

TD-OP-0075



OPERATING PROCEDURE FOR KPONE COLLECTOR STATION

GHANA GRID COMPANY LTD

TECHNICAL DIRECTIVES

Title: OPERATING PROCEDURE FOR KPONE COLLECTOR STATION (KC75)		
Issued Director, System Operations To: Director, SNS Manager, SCC Manager, Dispatch Operations Manager, Kpone Collector Operating Staff, Kpone Collector Maintenance Staff, Kpone Collector Dispatch Staff, SCC	Number: TD-OP-0075	
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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 KC75 Substation to service for planned and auto outages.

2. Scope

The directive will be used by Operators at Kpone Collector and System Control Center (SCC) for operation of equipment at KC75 Substation.

3. Procedure

3.1. To take CP1KC line out of service

SCC shall carry out (or advise the KC75 Operator to carry out) the following:

- Open 75L1D and 75L1L2 breakers

SCC shall carry out (or advise the CP76 Operator to carry out) the following:

- Open 76G1T1 breaker
- Check for no potential on CP1KC line

3.2. To take out, isolate and de-energize CP1KC line for work

- KC75 Operator request for Station Guarantee from CP76

SCC shall carry out (or advise the KC75 Operator to carry out) the following:

- Open 75L1D and 75L1L2 breakers

SCC shall carry out (or advise CP76 Operator to carry out) the following:

- Open 76G1T1 breaker
- Check for no potential on CP1KC line

SCC shall advise CP76 Operator to carry out the following:

- Open 76T1-L1 disconnect switch and turn off its 125Vdc supply
- Close 76CP1KC-G ground disconnect switch

SCC shall advise KC75 Operator to carry out the following:

- Open 75L1D-L1 and 75L1L2-L1 disconnect switches and turn off its 125Vdc supply

- Close 75CP1KC-G ground disconnect switch

3.3. To restore CP1KC line to service after work

3.3.1. Prepare CP1KC line for restoration:

KC75 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 CP1KC line

SCC shall advise CP76 Operator to carry out the following:

- Check opened 76G1T1 breaker
- Open 76CP1KC-G ground disconnect switch
- Turn on 125Vdc supply and close 76T1-L1 disconnect switch

SCC shall advise KC75 Operator to carry out the following:

- Check opened 75L1D and 75L1L2 breakers
- Open 75CP1KC-G ground disconnect switch
- Turn on 125Vdc supply and close 75L1D-L1 and 75L1L2-L1 disconnect switches

3.3.2. Restoration of CP1KC line to service:

SCC shall:

- Advise the CP76 and KC75 Operators of readiness to restore CP1KC line to service
- Close (or advise the KC75 Operator to close) 75L1D and 75L1L2 breakers
- Close (or advise the CP76 Operator to close) 76G1T1 breaker

3.4. To restore CP1KC line to service after automatic outage

If CP1KC line trips auto due to fault on the line:

KC75 Operator shall:

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- 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 KC75 Operator to energize) the line **ONCE** by closing 75L1D and 75L1L2 breakers
- Close (or advise the CP76 Operator to close) 76G1T1 breaker

KC75 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 CP2KC line out of service

SCC shall carry out (or advise the KC75 Operator to carry out) the following:

- Open 75L2D and 75L2L10 breakers

SCC shall carry out (or advise the CP76 Operator to carry out) the following:

- Open 76G2T2 breaker
- Check for no potential on CP2KC line

3.6. To take out, isolate and de-energize CP2KC line for work

- KC75 Operator request for Station Guarantee from CP76

SCC shall carry out (or advise the KC75 Operator to carry out) the following:

- Open 75L2D and 75L2L10 breakers

SCC shall carry out (or advise CP76 Operator to carry out) the following:

- Open 76G2T2 breaker
- Check for no potential on CP2KC line

SCC shall advise CP76 Operator to carry out the following:

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- Open 76T2-L2 disconnect switch and turn off its 125Vdc supply
- Close 76CP2KC-G ground disconnect switch

