TD-OP-0068

GRIDCo

OPERATING PROCEDURE FOR WA SUBSTATION

GHANA GRID COMPANY LTD

Title:	**OPERATING PROCEDURE FOR WA SUBSTATION (WA68)**		
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1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at WA68 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 WA68 Substation.

3. Procedure

3.1. To take WA1TU line out of service

SCC shall carry out (or advise the WA68 Operator to carry out) the following:

- Open 68AL1 and 68L1L2 breakers

SCC shall carry out (or advise the TU69 Operator to carry out) the following:

- Open 69L1D and 69L1L3 breakers
- Check for no potential on WA1TU line

3.2. To take out, isolate and de-energize WA1TU line for work

- WA68 Operator request for Station Guarantee from TU69

SCC shall carry out (or advise the WA68 Operator to carry out) the following:

- Open 68AL1 and 68L1L2 breakers

SCC shall carry out (or advise TU69 Operator to carry out) the following:

- Open 69L1D and 69L1L3 breakers
- Check for no potential on WA1TU line

SCC shall advise TU69 Operator to carry out the following:

- Open 69L1D-L1 and 69L1L3-L1 disconnect switches and turn off its 125Vdc supply
- Close 69WA1TU-G ground disconnect switch

SCC shall advise WA68 Operator to carry out the following:

- Open 68AL1-L1 and 68L1L2-L1 disconnect switches and turn off its 125Vdc supply

- Close 68WA1TU-G ground disconnect switch

3.3. To restore WA1TU line to service after work

3.3.1. Prepare WA1TU line for restoration:

WA68 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 WA1TU line

SCC shall advise TU69 Operator to carry out the following:

- Check opened 69L1D and 69L1L3 breakers

- Open 69WA1TU-G ground disconnect switch

- Turn on 125Vdc supply and close 69L1D-L1 and 69L1L3-L1 disconnect switches

SCC shall advise WA68 Operator to carry out the following:

- Check opened 68AL1 and 68L1L2 breakers

- Open 68WA1TU-G ground disconnect switch

- Turn on 125Vdc supply and close 68AL1-L1 and 68L1L2-L1 disconnect switches

3.3.2. Restoration of WA1TU line to service:

SCC shall:

- Advise the TU69 and WA68 Operators of readiness to restore WA1TU line to service

- Close (or advise the TU69 Operator to close) 69L1D and 69L1L3 breakers

- Close (or advise the WA68 Operator to close) 68AL1 and 68L1L2 breakers

3.4. To restore WA1TU line to service after automatic outage

If WA1TU line trips auto due to fault:

WA68 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 WA68 Operator to energize) the line **ONCE** by closing 68AL1 and 68L1L2 breakers
- Close (or advise the TU69 Operator to close) 69L1D and 69L1L3 breakers

WA68 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 SA2WA line out of service

SCC shall carry out (or advise the WA68 Operator to carry out) the following:

- Open 68L2D and 68L1L2 breakers

SCC shall carry out (or advise the SA38 Operator to carry out) the following:

- Verify opened 38L2-D transfer disconnect switch
- Open 38AL2 breaker
- Check for no potential on SA2WA line

3.6. To take out, isolate and de-energize SA2WA line for work

- WA68 Operator shall request for Station Guarantee from SA38

SCC shall carry out (or advise the WA68 Operator to carry out) the following:

- Open 68L2D and 68L1L2 breakers

SCC shall carry out (or advise the SA38 Operator to carry out) the following:

- Check opened 38L2-D transfer disconnect switch and turn off its 125Vdc supply

- Open 38AL2 breaker

- Check for no potential on SA2WA line

SCC shall advise WA68 operator to carry out the following:

- Open 68L2D-L2 and 68L1L2-L2 disconnect switches and turn off its 125Vdc supply

- Close 68SA2WA-G ground disconnect switch

SCC shall advise SA38 operator to carry out the following:

- Open 38AL2-L2 disconnect switch and turn off its 125Vdc supply

- Close 38SA2WA-G ground disconnect switch

3.7. To restore SA2WA line to service after work

3.7.1. Prepare SA2WA line for restoration:

WA68 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 SA2WA line

SCC shall advise SA38 Operator to carry out the following:

- Check opened 38AL2 breaker

- Check opened 38L2-D transfer disconnect switch and turn on its 125Vdc supply

- Open 38SA2WA-G ground disconnect switch

- Turn on 125Vdc supply and close 38AL2-L2 disconnect switch

SCC shall advise WA68 Operator to carry out the following:

- Check opened 68L2D and 68L1L2 breakers

- Open 68SA2WA-G ground disconnect switch

- Turn on 125Vdc supply and close 68L2D-L2 and 68L1L2-L2 disconnect switches

3.7.2. Restoration of SA2WA line to service:

SCC shall:

- Advise the SA38 and WA68 Operators of readiness to restore SA2WA line to service

- Close (or advise the SA38 Operator to close) 38AL2 breaker

- Close (or advise the WA68 Operator to close) 68L2D and 68L1L2 breakers

3.8. To restore SA2WA line to service after automatic outage

If SA2WA line trips auto due to fault:

WA68 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 SA38 Operator to energize) the line **ONCE** by closing 38AL2 breaker

- Close (or advise the WA68 Operator to close) 68L2D and 68L1L2 breakers

WA68 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 68T1 Transformer for work

SCC shall advise WA68 Operator to carry out the following:

- Inform Customer about readiness to take off 68T1 bank

- Request Customer on 68T1 Bank to take off their load

- Transfer Station Service from 68T1 to 68T2 transformer

- Open AC1 Contactor/MCB to take off supply to 68T1 transformer auxiliaries

SCC shall carry out (or advise WA68 Operator to carry out) the following:

- Open 68T1F1 breaker
- Open 68T1SC1 breaker
- Open 68DT1 and 68L4T1 breakers

SCC shall advise WA68 Operator to carry out the following:

- Check opened 68T1F1-S bypass disconnect switch
- Open 68T1F1-T1 disconnect switch
- Open 68T1SC1-T1 disconnect switch
- Open 68DT1-T1 and 68L4T1-T1 disconnect switches and turn off its 125Vdc supply
- Open AC control MCB to 68T1 auxiliaries and tag
- Open 125V DC MCB to 68T1 primary and secondary protection and tag with PC13
- Check for no potential on 68T1 Bank

3.10. To restore 68T1 Bank to service after work

3.10.1. Prepare 68T1 bank for restoration:

WA68 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 68T1 Bank and temporary grounds removed
- Check opened 68T1F1-S bypass disconnect switch
- Close 68T1SC1-T1 disconnect switch
- Close 68T1F1-T1 disconnect switch
- Turn on 125Vdc supply and close 68DT1-T1 and 68L4T1-T1 disconnect switches

- Close AC control MCB to 68T1 auxiliaries and remove tag

- Close 125V DC MCB to 68T1 primary and secondary protection and remove PC13 tag

- Advise SCC of readiness to restore 68T1 Bank to service

3.10.2. Restoration of 68T1 bank to service:

- SCC shall close (or advise WA68 Operator to close) the 68DT1 and 68L4T1 breakers

- WA68 Operator shall advise Customer of readiness to restore 68T1 Bank to service

- SCC shall close (or advise WA68 Operator to close) the 68T1F1 breaker

3.11. To restore 68T1 Bank to service after automatic outage

If 68T1 bank trips auto due to fault:

WA68 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 WA68 Operator to energize) the bank **ONCE** by closing 68DT1and 68L4T1 breakers

WA68 Operator shall advise Customers of readiness to restore 68F1 feeder to service

SCC shall close (or advise WA68 Operator to close) 68T1F1 breaker

WA68 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.

