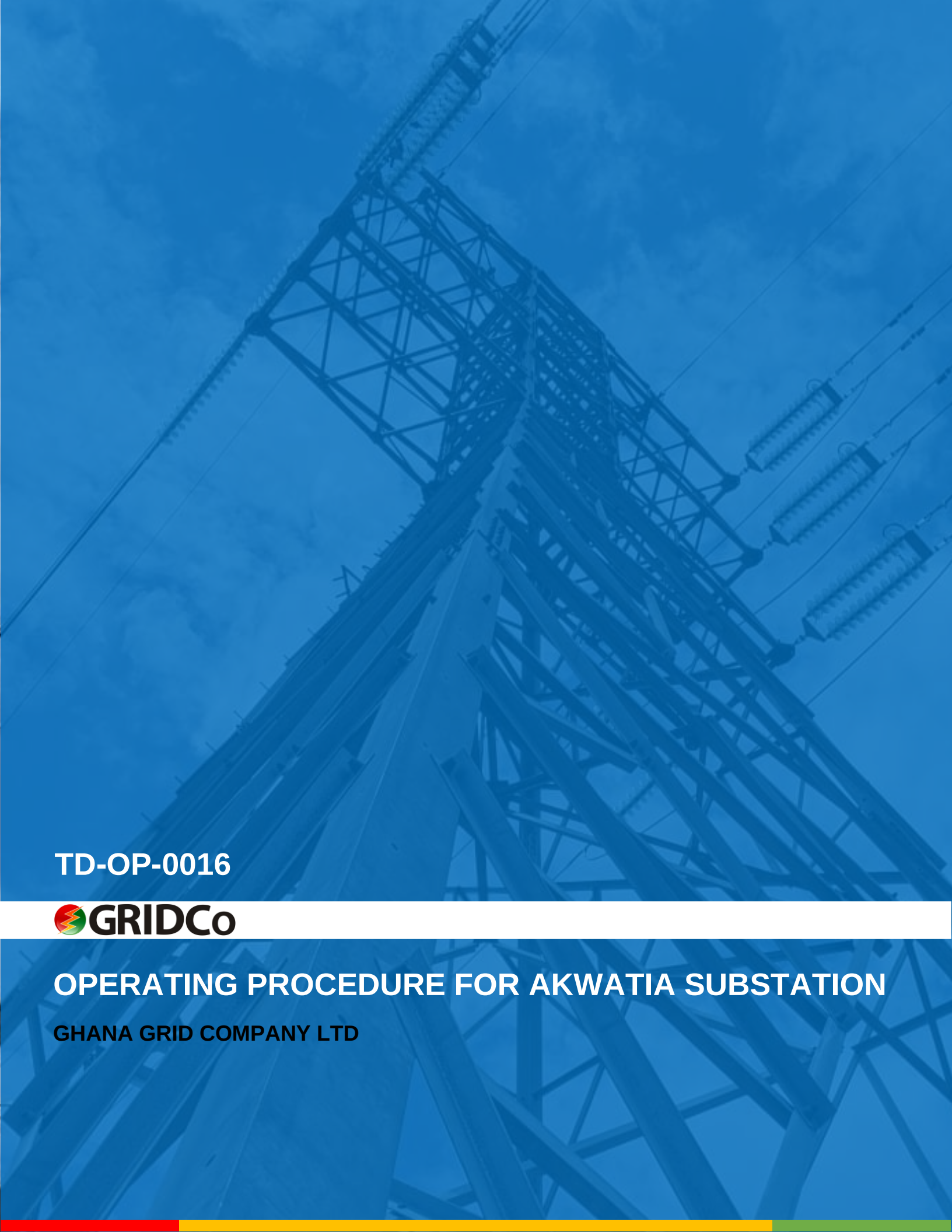

TD-OP-0016

GRIDCo

OPERATING PROCEDURE FOR AKWATIA SUBSTATION

GHANA GRID COMPANY LTD

TECHNICAL DIRECTIVES

Title:	**OPERATING PROCEDURE FOR AKWATIA SUBSTATION (Q16)**		
Issued To:	Director, System Operations Director, SNS Manager, SCC Manager, Dispatch Operations Area Manager, Akosombo Operating Staff, Akosombo Area Maintenance Staff, Akosombo Area Dispatch Staff, SCC	**Number:**	TD-OP-0016
		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 Q16 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 Q16 Substation.

