TD-OP-0017

GRIDCo

OPERATING PROCEDURE FOR OLD KPONG SUBSTATION

GHANA GRID COMPANY LTD

Title:	**OPERATING PROCEDURE FOR OLD KPONG SUBSTATION (G17)**		
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-0017
		Subject Area:	Operating
		Issue Date:	Trial
		Origin:	Technical Services
Key Words:	Take Out, Isolate, Prepare, Energize, Restore, Automatic Outage		

TECHNICAL DIRECTIVES

Contents

TECHNICAL DIRECTIVES

1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at G17 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 G17 Substation.

3. Procedure

3.1. To take A4G line out of service

SCC shall carry out (or advise the G17 Operator to carry out) the following:

- Open 17A4G breaker

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

- Open 1DL4 and 1T4L4 breakers
- Check for no potential on A4G line

3.2. To take out, isolate and de-energize A4G line for work

- G17 Operator shall request for Station Guarantee from A1

SCC shall carry out (or advise the G17 Operator to carry out) the following:

- Open 17A4G breaker

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

- Open 1DL4 and 1T4L4 breakers
- Check for no potential on A4G line

SCC shall advise A1 Operator to carry out the following:

- Open 1DL4-L4 and 1T4L4-L4 disconnect switches and turn off 125Vdc supply
- Close 1A4G-G ground disconnect switch

SCC shall advise G17 Operator to carry out the following:

- Open 17A4G-L4 disconnect switch and turn off 125Vdc supply
- Close 17A4G-G ground disconnect switch

3.3. To restore A4G line to service after work

3.3.1. Prepare A4G line for restoration

G17 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 A4G line

SCC shall advise A1 Operator to carry out the following

- Check opened 1DL4 and 1T4L4 breakers
- Open 1A4G-G ground disconnect switch
- Turn on 125Vdc supply and close 1DL4-L4 and 1T4L4-L4 disconnect switches

SCC shall advise G17 Operator to carry out the following:

- Check opened 17A4G breaker
- Open 17A4G-G ground disconnect switch
- Turn on 125Vdc supply and close 17A4G-L4 disconnect switches

3.3.2. Restoration of A4G line to service:

SCC shall:

- Advise the G17 and A1 Operators of readiness to restore A4G line to service
- Close (or advise the A1 Operator to close) 1DL4 and 1T4L4 breakers
- Close (or advise the G17 Operator to close) 17A4G breaker

3.4. To restore A4G line to service after automatic outage

If A4G line trips auto due to fault:

G17 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 1DL4 and 1T4L4 breakers
- Close (or advise the G17 Operator to close) 17A4G breaker

G17 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 G25V line out of service

SCC shall carry out (or advise the G17 Operator to carry out) the following:

- Open 17G25V breaker

SCC shall carry out (or advise the V2 Operator to carry out) the following:

- Open 2L25A and 2L25L14 breakers
- Check for no potential on G25V line

3.6. To take out, isolate and de-energize G25V line for work

- G17 Operator shall request for Station Guarantee from V2

SCC shall carry out (or advise the G17 Operator to carry out) the following:

- Open 17G25V breaker

SCC shall carry out (or advise the V2 Operator to carry out) the following:

- Open 2L25A and 2L25L14 breakers

- Check for no potential on G25V line

SCC shall advise V2 Operator to carry out the following:

- Open 2L25A-L25 and 2L25L14-L25 disconnect switches and turn off 125Vdc supply

- Close 2G25V-G ground disconnect switch

SCC shall advise G17 Operator to carry out the following:

- Open 17G25V-L25 disconnect switch and turn off its 125Vdc supply

- Close 17G25V-G ground disconnect switch

3.7. To restore G25V line to service after work

3.7.1. Prepare G25V line for restoration

G17 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 G25V line

SCC shall advise V2 Operator to carry out the following

- Check opened 2L25A and 2L25L14 breakers

- Open 2G25V-G ground disconnect switch

- Turn on 125Vdc supply and close 2L25A-L25 and 2L25L14-L25 disconnect switches

SCC shall advise G17 Operator to carry out the following:

- Check opened 17G25V breaker

- Open 17G25V-G ground disconnect switch

- Turn on 125Vdc supply and close 17G25V-L25 disconnect switches

3.7.2. Restoration of G25V line to service:

SCC shall:

- Advise the G17 and V2 Operators of readiness to restore G25V line to service
- Close (or advise the V2 Operator to close) 2L25A and 2L25L14 breakers
- Close (or advise the G17 Operator to close) 17G25V breaker

3.8. To restore G25V line to service after automatic outage

If G25V line trips auto due to fault:

G17 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 V2 Operator to energize) the line **ONCE** by closing 2L25A and 2L25L14 breakers
- Close (or advise the G17 Operator to close) 17G25V breaker

G17 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 17T1 Transformer for work

G17 Operator shall request for a brief outage from customers on 17F1 and 17F3 feeders

SCC shall advise G17 Operator to carry out the following:

- Inform Customer about readiness to take off 17T1 bank
- Request Customer on 17T1 Bank to take off their load
- Transfer Station Service from AC1 to AC2, if Station Service is on 17T1 bank
- Open AC1 Contactor/MCB to take off supply to 17T1 transformer auxiliaries

SCC shall carry out (or advise G17 Operator to carry out) the following:

- Check opened 17Y1Y2 breaker
- Open 17F1Y1 and 17Y1F3 breakers
- Open 17T1Y1 breaker
- Open 17AT1 breaker
- Check for no potential on 17T1 Bank

SCC shall advise G17 Operator to carry out the following:

- Open 17AT1-A disconnect switch and turn off 125Vdc supply
- Open 17T1Y1-Y1 disconnect switch
- Open AC control MCB to 17T1 auxiliaries and tag
- Open 125Vdc MCB to 17T1 primary and secondary protection and tag with PC13

3.10. To restore 17T1 Bank to service after work

3.10.1. Prepare 17T1 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 17T1 Bank and temporary grounds removed
- Check opened 17Y1F1 and 17Y1F3 breakers
- Check opened 17T1Y1 breaker
- Check opened 17Y1Y2 breaker

- Check opened 17AT1 breaker
- Turn on 125Vdc supply and close 17AT1-A disconnect switch
- Turn on 125Vdc supply and close 17T1Y1-Y1 disconnect switch
- Close AC control MCB to 17T1 auxiliaries and remove tag
- Close 125Vdc MCB to 17T1 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 17T1 Bank to service

3.10.2. Restoration of 17T1 bank to service:

- SCC shall close (or advise G17 Operator to close) 17AT1 breaker
- G17 Operator shall advise Customer of readiness to restore 17T1 Bank to service
- SCC shall close (or advise G17 Operator to close) the 17T1Y1, 17F1Y1 and 17Y1F3 breakers

3.11. Restore 17T1 Bank to service after automatic outage

If 17T1 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 G17 Operator to energize) the bank **ONCE** by closing 17AT1 breaker

G17 Operator shall advise Customer of readiness to restore 17F1 and 17F3 feeders to service

- SCC shall close (or advise G17 Operator to close) 17T1Y1, 17F1Y1 and 17Y1F3 breakers

G17 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.

3.12. Isolate 17T2 Transformer for work

G17 Operator shall request for brief outage from Customer on 17F2 and 17F4 feeders

SCC shall advise G17 Operator to carry out the following:

- Inform Customer about readiness to take off 17T2 Bank
- Request Customer on 17T2 Bank to take off their load
- Transfer Station Service from AC2 to AC1, if Station Service is on 17T2 bank
- Open AC1 Contactor/MCB to take off supply to 17T2 transformer auxiliaries

SCC shall carry out (or advise G17 Operator to carry out) the following:

- Check opened 17Y1Y2 breaker
- Open 17Y2F2 and 17Y2F4 breakers
- Open 17T2Y2 breaker
- Open 17AT2 breaker
- Check for no potential on 17T2 Bank

SCC shall advise G17 Operator to carry out the following:

- Open 17AT2-A disconnect switch and turn off 125Vdc supply
- Open 17T2Y2-Y2 disconnect switch
- Open AC control MCB to 17T2 auxiliaries and tag
- Open 125Vdc MCB to 17T2 primary and secondary protection and tag with PC13

3.13. To restore 17T2 Bank to service after work

3.13.1. Prepare 17T2 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 17T2 Bank and temporary grounds removed

- Check opened 17Y1Y2 breaker
- Check opened 17Y2F2 and 17Y2F4 breakers
- Check opened 17T2Y2 breaker
- Check opened 17AT2 breaker
- Turn on 125Vdc supply and close 17AT2-A disconnect switch
- Turn on 125Vdc supply and close 17T2Y2-Y2 disconnect switch
- Close AC control MCB to 17T2 auxiliaries and remove tag
- Close 125Vdc MCB to 17T2 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 17T2 Bank to service

