. Prepare 23T2 Bank to service after work

HO23 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 23T2 Bank and temporary grounds removed
- Check opened 23AT2-S bypass disconnect switch and turn on its 125Vdc supply
- Close 23T2F2-T2 and 23T2F2-T2 disconnect switches and turn off 125Vdc supply
- Turn on 125Vdc supply and close 23AT2-T2 disconnect switch
- Close AC control MCB to 23T2 auxiliaries and remove tag
- Close 125V DC MCB to 23T2 primary and secondary protection and remove PC13 tag

- Advise SCC of readiness to restore 23T2 Bank to service

3.13.2. Restoration of 23T2 Bank to service:

- SCC shall close (or advise HO23 Operator to close) 23AT1 breaker

- HO23 Operator shall advise Customer of readiness to restore 23F2 and 23F3 feeders to service

- SCC shall close (or advise HO23 Operator to close) 23T2F2 and 23T2F3 breakers

3.14. To restore 23T2 Bank to service after automatic outage

If 23T2 Bank trips auto due to fault:

HO23 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 HO23 Operator to energize) the bank ONCE by closing 23AT2 breaker

HO23 Operator shall advise Customer of readiness to restore 23T2 Bank to service

SCC shall close (or advise HO23 Operator to close) 23T2F2 and 23T2F3 breakers

HO23 Operator shall:

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

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

3.15. To Isolate 23T1F1 Breaker for work

- HO23 Operator shall request Station Guarantee from customer on 23F1 Bus

SCC shall advise HO23 Operator to carry out the following:

- Inform customers about readiness to take off 23T1 bank

- Request customers on 23T1 Bank to take off their load

- Open AC1 Contactor/MCB to take off supply to 23T1 transformer auxiliaries

- Transfer Station Service from AC1 to AC2, if station service is on 23T1 transformer

SCC shall carry out (or advise HO23 Operator to carry out) the following:

- Open 23T1F1 breaker

SCC shall advise HO23 Operator to carry out the following:

- Open 23T1F1-T1 disconnect switch

- Open 23T1F1-F1 disconnect switch

- Check for no potential on 23T1F1 breaker

3.16. To restore 23T1F1 Breaker to service after work

3.16.1. Prepare 23T1F1 breaker for restoration:

HO23 Operator shall:

- Advise SCC when work on the 23T1F1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 23T1F1 Breaker and temporary grounds removed

- Close 23T1F1-T1 disconnect switch
- Close 23T1F1-F1 disconnect switch

3.16.2. Restoration of 23T1F1 breaker to service:

- HO23 Operator shall advise customers of readiness to restore 23T1 Bank to service
- SCC shall close (or advise HO23 Operator to close) the 23T1F1 breaker

3.17. To Isolate 23T2F2 Breaker for work

- HO23 Operator shall request Station Guarantee from customer on 23F2 Bus

SCC shall advise HO23 Operator to carry out the following:

- Inform customers about readiness to take off 23T2 bank
- Request customers on 23T2 Bank to take off their load

- Open AC1 Contactor/MCB to take off supply to 23T2 transformer auxiliaries

- Transfer Station Service from AC2 to AC1, if station service is on 23T2 transformer

SCC shall carry out (or advise HO23 Operator to carry out) the following:

- Open 23T2F2 breaker

SCC shall advise HO23 Operator to carry out the following:

- Open 23T2F2-T2 disconnect switch

- Open 23T2F2-F2 disconnect switch
- Check for no potential on 23T2F2 breaker

3.18. To restore 23T2F2 Breaker to service after work

3.18.1. Prepare 23T2F2 breaker for restoration:

HO23 Operator shall:

- Advise SCC when work on the 23T2F2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 23T2F2 Breaker and temporary grounds removed
- Close 23T2F2-T2 disconnect switch
- Close 23T2F2-F2 disconnect switch

3.18.2. Restoration of 23T2F2 breaker to service:

- HO23 Operator shall advise customers of readiness to restore 23T2 Bank to service
- SCC shall close (or advise HO23 Operator to close) the 23T2F2 breaker

3.19. To Isolate 23T2F3 Breaker for work

- HO23 Operator shall request Station Guarantee from customer on 23F3 Bus

SCC shall advise HO23 Operator to carry out the following:

- Inform customers about readiness to take off 23T2 bank
- Request customers on 23T2 Bank to take off their load

- Open AC1 Contactor/MCB to take off supply to 23T2 transformer auxiliaries

- Transfer Station Service from AC2 to AC1, if station service is on 23T2 transformer

SCC shall carry out (or advise HO23 Operator to carry out) the following:

- Open 23T2F3 breaker

SCC shall advise HO23 Operator to carry out the following:

- Open 23T2F3-T2 disconnect switch
- Open 23T2F3-F3 disconnect switch
- Check for no potential on 23T2F3 breaker

3.20. To restore 23T2F3 Breaker to service after work

3.20.1. Prepare 23T2F3 breaker for restoration:

HO23 Operator shall:

- Advise SCC when work on the 23T2F3 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 23T2F3 Breaker and temporary grounds removed
- Close 23T2F3-T2 disconnect switch
- Close 23T2F3-F3 disconnect switch

3.20.2. Restoration of 23T2F3 breaker to service:

- HO23 Operator shall advise customers of readiness to restore 23T2 Bank to service
- SCC shall close (or advise HO23 Operator to close) the 23T2F3 breaker

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 is only one 69Kv bus arrangement. The main 'A' bus provides the normal points of supply to all circuits/equipment such as HO2PE and AP1HO lines, 23T1 and 23T2 transformers.

5. Approval

…….

Director, Technical Services