3. Procedure

3.1. To take Q1NB line out of service

SCC shall carry out (or advise the Q16 Operator to carry out) the following:

- Open 16Q1NB breaker

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

- Open 21L1L3 and 21L1A3 breakers
- Check for no potential on Q1NB line

3.2. To take out, isolate and de-energize Q1NB line for work

- Q16 Operator shall request for Station Guarantee from NB21

SCC shall carry out (or advise the Q16 Operator to carry out) the following:

- Open 16Q1NB breaker

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

- Open 21L1L3 and 21L1A3 breakers
- Check for no potential on Q1NB line

SCC shall advise the Q16 Operator to carry out the following:

- Open 16Q1NB–L1 disconnect switch and turn off 125Vdc supply
- Close 16Q1NB-G ground disconnect switch

SCC shall advise the NB21 Operator to carry out the following:

- Open 21L1L3-L1 and 21L1A3-L1 disconnect switches and turn off 125Vdc supply

- Close 21Q1NB-G ground disconnect switch

3.3. To restore Q1NB line to service after work

3.3.1. Prepare Q1NB line for restoration:

Q16 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 Q1NB line

SCC shall advise NB21 Operator to carry out the following:

- Check opened 21L1L3 and 21L1A3 breakers

- Open 21Q1NB-G ground disconnect switch

- Turn on 125Vdc supply and close 21L1L3-L1 and 21L1A3-L1 disconnect switches

SCC shall advise Q16 Operator to carry out the following:

- Check opened 16Q1NB breaker

- Open 16Q1NB-G ground disconnect switch

- Turn on 125Vdc supply and close 16Q1NB-L1 disconnect switch

3.3.2. Restoration of Q1NB line to service:

SCC shall:

- Advise the Q16 and NB21 Operators of readiness to restore Q1NB line to service

- Close (or advise NB21 Operator to close) 21L1L3 and 21L1A3 breakers

- Close (or advise Q16 Operator to close) 16Q1NB breaker

3.4. To restore Q1NB line to service after automatic outage

If Q1NB line trips auto due to fault:

Q16 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 Q16 Operator to energize) the line **ONCE** by closing 16Q1NB breaker
- Close (or advise the NB21 Operator to close) 21L1L3 and 21L1A3 breakers

Q16 Operator shall:

- 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 F2Q line out of service

SCC shall carry out (or advise the Q16 Operator to carry out) the following:

- Open 16F2Q breaker

SCC shall carry out (or advise the F15 Operator to carry out) the following:

- Open 15L2L11 and 15DL2 breakers
- Check for no potential on F2Q line

3.6. To take out, isolate and de-energize F2Q line for work

- Q16 Operator shall request for Station Guarantee from F15

SCC shall carry out (or advise the Q16 Operator to carry out) the following:

- Open 16F2Q breaker

SCC shall carry out (or advise the F15 Operator to carry out) the following:

- Open 15L2L11 and 15DL2 breakers

- Check for no potential on F2Q line

SCC shall advise the Q16 Operator to carry out the following:

- Open 16F2Q-L2 disconnect switch and turn off its 125Vdc supply

- Close 16F2Q-G ground disconnect switch

SCC shall advise the F15 Operator to carry out the following:

- Open 15L2L11-L2 and 15DL2-L2 disconnect switches and turn off 125Vdc supply

- Close 15F2Q-G ground disconnect switch

3.7. To restore F2Q line to service after work

3.7.1. Prepare F2Q line for restoration:

Q16 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 F2Q line

SCC shall advise F15 Operator to carry out the following:

- Check opened 15L2L11 and 15DL2 breakers

- Open 15F2Q-G ground disconnect switch

- Turn on 125Vdc supply and close 15L2L11-L2 and 15DL2-L2 disconnect switches

SCC shall advise Q16 Operator to carry out the following:

- Check opened 16F2Q breaker

- Open 16F2Q-G ground disconnect switch

- Turn on 125Vdc supply and close 16F2Q-L2 disconnect switch

3.7.2. Restoration of F2Q line to service:

SCC shall:

- Advise the Q16 and F15 Operators of readiness to restore F2Q line to

service

- Close (or advise F15 Operator to close) 15L2L11 and 15DL2 breakers
- Close (or advise Q16 Operator to close) 16F2Q breaker

3.8. To restore F2Q line to service after automatic outage

If F2Q line trips auto due to fault:

Q16 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 Q16 Operator to energize) the line **ONCE** by closing 16F2Q breaker
- Close (or advise the F15 Operator to close) 15L2L11 and 15DL2 breakers