SCC shall advise KC75 Operator to carry out the following:

- Open 75L2D-L2 and 75L2L10-L2 disconnect switches and turn off its 125Vdc supply
- Close 75CP2KC-G ground disconnect switch

3.7. To restore CP2KC line to service after work

3.7.1. Prepare CP2KC line for restoration:

KC75 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 CP2KC line

SCC shall advise CP76 Operator to carry out the following:

- Check opened 76G2T2 breaker
- Open 76CP2KC-G ground disconnect switch
- Turn on 125Vdc supply and close 76T2-L2 disconnect switch

SCC shall advise KC75 Operator to carry out the following:

- Check opened 75L2D and 75L2L10 breakers
- Open 75CP2KC-G ground disconnect switch
- Turn on 125Vdc supply and close 75L2D-L2 and 75L2L10-L2 disconnect switches

3.7.2. Restoration of CP2KC line to service:

SCC shall:

- Advise the CP76 and KC75 Operators of readiness to restore CP2KC line to service
- Close (or advise the KC75 Operator to close) 75L2D and 75L2L10 breakers
- Close (or advise the CP76 Operator to close) 76G2T2 breaker

3.8. To restore CP2KC line to service after automatic outage

If CP2KC line trips auto due to fault on the line:

KC75 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 KC75 Operator to energize) the line **ONCE** by closing 75L2D and 75L2L10 breakers
- Close (or advise the CP76 Operator to close) 76G2T2 breaker

KC75 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 CP3KC line out of service

SCC shall carry out (or advise the KC75 Operator to carry out) the following:

- Open 75L3D and 75T2T2 breakers

SCC shall carry out (or advise the CP76 Operator to carry out) the following:

- Open 76G3T3 breaker
- Check for no potential on CP3KC line

3.10. To take out, isolate and de-energize CP3KC line for work

- KC75 Operator request for Station Guarantee from CP76

SCC shall carry out (or advise the KC75 Operator to carry out) the following:

- Open 75L3D and 75T2T2 breakers

SCC shall carry out (or advise CP76 Operator to carry out) the following:

- Open 76G3T3 breaker
- Check for no potential on CP3KC line

SCC shall advise CP76 Operator to carry out the following:

- Open 76T3-L3 disconnect switch and turn off its 125Vdc supply
- Close 76CP3KC-G ground disconnect switch

SCC shall advise KC75 Operator to carry out the following:

- Open 75L3D-L3 and 75T2T2-L3 disconnect switches and turn off its 125Vdc supply
- Close 75CP3KC-G ground disconnect switch

3.11. To restore CP3KC line to service after work

3.11.1. Prepare CP3KC line for restoration:

KC75 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 CP3KC line

SCC shall advise CP76 Operator to carry out the following:

- Check opened 76G3T3 breaker
- Open 76CP3KC-G ground disconnect switch
- Turn on 125Vdc supply and close 76T3-L3 disconnect switch

SCC shall advise KC75 Operator to carry out the following:

- Check opened 75L3D and 75T2T2 breakers
- Open 75CP3KC-G ground disconnect switch
- Turn on 125Vdc supply and close 75L3D-L3 and 75T2T2-L3 disconnect switches

3.11.2. Restoration of CP3KC line to service:

SCC shall:

- Advise the CP76 and KC75 Operators of readiness to restore CP3KC line to service
- Close (or advise the KC75 Operator to close) 75L3D and 75T2T2 breakers
- Close (or advise the CP76 Operator to close) 76G3T3 breaker

3.12. To restore CP3KC line to service after automatic outage

If CP3KC line trips auto due to fault on the line:

KC75 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 KC75 Operator to energize) the line **ONCE** by closing 75L3D and 75T2T2 breakers
- Close (or advise the CP76 Operator to close) 76G3T3 breaker

KC75 Operator shall:

- Advise the Supervisor/Manager of operation above
- Advise maintenance men to patrol the line if the operation above is not successful