3.12. To isolate 68T2 Transformer for work

SCC shall advise WA68 Operator to carry out the following:

- Inform Customer about readiness to take off 68T2 bank
- Request Customer on 68T2 Bank to take off their load
- Transfer Station Service from 68T2 to 68T1 transformer
- Open AC1 Contactor/MCB to take off supply to 68T2 transformer auxiliaries

SCC shall carry out (or advise WA68 Operator to carry out) the following:

- Open 68T2SC2 breaker
- Open 68T2F2 breaker
- Open 68DT2 and 68L3T2 breakers

SCC shall advise WA68 Operator to carry out the following:

- Check opened 68T2F2-S bypass disconnect switch
- Open 68T2F2-T2 disconnect switch
- Open 68T2SC2-T2 disconnect switch
- Open 68DT2-T2 and 68L3T2-T2 disconnect switches and turn off its 125Vdc supply
- Open AC control MCB to 68T2 auxiliaries and tag
- Open 125V DC MCB to 68T2 primary and secondary protection and tag with PC13
- Check for no potential on 68T2 Bank

3.13. To restore 68T2 Bank to service after work

3.13.1. Prepare 68T2 bank for restoration:

WA68 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 68T2 Bank and temporary grounds removed
- Check opened 68T2F2-S bypass disconnect switch
- Close 68T2SC2-T2 disconnect switch

- Close 68T2F2-T2 disconnect switch

- Turn on 125Vdc supply and close 68DT2-T2 and 68L3T2-T2 disconnect switches

- Close AC control MCB to 68T2 auxiliaries and remove tag

- Close 125V DC MCB to 68T2 primary and secondary protection and remove PC13 tag

- Advise SCC of readiness to restore 68T2 Bank to service

3.13.2. Restoration of 68T2 bank to service:

- SCC shall close (or advise WA68 Operator to close) the 68DT2 and 68L3T2 breakers

- WA68 Operator shall advise Customer of readiness to restore 68F2 feeder to service

- SCC shall close (or advise WA68 Operator to close) the 68T2F2 breaker

3.14. To restore 68T2 Bank to service after automatic outage

If 68T2 bank trips auto due to fault:

WA68 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 WA68 Operator to energize) the bank ONCE by closing 68DT2 and 68L3T2 breakers

WA68 Operator shall advise Customers of readiness to restore 68F2 feeder to service

SCC shall close (or advise WA68 Operator to close) 68T2F2 breaker

WA68 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 68T1F1 Breaker for work

- WA68 Operator shall request for Station Guarantee from Customer on 68F1 Feeder

SCC shall advise WA68 Operator to carry out the following:

- Inform Customer about readiness to take off 68T1 bank
- Request Customer on 68T1 Bank to take off their load
- Transfer Station Service from 68T1 to 68T2
- Open AC1 Contactor/MCB to take off supply to 68T1 transformer auxiliaries

SCC shall carry out (or advise WA68 Operator to carry out) the following:

- Open 68T1F1 breaker
- Open 68T1SC1 breaker
- Open 68L4T1 and 68DT1 breakers
- Check for no potential on 68T1 Bank

SCC shall advise WA68 Operator to carry out the following:

- Check opened 68T1F1-S bypass disconnect switch
- Open 68T1F1-T1 disconnect switch
- Open 68T1F1-F1 disconnect switch
- Open 68T1SC1- T1 disconnect switch

3.16. To restore 68T1F1 Breaker to service after work

3.16.1. Prepare 68T1F1 breaker for restoration:

WA68 Operator shall:

- Advise SCC when work on the 68T1F1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 68T1F1 breaker and temporary grounds removed

- Check opened 68T1F1-S bypass disconnect switch
- Close 68T1F1-F1 disconnect switch
- Close 68T1SC1-T1 disconnect switch
- Close 68T1F1-T1 disconnect switch