Q16 Operator shall:

- 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 16T1 Transformer for work

- Q16 Operator shall request Station Guarantee from Customers on 16F1, 16F2 and 16F3 Feeders

SCC shall carry out or advise Q16 Operator to carry out the following:

- Inform Customer about readiness to take off 16T1 Bank
- Request Customer on 16T1 Bank to take off their load
- Transfer Station Service from AC1 to AC2, if Station Service is on 16T1

- Open AC1 Contactor/MCB to take off supply to 16T1 transformer auxiliaries

SCC shall carry out (or advise Q16 Operator to carry out) the following:

- Open 16T1F1 and 16T1F2 breakers

- Open 16AT1-A disconnect switch and turn off its 125Vdc supply

- Check for no potential on 16T1 Bank

SCC shall advise Q16 Operator to carry out the following:

- Open 16T1F1-T1 and 16T1F2-T1 disconnect switches and turn off 125Vdc supply

- Open AC control MCB to 16T1 auxiliaries and tag

- Open 125Vdc MCB to 16T1 primary and secondary protection and tag with PC13

3.10. To restore 16T1 Bank to service after work

3.10.1. Prepare 16T1 Bank to service after work

Q16 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 16T1 Bank and temporary grounds removed

- Turn on 125Vdc and close 16T1F1-T1 and 16T1F2-T1 disconnect switches

- Close AC control MCB to 16T1 auxiliaries and remove tag

- Close 125Vdc MCB to 16T1 primary and secondary protection and remove PC13 tag

- Advise SCC of readiness to restore 16T1 Bank to service

3.10.2. Restoration of 16T1 Bank to service:

- SCC shall close (or advise Q16 Operator to close) 16AT1-A disconnect switch

- Q16 Operator shall advise Customer of readiness to restore 16F1, 16F2 and 16F3 feeders to service

- SCC shall close (or advise Q16 Operator to close) 16T1F1 and 16T1F2 breakers

3.11. To restore 16T1 Bank to service after automatic outage

If 16T1 Bank trips auto due to fault:

Q16 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 Q16 Operator to close) 16Q1NB and 16F2Q breakers

Q16 Operator shall advise Customer of readiness to restore 16T1 Bank to service

SCC shall close (or advise Q16 Operator to close) 16T1F1 and 16T1F2 breakers

Q16 Operator shall:

- Advise the Supervisor/Area Manager 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 16T2 Transformer for work

- Q16 Operator shall request Station Guarantee from Customer on 16F4 feeder

SCC shall carry out or advise Q16 Operator to carry out the following:

- Inform Customer about readiness to take off 16T2 Bank
- Request Customer on 16T2 Bank to take off their load
- Transfer Station Service from AC2 to AC1, if Station Service is on 16T2
- Open AC1 Contactor/MCB to take off supply to 16T2 transformer auxiliaries

SCC shall carry out (or advise Q16 Operator to carry out) the following:

- Open 16T2F4 breaker
- Open 16AT2-A disconnect switch and turn off its 125Vdc supply
- Check for no potential on 16T2 Bank

SCC shall advise Q16 Operator to carry out the following:

- Open 16T2F4-T2 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 16T2 auxiliaries and tag
- Open 125Vdc MCB to 16T2 primary and secondary protection and tag with PC13

3.13. To restore 16T2 Bank to service after work

3.13.1. Prepare 16T2 Bank to service after work

Q16 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 16T2 Bank and temporary grounds removed
- Close 16T2F4-T2 disconnect switch
- Close AC control MCB to 16T2 auxiliaries and remove tag
- Close 125Vdc MCB to 16T2 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 16T2 Bank to service

3.13.2. Restoration of 16T2 Bank to service:

- SCC shall close (or advise Q16 Operator to close) 16AT2-A disconnect switch
- Q16 Operator shall advise Customer of readiness to restore 16F4 feeder to service
- SCC shall close (or advise Q16 Operator to close) 16T2F4 breaker

3.14. To restore 16T2 Bank to service after automatic outage

If 16T2 Bank trips auto due to fault:

Q16 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 Q16 Operator to close) 16Q1NB and 16F2Q breakers

Q16 Operator shall advise Customer of readiness to restore 16T2 Bank to service

SCC shall close (or advise Q16 Operator to close) 16T2F4 breaker

Q16 Operator shall:

- Advise the Supervisor/Area Manager 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 16T1F1 Breaker for work

