

TD-OP-0006



OPERATING PROCEDURE FOR WINNEBA SUBSTATION

GHANA GRID COMPANY LTD

TECHNICAL DIRECTIVES

Title: OPERATING PROCEDURE FOR WINNEBA SUBSTATION (W6)		
Issued To: Director, System Operations Director, SNS Manager, SCC Manager, Dispatch Operations Area Manager, Accra Operating Staff, Accra Area Maintenance Staff, Accra Area Dispatch Staff, SCC	Number: TD-OP-0006	
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TECHNICAL DIRECTIVES

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TECHNICAL DIRECTIVES

1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at W6 Substation to service for planned and auto outages.

2. Scope

The directive will be used by Operators at Accra Operating Area and System Control Center (SCC) for operation of equipment at W6 Substation.

3. Procedure

3.1. To take TE1W line out of service

SCC shall carry out (or advise the W6 Operator to carry out) the following:

- Verify opened 6TE1W-S bypass disconnect switch
- Open 6TE1W breaker

SCC shall carry out (or advise the TE66 Operator to carry out) the following:

- Open 66L1D breaker
- Check for no potential on TE1W line

3.2. To take out, isolate and de-energize TE1W line for work

- W6 Operator shall request for Station Guarantee from TE66

SCC shall carry out (or advise the W6 Operator to carry out) the following:

- Check opened 6TE1W-S bypass disconnect switch and turn off its 125Vdc supply
- Open 6TE1W breaker

SCC shall carry out (or advise the TE66 Operator to carry out) the following:

- Open 66L1D breaker
- Check for no potential on TE1W line

SCC shall advise the W6 Operator to carry out the following:

- Open 6TE1W-L1 disconnect switch and turn off 125Vdc supply
- Close 6TE1W-G ground disconnect switch

SCC shall advise the TE66 Operator to carry out the following:

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- Open 66L1D-L1 disconnect switch and turn off 125Vdc supply
- Close 66TE1W-G ground disconnect switch

3.3. To restore TE1W line to service after work

3.3.1. Prepare TE1W line for restoration:

W6 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 TE1W line

SCC shall advise TE66 Operator to carry out the following:

- Check opened 66L1D breaker
- Open 66TE1W-G ground disconnect switch
- Turn on 125Vdc supply and close 66L1D-L1 disconnect switch

SCC shall advise W6 Operator to carry out the following:

- Check opened 6TE1W breaker
- Open 6TE1W-G disconnect switch
- Turn on 125Vdc supply and close 6TE1W-L1 disconnect switch

3.3.2. Restoration of TE1W line to service:

SCC shall:

- Advise the W6 and TE66 Operators of readiness to restore TE1W line to service
- Close (or advise TE66 Operator to close) 66L1D breaker
- Close (or advise W6 Operator to close) 6TE1W breaker

3.4. To restore TE1W line to service after automatic outage

If TE1W line trips auto due to fault:

W6 Operator shall:

- Advise SCC about the outage
- Acknowledge all alarms and record relay operation details

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- Reset relay targets
- Report relay operation details to SCC

SCC shall:

- Energize (or advise the W6 Operator to energize) the line **ONCE** by closing 6TE1W breaker
- Close (or advise the TE66 Operator to close) 66L1D breaker
- 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 W2KS line out of service

SCC shall carry out (or advise the W6 Operator to carry out) the following:

- Verify opened 6W2KS-S bypass disconnect switch
- Open 6W2KS breaker

SCC shall carry out (or advise the KS87 Operator to carry out) the following:

- Open 87L2A and 87L2T2 breakers
- Check for no potential on W2KS line

3.6. To take out, isolate and de-energize W2KS line for work

- W6 Operator shall request for Station Guarantee from KS87

SCC shall carry out (or advise the W6 Operator to carry out) the following:

- Check opened 6W2KS-S bypass disconnect switch and turn off its 125Vdc supply
- Open 6W2KS breaker

SCC shall carry out (or advise the KS87 Operator to carry out) the following:

- Open 87L2A and 87L2T2 breakers
- Check for no potential on W2KS line

SCC shall advise the KS87 Operator to carry out the following:

- Open 87L2A-L2 and 87L2T2-L2 disconnect switches and turn off 125Vdc supply
- Close 87W2KS-G ground disconnect switch

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SCC shall advise the W6 Operator to carry out the following:

- Check opened 6W2KS-S bypass disconnect switch and turn off its 125Vdc supply
- Open 6W2KS-L2 disconnect switch and turn off its 125Vdc supply
- Close 6W2KS-G ground disconnect switch

3.7. To restore W2KS line to service after work

3.7.1. Prepare W2KS line for restoration

W6 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 W2KS line

SCC shall advise KS87 Operator to carry out the following:

- Check opened 87L2A and 87L2T2 breakers
- Open 87W2KS-G ground disconnect switch
- Turn on 125Vdc supply and close 87L2A-L2 and 87L2T2-L2 disconnect switches

SCC shall advise W6 Operator to carry out the following:

- Check opened 6W2KS-S bypass disconnect switch and turn off 125Vdc supply
- Check opened 6W2KS breaker
- Open 6W2KS-G ground disconnect switch
- Turn on 125Vdc supply and close 6W2KS-L2 disconnect switch

3.7.2. Restoration of W2KS line to service:

SCC shall:

- Advise the W6 and KS87 Operators of readiness to restore W2KS line to service
- Close (or advise the W6 Operator to close) 6W2KS breaker
- Close (or advise the KS87 Operator to close) 87L2A and 87L2T2 breakers

3.8. To restore W2KS line to service after automatic outage

If W2KS line trips auto due to fault:

W6 Operator shall:

- Advise SCC about the outage
- Acknowledge all alarms and record relay operation details

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- Reset relay targets
- Report relay operation details to SCC

SCC shall:

- Energize (or advise the W6 Operator to energize) the line **ONCE** by closing 6W2KS breaker
- Close (or advise the KS87 Operator to close) 87L2A and 87L2T2 breakers

W6 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 6T1 Transformer for work

- W6 Operator shall request Station Guarantee from Customer on 6F1 Feeder

SCC shall carry out or advise W6 Operator to carry out the following:

- Inform Customer about readiness to take off 6T1 Bank
- Request Customer on 6T1 Bank to take off their load
- Transfer Station Service from AC1 to AC2, if Station Service is on 6T1
- Open AC1 Contactor/MCB to take off supply to 6T1 transformer auxiliaries

SCC shall carry out (or advise W6 Operator to carry out) the following:

- Open 6SC1F1 breaker
- Open 6T1F1 breaker
- Open 6AT1 breaker
- Check for no potential on 6T1 Bank
- Open 6SC1F1-T1 disconnect switch and turn off its 125Vdc supply
- Open 6T1F1-F1 disconnect switch and turn off its 125Vdc supply
- Open 6AT1-A disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 6T1 auxiliaries and tag
- Open 125V DC MCB to 6T1 primary and secondary protection and tag with PC13

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3.10. To restore 6T1 Bank to service after work

3.10.1. Prepare 6T1 Bank to service after work

W6 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 6T1 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 6SC1F1-T1 disconnect switch
- Close 6T1F1-F1 disconnect switch
- Turn on 125Vdc supply and close 6AT1-A disconnect switch
- Close AC control MCB to 6T1 auxiliaries and remove tag
- Close 125V DC MCB to 6T1 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 6T1 Bank to service

3.10.2. Restoration of 6T1 Bank to service:

- SCC shall close (or advise W6 Operator to close) 6AT1 breaker
- W6 Operator shall advise Customer of readiness to restore 6F1 feeder to service
- SCC shall close (or advise W6 Operator to close) 6T1F1 breaker
- SCC shall close (or advise W6 Operator to close) 6SC1F1 breaker if the voltage is below 32.8kV

3.11. To restore 6T1 Bank to service after automatic outage

If 6T1 Bank trips auto due to fault:

W6 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 W6 Operator to energize) the bank ONCE by closing 6AT1 breaker

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W6 Operator shall advise Customer of readiness to restore 6T1 Bank to service

SCC shall close (or advise W6 Operator to close) 6T1F1 breaker

W6 Operator shall:

- Advise the Supervisor/Area Manager and SCC 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 6T2 Transformer for work

- W6 Operator shall request Station Guarantee from Customer on 6F2 Feeder

SCC shall advise W6 Operator to carry out the following:

- Inform Customer about readiness to take off 6T2 bank
- Request Customer on 6T2 Bank to take off their load
- Transfer Station Service from AC2 to AC1, if Station Service is on 6T2
- Open AC2 Contactor/MCB to take off supply to 6T2 transformer auxiliaries

SCC shall carry out (or advise W6 Operator to carry out) the following:

- Open 6SC2F2 breaker
- Open 6T2F21 breaker
- Open 6AT2 breaker
- Check for no potential on 6T2 Bank
- Open 6SC2F2-T2 disconnect switch and turn off its 125Vdc supply
- Open 6T2F2-F2 disconnect switch
- Open 6AT2-A disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 6T2 auxiliaries and tag
-
- Open 125V DC MCB to 6T2 primary and secondary protection and tag with PC13

3.13. To restore of 6T2 Bank to service

3.13.1. Prepare 6T2 Bank to service after work

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W6 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 6T2 Bank and temporary grounds removed
- Turn on its 125Vdc supply and close 6SC2F2-T2 disconnect switch
- Close 6T2F2-F2 disconnect switch
- Turn on its 125Vdc supply and close 6AT2-A disconnect switch
- Advise SCC of readiness to restore 6T2 Bank to service

3.13.2. Restoration of 6T2 Bank to service:

- SCC shall close (or advise W6 Operator to close) 6AT2 breaker
- W6 Operator shall advise Customer of readiness to restore 6F2 feeder to service
- SCC shall close (or advise W6 Operator to close) 6T2F2 breaker
- SCC shall close (or advise W6 Operator to close) 6SC2F2 breaker, if the voltage is below 32.8kV

3.14. To restore 6T2 Bank to service after automatic outage

If 6T2 Bank trips auto due to fault:

W6 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 W6 Operator to energize) the bank ONCE by closing 6AT2 breaker

W6 Operator shall advise Customer of readiness to restore 6F2 Bank to service

SCC shall close (or advise W6 Operator to close) 6T2F2 breaker

W6 Operator shall:

- Advise the Supervisor/Area Manager and SCC of operation above

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- Isolate the Transformer for maintenance men to work on the equipment if operation above is not successful. See explanation.

3.15. To isolate 6T1F1 Breaker for work

- W6 Operator shall request Station Guarantee from Customer on 6F1 Feeder

SCC shall carry out or advise W6 Operator to carry out the following:

- Inform Customer about readiness to take off 6T1 bank
- Request Customer on 6T1 Bank to take off their load
- Transfer Station Service from AC1 to AC2, if Station Service is on 6T1
- Open AC1 Contactor/MCB to take off supply to 6T1 transformer auxiliaries

SCC shall carry out (or advise W6 Operator to carry out) the following:

- Open 6SC1F1 breaker
- Open 6T1F1 breaker
- Open 6AT1 breaker
- Open 6SC1F1-T1 disconnect switch and turn off its 125Vdc supply
- Open 6T1F1-F1 disconnect switch and turn off its 125Vdc supply
- Open 6AT1-A disconnect switch and turn off its 125Vdc supply

3.16. To restore 6T1F1 breaker to service after work

3.16.1. Prepare 6T1F1 breaker to service after work

W6 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 6T1 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 6SC1F1-T1 disconnect switch
- Turn on 125Vdc supply and close 6T1F1-F1 disconnect switch
- Turn on 125Vdc supply and close 6AT1-A disconnect switch
- Advise SCC of readiness to restore 6T1F1 breaker to service

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3.16.2. Restoration of 6T1F1 Breaker to service:

- SCC shall close (or advise W6 Operator to close) 6AT1 breaker
- W6 Operator shall advise Customer of readiness to restore 6F1 feeder to service
- SCC shall close (or advise W6 Operator to close) 6T1F1 breaker
- SCC shall close (or advise W6 Operator to close) 6SC1F1 breaker, if the voltage is below 32.8kV