3.16.2. Restoration of 68T1F1 breaker to service:

- SCC shall close (or advise WA68 Operator to close) the 68DT1 and 68L4T1 breakers
- WA68 Operator shall advise Customer of readiness to restore 68T1 Bank to service
- SCC shall close (or advise WA68 Operator to close) the 68T1F1 breaker

3.17. To Isolate 68T2F2 Breaker for work

- WA68 Operator shall request for Station Guarantee from Customer on 68F2 Feeder

SCC shall carry out (or advise WA68 Operator to carry out) the following:

- Open 68T2SC2 breaker
- Open 68T2F2 breaker
- Open 68DT2 and 68L3T2 breakers
- Check for no potential on 68T1 Bank

SCC shall advise WA68 Operator to carry out the following:

- Check opened 68T2F2-S bypass disconnect switch
- Open 68T2F2-F2 disconnect switch
- Open 68T2SC2-T2 disconnect switch
- Open 68T2F2-T2 disconnect switch

3.18. To restore 68T2F2 Breaker to service after work

3.18.1. Prepare 68T2F2 breaker for restoration:

WA68 Operator shall:

- Advise SCC when work on the 68T2F2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 68T2F2 Breaker and temporary grounds removed

- Check opened 68T2F2-S bypass disconnect switch

- Close 68T2F2-F2 disconnect switch

- Close 68T2F2-T2 disconnect switch

- Close 68T2SC2-T2 disconnect switch

3.18.2. Restoration of 68T2F2 breaker to service:

- SCC shall close (or advise WA68 Operator to close) the 68L3T2 and 68DT2 breakers

- WA68 Operator shall advise Customer of readiness to restore 68F2 feeder to service

- SCC shall close (or advise WA68 Operator to close) the 68T2F2 breaker

3.19. To isolate 68SC1 Capacitor Bank for work

SCC shall carry out (or advise WA68 Operator to carry out) the following:

- Open 68T1SC1 breaker

SCC shall advise WA68 Operator to carry out the following:

- Open 68T1SC1-SC1disconnect switch

- Close 68T1SC1-G ground disconnect switch

3.20. To restore 68SC1 Capacitor Bank to service after work

3.20.1. Prepare 68SC1 Capacitor Bank for restoration:

WA68 Operator shall:

- Advise SCC when work on the 68SC1 Capacitor Bank has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 68SC1 Capacitor Bank and temporary grounds removed

- Open 68SC1-G ground disconnect switch

- Close 68T1SC1-SC1 disconnect switch

- Advise SCC of readiness to restore 68SC1 Capacitor Bank to service

3.20.2. Restoration of 68SC1 Capacitor Bank to service:

- SCC shall close (or advise WA68 Operator to close) 68T1SC1 breaker if the voltage is below 32.8kV

3.21. To isolate 68SC2 Capacitor Bank for work

SCC shall carry out (or advise WA68 Operator to carry out) the following:

- Open 68T2SC2 breaker

SCC shall advise WA68 Operator to carry out the following:

- Open 68T2SC2-SC2 disconnect switch

- Close 68T2SC2-G ground disconnect switch

3.22. To restore 68SC2 Capacitor Bank to service after work

3.22.1. Prepare 68SC2 Capacitor Bank for restoration:

WA68 Operator shall:

- Advise SCC when work on the 68SC2 Capacitor Bank has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 68SC2 Capacitor Bank and temporary grounds removed

- Open 68SC2-G ground disconnect switch

- Close 68T2SC2-SC2 disconnect switch

- Advise SCC of readiness to restore 68SC2 Capacitor Bank to service

3.22.2. Restoration of 68SC2 Capacitor Bank to service:

- SCC shall close (or advise WA68 Operator to close) 68T2SC2 breaker if the voltage is below 32.8kV

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, a breaker and half configuration provide the normal points of supply to all circuits/equipment such as WA1TU, SA2WA lines, 68T1, 68T2 transformers, 68SC1 and 68SC2 Capacitor Banks

5. Approval

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Director, TSD

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