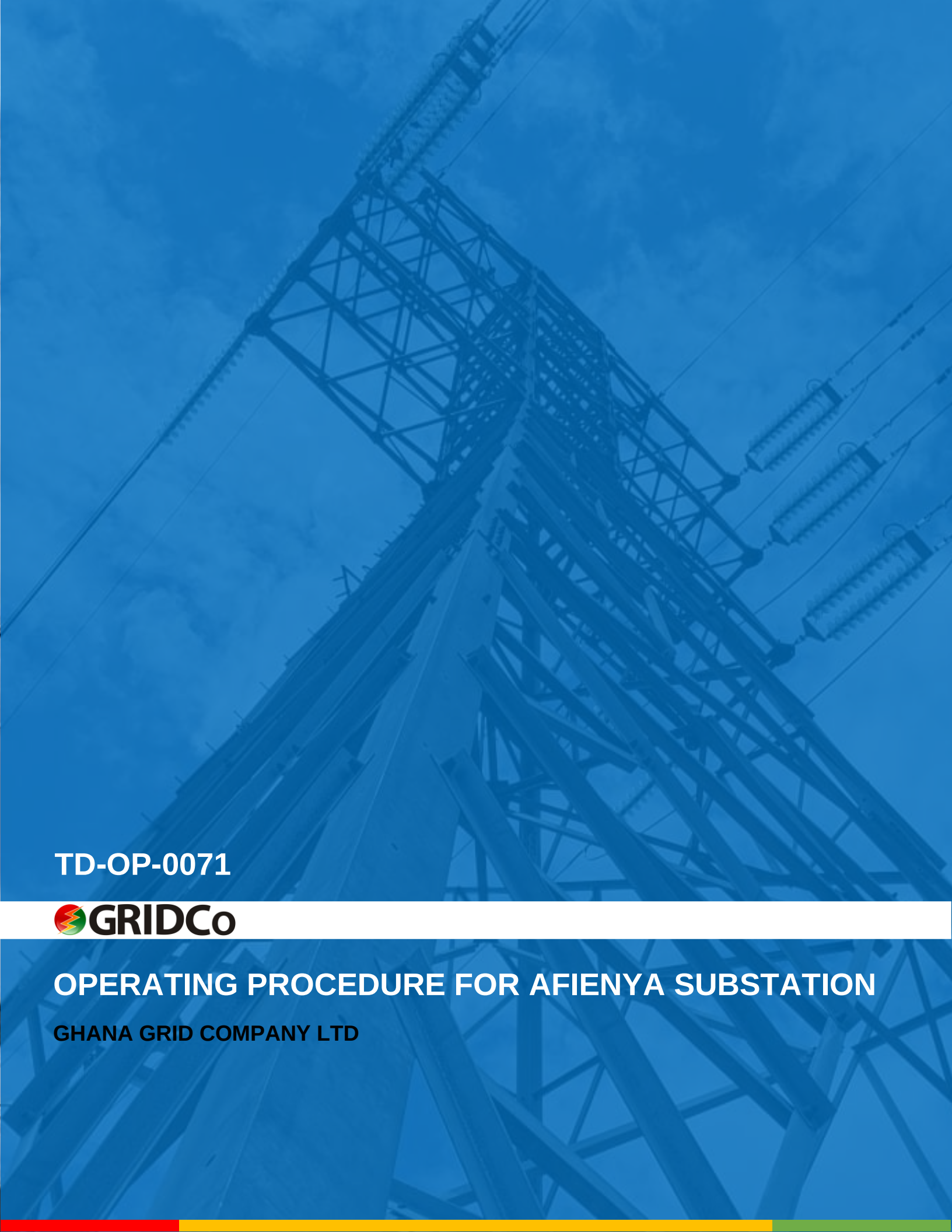

TD-OP-0071

GRIDCo

OPERATING PROCEDURE FOR AFIENYA SUBSTATION

GHANA GRID COMPANY LTD

TECHNICAL DIRECTIVES

Title:	**OPERATING PROCEDURE FOR AFIENYA SUBSTATION (AA71)**		
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-0071
		Subject Area:	Operating
		Issue Date:	Trial
		Origin:	Technical Services
Key Words:	Take Out, Isolate, Prepare, Energize, Restore, Automatic Outage		

Contents

TECHNICAL DIRECTIVES

1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at AA71 Substation to service for planned and auto outages.