3.13.2. Restoration of 17T2 Bank to service:

- SCC shall close (or advise G17 Operator to close) 17AT2 breaker
- G17 Operator shall advise Customer of readiness to restore 17T2 Bank to service
- SCC shall close (or advise G17 Operator to close) the 17T2Y2, 17Y2F2 and 17Y2F4 breakers

3.14. Restore 17T2 Bank to service after automatic outage

If 17T2 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 G17 Operator to energize) the Bank **ONCE** by closing 17AT2 breaker

G17 Operator shall advise Customer of readiness to restore 17F2and 17F4 feeders to service

SCC shall close (or advise G17 Operator to close) 17T2Y2, 17Y2F2 and 17Y2F4

breakers

G17 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.

3.15. To Isolate 17T1Y1 Breaker for work

G17 Operator shall request for a brief outage from customers on 17F1 and 17F3 feeders

SCC shall advise G17 Operator to carry out the following:

- Inform Customer about readiness to take off 17T1 bank
- Request Customer on 17T1 Bank to take off their load
- Transfer station service supply from AC1 to AC2, if Station Service is on 17T1 bank

SCC shall carry out (or advise G17 Operator to carry out) the following:

- Check opened 17Y1Y2 breaker
- Open 17F1Y1 and 17Y1F3 breakers
- Open 17T1Y1 breaker
- Open 17AT1 breaker

SCC shall advise G17 Operator to carry out the following:

- Open 17T1Y1-Y1 disconnect switch and turn off its 125Vdc supply
- Open 17AT1-A disconnect switch and turn off its 125Vdc supply

3.16. To restore 17T1Y1 Breaker to service after work

3.16.1. Prepare 17T1Y1 breaker for restoration:

G17 Operator shall:

- Advise SCC when work on the 17T1Y1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 17T1Y1 Breaker and temporary grounds removed

- Turn on 125Vdc supply and close 17T1Y1-Y1 disconnect switch

- Turn on 125Vdc supply and close 17AT1-A disconnect switch

-

3.16.2. Restoration of 17T1Y1 Breaker to service:

- SCC shall close (or advise G17 Operator to close) the 17AT1 breaker

- G17 Operator shall advise Customer of readiness to restore 17F1 Feeder

- SCC shall close (or advise G17 Operator to close) the 17T1Y1, 17Y1F1 and 17Y1F3 breakers

3.17. To Isolate 17T2Y2 Breaker for work

G17 Operator shall request for a brief outage from customers on 17F2 and 17F4 feeders

SCC shall advise G17 Operator to carry out the following:

- Inform Customer about readiness to take off 17T2 bank

- Request Customer on 17T2 Bank to take off their load

- Transfer station service supply from AC2 to AC1

SCC shall carry out (or advise G17 Operator to carry out) the following:

- Check opened 17Y1Y2 breaker

- Check opened 17Y2F2 and 17Y2F4 breakers

- Open 17T2Y2 breaker

- Open 17AT2 breaker

SCC shall advise G17 Operator to carry out the following:

- Open 17T2Y2-Y2 disconnect switch and turn off its 125Vdc supply

- Open 17AT2-A disconnect switch and turn off its 125Vdc supply

3.18. To restore 17T2Y2 Breaker to service after work

3.18.1. Prepare 17T2Y2 breaker for restoration:

G17 Operator shall:

- Advise SCC when work on the 17T2Y2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 17T2Y2 Breaker and temporary grounds removed
- Open 17T2Y2-Y2 disconnect switch and turn off its 125Vdc supply
- Open 17AT2-A disconnect switch and turn off its 125Vdc supply

3.18.2. Restoration of 17T2Y2 Breaker to service:

- SCC shall close (or advise G17 Operator to close) the 17AT2 breaker
- G17 Operator shall advise Customer of readiness to restore 17F2 and 17F4 Feeders
- SCC shall close (or advise G17 Operator to close) the 17T2Y2, 17Y2F2 and 17Y2F4 breakers

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 17kV 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 A4G and G25V lines, 17T1 and 17T2 transformers.

5. Approval

……

Director, Technical Services