

TD-OP-030



OPERATING PROCEDURE FOR BOGOSU SUBSTATION

GHANA GRID COMPANY LTD

TECHNICAL DIRECTIVES

Title: OPERATING PROCEDURE FOR BOGOSU SUBSTATION (BS30)	
Issued To: Director, System Operations Director, SNS Manager, SCC Manager, Dispatch Operations Area Manager, Prestea Operating Staff, Prestea Area Maintenance Staff, Prestea Area Dispatch Staff, SCC	Number: TD-OP-030
	Subject Area: Operating
	Issue Date: Trial
	Origin: Technical Services
Key Words: Take Out, Isolate, Prepare, Energize, Restore, Automatic Outage	

Contents

1. Purpose	Error! Bookmark not defined.
2. Scope	3
3. Procedure	3
3.1. To take D1BS line out of service	3
3.2. To take out, isolate and de-energize D1BS line for work.....	3
3.3. To restore D1BS line to service after work	4
3.4. To restore D1BS line to service after automatic outage.....	5
3.5. To take BS2AY line out of service.....	5
3.6. To take out, isolate and de-energize BS2AY line for work	5
3.7. To restore BS2AY line to service after work.....	6
3.8. To restore BS2AY line to service after automatic outage	7
3.9. To take BS4P line out of service.....	7
3.10. To take out, isolate and de-energize BS4P line for work	8
3.11. To restore BS4P line to service after work.....	8
3.12. To restore BS4P line to service after automatic outage	9
3.13. To isolate 30T1 Transformer for work	10
3.14. To restore 30T1 Bank to service.....	10
3.15. To restore 30T1 Bank to service after automatic outage.....	11
3.16. To isolate 30T2 Transformer for work	11
3.17. To restore 30T2 Bank to service.....	12
3.18. To restore 30T2 Bank to service after automatic outage.....	13
3.19. To Isolate 30T1F1 Breaker for work (Temporary Arrangement).....	13
3.20. To restore 30T1F1 Breaker to service after work.....	14
3.21. To Isolate 30T2F2 Breaker for work (Temporary Arrangement).....	14
3.22. To restore 30T2F2 Breaker to service after work	14
4. Explanation.....	15
5. Approval.....	16

1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at BS30 Substation to service for planned and auto outages.

2. Scope

The directive will be used by Operators at Takoradi Operating Area and System Control Center (SCC) for operation of equipment at BS30 Substation.

3. Procedure

3.1. To take D1BS line out of service

SCC shall carry out (or advise the BS30 Operator to carry out) the following:

- Open 30L1A and 30L1L2 breakers

SCC shall advise D11 Operator to carry out the following:

- Verify opened 11D1BS-S bypass disconnect switch
- Open 11D1BS breaker
- Check for no potential on D1BS line

3.2. To take out, isolate and de-energize D1BS line for work

- BS30 Operator shall request for Station Guarantee from D11

SCC shall carry out (or advise the BS30 Operator to carry out) the following:

- Open 30L1A and 30L1L2 breakers

SCC shall advise D11 Operator to carry out the following:

- Check opened 11D1BS-S bypass disconnect and turn off its 125Vdc supply
- Open 11D1BS breaker
- Check for no potential on D1BS line

SCC shall advise D11 Operator to carry out the following:

- Open 11D1BS-L1 disconnect switch and turn off its 125Vdc supply

TECHNICAL DIRECTIVES

- Close 11D1BS-G ground disconnect switch

SCC shall advise BS30 Operator to carry out the following:

- Open 30L1A-L1 and 30LIL2-L1 disconnect switches and turn off 125Vdc supply
- Close 30D1BS-G ground disconnect switch

3.3. To restore D1BS line to service after work

3.3.1. Prepare D1BS line for restoration

BS30 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 D1BS line

SCC shall advise D11 Operator to carry out the following

- Check opened 11D1BS breaker
- Check opened 11D1BS-S bypass disconnect switch and turn on its 125Vdc supply
- Open 11D1BS-G ground disconnect switch
- Turn on 125Vdc supply and close 11D1BS-L1 disconnect switch

SCC shall advise BS30 Operator to carry out the following:

- Check opened 30L1A and 30LIL2 breakers
- Open 30D1BS-G ground disconnect switch
- Turn on 125Vdc supply and close 30L1A-L1 and 30LIL2-L1 disconnect switches