- Q16 Operator shall request Station Guarantee from Customer on 16F1 feeder

SCC shall carry out or advise Q16 Operator to carry out the following:

- Inform Customer about readiness to take off 16T1 bank
- Request Customer on 16T1 Bank to take off their load
- Transfer Station Service from AC1 to AC2, if Station Service is on 16T1
- Open AC1 Contactor/MCB to take off supply to 16T1 transformer auxiliaries

SCC shall carry out (or advise Q16 Operator to carry out) the following:

- Open 16T1F1 breaker
- Open 16AT1-A disconnect switch and turn off its 125Vdc supply
- Check for no potential on 16T1 bank

SCC shall advise Q16 Operator to carry out the following:

- Open 16T1F1-F1 disconnect switch and turn off its 125Vdc supply

3.16. To restore 16T1F1 breaker to service after work

3.16.1. Prepare 16T1F1 breaker to service after work

Q16 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 16T1 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 16T1F1-F1 disconnect switch
- Advise SCC of readiness to restore 16T1F1 breaker to service

3.16.2. Restoration of 16T1F1 Breaker to service:

- SCC shall close (or advise Q16 Operator to close) 16AT1-A disconnect switch
- Q16 Operator shall advise Customer of readiness to restore 16F1 feeder to service
- SCC shall close (or advise Q16 Operator to close) 16T1F1 breaker

3.17. To isolate 16T1F2 Breaker for work

- Q16 Operator shall request Station Guarantee from Customers on 16F2 and 16F3 feeders

SCC shall carry out or advise Q16 Operator to carry out the following:

- Inform Customer about readiness to take off 16T1 bank
- Request Customer on 16T1 Bank to take off their load
- Transfer Station Service from AC1 to AC2, if Station Service is on 16T1
- Open AC1 Contactor/MCB to take off supply to 16T1 transformer auxiliaries

SCC shall carry out (or advise Q16 Operator to carry out) the following:

- Open 16T1F2 breaker

- Open 16AT1-A disconnect switch and turn off its 125Vdc supply

- Check for no potential on 16T1 bank

SCC shall advise Q16 Operator to carry out the following:

- Open 16T1F2-F2 disconnect switch and turn off its 125Vdc supply

3.18. To restore 16T1F2 breaker to service after work

3.18.1. Prepare 16T1F2 breaker to service after work

Q16 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 16T1 Bank and temporary grounds removed

- Turn on 125Vdc supply and close 16T1F2-F2 disconnect switch

- Advise SCC of readiness to restore 16T1F2 breaker to service

3.18.2. Restoration of 16T1F2 Breaker to service:

- SCC shall close (or advise Q16 Operator to close) 16AT1-A disconnect switch

- Q16 Operator shall advise Customer of readiness to restore 16F2 and 16F3 feeders to service

- SCC shall close (or advise Q16 Operator to close) 16T1F2 breaker

3.19. To isolate 16T2F4 Breaker for work

- Q16 Operator shall request Station Guarantee from Customer on 16F4 feeder

SCC shall carry out or advise Q16 Operator to carry out the following:

- Inform Customer about readiness to take off 16T2 bank

- Request Customer on 16T2 Bank to take off their load

- Transfer Station Service from AC2 to AC1, if Station Service is on 16T2

- Open AC1 Contactor/MCB to take off supply to 16T2 transformer auxiliaries

SCC shall carry out (or advise Q16 Operator to carry out) the following:

- Open 16T2F4 breaker
- Open 16T2-A disconnect switch and turn off 125Vdc supply

SCC shall advise Q16 Operator to carry out the following:

- Open 16T2F4-F4 disconnect switch and turn off its 125Vdc supply

3.20. To restore 16T2F4 breaker to service after work

3.20.1. Prepare 16T2F4 breaker to service after work

Q16 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 16T2 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 16T2F4-F4 disconnect switch
- Advise SCC of readiness to restore 16T2F4 breaker to service

3.20.2. Restoration of 16T2F4 Breaker to service:

- SCC shall close (or advise Q16 Operator to close) 16T2-A disconnect switch
- Q16 Operator shall advise Customer of readiness to restore 16F4 feeder to service
- SCC shall close (or advise Q16 Operator to close) 16T2F4 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 16kV 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 161kV bus arrangement. The main 'A' bus provides the normal points of supply to all circuits/equipment such as Q1NB and F2Q lines, 16T1 and 16T2 transformers.

5. Approval

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Director, Technical Services