TD-OP-0011

GRIDCo

OPERATING PROCEDURE FOR DUNKWA SUBSTATION

GHANA GRID COMPANY LTD

TECHNICAL DIRECTIVES

Title:	**OPERATING PROCEDURE FOR DUNKWA SUBSTATION (DI1)**		
Issued To:	Director, System Operations Director, SNS Manager, SCC Manager, Dispatch Operations Area Manager, Kumasi Operating Staff, Kumasi Area Maintenance Staff, Kumasi Area Dispatch Staff, SCC	**Number:**	TD-OP-0011
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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 D11 Substation to service for planned and auto outages.

2. Scope

The directive will be used by Operators at Kumasi Operating Area and System Control Center (SCC) for operation of equipment at D11 Substation.

3. Procedure

3.1. To take D1BS line out of service

SCC shall carry out (or advise the D11 Operator to carry out) the following:

- Verify opened 11D1BS-S bypass disconnect switch
- Open 11D1BS breaker

SCC shall carry out (or advise the BS30 Operator to carry out) the following:

- Open 30L1A and 30L1L2 breakers
- Check for no potential on D1BS line

3.2. To take out, isolate and de-energize D1BS line for work

- D11 Operator shall request for Station Guarantee from BS30

SCC shall carry out (or advise the D11 Operator to carry out) the following:

- Checked opened 11D1BS-S bypass disconnect switch and turn off its 125Vdc supply
- Open 11D1BS breaker

SCC shall carry out (or advise BS30 operator to carry out) the following:

- Open 30L1A and 30L1L2 breakers
- Check for no potential on D1BS line

SCC shall advise the D11 Operator to carry out the following:

- Open 11D1BS-L1 and turn off its 125Vdc supply
- Close 11D1BS-G ground disconnect switch

SCC shall advise BS30 Operator to carry out the following:

- Open 30L1A-L1 and 30L1L2-L1 disconnect switches and turn off its 125Vdc supply

- Close 30D1BS-G ground disconnect switch

3.3. To restore D1BS line to service after work

3.3.1. Prepare D1BS line for restoration:

D1BS 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 D1BS line

SCC shall advise BS30 Operator to carry out the following:

- Check opened 30L1A and 30L1L2 breakers

- Open 30D1BS-G ground disconnect switch

- Turn on 125Vdc supply and close 30L1A-L1 and 30L1L2-L1 disconnect switches

SCC shall advise D11 Operator to carry out the following:

- Check opened 11D1BS-S bypass disconnect switch and turn on its 125Vdc supply

- Check opened 11D1BS breaker

- Open 11D1BS-G ground disconnect switch

- Turn on 125Vdc supply and close 11D1BS-L1 disconnect switch

3.3.2. Restoration of D1BS line to service:

SCC shall:

- Advise the D11 and BS30 Operators of readiness to restore D1BS line to service

- Close (or advise the BS30 Operator to close) 30L1A and 30L1L2 breakers

- Close (or advise the D11 Operator to close) 11D1BS breaker

3.4. To restore D1BS line to service after automatic outage

If D1BS line trips auto due to fault:

D11 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 D11 Operator to energize) the line **ONCE** by closing 11D1BS breaker
- Close (or advise the BS30 Operator to close) 30L1A and 30L1L2 breakers

D11 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 NB2D line out of service

SCC shall carry out (or advise the D11 Operator to carry out) the following:

- Verify opened 11NB2D-S bypass disconnect switch
- Open 11NB2D breaker

SCC shall carry out (or advise the NB21 Operator to carry out) the following:

- Open 21L2L5 and 21A1L2 breakers
- Check for no potential on NB2D line

3.6. To take, isolate and de-energize NB2D line for work

- D11 Operator shall request for Station Guarantee from NB21

SCC shall carry out (or advise the D11 Operator to carry out) the following:

- Check opened 11NB2D-S bypass disconnect switch and turn off its

125Vdc supply

- Open 11NB2D breaker

SCC shall carry out (or advise the NB21 Operator to carry out) the following:

- Open 21L2L5 and 21A1L2 breakers

- Check for no potential on NB2D line

SCC shall advise NB21 Operator to carry out the following:

- Open 21L2L5-L2 and 21A1L2-L2 disconnect switches and turn off its 125Vdc supply

- Close 21NB2D-G ground disconnect switch

SCC shall advise D11 Operator to carry out the following:

- Open 11NB2D-L2 and turn off its 125Vdc supply

- Close 11NB2D-G ground disconnect switch

3.7. To restore NB2D line to service after work

3.7.1. Prepare NB2D line for restoration:

D11 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 NB2D line

SCC shall advise NB21 Operator to carry out the following:

- Check opened 21L2L5 and 21A1L2 breakers

- Open 21NB2D-G ground disconnect switch

- Turn on 125Vdc supply and close 21L2L5-L2 and 21A1L2-L2 disconnect switches

SCC shall advise D11 Operator to carry out the following:

- Check opened 11D1BS-S bypass disconnect switch and turn on its 125Vdc supply

- Check opened 11NB2D breaker

- Open 11NB2D-G ground disconnect switch

- Turn on 125Vdc supply and close 11NB2D-L2 disconnect switch

3.7.2. Restoration of NB2D line to service:

SCC shall:

- Advise the D11 and NB21 Operators of readiness to restore NB2D line to service
- Close (or advise the NB21 Operator to close) 21L2L5 and 21A1L2 breakers
- Close (or advise the D11 Operator to close) 11NB2D breaker

3.8. To restore NB2D line to service after automatic outage

If NB2D line trips auto due to fault:

D11 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 NB21 Operator to energize) the line **ONCE** by closing 21L2L5 and 21A1L2 breakers
- Close (or advise the D11 Operator to close) 11NB2D breaker

D11 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 D3AR line out of service

SCC shall carry out (or advise the D11 Operator to carry out) the following:

- Verify opened 11D3AR-S bypass disconnect switch
- Open 11D3AR breaker

SCC shall carry out (or advise the AR57 Operator to carry out) the following:

- Open 57L3A breaker
- Check for no potential on D3AR line

3.10. To take, isolate and de-energize D3AR line for work

- D11 Operator shall request for Station Guarantee from AR57

SCC shall carry out (or advise the D11 Operator to carry out) the following:

- Check opened 11D3AR-S bypass disconnect switch and turn off its 125Vdc supply
- Open 11D3AR breaker

SCC shall carry out (or advise the AR57 Operator to carry out) the following:

- Open 57L3A breaker
- Check for no potential on D3AR line

SCC shall advise AR57 Operator to carry out the following:

- Open 57L3A-L3 and turn off its 125Vdc supply
- Close 57D3AR-G ground disconnect switch

SCC shall advise D11 Operator to carry out the following:

- Open 11D3AR-L3 and turn off its 125Vdc supply
- Close 11D3AR-G ground disconnect switch

3.11. To restore D3AR line to service after work

3.11.1. Prepare D3AR line for restoration:

D11 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 D3AR line

SCC shall advise AR57 Operator to carry out the following:

- Check opened 57L3A breaker

- Open 57D3AR-G ground disconnect switch

- Turn on 125Vdc supply and close 57L3A-L3 disconnect switch

SCC shall advise D11 Operator to carry out the following:

- Check opened 11D3AR-S bypass disconnect switch and turn on its 125Vdc supply

- Check opened 11D3AR breaker

- Open 11D3AR-G ground disconnect switch

- Turn on 125Vdc supply and close 11D3AR-L3 disconnect switch

3.11.2. Restoration of D3AR line to service:

SCC shall:

- Advise the D11 and AR57 Operators of readiness to restore D1BS line to service

- Close (or advise the D11 Operator to close) 11D3AR breaker

- Close (or advise the AR57 Operator to close) 57L3A breaker

3.12. To restore D3AR line to service after automatic outage

If D3AR line 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 D11 Operator to energize) the line **ONCE** by closing 11D3AR breaker

- Close (or advise the AR57 Operator to close) 57L3A breaker

D11 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 11T1 Transformer for work

- D11 Operator shall request Station Guarantee from customer on 11F1 Feeder

SCC shall advise D11 Operator to carry out the following:

- Inform customers about readiness to take off 11T1 bank
- Request customers on 11T1 Bank to take off their load
- Transfer Station Service supply from AC1 to AC2, if station service is on 11T1
- Open AC1 Contactor/MCB to take off supply to 11T1 transformer auxiliaries

SCC shall carry out (or advise D11 Operator to carry out) the following:

- Open 11T1F1 breaker
- Open 11AT1 breaker
- Check for no potential on 11T1 Bank

SCC shall advise D11 Operator to carry out the following:

- Open 11AT1-A disconnect switch and turn off its 125Vdc supply
- Open 11T1F1-F1 disconnect switch

3.14. To restore 11T1 Bank to service after work

3.14.1. Prepare 11T1 Bank for restoration:

D11 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 11T1 Bank and temporary grounds removed
- Close 11T1F1-F1 disconnect switch
- Turn on 125Vdc supply and close 11AT1-A disconnect switch
- Advise SCC of readiness to restore 11T1 Bank to service

3.14.2. Restoration of 11T1 Transformer to service:

- SCC shall close (or advise D11 Operator to close) the 11AT1 breaker
- D11 Operator shall advise Customers of readiness to restore 11T1 Bank to service
- SCC shall close (or advise D11 Operator to close) the 11T1F1 feeder breaker

3.15. To restore 11T1 Bank to service after automatic outage

If 11T1 bank trips auto due to fault:

D11 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 D11 Operator to energize) the transformer **ONCE** by closing 11AT1 breaker

D11 Operator shall advise Customers of readiness to restore 11F1 feeder to service

SCC shall close (or advise the D11 Operator to close) 11T1F1 breaker

D11 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.

