

TD-OP-0054



OPERATING PROCEDURE FOR BUI SUBSTATION

GHANA GRID COMPANY LTD

TECHNICAL DIRECTIVES

Title: OPERATING PROCEDURE FOR TECHIMAN SUBSTATION (BU54)		
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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 BU54 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 BU54 Substation.

3. Procedure

3.1. To take BU1SA line out of service

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

- Open 54T3L1 and 54DL1 breakers

SCC shall advise SA38 Operator to carry out the following:

- Verify Opened 38L1-D transfer disconnect switch
- Open 38L1A breaker
- Check for no potential on BU1SA line

3.2. To take out, isolate and de-energize BU1SA line for work

- BU54 Operator shall request for Station Guarantee from SA38

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

- Open 54T3L1 and 54DL1 breakers

SCC shall advise SA38 Operator to carry out the following:

- Verify Opened 38L1-D transfer disconnect switch
- Open 38L1A breaker
- Check for no potential on BU1SA line

SCC shall advise SA38 Operator to carry out the following:

- Open 38L1A-L1 disconnect switch and turn off its 125Vdc supply
- Close 38BU1SA-G ground disconnect switch

SCC shall advise BU54 Operator to carry out the following:

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- Open 54T3L1-L1 and 54DL1-L1 disconnect switches and turn off its 125Vdc supply
- Close 54BU1SA-G ground disconnect switch

3.3. To restore BU1SA line to service after work

3.3.1. Prepare BU1SA line for restoration

BU54 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 BU1SA line

SCC shall advise SA38 Operator to carry out the following

- Verify Opened 38L1-D transfer disconnect switch
- Check opened 38L1A breaker
- Open 38BU1SA-G ground disconnect switch
- Turn on 125Vdc supply and close 38L1A-L1 disconnect switch

SCC shall advise BU54 Operator to carry out the following:

- Check opened 54T3L1 and 54L1D breakers
- Open 54BU1SA-G ground disconnect switch
- Turn on 125Vdc supply and close 1TILI-L1 and 54T3L1-L1 disconnect switches

3.3.2. Restoration of BU1SA line to service:

SCC shall:

- Advise the BU54 and SA38 Operators of readiness to restore BU1SA line to service
- Close (or advise the SA38 Operator to close) 38L1A breaker
- Close (or advise the BU54 Operator to close) 54DL1 and 54T3L1 breakers

3.4. To restore BU1SA line to service after automatic outage

If BU1SA line trips auto due to fault:

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BU54 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 SA38 Operator to energize) the line **ONCE** by closing 38L1A breaker
- Close (or advise the BU54 Operator to close) 54DL1 and 54T3L1 breakers

BU54 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 BU54 Operator to carry out) the following:

- Open 54T2L2 and 54DL2 breakers

SCC shall advise KP56 Operator to carry out the following:

- Open 56L2L1 and 56L2D breakers
- Check for no potential on BU2KP line

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

- BU54 Operator shall request for Station Guarantee from KP56

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

- Open 54DL2 and 54T2L2 breakers

SCC shall advise KP56 Operator to carry out the following:

- Open 56L2L1 and 56L2D breakers
- Check for no potential on BU2KP line

SCC shall advise KP56 Operator to carry out the following:

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- Open 56L2L1-L2 and 56L2D-L2 disconnect switches and turn off its 125Vdc supply
- Close 56BU2KP-G ground disconnect switch

SCC shall advise BU54 Operator to carry out the following:

- Open 54DL2-L2 and 54T2L2-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

BU54 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 KP56 Operator to carry out the following:

- Check opened 56L2L1 and 56L2D breakers
- Open 56BU2KP-G ground disconnect switch
- Turn on 125Vdc supply and close 56L2L1-L2 and 56L2D-L2 disconnect switches

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

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) 56L2L1 and 56L2D breakers

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3.8. To restore BU2KP line to service after automatic outage

If BU2KP line trips auto due to fault:

BU54 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 56L2L1 and 56L2D breakers
- Close (or advise the BU54 Operator to close) 54DL2 and 54T2L2 breakers

BU54 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 BU4TH line out of service

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

- Open 54T1L4 and 54DL4 breakers

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

- Verify Opened 26L4-D transfer disconnect switch
- Open 26L4A and 2L3L13 breakers
- Check for no potential on BU4TH line

3.10. To take out, isolate and de-energize BU4TH line for work

- BU54 Operator shall request for Station Guarantee from KP56

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

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- Open 54DL4 and 54T1L4 breakers