3.13. To take SG4KC line out of service

SCC shall carry out (or advise the KC75 Operator to carry out) the following:

- Open 75L4T1 and 75L4A breakers

SCC shall carry out (or advise the SG51 Operator to carry out) the following:

- Open 51ADL4 breaker
- Check for no potential on SG4KC line

3.14. To take out, isolate and de-energize SG4KC line for work

- KC75 Operator request for Station Guarantee from SG51

SCC shall carry out (or advise the KC75 Operator to carry out) the following:

- Open 75L4T1 and 75L4A breakers

SCC shall carry out (or advise SG51 Operator to carry out) the following:

- Open 51ADL4 breaker
- Check for no potential on SG4KC line

SCC shall advise SG51 Operator to carry out the following:

- Open 51ADL4-L4 disconnect switch and turn off its 125Vdc supply
- Close 51SG4KC-G ground disconnect switch

SCC shall advise KC75 Operator to carry out the following:

- Open 75L2L10-L4 and 75AL10-L4 disconnect switches and turn off its 125Vdc supply
- Close 75SG4KC-G ground disconnect switch

3.15. To restore SG4KC line to service after work

3.15.1. Prepare SG4KC line for restoration:

KC75 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 SG4KC line

SCC shall advise SG51 Operator to carry out the following:

- Check opened 51ADL4 breaker
- Open 51SG4KC-G ground disconnect switch
- Turn on 125Vdc supply and close 51ADL4-L4 disconnect switch

SCC shall advise KC75 Operator to carry out the following:

- Check opened 75L4T1 and 75L4A breakers
- Open 75SG4KC-G ground disconnect switch

- Turn on 125Vdc supply and close 75L2L10-L4 and 75AL10-L4 disconnect switches

3.15.2. Restoration of SG4KC line to service:

SCC shall:

- Advise the SM60 and KC75 Operators of readiness to restore SG4KC line to service
- Close (or advise the KC75 Operator to close) 75L4T1 and 75L4A breakers
- Close (or advise the SG51 Operator to close) 51ADL4 breaker

3.16. To restore SG4KC line to service after automatic outage

If SG4KC line trips auto due to fault on the line:

KC75 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 KC75 Operator to energize) the line **ONCE** by closing 75L4T1 and 75L4A breakers
- Close (or advise the SG51 Operator to close) 51ADL4 breaker

KC75 Operator shall:

- Advise the Supervisor/Manager of operation above
- Advise maintenance men to patrol the line if the operation above is not successful

3.17. To take KC10SM line out of service

SCC shall carry out (or advise the KC75 Operator to carry out) the following:

- Open 75L2L10 and 75AL10 breakers.

SCC shall carry out (or advise the SM60 Operator to carry out) the following:

- Open 60L10D and 60L22L10 breakers
- Check for no potential on KC10SM line

3.18. To take out, isolate and de-energize KC10SM line for work

- KC75 Operator shall request for Station Guarantee from SM60

SCC shall carry out (or advise the KC75 Operator to carry out) the following:

- Open 75L2L10 and 75AL10 breakers

SCC shall carry out (or advise the SM60 Operator to carry out) the following:

- Open 60L10D and 60L22L10 breakers
- Check for no potential on KC10SM line

SCC shall advise SM60 Operator to carry out the following:

- Open 60L10D-L10 and 60L22L10-L10 disconnect switches and turn off its 125Vdc supply
- Close 60KC10SM-G ground disconnect switch

SCC shall advise KC75 operator to carry out the following:

- Open 75L2L10-L10 and 75AL10-L10 disconnect switches and turn off its 125Vdc supply
- Close 75KC10SM-G ground disconnect switch

3.19. To restore KC10SM line to service after work

3.19.1. Prepare KC10SM line for restoration:

KC75 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 KC10SM line

SCC shall advise SM60 Operator to carry out the following:

- Check opened 60L10D and 60L22L10 breakers
- Open 60KC10SM-G ground disconnect switch

- Turn on 125Vdc supply and close 60L10D-L10 and 60L22L10-L10 disconnect switches