2. Scope

Operators at Tema Operating Area and System Control Center (SCC) will use the directive for operation of equipment at AA71 Substation.

3. Procedure

3.1. To take A1AA line out of service

SCC shall carry out (or advise the AA71 Operator to carry out) the following:

- Open 71L1A1 and 71L1L2 breakers

SCC shall carry out (or advise the A1 Operator to carry out) the following:

- Open 1DL1 and 1T1L1 breakers
- Check for no potential on A1AA line

3.2. To take out, isolate and de-energize A1AA line for work

- AA71 Operator shall request for Station Guarantee from A1

SCC shall carry out (or advise the AA71 Operator to carry out) the following:

- Open 71L1A1 and 71L1L2 breakers

SCC shall carry out (or advise the A1 Operator to carry out) the following:

- Open 1DL1 and 1T1L1 breakers
- Check for no potential on A1AA line

SCC shall advise A1 Operator to carry out the following:

- Open 1DL1-L1 and 1T1L1-L1disconnect switches and turn off 125Vdc supply
- Close 1A1AA-G ground disconnect switch

SCC shall advise AA71 Operator to carry out the following:

- Open 71L1A1-L1 and 71L1L2-L1 disconnect switches and turn off 125Vdc supply
- Close 71A1AA-G ground disconnect switch

3.3. To restore A1AA line to service after work

3.3.1. Prepare A1AA line for restoration

AA71 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 A1AA line

SCC shall advise A1 Operator to carry out the following

- Check opened 1DL1 and 1T1L1 breakers
- Open 1A1AA-G ground disconnect switch
- Turn on 125Vdc supply and close 1DL1-L1 and 1T1L1-L1 disconnect switches

SCC shall advise AA71 Operator to carry out the following:

- Check opened 71L1A1 and 71L1L2 breakers
- Open 71A1AA-G ground disconnect switch
- Turn on 125Vdc supply and close 71L1A1-L1 and 71L1L2-L1 disconnect switches

3.3.2. Restoration of A1AA line to service:

SCC shall:

- Advise the AA71 and A1 Operators of readiness to restore A1AA line to service
- Close (or advise the A1 Operator to close) 1DL1 and 1T1L1 breakers
- Close (or advise the AA71 Operator to close) 71L1A1 and 71L1L2 breakers

3.4. To restore A1AA line to service after automatic outage

If A1AA line trips auto due to fault:

AA71 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 A1 Operator to energize) the line **ONCE** by closing 1DL1 and 1T1L1 breakers
- Close (or advise the AA71 Operator to close) 71L1A1 and 71L1L2 breakers

AA71 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 AA3H line out of service

SCC shall carry out (or advise the AA71 Operator to carry out) the following:

- Open 71L1L3 and 71L3A2 breakers

SCC shall carry out (or advise the H5 Operator to carry out) the following:

- Open 5L3A and 5L3T6 breakers
- Check for no potential on AA3H line

3.6. To take out, isolate and de-energize AA3H line for work

- AA71 Operator shall request for Station Guarantee from H5

SCC shall carry out (or advise the AA71 Operator to carry out) the following:

- Open 71L1L3 and 71L3A2 breakers

SCC shall carry out (or advise the H5 Operator to carry out) the following:

- Open 5L3A and 5L3T6 breakers
- Check for no potential on AA3H line

SCC shall advise H5 Operator to carry out the following:

- Open 5L3A-L3 and 5L3T6-L3 disconnect switches and turn off its 125Vdc supply
- Close 5AA3H-G ground disconnect switch

SCC shall advise AA71 Operator to carry out the following:

- Open 71L1L3-L3 and 71L3A2-L3 disconnect switches and turn off its 125Vdc supply
- Close 71AA3H-G ground disconnect switch