SCC shall advise TH26 Operator to carry out the following:

- Verify Opened 26L4-D transfer disconnect switch
- Open 26L4A breaker
- Check for no potential on BU4TH line

SCC shall advise BU54 Operator to carry out the following:

- Open 54DL4-L4 and 54T1L4-L4 disconnect switches and turn off its 125Vdc supply
- Close 54BU4TH-G ground disconnect switch

SCC shall advise TH26 Operator to carry out the following:

- Open 26L4A-L4 disconnect switch and turn off its 125Vdc supply
- Close 26BU4TH-G ground disconnect switch

3.11. To restore BU4TH line to service after work

3.11.1. Prepare BU4TH line for restoration

BU54 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 BU4TH line

SCC shall advise TH26 Operator to carry out the following:

- Verify Opened 26L4-D transfer disconnect switch
- Check opened 26L4A breaker
- Open 26BU4TH-G ground disconnect switch
- Turn on 125Vdc supply and close 26L4A-L3 disconnect switch

SCC shall advise BU54 Operator to carry out the following:

- Check opened 54DL4 and 54T1L4 breakers
- Open 54BU4TH-G ground disconnect switch
- Turn on 125Vdc supply and close 54DL4-L3 and 54T1L4-L3 disconnect switches

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3.11.2. Restoration of BU4TH line to service:

SCC shall:

- Advise the BU54 and TH26 Operators of readiness to restore BU4TH line to service
- Close (or advise the TH26 Operator to close) 26L4A breaker
- Close (or advise the BU54 Operator to close) 54DL4 and 54T1L4 breakers

3.12. To restore BU4TH line to service after automatic outage

If BU4TH line trips auto due to fault:

BU54 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 54DL4 and 54T1L4 breakers
- Close (or advise the TH26 Operator to close) 26L4A breaker

BU54 Operator:

- 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 take BU5SN line out of service

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

- Open 54T4L5 and 54DL5 breakers

SCC shall carry out (or advise the SN27 Operator to carry out) the following:

- Verify Opened 27L5-D transfer disconnect switch
- Open 27L5A breaker

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- Check for no potential on BU5SN line

3.14. To take out, isolate and de-energize BU5SN line for work

- BU54 Operator shall request for Station Guarantee from SN27

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

- Open 54T4L5 and 54DL5 breakers

SCC shall carry out (or advise the SN27 Operator to carry out) the following:

- Verify Opened 27L5-D transfer disconnect switch
- Open 27L5A breaker
- Check for no potential on BU5SN line

SCC shall advise BU54 Operator to carry out the following:

- Open 54T4L5-L5 and 54DL5-L5 disconnect switches and turn off its 125Vdc supply
- Close 54BU5SN-G ground disconnect switch

SCC shall advise SN27 Operator to carry out the following:

- Open 27L5A-L5 disconnect switch and turn off its 125Vdc supply
- Close 27BU5SN-G ground disconnect switch

3.15. To restore BU5SN line to service after work

3.15.1. Prepare BU5SN line for restoration

- Advise SCC when work on the line has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on BU5SN line

SCC shall advise SN27 Operator to carry out the following:

- Verify Opened 27L5-D transfer disconnect switch
- Check opened 27L5A breaker
- Open 27BU5SN-G ground disconnect switch
- Turn on 125Vdc supply and close 27L5A-L5 disconnect switch

SCC shall advise BU54 Operator to carry out the following:

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- Check opened 54DL5 and 54T4L5 breakers
- Open 54BU5SN-G ground disconnect switch
- Turn on 125Vdc supply and close 54T4L5-L4 and 54DL5-L4 disconnect switches

3.15.2. Restoration of BU5SN line to service:

SCC shall:

- Advise the BU54 and SN27 Operators of readiness to restore BU5SN line to service
- Close (or advise the SN27 Operator to close) 27L5A breaker
- Close (or advise the BU54 Operator to close) 54DL5 and 54T4L5 breakers

3.16. To restore BU5SN line to service after automatic outage

If BU5SN line trips auto due to fault:

BU54 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 SN27 Operator to energize) the line **ONCE** by closing 27L5A breaker
- Close (or advise the BU54 Operator to close) 54DL5 and 54T4L5 breakers

BU54 Operator shall:

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

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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:

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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. The main 'A' and 'D' buses, a breaker and half configuration provide the normal points of supply to all circuits/equipment such as BU1SA, BU2KP, BU4TH, BU5SN lines and six transformers at the generating station.

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5. Approval

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Director, Technical Services