SCC shall advise KC75 Operator to carry out the following:

- Check opened 75L2L10 and 75AL10 breakers
- Open 75KC10SM-G ground disconnect switch
- Turn on 125Vdc supply and close 75L2L10-L10 and 75AL10-L10 disconnect switches

3.19.2. Restoration of KC10SM line to service:

SCC shall:

- Advise the KC75 and SM60 Operators of readiness to restore KC10SM line to service
- Close (or advise the KC75 Operator to close) 75L2L10 and 75AL10 breakers
- Close (or advise the SM60 Operator to close) 60L10D and 60L22L10 breakers

3.20. To restore KC10SM line to service after automatic outage

If KC10SM line trips auto due to fault on the line:

KC75 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 KC75 Operator to energize) the line **ONCE** by closing 75L2L10 and 75AL10 breakers
- Close (or advise the SM60 Operator to close) 60L10D and 60L22L10 breakers

KC75 Operator shall:

- Advise the Supervisor/Manager of operation above

- Advise maintenance men to patrol the line if the operation above is not successful

3.21. To take KC20SM line out of service

SCC shall carry out (or advise the KC75 Operator to carry out) the following:

- Open 75L3L20 and 75AL20 breakers

SCC shall carry out (or advise the SM60 Operator to carry out) the following:

- Open 60L20D and 60L23L20 breakers
- Check for no potential on KC20SM line

3.22. To take out, isolate and de-energize KC20SM line for work

- KC75 Operator request for Station Guarantee from SM60

SCC shall carry out (or advise the KC75 Operator to carry out) the following:

- Open 75L3L20 and 75AL20 breakers

SCC shall carry out (or advise SM60 Operator to carry out) the following:

- Open 60L20D and 60L23L20 breakers
- Check for no potential on KC20SM line

SCC shall advise SM60 Operator to carry out the following:

- Open 60L20D-L20 and 60L23L20-L20 disconnect switches and turn off 125Vdc supply
- Close 60KC20SM-G ground disconnect switch

SCC shall advise KC75 Operator to carry out the following:

- Open 75L3L20-L20 and 75AL20-L20 disconnect switches and turn off its 125Vdc supply
- Close 75KC20SM-G ground disconnect switch

3.23. To restore KC20SM line to service after work

3.23.1. Prepare KC20SM line for restoration:

KC75 Operator shall:

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- Advise SCC when work on the line has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on KC20SM line

SCC shall advise SM60 Operator to carry out the following:

- Check opened 60L20D and 60L23L20 breakers
- Open 60KC20SM-G ground disconnect switch
- Turn on 125Vdc supply and close 60L20D-L20 and 60L23L20-L20 disconnect switches

SCC shall advise KC75 Operator to carry out the following:

- Check opened 75L3L20 and 75AL20 breakers
- Open 75KC20SM-G ground disconnect switch
- Turn on 125Vdc supply and close 75L3L20-L20 and 75AL20-L20 disconnect switches

3.23.2. Restoration of KC20SM line to service:

SCC shall:

- Advise the SM60 and TKC75 Operators of readiness to restore KC20SM line to service
- Close (or advise the SM60 Operator to close) 60L20D and 60L23L20 breakers
- Close (or advise the KC75 Operator to close) 75L3L20 and 75AL20 breakers

3.24. To restore KC20SM line to service after automatic outage

If KC20SM line trips auto due to fault on the line:

KC75 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 SM60 Operator to energize) the line **ONCE** by closing 60L20D and 60L23L20 breakers
- Close (or advise the KC75 Operator to close) 75L3L20 and 75AL20 breakers

KC75 Operator shall:

- Advise the Supervisor/Manager of operation above
- Advise maintenance men to patrol the line if the operation above is not successful

3.25. To isolate 75T2 Transformer for work

SCC shall advise KC75 Operator to carry out the following:

- Inform Customer about readiness to take off 75T2 bank
- Request Customer on 75T2 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 75T2 transformer auxiliaries
- Transfer Station Service from AC1 to AC2, if Station Service is on 75T2 bank

SCC shall carry out (or advise KC75 Operator to carry out) the following:

- Open 75Y2F2 breaker
- Open 75DT2 and 75T1T2 breakers
- Check for no potential on 75T2 Bank

SCC shall advise KC75 Operator to carry out the following:

- Open 75Y2F2-T2 disconnect switch
- Open 75DT2-T2 and 75T1T2-T2 disconnect switches and turn off 125Vdc supply
- Open AC control MCB to 75T2 auxiliaries and tag
- Open 125Vdc MCB to 75T2 primary and secondary protection and tag with PC13

3.26. To restore 75T2 Bank to service after work

3.26.1. Prepare 75T2 bank for restoration:

KC75 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 75T2 Bank and temporary grounds removed
- Close 75Y2F2-T2 disconnect switch
- Turn on 125Vdc supply and close 75DT2-T2 and 75T1T2-T2 disconnect switches
- Close AC control MCB to 75T2 auxiliaries and remove tag
- Close 125Vdc MCB to 75T2 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 75T2 Bank to service

3.26.2. Restoration of 75T2 bank to service:

- SCC shall close (or advise KC75 Operator to close) the 75DT2 and 75T1T2 breakers
- KC75 Operator shall advise Customer of readiness to restore 75T2 Bank to service
- SCC shall close (or advise KC75 Operator to close) the 75Y2F2 breaker

3.27. To restore 75T2 Bank to service after automatic outage

If 75T2 bank trips auto due to fault:

KC75 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 KC75 Operator to energize) the bank **ONCE** by closing 75DT2 and 75T2T2 breakers

KC75 Operator shall advise Customer of readiness to restore 56F1 feeder to service

SCC shall close (or advise KC75 Operator to close) 75Y2F2 breaker

KC75 Operator shall:

- Advise the Supervisor/Manager of item above
- Isolate the Transformer for maintenance men to work on the equipment if the operation above is not successful. See explanation.

3.28. To Isolate 75Y2F2 Breaker for work

- KC75 Operator shall request Station Guarantee from Customer on 56F1 Feeder

SCC shall advise KC75 Operator to carry out the following:

- Inform Customer about readiness to take off 75T2 bank
- Request Customer on 75T2 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 75T2 transformer auxiliaries
- Transfer Station Service from AC1 to AC2, if Station Service is on 75T2 bank

SCC shall carry out (or advise KC75 Operator to carry out) the following:

- Open 75Y2F2 breaker
- Open 75T1T2 and 75DT2 breakers
- Check for no potential on 75T2 Bank

SCC shall advise KC75 Operator to carry out the following:

- Open 75Y2F2-T2 disconnect switch
- Open 75T1T2-T2 and 75DT2-T2 disconnect switches and turn off 125Vdc supply

3.29. To restore 75Y2F2 Breaker to service after work

3.29.1. Prepare 75Y2F2 breaker for restoration:

KC75 Operator shall:

- Advise SCC when work on the 75Y2F2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 56F1 Breaker and temporary grounds removed
- Close 75Y2F2-F2 disconnect switch
- Turn on 125Vdc supply and close 75T1T2-T2 and 75DT2-T2 disconnect switches
- Advise SCC of readiness to restore 75Y2F2 breaker to service

3.29.2. Restoration of 75Y2F2 breaker to service:

- SCC shall close (or advise KC75 Operator to close) the 75T1T2 and 75DT2 breakers
- KC75 Operator shall advise Customer of readiness to restore 75T2 Bank to service
- SCC shall close (or advise KC75 Operator to close) the 75Y2F2 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 its 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:

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- 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, A and D buses. The 'A' bus provides the normal points of connection to all circuits such as SG4KC, KC10SM, KC20SM and **TT7TE lines**. The 'D' bus provides the normal points of connection to 75T2, 66T2 and 66TT3 transformers

5. Approval

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Director, TSD