TD-OP-039

GRIDCo

OPERATING PROCEDURE FOR AFLAO SUBSTATION

GHANA GRID COMPANY LTD

Title:	**OPERATING PROCEDURE FOR AFLAO SUBSTATION (AF39)**		
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-039
		Subject Area:	Operating
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Contents

1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at AF39 Substation to service for planned and auto outages.

2. Scope

The directive will be used by Operators at Tema Operating Area and System Control Center (SCC) for operation of equipment at AF39 Substation.

3. Procedure

3.1. To take AF1L line out of service

SCC shall carry out (or advise the AF39 Operator to carry out) the following:

- Open 39AFL1 breaker

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

- Open the necessary breakers at their end
- Check for no potential on AF1L line

3.2. To take out, isolate and de-energize AF1L line for work

- AF39 Operator shall request for Station Guarantee from Lome

SCC shall carry out (or advise the AF39 Operator to carry out) the following:

- Open 39AFL1 breaker

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

- Open the necessary breakers at their end
- Check for no potential on AF1L line

SCC shall advise LOME Operator to carry out the following:

- Isolate their end of the line

SCC shall advise AF39 Operator to carry out the following:

- Open 39AFL1-L1 disconnect switch and turn off its 125Vdc supply

- Close 39AFL1-G ground disconnect switch

3.3. To restore AF1L line to service after work

3.3.1. Prepare AF1L line for restoration

AF39 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 AF1L line

SCC shall advise LOME Operator to carry out the following

- Check opened the necessary breakers

SCC shall advise AF39 Operator to carry out the following:

- Check opened 39AFL1 breaker

- Open 39AFL1-G ground disconnect switch

- Turn on 125Vdc supply and close 39AFL1-L1 disconnect switch

3.3.2. Restoration of AF1L line to service:

SCC shall:

- Advise the AF39 and LOME Operators of readiness to restore AF1L line to service

- Close (or advise the AF39 Operator to close) 39AFL1 breaker

- Advise the LOME Operator to close the necessary breakers at their end

3.4. To restore AF1L line to service after automatic outage

If AF1L line trips auto due to fault:

AF39 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 AF39 Operator to close) the line **ONCE** by closing 39AFL1 breaker
- Advise the LOME Operator to close their end breakers

AF39 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 AF2L line out of service

SCC shall carry out (or advise the AF39 Operator to carry out) the following:

- Open 39AFL2 breaker

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

- Open the necessary breakers at their end
- Check for no potential on AF2L line

3.6. To take out, isolate and de-energize AF2L line for work

- AF39 Operator shall request for Station Guarantee from Lome

SCC shall carry out (or advise the AF39 Operator to carry out) the following:

- Open 39AFL2 breaker

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

- Open the necessary breakers at their end

- Check for no potential on AF2L line

SCC shall advise LOME Operator to carry out the following:

- Isolate their end of the line

SCC shall advise AF39 Operator to carry out the following:

- Open 39AFL2-L2 disconnect switch and turn off its 125Vdc supply

- Close 39AFL2-G ground disconnect switch

3.7. To restore AF2L line to service after work

3.7.1. Prepare AF2L line for restoration

AF39 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 AF2L line

SCC shall advise LOME Operator to carry out the following

- Check opened the necessary breakers

SCC shall advise AF39 Operator to carry out the following:

- Check opened 39AFL2 breaker

- Open 39AFL2-G ground disconnect switch

- Turn on 125Vdc supply and close 39AFL2-L2 disconnect switch

3.7.2. Restoration of AF2L line to service:

SCC shall:

- Advise the AF39 and LOME Operators of readiness to restore AF2L line to service

- Energize (or advise the AF39 Operator to close) the line **ONCE** by closing 39AFL2 breaker

- Advise the LOME Operator to close their end breakers

3.8. To restore AF2L line to service after automatic outage

If AF2L line trips auto due to fault:

AF39 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 AF39 Operator to close) the line **ONCE** by closing 39AFL2 breaker
- Advise the LOME Operator to close their end breakers

AF39 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 AP3AF line out of service

SCC shall carry out (or advise the AF39 Operator to carry out) the following:

- Open 39AFL1 breakers

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

- Open 22ADL3 breaker
- Check for no potential on AP3AF line

3.10. To take out, isolate and de-energize AP3AF line for work

SCC shall advise Lome of readiness to take out AF1L line for work

- AF39 Operator shall request for Station Guarantee from AP22

SCC shall carry out (or advise the AF39 Operator to carry out) the following:

- Open 39AFL1 breaker

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

- Open 22ADL3 breakers

- Check for no potential on AP3AF line

SCC shall advise AP22 Operator to carry out the following:

- Open 22ADL3-L3 disconnect switch and turn off its 125Vdc supply

SCC shall advise AF39 Operator to carry out the following:

- Verify opened 39ADT1-A and 39ADT2-A disconnect switches and turn off 125Vdc supply

- Open 39AFL1-L3 disconnect switch and turn off its 125Vdc supply

- Close 39AFL1-G3 ground disconnect switch

3.11. To restore AP3AF line to service after work

3.11.1. Prepare AP3AF line for restoration

AF39 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 AP3AF line

SCC shall advise AP22 Operator to carry out the following

- Check opened 22ADL3 breaker

SCC shall advise AF39 Operator to carry out the following:

- Check opened 39ADT1-A and 39ADT2-A disconnect switches and turn off 125Vdc supply

- Check opened 39AFL1 breaker

- Open 39AFL1-G3 ground disconnect switch

- Turn on 125Vdc supply and close 39AFL1-L3 disconnect switch

3.11.2. Restoration of AP3AF line to service:

SCC shall:

- Advise the AF39 and AP22 Operators of readiness to restore AP3AF line to service
- Close (or advise the AP22 Operator to close) 22ADL3 breaker

- Close (or advise the AF39 Operator to close) 39AFL1 breaker

SCC shall advise Lome operator to close their end breakers

3.12. To restore AP3AF line to service after automatic outage

If AP3AF line trips auto due to fault:

AF39 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 AP22 Operator to energize) the line **ONCE** by closing 22ADL3 breaker

- Close (or advise the AF39 Operator to close) 39AFL1 breaker

AF39 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 take AP4AF line out of service

SCC shall carry out (or advise the AF39 Operator to carry out) the following:

- Open 39AFL2 breakers

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

- Open 22ADL4 breaker
- Check for no potential on AP4AF line

3.14. To take out, isolate and de-energize AP4AF line for work

SCC shall advise Lome of readiness to take out AF2L line for work

- AF39 Operator shall request for Station Guarantee from AP22

SCC shall carry out (or advise the AF39 Operator to carry out) the following:

- Open 39AFL2 breaker

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

- Open 22ADL4 breakers
- Check for no potential on AP4AF line

SCC shall advise AP22 Operator to carry out the following:

- Open 22ADL4-L4 disconnect switch and turn off its 125Vdc supply

SCC shall advise AF39 Operator to carry out the following:

- Verify opened 39ADT1-D and 39ADT2-D disconnect switches and turn off 125Vdc supply
- Open 39AFL2-L4 disconnect switches and turn off its 125Vdc supply
- Close 39AFL2-G4 ground disconnect switch

3.15. To restore AP4AF line to service after work

3.15.1. Prepare AP4AF line for restoration

AF39 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 AP4AF line

SCC shall advise AP22 Operator to carry out the following

- Check opened 22ADL4 breaker

SCC shall advise AF39 Operator to carry out the following:

- Check opened 39ADT1-D and 39ADT2-D disconnect switches and turn off 125Vdc supply

- Check opened 39AFL2 breaker

- Open 39AFL2-G4 ground disconnect switch

- Turn on 125Vdc supply and close 39AFL2-L4 disconnect switch

3.15.2. Restoration of AP4AF line to service:

SCC shall:

- Advise the AF39 and AP22 Operators of readiness to restore AP4AF line to service

- Close (or advise the AF39 Operator to close) 39AFL2 breaker

- Close (or advise the AP22 Operator to close) 22ADL4 breaker

3.16. To restore AP4AF line to service after automatic outage

If AP4AF line trips auto due to fault:

AF39 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 AP22 Operator to energize) the line **ONCE** by closing 22ADL4 breaker
- Close (or advise the AF39 Operator to close) 39AFL2 breaker

  SCC shall advise Lome operator to close their end breakers

AF39 Operator shall:

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

3.17. Isolate 39T1 Transformer for work

AF39 Operator shall request for Station Guarantee from Customer on 39F1 Feeder

SCC shall advise AF39 operator to carry out the following:

- Inform Customer about readiness to take off 39T1 bank
- Request Customer on 39T1 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 39T1 transformer auxiliaries
- Transfer Station Service from AC1 to AC2, if station service is on 39T1 transformer

SCC shall carry out (or advise AF39 operator to carry out) the following:

- Open 39ADT1 breaker
- Open 39T1Y1 breaker
- Check for no potential on 39T1 Bank
- Open 39ADT1-AD disconnect switch and turn off its 125Vdc supply
- Open 39T1Y1-Y1 disconnect switch
- Open AC control MCB to 39T1 auxiliaries and tag
- Open 125Vdc MCB to 39T1 primary and secondary protection and tag with PC13

3.18. To restore 39T1 Bank to service after work

3.18.1. Prepare 39T1 bank for restoration:

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 39T1 Bank and temporary grounds removed
- Check opened 39T1Y1 breaker
- Check opened 39ADT1 breaker
- Turn on 125Vdc and close 39ADT1-AD disconnect switch
- Close 39T1Y1-Y1 disconnect switch
- Close AC control MCB to 39T1 auxiliaries and remove tag
- Close 125Vdc MCB to 39T1 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 39T1 Bank to service

3.18.2. Restoration of 39T1 bank to service:

- SCC shall close (or advise AF39 operator to close) 39ADT1 breaker
- AF39 Operator shall advise Customer of readiness to restore 39T1 Bank to service
- SCC shall close (or advise AF39 operator to close) the 39T1Y1 breaker

3.19. Restore 39T1 Bank to service after automatic outage

If 39T1 bank trips auto due to fault:

- 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 AF39 Operator to energize) the bank **ONCE** by closing 39ADT1 breaker

AF39 Operator shall advise Customer of readiness to restore 39F1 feeder to service

SCC shall close (or advise AF39 Operator to close) 39T1Y1 breaker

AF39 Operator shall:

- Advise the Supervisor/Area Manager of item above
- If not successful, isolate the Transformer for maintenance men to work on the equipment. See explanation.

3.20. To isolate 39T2 Bank for work

3.20.1. Isolate 39T2 Transformer for work

AF39 Operator shall request for Station Guarantee from Customer on 39F2 Feeder

SCC shall advise AF39 operator to carry out the following:

- Inform Customer about readiness to take off 39T2 bank
- Request Customer on 39T2 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 39T2 transformer auxiliaries
- Transfer Station Service from AC2 to AC1, if station service is on 39T2 transformer

SCC shall carry out (or advise AF39 operator to carry out) the following:

- Open 39ADT2 breaker
- Open 39T2Y2 breaker
- Check for no potential on 39T2 Bank
- Open 39ADT2-AD disconnect switch and turn off its125Vdc supply
- Open 39T2Y2-Y2 disconnect switch
- Open AC control MCB to 39T2 auxiliaries and tag
- Open 125Vdc MCB to 39T2 primary and secondary protection and tag with PC23

3.21. To restore 39T2 Bank to service after work

3.21.1. Prepare 39T2 bank for restoration:

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 39T2 Bank and temporary grounds removed
- Check opened 39T2Y2 breaker
- Check opened 39ADT2 breaker
- Turn on 125Vdc and close 39ADT2-AD disconnect switch
- Close 39T2Y2-Y2 disconnect switch
- Close AC control MCB to 39T2 auxiliaries and remove tag
- Close 125Vdc MCB to 39T2 primary and secondary protection and remove PC23 tag
- Advise SCC of readiness to restore 39T2 Bank to service

3.21.2. Restoration of 39T2 bank to service:

- SCC shall close (or advise AF39 operator to close) 39ADT2 breaker
- AF39 Operator shall advise Customer of readiness to restore 39T2 Bank to service
- SCC shall close (or advise AF39 operator to close) the 39T2Y2 breaker

3.22. Restore 39T2 Bank to service after automatic outage

If 39T2 bank trips auto due to fault:

- 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 AF39 Operator to energize) the bank **ONCE** by closing 39ADT2 breaker

AF39 Operator shall advise Customer of readiness to restore 39F2 feeder to service

SCC shall close (or advise AF39 Operator to close) 39T2Y2 breaker

AF39 Operator shall:

- Advise the Supervisor/Area Manager of item above

- If not successful, isolate the Transformer for maintenance men to work on the equipment. See explanation.

4. Explanation

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

- Transformer differential lockout relay-86T

- Transformer Bucloltz 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 through 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 station 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. 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 on, a permanent ground switches a PC 14 to close the ground switch is not required.

The station has two 161Kv buses. The main 'A' bus provides the normal points of supply to all circuits such as AF1L, AF2L , AP3AF and AP4AF lines, 39T1 and 39T2 transformers. The 'D' bus provides the necessary by-pass route.

5. Approval

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Director, Technical Services