3.17. To isolate 6T2F2 Breaker for work

- W6 Operator shall request Station Guarantee from Customer on 6F2 Feeder

SCC shall carry out or advise W6 Operator to carry out the following:

- Inform Customer about readiness to take off 6T2 bank
- Request Customer on 6T2 Bank to take off their load
- Transfer Station Service from AC2 to AC1, if Station Service is on 6T2
- Open AC2 Contactor/MCB to take off supply to 6T2 transformer auxiliaries

SCC shall carry out (or advise W6 Operator to carry out) the following:

- Open 6SC2F2 breaker
- Open 6T2F2 breaker
- Open 6AT2 breaker
- Open 6SC2F2-T2 disconnect switch and turn off its 125Vdc supply
- Open 6T2F2-F2 disconnect switch and turn off its 125Vdc supply
- Open 6AT2-A disconnect switch and turn off its 125Vdc supply

3.18. To restore 6T2F2 breaker to service after work

3.18.1. Prepare 6T2F2 breaker to service after work

W6 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 6T2 feeder breaker and temporary grounds removed

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- Turn on 125Vdc supply and close 6SC2F2-T2 disconnect switch
- Turn on 125Vdc supply and close 6T2F2-F2 disconnect switch
- Turn on 125Vdc supply and close 6AT2-A disconnect switch
- Advise SCC of readiness to restore 6T2F2 breaker to service

3.18.2. Restoration of 6T2F2 breaker to service:

- SCC shall close (or advise W6 Operator to close) 6AT2 breaker
- W6 Operator shall advise Customer of readiness to restore 6F2 feeder to service
- SCC shall close (or advise W6 Operator to close) 6T2F2 breaker
- SCC shall close (or advise W6 Operator to close) 6SC2F2 breaker if the voltage is below 32.8kV

3.19. To isolate 6SC1 Capacitor Bank for work

SCC shall carry out or advise W6 Operator to carry out the following:

- Open 6SC1F1 breaker
- Open 6SC1F1-SC1 disconnect switch and turn off its 125Vdc supply
- Close 6SC1F1-G ground disconnect switch

3.20. To restore 6SC1 Capacitor Bank to service after work

3.20.1. Prepare 6SC1 Capacitor Bank to service after work

- Advise SCC when work on the 6SC1 Capacitor Bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 6SC1F1 Capacitor Bank and grounds removed
- Check opened 6SC1F1 breaker
- Open 6SC1F1-G ground disconnect switch
- Turn on 125Vdc supply and close 6SC1F1-T1 disconnect switch
- Advise SCC of readiness to restore 6SC1 Capacitor bank to service

3.20.2. Restoration of 6SC1 Capacitor Bank to service:

- SCC shall close (or advise W6 Operator to close) 6SC1F1 breaker if the voltage

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is below 32.8kV

3.21. To isolate 6SC2F2 Capacitor Bank for work

SCC shall carry out or advise W6 Operator to carry out the following:

- Open 6SC2F2 breaker
- Open 6SC2F2-SC2 disconnect switch and turn off its 125Vdc supply
- Close 6SC2F2-G ground disconnect switch

3.22. To restore 6SC2 Capacitor Bank to service after work

3.22.1. Prepare 6SC2 Bank to service after work

- Advise SCC when work on the 6SC2 Capacitor Bank has been completed and permit(s) surrendered
- Check for no potential and grounds removed on 6SC2 Capacitor Bank
- Check opened 6SC2F2 breaker
- Open 6SC2F2-G disconnect switch
- Turn on 125Vdc supply and close 6SC2F2-T2 disconnect switch
- Advise SCC of readiness to restore 6SC2 Bank to service

3.22.2. Restoration of 6SC2 Capacitor Bank to service:

- SCC to close (or advise W6 Operator to close) 6SC2F2 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

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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.

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The station is only one 161Kv bus arrangement. The main 'A' bus provides the normal points of supply to all circuits/equipment such as TE1W (Winneba-Aboadze T3) and W2M (Mallam- Winneba) lines, 6T2 transformer.

5. Approval

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Director, Technical Services