3.7. To restore AA3H line to service after work

3.7.1. Prepare AA3H line for restoration

AA71 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 AA3H line

SCC shall advise H5 Operator to carry out the following

- Check opened 5L3A and 5L3T6 breakers
- Open 5AA3H-G ground disconnect switch
- Turn on 125Vdc supply and close 5L3A-L3 and 5L3T6-L3 disconnect switches

SCC shall advise AA71 Operator to carry out the following:

- Check opened 71L3A2 and 71L1L3 breakers
- Open 71AA3H-G ground disconnect switch

- Turn on 125Vdc supply and close 71L1L3-L3 and 71L3A2-L3 disconnect switches

3.7.2. Restoration of AA3H line to service:

SCC shall:

- Advise the AA71 and H5 Operators of readiness to restore AA3H line to service
- Close (or advise the H5 Operator to close) 5L3A and 5L3T6 breakers
- Close (or advise the AA71 Operator to close) 71L1L3 and 71L3A2 breakers

3.8. To restore AA3H line to service after automatic outage

If AA3H line trips auto due to fault:

AA71 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 H5 Operator to energize) the line **ONCE** by closing 5L3A and 5L3T6 breakers
- Close (or advise the AA71 Operator to close) 71L1L3 and 71L3A2 breakers

AA71 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. Isolate 71T1 Transformer for work

AA71 Operator shall request for Station Guarantee from Customer on 71F1 and 71F2 Feeders

SCC shall advise AA71 operator to carry out the following:

- Inform Customer about readiness to take off 71T1 bank
- Request Customer on 71T1 Bank to take off their load
- Transfer Station Service from AC1 to AC2, if Station Service is on 71T1
- Open AC1 Contactor/MCB to take off supply to 71T1 transformer auxiliaries

SCC shall carry out (or advise AA71 operator to carry out) the following:

- Open 71Y1F1 and 71Y1F2 breakers
- Open 71L1A1 and 71A1A2 breakers
- Check for no potential on 71T1 Bank

SCC shall advise AA71 operator to carry out the following:

- Open 71A1-T1 disconnect switch and turn off 125Vdc supply
- Open 71Y1F1-Y1 and 71Y1F2-Y1 disconnect switches
- Open AC control MCB to 71T1 auxiliaries and tag
- Open 125Vdc MCB to 71T1 primary and secondary protection and tag with PC13

3.10. To restore 71T1 Bank to service after work

3.10.1. Prepare 71T1 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 71T1 Bank and temporary grounds removed
- Check opened 71L1A1 and 71A1A2 breakers

- Check opened 71Y1F1 and 71Y1F2 breakers
- Close 71A1-T1 disconnect switch
- Turn on 125Vdc supply and close 71Y1F1-Y1 and 71Y1F2-Y1 disconnect switches
- Close AC control MCB to 71T1 auxiliaries and remove tag
- Close 125Vdc MCB to 71T1 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 71T1 Bank to service

3.10.2. Restoration of 71T1 bank to service:

- SCC shall close (or advise AA71 operator to close) 71L1A1 and 71A1A2 breakers
- AA71 Operator shall advise Customer of readiness to restore 71T1 Bank to service
- SCC shall close (or advise AA71 operator to close) the 71Y1F1 and 71Y1F2 breakers

3.11. Restore 71T1 Bank to service after automatic outage

If 71T1 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 AA71 Operator to energize) the bank **ONCE** by closing 71L1A1 and 71A1A2 breakers

AA71 Operator shall advise Customer of readiness to restore 71F1 and 71F2 feeder to service

SCC shall close (or advise AA71 Operator to close) 71Y1F1 and 71Y1F2 breakers

AA71 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.