3.3.2. Restoration of D1BS line to service:

SCC shall:

- Advise the BS30 and D11 Operators of readiness to restore D1BS line to service
- Close (or advise the D11 Operator to close) 11D1BS breaker
- Close (or advise the BS30 Operator to close) 30L1A and 30LIL2 breakers

3.4. To restore D1BS line to service after automatic outage

If D1BS line trips auto due to fault:

BS30 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 D11 Operator to energize) the line **ONCE** by closing 11D1BS breaker
- Close (or advise the BS30 Operator to close) 30L1A and 30L1L2 breakers

BS30 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 BS2AY line out of service

SCC shall carry out (or advise the BS30 Operator to carry out) the following:

- Open 30L1L2 and 30L2L4 breakers

SCC shall advise AY42 Operator to carry out the following:

- Verify opened 42AT1-S bypass disconnect switch
- Open 42AT1 breakers
- Check for no potential on BS2AY line

3.6. To take out, isolate and de-energize BS2AY line for work

- BS30 Operator shall request for Station Guarantee from AY42

SCC shall carry out (or advise the BS30 Operator to carry out) the following:

TECHNICAL DIRECTIVES

- Open 30L1L2 and 30L2L4 breakers

SCC shall advise AY42 Operator to carry out the following:

- Check opened 42AT1-S bypass disconnect switch and turn off its 125Vdc supply
- Open 42AT1 breaker
- Check for no potential on BS2AY line

SCC shall advise AY42 Operator to carry out the following:

- Open 42L2-A disconnect switch and turn off its 125Vdc supply
- Close 42BS2AY-G ground disconnect switch

SCC shall advise BS30 Operator to carry out the following:

- Open 30L2L4-L2 and 30L1L2-L2 disconnect switches and turn off its 125Vdc supply
- Close 30BS2AY-G ground disconnect switch

3.7. To restore BS2AY line to service after work

3.7.1. Prepare BS2AY line for restoration

BS30 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 BS2AY line

SCC shall advise AY42 Operator to carry out the following

- Check opened 42AT1 breaker
- Check opened 42AT1-S bypass disconnect switch and turn on its 125Vdc supply
- Open 42BS2AY-G ground disconnect switch
- Turn on 125Vdc supply and close 42L2-A disconnect switch

SCC shall advise BS30 Operator to carry out the following:

- Check opened 30L2L4 and 30L1L2 breakers
- Open 30BS2AY-G ground disconnect switch

TECHNICAL DIRECTIVES

- Turn on 125Vdc supply and close 30L2L4-L2 and 30L1L2-L2 disconnect switches

3.7.2. Restoration of BS2AY line to service:

SCC shall:

- Advise the BS30 and AY42 Operators of readiness to restore BS2AY line to service
- Close (or advise the AY42 Operator to close) 42AT1 breaker
- Close (or advise the BS30 Operator to close) 30L1L2 and 30L2L4 breakers

3.8. To restore BS2AY line to service after automatic outage

If BS2AY line trips auto due to fault:

BS30 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 BS30 Operator to energize) the line **ONCE** by closing 30L1L2 and 30L2L4 breakers
- Close (or advise the AY42 Operator to close) 42AT1 breaker

BS30 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 BS4P line out of service

SCC shall carry out (or advise the BS30 Operator to carry out) the following:

- Open 30L2L4 and 30DL4 breakers

SCC shall carry out (or advise the P10 Operator to carry out) the following:

- Open 10DL4 and 10L4L7 breakers
- Check for no potential on BS4P line

3.10. To take out, isolate and de-energize BS4P line for work

- BS30 Operator shall request for Station Guarantee from P10

SCC shall carry out (or advise the BS30 Operator to carry out) the following:

- Open 30L2L4 and 30DL4 breakers

SCC shall advise P10 Operator to carry out the following:

- Open 10DL4 and 10L4L7 breakers
- Check for no potential on BS4P line

SCC shall advise P10 Operator to carry out the following:

- Open 10DL4-L4 and 10L4L7-L4 disconnect switches and turn off its 125Vdc supply
- Close 10BS4P-G ground disconnect switch

SCC shall advise BS30 Operator to carry out the following:

- Open 30L2L4-L4 and 30L1L2-L4 disconnect switches and turn off its 125Vdc supply
- Close 30BS4P-G ground disconnect switch

3.11. To restore BS4P line to service after work

3.11.1. Prepare BS4P line for restoration

BS30 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 BS4P line

SCC shall advise P10 Operator to carry out the following

- Check opened 10DL4 and 10L4L7 breakers
- Open 10BS4P-G ground disconnect switch

TECHNICAL DIRECTIVES

- Turn on 125Vdc supply and close 10DL4-L4 and 10L4L7-L4 disconnect switches

SCC shall advise BS30 Operator to carry out the following:

- Check opened 30L2L4 and 30LIL2 breakers
- Open 30BS4P-G ground disconnect switch
- Turn on 125Vdc supply and close 30L2L4-L4 and 30DL4-L4 disconnect switches

3.11.2. Restoration of BS4P line to service:

SCC shall:

- Advise the BS30 and P10 Operators of readiness to restore BS4P line to service
- Close (or advise the P10 Operator to close) 10DL4 and 10L4L7 breakers
- Close (or advise the BS30 Operator to close) 30L2L4 and 30DL4 breakers

3.12. To restore BS4P line to service after automatic outage

If BS4P line trips auto due to fault:

BS30 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 P10 Operator to energize) the line **ONCE** by closing 10DL4 and 10L4L7 breakers
- Close (or advise the BS30 Operator to close) 30L2L4 and 30DL4 breakers

BS30 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 30T1 Transformer for work

- BS30 Operator shall request Station Guarantee from Customer on 30F1 Feeder

SCC shall carry out or advise BS30 operator to carry out the following:

- Inform Customer about readiness to take off 30T1 Bank
- Request Customer on 30T1 Bank to take off their load
- If the station service is on 30T1 transfer supply to 30T2 by switching from AC1 to AC2
- Open AC1 Contactor/MCB to take off supply to 30T1 transformer auxiliaries

SCC shall carry out (or advise BS30 Operator to carry out) the following:

- Open 30T1F1 breaker
- Open 30A-T1 disconnect switch and turn off its 125Vdc supply
- Check for no potential on 30T1 Bank

BS30 Operator shall:

- Open 30T1F1-T1 disconnect switch and turn off its 125Vdc supply
- Open 30T1-TSS1 disconnect switch
- Open AC control MCB to take off supply to 30T1 transformer auxiliaries
- Open 125Vdc MCB to 30T1 primary and secondary protection and tag with PC13

3.14. To restore 30T1 Bank to service

3.14.1. Prepare 30T1 Bank for restoration:

BS30 Operation shall:

- Advise SCC when work on the bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 30T1 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 30T1F1-T1 disconnect switch

TECHNICAL DIRECTIVES

- Turn on 125Vdc supply and close 30TI-TSSI disconnect switch

3.14.2. Restoration of 30T1 Bank:

BS30 Operation shall:

- Advise SCC of readiness to energize 30T1 bank
- Turn on 125Vdc supply and close 30A-T1 disconnect switch to energize 30T1 transformer
- Close AC control MCB to 30T1 auxiliaries
- Close 125Vdc MCB to 30T1 primary and secondary protection and remove PC13 tag

BS30 Operator shall advise Customer of readiness to restore 30F1 feeder to service

SCC shall close (or advise BS30 Operator to close) the 30T1F1 breaker

3.15. To restore 30T1 Bank to service after automatic outage

If 30T1 Bank trips auto due to fault:

BS30 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 BS30 Operator to energize) the bank **ONCE** by closing 30L1A and 30DL4 breakers

BS30 Operator shall advise Customer of readiness to restore 30F1 feeder to service

SCC shall close (or advise BS30 Operator to close) 30T1F1 breaker

3.16. To isolate 30T2 Transformer for work

- BS30 Operator shall request Station Guarantee from Customer on 30F2 Feeder

TECHNICAL DIRECTIVES

SCC shall carry out or advise BS30 operator to carry out the following:

- Inform Customer about readiness to take off 30T2 Bank
- Request Customer on 30T2 Bank to take off their load
- If the station service is on 30T2 transfer supply to 30T1 by switching from AC2 to AC1
- Open AC2 Contactor/MCB to take off supply to 30T2 transformer auxiliaries

