TD-OP-0056

GRIDCo

# OPERATING PROCEDURE FOR KINTAMPO SUBSTATION

**GHANA GRID COMPANY LTD**

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| **Title:** | **OPERATING PROCEDURE FOR KINTAMPO SUBSTATION (KP56)** | | |
| **Issued To:** | Director, System Operations<br>Director, NNS<br>Manager, SCC<br>Manager, Dispatch Operations<br>Area Manager, Techiman<br>Operating Staff, Techiman Area<br>Maintenance Staff, Techiman Area<br>Dispatch Staff, SCC | **Number:** | TD-OP-0056 |
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## 1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at KP56 Substation to service for planned and auto outages.

## 2. Scope

The directive will be used by Operators at Techiman Operating Area and System Control Center (SCC) for operation of equipment at KP56 Substation.

## 3. Procedure

### 3.1. To take TH1KP line out of service

SCC shall carry out (or advise the KP56 Operator to carry out) the following:

- Open 56L1A and 56L1L2 breakers

SCC shall carry out (or advise the TH26 Operator to carry out) the following:

- Verify opened 26L1-D transfer disconnect switch
- Open 26L1A breaker
- Check for no potential on TH1KP line

### 3.2. To take out, isolate and de-energize TH1KP line for work

- KP56 Operator request for Station Guarantee from TH26

SCC shall carry out (or advise the KP56 Operator to carry out) the following:

- Open 56L1A and 56L1L2 breakers

SCC shall carry out (or advise TH26 Operator to carry out) the following:

- Check opened 26L1-D transfer disconnect switch and turn off its 125Vdc supply
- Open 26L1A breaker
- Check for no potential on TH1KP line

SCC shall advise TH26 Operator to carry out the following:

- Open 26L1A-L1 disconnect switch and turn off its 125Vdc supply

- Close 26TH1KP-G ground disconnect switch

SCC shall advise KP56 Operator to carry out the following:

- Open 56L1A-L1 and 56L1L2-L1 disconnect switches and turn off its 125Vdc supply
- Close 56TH1KP-G ground disconnect switch

### 3.3. To restore TH1KP line to service after work

#### 3.3.1. Prepare TH1KP line for restoration:

KP56 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 TH1KP line

SCC shall advise TH26 Operator to carry out the following:

- Check opened 26L1A breaker
- Check opened 26L1-D transfer disconnect switch and turn on its 125Vdc supply
- Open 26TH1KP-G ground disconnect switch
- Turn on 125Vdc supply and close 26L1A-L1 disconnect switch

SCC shall advise KP56 Operator to carry out the following:

- Check opened 56L1A and 56L1L2 breakers
- Open 56TH1KP-G ground disconnect switch
- Turn on 125Vdc supply and close 56L1A-L1 and 56L1L2-L1 disconnect switches

#### 3.3.2. Restoration of TH1KP line to service:

SCC shall:

- Advise the TH26 and KP56 Operators of readiness to restore TH1KP line to service
- Close (or advise the TH26 Operator to close) 26L1A breaker
- Close (or advise the KP56 Operator to close) 56L1A and 56L1L2 breakers

### 3.4. To restore TH1KP line to service after automatic outage

If TH1KP line trips auto due to fault:

KP56 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 TH26 Operator to energize) the line **ONCE** by closing 26L1A breaker
- Close (or advise the KP56 Operator to close) 56L1A and 56L1L2 breakers

KP56 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 BU2KP line out of service

SCC shall carry out (or advise the KP56 Operator to carry out) the following:

- Open 56L2D and 56L1L2 breakers

SCC shall carry out (or advise the BU54 Operator to carry out) the following:

- Open 54DL2 and 54T2L2 breakers
- Check for no potential on BU2KP line

### 3.6. To take out, isolate and de-energize BU2KP line for work

- KP56 Operator shall request for Station Guarantee from BU54

SCC shall carry out (or advise the KP56 Operator to carry out) the following:

- Open 56L2D and 56L1L2 breakers

SCC shall carry out (or advise the BU54 Operator to carry out) the following:

- Open 54DL2 and 54T2L2 breakers

- Check for no potential on BU2KP line

SCC shall advise BU54 Operator to carry out the following:

- Open 54DL2-L2 and 54T2L2-I2 disconnect switches and turn off 125Vdc supply

- Close 54BU2KP-G ground disconnect switch

SCC shall advise KP56 operator to carry out the following:

- Open 56L2D-L2 and 56L1L2-L2 disconnect switches and turn off 125Vdc supply

- Close 54BU2KP-G ground disconnect switch

### 3.7. To restore BU2KP line to service after work

#### 3.7.1. Prepare BU2KP line for restoration:

KP56 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 BU2KP line

SCC shall advise BU54 Operator to carry out the following:

- Check opened 54DL2 and 54T2L2 breakers

- Open 54BU2KP-G ground disconnect switch

- Turn on 125Vdc supply and close 54DL2-L2 and 54T2L2-L2 disconnect switches

SCC shall advise KP56 Operator to carry out the following:

- Check opened 56L2D and 56L1L2 breakers

- Open 56BU2KP-G ground disconnect switch

- Turn on 125Vdc supply and close 56L2D-L2 and 56L1L2-L2 disconnect switches

#### 3.7.2. Restoration of BU2KP line to service:

SCC shall:

- Advise the BU54 and KP56 Operators of readiness to restore BU2KP line to service
- Close (or advise the BU54 Operator to close) 54DL2 and 54T2L2 breakers
- Close (or advise the KP56 Operator to close) 56L2D and 56L1L2 breakers

### 3.8. To restore BU2KP line to service after automatic outage

If BU2KP line trips auto due to fault:

KP56 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 BU54 Operator to energize) the line **ONCE** by closing 54DL2 and 54T2L2 breakers
- Close (or advise the KP56 Operator to close) 56L2D and 56L1L2 breakers

KP56 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 KP3BP line out of service

SCC shall carry out (or advise the KP56 Operator to carry out) the following:

- Open 56DL3 and 56L3L4 breakers

SCC shall carry out (or advise the BP55 Operator to carry out) the following:

- Open 55L3A and 55L1L3 breakers
- Check for no potential on KP3BP line

### 3.10. To take out, isolate and de-energize KP3BP line for work

- KP56 Operator request for Station Guarantee from TH26

SCC shall carry out (or advise the KP56 Operator to carry out) the following:

- Open 56DL3 and 56L3L4 breakers

SCC shall carry out (or advise BP55 Operator to carry out) the following:

- Open 55L3A and 55L1L3 breakers
- Check for no potential on KP3BP line

SCC shall advise KP56 Operator to carry out the following:

- Open 55L3A-L3 and 55L1L3-L3 disconnect switches and turn off 125Vdc supply
- Close 55KP3BP-G ground disconnect switch

SCC shall advise KP56 Operator to carry out the following:

- Open 56DL3-L3 and 56L3L4-L3 disconnect switches and turn off 125Vdc supply
- Close 56KP3BP-G ground disconnect switch

### 3.11. To restore KP3BP line to service after work

#### 3.11.1. Prepare KP3BP line for restoration:

KP56 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 KP3BP line

SCC shall advise BP55 Operator to carry out the following:

- Check opened 55L3A and 55L1L3 breakers
- Open 55KP3BP-G ground disconnect switch
- Turn on 125Vdc supply and close 55L3A-L3 and 55L1L3-L3 disconnect switches

SCC shall advise KP56 Operator to carry out the following:

- Check opened 56DL3 and 56L3L4 breakers

- Open 56KP3BP-G ground disconnect switch

- Turn on 125Vdc supply and close 56DL3-L3 and 56L3L4-L3 disconnect switches

**3.11.2. Restoration of KP3BP line to service:**

SCC shall:

- Advise the BP55 and KP56 Operators of readiness to restore KP3BP line to service

- Close (or advise the BP55 Operator to close) 55L3A and 55L1L3 breakers

- Close (or advise the KP56 Operator to close) 56DL3 and 56L3L4 breakers

## 3.12. To restore KP3BP line to service after automatic outage

If KP3BP line trips auto due to fault:

KP56 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 KP56 Operator to energize) the line **ONCE** by closing 56DL3 and 56L3L4 breakers

- Close (or advise the BP55 Operator to close) 55L3A and 55L1L3 breakers

KP56 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 56T1 Transformer for work

SCC shall advise KP56 Operator to carry out the following:

- Inform Customer about readiness to take off 56T1 bank
- Request Customer on 56T1 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 56T1 transformer auxiliaries
- Transfer Station Service from AC1 to AC2, if Station Service is on 56T1 bank

SCC shall carry out (or advise KP56 Operator to carry out) the following:

- Open 56T1SC1 and 56T1F1 breakers
- Open 56AT1 and 56T1T2 breakers
- Check for no potential on 56T1 Bank

SCC shall advise KP56 Operator to carry out the following:

- Open 56T1F1-T1 disconnect switch
- Open 56AT1-T1 and 56T1T2-T1 disconnect switches and turn off 125Vdc supply
- Open AC control MCB to 56T1 auxiliaries and tag
- Open 125Vdc MCB to 56T1 primary and secondary protection and tag with PC13

## 3.14. To restore 56T1 Bank to service after work

### 3.14.1. Prepare 56T1 bank for restoration:

KP56 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 56T1 Bank and temporary grounds removed
- Close 56T1F1-T1 disconnect switch
- Turn on 125Vdc supply and close 56AT1-T1 and 56T1T2-T1 disconnect switches
- Close AC control MCB to 56T1 auxiliaries and remove tag

- Close 125Vdc MCB to 56T1 primary and secondary protection and remove PC13 tag

- Advise SCC of readiness to restore 56T1 Bank to service

**3.14.2. Restoration of 56T1 bank to service:**

- SCC shall close (or advise KP56 Operator to close) the 56AT1 and 56T1T2 breakers

- KP56 Operator shall advise Customer of readiness to restore 56T1 Bank to service

- SCC shall close (or advise KP56 Operator to close) the 56T1F1 breaker

## 3.15. To restore 56T1 Bank to service after automatic outage

If 56T1 bank trips auto due to fault:

KP56 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 KP56 Operator to energize) the bank **ONCE** by closing 56AT1 and 56T1T2 breakers

KP56 Operator shall advise Customer of readiness to restore 56F1 feeder to service

SCC shall close (or advise KP56 Operator to close) 56T1F1 breaker

KP56 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. See explanation.

## 3.16. To isolate 56T2 Transformer for work

SCC shall advise KP56 Operator to carry out the following:

- Inform Customer about readiness to take off 56T2 bank

- Request Customer on 56T2 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 56T2 transformer auxiliaries
- Transfer Station Service from AC2 to AC1

SCC shall carry out (or advise KP56 Operator to carry out) the following:

- Open 56T2SC2 and 56T2F2 breakers
- Open 56DT2 and 56T1T2 breakers
- Check for no potential on 56T2 Bank

SCC shall advise KP56 Operator to carry out the following:

- Open 56T2F2-T2 disconnect switch
- Open 56DT2-T2 and 56T1T2-T2 disconnect switches and turn off 125Vdc supply
- Open AC control MCB to 56T2 auxiliaries and tag
- Open 125Vdc MCB to 56T2 primary and secondary protection and tag with PC13

## 3.17. To restore 56T2 Bank to service after work

### 3.17.1. Prepare 56T2 bank for restoration:

KP56 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 56T2 Bank and temporary grounds removed
- Close 56T2F2-T2 disconnect switch
- Turn on 125Vdc supply and 56DT2-T2 and 56T1T2-T2 disconnect switches
- Close AC control MCB to 56T2 auxiliaries and remove tag
- Close 125Vdc MCB to 56T2 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 56T2 Bank to service

### 3.17.2. Restoration of 56T2 bank to service:

- SCC shall close (or advise KP56 Operator to close) the 56DT2 and 56T1T2 breakers

- KP56 Operator shall advise Customer of readiness to restore 56T2 Bank to service

- SCC shall close (or advise KP56 Operator to close) the 56T2F2 breaker

## 3.18. To restore 56T2 Bank to service after automatic outage

If 56T2 bank trips auto due to fault:

KP56 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 KP56 Operator to energize) the bank **ONCE** by closing 56L1T2 and 56DT2 breakers

KP56 Operator shall advise Customer of readiness to restore 56F2 feeder to service

SCC shall close (or advise KP56 Operator to close) 56T2F2 breaker

KP56 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. See explanation.

## 3.19. To Isolate 56T1F1 Breaker for work

- KP56 Operator shall request Station Guarantee from Customer on 56F1 Feeder

SCC shall advise KP56 Operator to carry out the following:

- Inform Customer about readiness to take off 56T1 bank

- Request Customer on 56T1 Bank to take off their load

- Open AC1 Contactor/MCB to take off supply to 56T1 transformer auxiliaries

- Transfer Station Service from AC1 to AC2, if Station Service is on 56T1 bank

SCC shall carry out (or advise KP56 Operator to carry out) the following:

- Open 56SC1F1 breaker

- Open 56T1F1 breaker

- Open 56T1T2 and 56AT1 breakers

- Check for no potential on 56T1 Bank

SCC shall advise KP56 Operator to carry out the following:

- Open 56T1F1-T1 disconnect switch

- Open 56T1T2-T1 and 56AT1-T1 disconnect switches and turn off 125Vdc supply

- Open 56SC1F1-F1 disconnect switch

## 3.20. To restore 56T1F1 Breaker to service after work

### 3.20.1. Prepare 56T1F1 breaker for restoration:

KP56 Operator shall:

- Advise SCC when work on the 56T1F1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 56F1 Breaker and temporary grounds removed

- Close 56T1F1-F1 disconnect switch

- Close 56SC1F1-F1 disconnect switch

- Turn on 125Vdc supply and close 56T1T2-T1 and 56AT1-T1 disconnect switches

- Advise SCC of readiness to restore 56T1F1 breaker to service

### 3.20.2. Restoration of 56T1F1 breaker to service:

- SCC shall close (or advise KP56 Operator to close) the 56T1T2 and 56AT1 breakers

- KP56 Operator shall advise Customer of readiness to restore 56T1 Bank to service

- SCC shall close (or advise KP56 Operator to close) the 56T1F1 breaker

### 3.21. To Isolate 56T2F2 Breaker for work

- KP56 Operator shall request Station Guarantee from Customer on 56F2 feeder

SCC shall carry out (or advise KP56 Operator to carry out) the following:

- Open 56SC2F2 breaker

- Open 56T2F2 breaker

- Open 56T1T2 and 56DT2 breakers

- Check for no potential on 56T2 Bank

SCC shall advise KP56 Operator to carry out the following:

- Open 56SC2F2-F2 disconnect switch

- Open 56T2F2-T2 disconnect switch

- Open 56T1T2-T2 and 56DT2-T2 disconnect switches and turn off 125Vdc supply

### 3.22. To restore 56T2F2 Breaker to service after work

#### 3.22.1. Prepare 56T2F2 breaker for restoration:

KP56 Operator shall:

- Advise SCC when work on the 56T2F2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 56T2F2 Breaker and temporary grounds removed

- Close 56T2F2-F2 disconnect switch

- Close 56SC2F2-F2 disconnect switch

- Turn on 125Vdc supply and close 56DT2-T2 and 56T1T2-T2 disconnect switches

#### 3.22.2. Restoration of 56T2F2 breaker to service:

- SCC shall close (or advise KP56 Operator to close) the 56T1T2 and 56DT2 breakers

- KP56 Operator shall advise Customer of readiness to restore 56T2 Bank to service

- SCC shall close (or advise KP56 Operator to close) the 56T2F2 breaker

### 3.23. To isolate 56SC1 Capacitor Bank for work

SCC shall carry out (or advise KP56 Operator to carry out) the following:

- Open 56SC1F1 breaker

SCC shall advise KP56 Operator to carry out the following:

- Open 56SC1F1-F1 disconnect switch

- Close 56SC1-G ground disconnect switch

### 3.24. To restore 56SC1 Capacitor Bank to service after work

#### 3.24.1. Prepare 56SC1 Capacitor Bank for restoration:

KP56 Operator shall:

- Advise SCC when work on the 56SC1 Capacitor Bank has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 56SC1 Capacitor Bank and temporary grounds removed

- Open 56SC1-G ground disconnect switch

- Close 56SC1F1-F1 disconnect switch

#### 3.24.2. Restoration of 56SC1 Capacitor Bank to service:

- SCC shall close (or advise KP56 Operator to close) 56SC1F1 breaker if the voltage is below 32.8kV

### 3.25. To isolate 56SC2 Capacitor Bank for work

SCC shall carry out (or advise KP56 Operator to carry out) the following:

- Open 56SC2F2 breaker

SCC shall advise KP56 Operator to carry out the following:

- Open 56SC2F2-F2 disconnect switch

- Close 56SC2-G ground disconnect switch

### 3.26. To restore 56SC2 Capacitor Bank to service after work

#### 3.26.1. Prepare 56SC2 Capacitor Bank for restoration:

KP56 Operator shall:

- Advise SCC when work on the 56SC2 Capacitor Bank has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 56SC2 Capacitor Bank and temporary grounds removed

- Open 56SC2-G ground disconnect switch

- Close 56SC2F2-F2 disconnect switch

#### 3.26.2. Restoration of 56SC2 Capacitor Bank to service:

- SCC shall close (or advise KP56 Operator to close) 56SC2F2 breaker if the voltage is below 32.8kV

## 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 a permanent ground switches a PC 14 to close the ground switch is not required.

The station has two 161kV buses. The main 'A' and 'D' buses have a breaker and half configuration which provides the normal points of supply to all circuits/equipment such as TH1KP, BU2KP and KP3BP lines, 56T1, 56T2 Transformers, 56SC1 and 56SC2 Capacitor Banks.

## 5. Approval

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**Director, TSD**