3.11.1. Isolate 71T2 Transformer for work

AA71 Operator shall request for Station Guarantee from Customer on 71F3 and 71F4 Feeders

SCC shall advise AA71 operator to carry out the following:

- Inform Customer about readiness to take off 71T2 bank

- Request Customer on 71T2 Bank to take off their load

- Transfer Station Service from AC2 to AC1, if Station Service is on 71T2 bank

- Open AC2 Contactor/MCB to take off supply to 71T2 transformer auxiliaries

SCC shall carry out (or advise AA71 operator to carry out) the following:

- Open 71Y2F3 and 71Y2F4 breakers

- Open 71L3A2 and 71A1A2 breakers

- Check for no potential on 71T2 Bank

SCC shall advise AA71 operator to carry out the following:

- Open 71A2-T2 disconnect switch and turn off 125Vdc supply

- Open 71Y2F3-Y2 and 71Y2F4-Y2 disconnect switches

- Open AC control MCB to 71T2 auxiliaries and tag

- Open 125Vdc MCB to 71T2 primary and secondary protection and tag with PC13

3.12. To restore 71T2 Bank to service after work

3.12.1. Prepare 71T2 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 71T2 Bank and temporary grounds removed

- Check opened 71L3A2 and 71A1A2 breakers

- Check opened 71Y2F3 and 71Y2F4 breakers

- Turn on 125Vdc and close 71A2-T2 disconnect switch

- Turn on 125Vdc supply and close 71Y2F3-Y2 and 71Y2F4-Y2 disconnect switches

- Close AC control MCB to 71T2 auxiliaries and remove tag

- Close 125Vdc MCB to 71T2 primary and secondary protection and remove PC13 tag

- Advise SCC of readiness to restore 71T2 Bank to service

3.12.2. Restoration of 71T2 bank to service:

- SCC shall close (or advise AA71 operator to close) 71L3A2 and 71A1A2 breakers

- AA71 Operator shall advise Customer of readiness to restore 71T2 Bank to service

- SCC shall close (or advise AA71 operator to close) the 71Y2F3 and 71Y2F4 breakers

3.13. Restore 71T2 Bank to service after automatic outage

If 71T2 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 AA71 Operator to energize) the bank **ONCE** by closing 71L3A2 breaker

AA71 Operator shall advise Customer of readiness to restore 71F3 and 71F4 feeder to service

SCC shall close (or advise AA71 Operator to close) 71Y2F3 and 71Y2F4 breakers

AA71 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.

3.14. To Isolate 71Y1F1 Breaker for work

- AA71 Operator shall request for Station Guarantee from Customer on 71F1 Feeder

SCC shall advise AA71 Operator to carry out the following:

- Inform Customer about readiness to take off 71T1 bank

- Request Customer on 71T1 Bank to take off their load

- Transfer station service supply from AC1 to AC2, if Station Service is on 71T1 bank

SCC shall carry out (or advise AA71 Operator to carry out) the following:

- Open 71Y1F1 breaker

- Open 71L1A1 and 71A1A2 breakers

SCC shall advise AA71 Operator to carry out the following:

- Open 71Y1F1-F1 and 71Y1F1-Y1 disconnect switches and turn off its 125Vdc supply

3.15. To restore 71Y1F1 Breaker to service after work

3.15.1. Prepare 71Y1F1 breaker for restoration:

AA71 Operator shall:

- Advise SCC when work on the 71Y1F1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 71Y1F1 Breaker and temporary grounds removed

- Turn on 125Vdc supply and close 71Y1F1-F1 and 71Y1F1-Y1 disconnect switches

3.15.2. Restoration of 71Y1F1 Breaker to service:

- SCC shall close (or advise AA71 Operator to close) the 71L1A1 and 71A1A2 breakers

- AA71 Operator shall advise Customer of readiness to restore 71F1 Feeder

- SCC shall close (or advise AA71 Operator to close) the 71Y1F1 and breaker

3.16. To Isolate 71Y1F2 Breaker for work

- AA71 Operator shall request for Station Guarantee from Customer on 71F2 Feeder

SCC shall advise AA71 Operator to carry out the following:

- Inform Customer about readiness to take off 71T1 bank

- Request Customer on 71T1 Bank to take off their load

- Transfer station service supply from AC1 to AC2, if Station Service is on 71T1 bank

SCC shall carry out (or advise AA71 Operator to carry out) the following:

- Open 71Y1F2 breaker

- Open 71L1A1 and 71A1A2 breakers

SCC shall advise AA71 Operator to carry out the following:

- Open 71Y1F2-F2 and 71Y1F2-Y1 disconnect switches and turn off its 125Vdc supply

3.17. To restore 71Y1F2 Breaker to service after work

3.17.1. Prepare 71Y1F2 breaker for restoration:

H5 Operator shall:

- Advise SCC when work on the 71Y1F2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 71Y1F2 Breaker and temporary grounds removed

- Turn on 125Vdc supply and close 71Y1F2-F2 and 71Y1F2-Y1 disconnect switches

3.17.2. Restoration of 71Y1F2 Breaker to service:

- SCC shall close (or advise AA71 Operator to close) the 71L1A1 and 71A1A2 breakers

- AA71 Operator shall advise Customer of readiness to restore 71F2 Feeder

- SCC shall close (or advise AA71 Operator to close) the 71Y1F2 breaker

3.18. To Isolate 71Y2F3 Breaker for work

- AA71 Operator shall request for Station Guarantee from Customer on 71F3 Feeder

SCC shall advise AA71 Operator to carry out the following:

- Inform Customer about readiness to take off 71T2 bank

- Request Customer on 71T2 Bank to take off their load

- Transfer station service supply from AC2 to AC1, if Station Service is on 71T2 bank

SCC shall carry out (or advise AA71 Operator to carry out) the following:

- Open 71Y2F3 breaker

- Open 71L3A2 and 71A1A2 breakers

SCC shall advise AA71 Operator to carry out the following:

- Open 71Y2F3-F3 and 71Y2F3-Y2 disconnect switches and turn off its 125Vdc supply

3.19. To restore 71Y2F3 Breaker to service after work

3.19.1. Prepare 71Y2F3 breaker for restoration:

AA71 Operator shall:

- Advise SCC when work on the 71Y2F3 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 71Y2F3 Breaker and temporary grounds removed

- Turn on 125Vdc supply and close 71Y2F3-F3 and 71Y2F3-Y2 disconnect switches

3.19.2. Restoration of 71Y2F3 Breaker to service:

- SCC shall close (or advise AA71 Operator to close) the 71L3A2 and 71A1A2 breakers

- AA71 Operator shall advise Customer of readiness to restore 71F3 Feeder

- SCC shall close (or advise AA71 Operator to close) the 71Y2F3 breaker

3.20. To Isolate 71Y2F4 Breaker for work

- AA71 Operator shall request for Station Guarantee from Customer on 71F4 Feeder

SCC shall advise AA71 Operator to carry out the following:

- Inform Customer about readiness to take off 71T2 bank

- Request Customer on 71T2 Bank to take off their load

- Transfer station service supply from AC2 to AC1, if Station Service is on 71T2 bank

SCC shall carry out (or advise AA71 Operator to carry out) the following:

- Open 71Y2F4 breaker

- Open 71L3A2 and 71A1A2 breakers

SCC shall advise AA71 Operator to carry out the following:

- Open 71Y2F4-F4 and 71Y2F4-Y2 disconnect switches and turn off its 125Vdc supply

3.21. To restore 71Y2F4 Breaker to service after work

3.21.1. Prepare 71Y2F4 breaker for restoration:

AA71 Operator shall:

- Advise SCC when work on the 71Y2F4 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 71Y2F4 Breaker and temporary grounds removed
- Turn on 125Vdc supply and close 71Y2F4-F4 and 71Y2F4-Y2 disconnect switches

3.21.2. Restoration of 71Y2F4 Breaker to service:

- SCC shall close (or advise AA71 Operator to close) the 71L3A2 and 71A1A2 breakers
- AA71 Operator shall advise Customer of readiness to restore 71F4 Feeder
- SCC shall close (or advise AA71 Operator to close) the 71Y2F4 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.

TECHNICAL DIRECTIVES

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 'A1' and 'A2' bus arrangement in Ring Main configuration that provides the normal points of supply to all circuits such as A1AA

and AA3H lines, 71T1 and 71T2 transformers.

5. Approval

…….

Director, Technical Services