SCC shall carry out (or advise BS30 Operator to carry out) the following:

- Open 30T2F3 breaker
- Open 30D-T2 disconnect switch and turn off its 125Vdc supply
- Check for no potential on 30T2 Bank

BS30 Operator shall:

- Open 30T2F3-T2 disconnect switch and turn off its 125Vdc supply
- Open 30T2-TSS2 disconnect switch
- Open AC control MCB to 30T2 auxiliaries and tag
- Open 125Vdc MCB to 30T2 primary and secondary protection and tag with PC13

3.17. To restore 30T2 Bank to service

3.17.1. Prepare 30T2 Bank restoration:

BS30 Operator shall:

- Advise SCC when work on the bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 30T2 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 30T2F3-T2 disconnect switch
- Turn on 125Vdc supply and close 30T2-TSS2 disconnect switch

3.17.2. Restoration of 30T2 Bank

BS30 Operation shall:

- Advise SCC of readiness to energize 30T2 bank

TECHNICAL DIRECTIVES

- Turn on 125Vdc supply and close 30D-T2 disconnect switch to energize 30T2 transformer
- Close AC control MCB to 30T2 auxiliaries
- Close 125Vdc MCB to 30T2 primary and secondary protection and remove PC13 tag

BS30 Operator shall advise Customer of readiness to restore 30F3 feeder to service

- SCC shall close (or advise BS30 Operator to close) the 30T2F3 breaker

3.18. To restore 30T2 Bank to service after automatic outage

If 30T2 Bank trips auto due to fault:

BS30 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 BS30 Operator to energize) the bank **ONCE** by closing 30DL4 breaker and 30L1A breaker

BS30 Operator shall advise Customer of readiness to restore 30Y Bus to service

SCC shall close (or advise BS30 Operator to close) 30T2F3 breaker

3.19. To Isolate 30T1F1 Breaker for work (Temporary Arrangement)

- BS30 Operator shall request for Station Guarantee from Customer on 30F1 Feeder

SCC shall advise BS30 Operator to carry out the following:

- Inform Customer about readiness to take off 30F1 Feeder
- Request Customer on 30F1 Feeder to take off their load

SCC shall carry out (or advise BS30 Operator to carry out) the following:

- Open 30T1F1 breaker

SCC shall advise BS30 Operator to carry out the following:

- Open 30T1F1-T1 disconnect switch

3.20. To restore 30T1F1 Breaker to service after work

3.20.1. Prepare 30T1F1 breaker for restoration:

BS30 Operator shall:

- Advise SCC when work on the 30T1F1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 30T1F1 Breaker and temporary grounds removed
- Close 30T1F1-T1 disconnect switch

3.21. Restoration of 30T1F1 Breaker to service:

- BS30 Operator shall advise Customer of readiness to restore 30F1 feeder
- SCC shall close (or advise BS30 Operator to close) the 30T1F1 breaker

3.22. To Isolate 30T2F3 Breaker for work (Temporary Arrangement)

- BS30 Operator shall request for Station Guarantee from Customer on 30F2 Feeder

SCC shall advise BS30 Operator to carry out the following:

- Inform Customer about readiness to take off 30F3 Feeder
- Request Customer on 30F3 Feeder to take off their load

SCC shall carry out (or advise BS30 Operator to carry out) the following:

- Open 30T2F3 breaker

SCC shall advise BS30 Operator to carry out the following:

- Open 30T2F3-T2 disconnect switch

3.23. To restore 30T2F3 Breaker to service after work

3.23.1. Prepare 30T2F3 breaker for restoration:

BS30 Operator shall:

- Advise SCC when work on the 30T2F3 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 30T2F3 Breaker and temporary grounds removed
- Close 30T2F3-T2 disconnect switch

3.24. Restoration of 30T2F3 Breaker to service:

- BS30 Operator shall advise Customer of readiness to restore 30F2 feeder
- SCC shall close (or advise BS30 Operator to close) the 30T2F3 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 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 is only one 161kV bus arrangement. The main 'A' bus provides the normal points of supply to all circuits/equipment such as AR1AS, BS2AY, AS3BT lines, 20T1 and 20T2 transformers.

NOTE: Temporal arrangements are in place to supply customers pending construction of an outdoor feeder structure in the near future.

5. Approval

.....

Director, Technical Services

