

TD-OP-0056



OPERATING PROCEDURE FOR KINTAMPO 330kV SUBSTATION

GHANA GRID COMPANY LTD

Title: OPERATING PROCEDURE FOR KINTAMPO 330kV SUBSTATION (KP56)		
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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 56KP 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 56KP Substation.

3. Procedure

3.1. To take AW5KP line out of service

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

- Open 56L5E and 56L5T4 breakers
- SCC shall carry out (or advise the AW58 Operator to carry out) the following:
- Open 58EL5 and 58L5T3 breakers
- Check for no potential on AW5KP line

3.2. To take out, isolate and de-energize AW5KP line for work

KP56 Operator request for Station Guarantee from AW58

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

- Open 56L5E and 56L5T4 breakers
- Open 56L5R1 breaker

SCC shall carry out (or advise AW58 Operator to carry out) the following:

- Open 58EL5 and 58L5T3 breakers
- Check for no potential on AW5KP line

SCC shall advise AW58 Operator to carry out the following:

- Open 58EL5-L5 and 58L5T3-L5 disconnect switches and turn off 125Vdc supply
- Close 58AW5KP-G ground disconnect switch

SCC shall advise KP56 Operator to carry out the following:

- Open 56L5E-L5 and 56L5T3-L5 disconnect switches and turn off 125Vdc supply
- Open 56L5R1-L5 disconnect switch and turn off its 125Vdc supply
- Close 56AW5KP-G ground disconnect switch

3.3. To restore AW5KP line to service after work

3.3.1. Prepare AW5KP 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 AW5KP line

SCC shall advise AW58 Operator to carry out the following:

- Check opened 58EL5 and 58L5T3 breakers
- Open 58AW5KP-G ground disconnect switch
- Turn on 125Vdc supply and close 58EL5-L5 and 58L5T3-L5 disconnect switches

SCC shall advise KP56 Operator to carry out the following:

- Check opened 56L5E and 56L5T4 breakers

- Check opened 56L5R1 breaker
- Open 56AW5KP-G ground disconnect switch
- Turn on 125Vdc supply and close 56L5E-L5 and 56L5T4-L5 disconnect switches
- Turn on its 125Vdc supply and close 56L5R1-L5 disconnect switch

3.3.2. Restoration of AW5KP line to service:

SCC shall:

- Advise the KP56 and AW58 Operators of readiness to restore AW5KP line to service
- Close (or advise the KP56 Operator to close) 56L5E and 56L5T3 breakers
- Close (or advise the 56KP Operator to close) 58EL5 and 58L5T3 breakers

3.4. To restore AW5KP line to service after automatic outage

If AW5KP line trips auto due to fault on the line:

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 AW58 Operator to energize) the line **ONCE** by closing 58EL5 and 58L5T3 breakers
- Close (or advise the KP56 Operator to close) 56L5E and 56L5T3 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 KP6AD line out of service

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

- Open 56L6E and 5L6T3 breakers

SCC shall carry out (or advise the AD81 Operator to carry out) the following:

- Open 81L6E and 81L6T2 breakers
- Check for no potential on KP6AD line

3.6. To take out, isolate and de-energize KP6AD line for work

- KP56 Operator shall request for Station Guarantee from AD81

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

- Open 56L6E and 5L6T3 breakers

SCC shall carry out (or advise AD81 Operator to carry out) the following:

- Open 81L6E and 81L6T2 breakers
- Open 81L6R1 breaker
- Check for no potential on KP6AD line

SCC shall advise AD81 Operator to carry out the following:

- Open 81L6E-L6 and 81L6T2-L6 disconnect switches and turn off its 125Vdc supply
- Open 81L6R1-L6 disconnect switches and turn off its 125Vdc supply
- Close 81KP6AD-G ground disconnect switch

SCC shall advise KP56 Operator to carry out the following:

- Open 56L6E-L6 and 56L6T3-L6 disconnect switches and turn off its 125Vdc supply
- Close 56KP6AD-G ground disconnect switch

3.7. To restore KP6AD line to service after work

3.7.1. Prepare KP6AD line for restoration:

56KP 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 KP6AD line

SCC shall advise AD81 Operator to carry out the following:

- Check opened 81L6E and 81L6T2 breakers
- Check opened 81L6R1 breaker
- Open 81KP6AD-G ground disconnect switch
- Turn on 125Vdc supply and close 81L6E-L6 and 81L6T2-L6 disconnect switches
- Turn on 125Vdc supply and close 81L6R1-L6 disconnect switch

SCC shall advise KP56 Operator to carry out the following:

- Check opened 56L6E and 56L6T3 breakers
- Open 56KP6AD-G ground disconnect switch
- Turn on 125Vdc supply and close 56L6E-L6 and 56L6T3-L6 disconnect switches

3.7.2. Restoration of KP6AD line to service:

SCC shall:

- Advise the KP56 and AD81 Operators of readiness to restore KP6AD line to service
- Close (or advise the KP56 Operator to close) 56L6E and 56L6T3 breakers
- Close (or advise the AD81 Operator to close) 81L6E and 81L6T2 breakers

3.8. To restore KP6AD line to service after automatic outage

If KP6AD line trips auto due to fault on the line:

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:

- Close (or advise the 56KP Operator to close) 56L6E and 56L6T3 breakers
- Energize (or advise the AD81 Operator to energize) the line **ONCE** by closing 81L6E and 81L6T2 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 isolate 56T3 Bank for work

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

- Open 56ET3 and 56L6T3 breakers

- Open 56AT3 and 56T3T4 breakers
- Open 56ET3-T3 and 56L6T3-T3 disconnect switches and turn off 125vdc supply
- Open 56AT3-T3 and 56T3T4-T3 disconnect switches and turn off 125vdc supply
- Open AC control MCB to 56T3 auxiliaries and tag
- Open 125V DC breaker to 56T3 primary and secondary protection and tag with PC13
- Check for no potential on 56T3 Bank

3.10. To restore 56T3 Bank to service after work

3.10.1. Prepare 56T3 bank for restoration:

56KP 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 56T3 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 56ET3-T3 and 56L6T3-T3 disconnect switches
- Turn on 125Vdc supply and close 56AT3-T3 and 56T3T4-T3 disconnect switches
- Close AC control MCB to 56T3 auxiliaries and remove tag
- Close 125V DC breaker to 56T3 primary and secondary protection and remove tag PC13

- Advise SCC of readiness to restore 56T3 Bank to service

3.10.2. Restoration of 56T3 bank to service:

- SCC shall close (or advise KP56 Operator to close) the 56ET3 and 56L6T3 breakers (330kV)
- SCC shall close (or advise KP56 Operator to close) the 56AT3 and 56T3T4 breakers to tie to 161kV Bus

3.11. To restore 56T3 Bank to service after automatic outage

If 56T3 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 transformer **ONCE** by closing 56ET3 and 56L6T3 breakers (330kV)

56KP Operator shall:

- Check for potential on 56T3 and advise SCC

SCC shall:

- Energize (or advise the KP56 Operator to energize) the transformer **ONCE** by closing 56AT3 and 56T3T4 breakers to tie to 161kV Bus

56KP 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.

3.12. To isolate 56T4 Bank for work

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

- Open 56PT4 and 56L5T4 breakers
- Open 56DT4 and 56T3T4 breakers
- Open 56PT4-T4 and 56L5T4-T4 disconnect switches and turn off 125vdc supply
- Open 56DT4-T4 and 56T3T4-T4 disconnect switches and turn off 125vdc supply
- Open AC control MCB to 56T4 auxiliaries and tag
- Open 125V DC breaker to 56T4 primary and secondary protection and tag with PC13
- Check for no potential on 56T4 Bank

3.13. To restore 56T4 Bank to service after work

3.13.1. Prepare 56T4 bank for restoration:

56KP 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 56T4 Bank and temporary grounds removed
- Turn on 125vdc supply and close 56PT4-T4 and 56L5T4-T4 disconnect switches
- Turn on 125vdc supply and close 56DT4-T4 and 56T3T4-T4 disconnect switches

- Close 125V DC breaker to 56T4 primary and secondary protection and remove tag PC13
- Close 125V DC breaker to 56T4 primary and secondary protection and remove tag PC13
- Advise SCC of readiness to restore 56T4 Bank to service

3.13.2. Restoration of 56T4 bank to service:

- SCC shall close (or advise KP56 Operator to close) the 56PT4 and 56L5T4 (330kV)
- SCC shall close (or advise KP56 Operator to close) the 56DT4 and 56T3T4 breakers to tie to 161kV Bus

3.14. To restore 56T4 Bank to service after automatic outage

If 56T4 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 transformer **ONCE** by closing 56PT4 and 56L5T4 breakers (330kV)

KP56 Operator shall:

- Check for potential on 56T3 and advise SCC

SCC shall:

- Energize (or advise the KP56 Operator to energize) the transformer **ONCE** by closing 56DT4 and 56T3T4 breakers to tie to 161kV Bus

56KP 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.

3.15. To isolate 56R1 Bank for work

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

- Open AC1 Contactor/MCB to take off supply to 56R1 Reactor auxiliaries
- Open 56L5R1 breaker
- Open 56L5R1-L5 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 56R1 auxiliaries and tag
- Open 125VDC MCB to 56R1 primary and secondary protection and tag with PC13
- Check for no potential on 56R1 Reactor

3.16. To restore 56R1 Bank to service after work

3.16.1. Prepare 56R1 bank for restoration:

KP56 Operator shall:

- Check for no potential on 56R1 Reactor and temporary grounds removed
- Turn on 125Vdc supply and close 56L5R1-L5 disconnect switch
- Close AC control MCB to 56R1 auxiliaries and tag
- Close 125VDC MCB to 56R1 primary and secondary protection and tag with PC13
- Advise SCC of readiness to restore 56R1 Reactor to service

3.16.2. Restoration of 56R1 bank to service:

- SCC shall close (or advise KP56 Operator to close) the 56L5R1 breaker
- **Close the Reactor breaker, if line voltage is +8.25% of 330kV**

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 330kV buses. The main 'E' and 'P' buses, a breaker and half configuration provides the normal points of supply to all circuits/equipment such as AW5KP, KP6AD, 56T3 and 56T4 transformers.

5. Approval

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Director, TSD