3.16. To isolate 11T1F1 Breaker for work

- D11 Operator shall request for Station Guarantee from Customer on 11F1 feeder

SCC shall advise D11 Operator to carry out the following:

- Inform Customer about readiness to take off 11T1 bank

- Request Customer on 11T1 Bank to take of their load

- Transfer Station Service supply from AC1 to AC2, if station service is on 11T1

- Open AC1 Contactor/MCB to take off supply to 11T1 transformer auxiliaries

SCC shall carry out (or advise D11 Operator to carry out) the following:

- Open 11T1F1 breaker

SCC shall advise D11 Operator to carry out the following:

- Open 11AT1-A disconnect switch and turn off its 125Vdc supply

- Open 11T1F1-F1 disconnect switch

- Check for no potential on 11T1 Bank

3.17. To restore 11T1F1 Breaker to service after work

3.17.1. Prepare 11T1F1 breaker for restoration:

D11 Operator shall:

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

- Check for no potential on 11T1 Bank and temporary grounds removed

- Turn on 125Vdc supply and close 11T1F1-F1 disconnect switch

- Turn on 125Vdc supply and close 11AT1-A disconnect switch

- Advise SCC of readiness to restore 11T1F1 breaker to service

3.17.2. Restoration of 11T1F1 Feeder breaker to service:

- SCC shall close (or advise the D11 Operator to close) 11AT1 breaker

- D11 Operator shall advise Customer of readiness to restore 11F1 feeder to service

- SCC shall close (or advise D11 Operator to close) 11T1F1 breaker

3.18. To isolate 11T2 Transformer for work

- D11 Operator shall request for Station Guarantee from Customer on 11F2 Feeder

SCC shall advise D11 Operator to carry out the following:

- Inform Customer about readiness to take off 11T2 bank
- Request Customer on 11T2 Bank to take off their load
- Transfer Station Service supply from AC2 to AC1, if station service is on 11T2
- Open AC2 Contactor/MCB to take off supply to 11T2 transformer auxiliaries

SCC shall carry out (or advise D11 Operator to carry out) the following:

- Open 11T2F2 breaker
- Open 11AT2 breaker
- Check for no potential on 11T2 Bank

SCC shall advise D11 Operator to carry out the following:

- Open 11AT2-A disconnect switch and turn off its 125Vdc supply
- Open 11T2F2-F2 disconnect switch

3.19. To restore 11T2 Bank to service after work

3.19.1. Prepare 11T2 Bank for restoration:

D11 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 11T2 Bank and temporary grounds removed
- Close 11T2F2-F2 disconnect switch
- Turn on 125Vdc and close 11AT2-A disconnect switch
- Advise SCC of readiness to restore 11T2 Bank to service

3.19.2. Restoration of 11T2 bank to service:

- SCC shall close (or advise D11 Operator to close) the 11AT2 breaker
- D11 Operator shall advise Customer of readiness to restore 11T2 Bank to service
- SCC shall close (or advise D11 Operator to close) the 11T2F2 feeder

breaker

3.20. To restore 11T2 Bank to service after automatic outage

If 11T2 bank trips auto due to fault:

D11 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 D11 Operator to energize) the transformer ONCE by closing 11AT2 breaker

D11 Operator shall advise Customer of readiness to restore 11F2 feeder to service

SCC shall close (or advise the D11 Operator to close) 11T2F2 breaker

D11 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 (Refer to **4. Explanation**).

3.21. To isolate 11T2F2 Breaker for work

- D11 Operator shall request for Station Guarantee from Customer on 11F2 feeder

SCC shall advise D11 Operator to carry out the following:

- Inform Customer about readiness to take off 11T2 bank
- Request Customer on 11T2 Bank to take off their load
- Transfer Station Service supply from AC2 to AC1, if station service is on 11T2
- Open AC2 Contactor/MCB to take off supply to 11T2 transformer auxiliaries

SCC shall carry out (or advise D11 Operator to carry out) the following:

- Open 11T2F2 breaker
- Open 11AT2 breaker

SCC shall advise D11 Operator to carry out the following:

- Open 11AT2-A disconnect switch and turn off its 125Vdc supply
- Open 11T2F2-F2 disconnect switch
- Check for no potential on 11T2 Bank

3.22. To restore 11T2F2 Breaker to service after work

3.22.1. Prepare 11T2F2 breaker for restoration:

D11 Operator shall:

- Advise SCC when work on the feeder breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 11T2 Bank and temporary grounds removed
- Close 11T2F2-F2 disconnect switch
- Turn on 125Vdc and close 11AT2-A disconnect switch
- Advise SCC of readiness to restore 11T2F2 breaker to service

3.22.2. Restoration of 11T2F2 Feeder breaker to service:

- SCC shall close (or advise the D11 Operator to close) 11AT2 breaker
- D11 Operator shall advise Customer of readiness to restore 11F2 feeder to service
- SCC shall close (or advise D11 Operator to close) 11T2F2 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 on a permanent ground switch, a PC 14 to close the ground switch is not required.

The station is only one 161Kv bus arrangement. The main 'A' bus provides the normal points of supply to all circuits/equipment such as D1BS, NB2D (and D3AR lines, 11T1 and 11T2 transformers.

5. Approval

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Director, Technical Services