TD-OP-0063

GRIDCo

OPERATING PROCEDURE FOR BEREKUM SUBSTATION

GHANA GRID COMPANY LTD

TECHNICAL DIRECTIVES

Title:	**OPERATING PROCEDURE FOR BEREKUM SUBSTATION (BR63)**		
Issued To:	Director, System Operations Director, NNS Manager, SCC Manager, Dispatch Operations Area Manager, Techiman Operating Staff, Techiman Area Maintenance Staff, Techiman Area Dispatch Staff, SCC	**Number:**	TD-OP-0063
		Subject Area:	Operating
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		Origin:	Technical Services
Key Words:	Take Out, Isolate, Prepare, Energize, Restore, Automatic Outage		

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 BR63 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 BR63 Substation.

3. Procedure

3.1. To take SN1BR line out of service

SCC shall advise BR63 operator to carry out the following:

- Inform Customer about readiness to take off SN1BR line
- Request Customer on 63T1 and 63T2 Banks to take off their load

SCC shall carry out (or advise the BR63 Operator to carry out) the following:

- Open 63L1A and 63L1T1 breakers

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

- Open 27L1A breaker
- Check for no potential on SN1BR line

3.2. To take out, isolate and de-energize SN1BR line for work

- BR63 Operator shall request for Station Guarantee from SN27

SCC shall carry out (or advise the BR63 Operator to carry out) the following:

- Open 63L1A and 63L1T1 breakers

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

- Open 27L1A breaker
- Check for no potential on SN1BR line

SCC shall advise SN27 Operator to carry out the following:

- Check opened 27AL1-D transfer disconnect switch and turn off its 125Vdc supply

- Open 27AL1-L1 disconnect switch and turn off its 125Vdc supply
- Close 27SN1BR-G ground disconnect switch

SCC shall advise BR63 Operator to carry out the following:

- Open 63L1A-L1 and 63L1T1-L1 disconnect switches and turn off its 125Vdc supply
- Close 63SN1BR-G ground disconnect switch

3.3. To restore SN1BR line to service after work

3.3.1. Prepare SN1BR line for restoration:

BR63 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 SN1BR line

SCC shall advise SN27 Operator to carry out the following:

- Check opened 27AL1-D transfer disconnect switch and turn off its 125Vdc supply
- Check opened 27AL1 breaker
- Open 27SN1BR-G ground disconnect switch
- Turn on 125Vdc supply and close 27AL1-L1 disconnect switch

SCC shall advise BR63 operator to carry out the following:

- Check opened 63L1A and 63L1T1 breakers
- Open 63SN1BR-G ground disconnect switch
- Turn on 125Vdc supply and close 63L1A-L1 and 63L1T1-L1 disconnect switches

3.3.2. Restoration of SN1BR line to service:

SCC shall:

- Advise the SN27 and BR63 Operators of readiness to restore SN1BR line to service

- Close (or advise the SN27 Operator to close) 27AL1 breaker

- Close (or advise the BR63 Operator to close) 63L1A and 63L1T1 breakers

3.4. To restore SN1BR line to service after automatic outage

If SN1BR line trips auto due to fault on the line:

BR63 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 SN27 Operator to energize) the line **ONCE** by closing 27L1A breaker

- Close (or advise the BR63 Operator to close) 63L1A and 63L1T1 breakers

BR63 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 isolate 63T1 Transformer for work

- BR63 Operator shall request Station Guarantee from Customer on 63T1 Feeder

SCC shall advise BR63 Operator to carry out the following:

- Inform Customer about readiness to take off 63T1 bank

- Request Customer on 63T1 Bank to take off their load

- Transfer Station Service from 63T1 to 63T2, if Station Service is on 63T1

- Open AC1 Contactor/MCB to take off supply to 63T1 transformer auxiliaries

SCC shall carry out (or advise BR63 operator to carry out) the following:

- Open 63T1F1 breaker
- Open 63DT1and 63L1T1 breakers
- Check for no potential on 63T1 Bank
- Open 63DT1-T1 and 63L1T1-T1 disconnect switches and turn off its 125Vdc supply
- Open 63T1F1-T1 disconnect switch
- Open AC control MCB to 63T1 auxiliaries and tag
- Open 125V DC MCB to 63T1 primary and secondary protection and tag with PC13

3.6. To restore 63T1 Bank to service after work

3.6.1. Prepare 63T1 bank for restoration:

BR63 Operator shall:

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential and grounds removed on 63T1 Bank
- Close 63T1F1-T1 disconnect switch
- Turn on 125Vdc supply and close 63DT1-T1 and 63L1T1-L1 disconnect switches
- Close AC control MCB to 63T1 auxiliaries and remove tag
- Close 125V DC MCB to 63T1 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 63T1 Bank to service

3.6.2. Restoration of 63T1 bank to service:

- SCC shall close (or advise BR63 operator to close) the 63DT1and 63L1T1 breakers
- BR63 Operator shall advise Customer of readiness to restore 63F1 feeder to service
- SCC shall close (or advise BR63 operator to close) the 63T1F1 breaker

3.7. To restore 63T1 Bank to service after automatic outage

If 63T1 bank trips auto due to fault:

BR63 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 BR63 Operator to energize) the bank ONCE by closing 63DT1and 63L1T1 breakers

BR63 Operator shall advise Customer of readiness to restore 63F1 feeder to service

SCC shall close (or advise BR63 Operator to close) 63T1F1 breaker

BR63 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.

3.8. To isolate 63T1F1 Breaker for work

- BR63 Operator shall request Station Guarantee from customer on 63F1 Feeder

SCC shall advise BR63 operator to carry out the following:

- Inform Customer about readiness to take off 63T1 bank
- Request Customer on 63T1 Bank to take off their load
- Transfer Station Service supply from 63T1 to 63T2, if station service is on 63T1
- Open AC1 Contactor/MCB to take off supply to 63T1 transformer auxiliaries

SCC shall carry out (or advise BR63 operator to carry out) the following:

- Open 63T1F1 breaker
- Open 63DT1 and 63L1T1 breakers
- Open 63T1F1- F1
- Open 63DT1-T1 disconnect switch and turn off its 125Vdc supply
- Open 63L1T1-T1 disconnect switch and turn off its 125Vdc supply

3.9. To restore 63T1F1 Breaker to service after work

3.9.1. Prepare 63T1F1 breaker for restoration:

BR63 Operator shall:

- Advise SCC when work on the 63T1F1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 63T1 Bank and temporary grounds removed
- Close 63T1F1-F1
- Turn on 125Vdc supply and close 63DT1-T1 disconnect switch
- Turn on 125Vdc supply and close 63L1T1-T1 disconnect switch
- Advise SCC of readiness to restore 63T1F1 breaker to service

3.9.2. Restoration of 63T1F1 breaker to service:

- SCC shall close (or advise BR63 Operator to close) the 63DT1and 63L1T1 breaker
- BR63 Operator shall advise Customer of readiness to restore 63F1 feeder to service
- SCC shall close (or advise BR63 Operator to close) the 63T1F1 breaker

3.10. To isolate 63T2 Bank for work

SCC shall advise BR63 Operator to carry out the following:

- Inform Customer about readiness to take off 63T2 bank
- Request Customer on 63T2 Bank to take off their load
- Transfer Station Service from AC2 to AC1 if Station Service is on 63T2
- Open AC2 Contactor/MCB to take off supply to 63T2 transformer auxiliaries

SCC shall carry out (or advise BR63 Operator to carry out) the following:

- Open 63T2F2 breaker
- Open 63L1A breaker
- Open 63DT1 breaker
- Check for no potential on 63T2 Bank
- Open 63T2-D and 63T2-A disconnect switches and turn off its 125Vdc supply
- Open 63T2F2-T2 disconnect switch
- Open AC control MCB to 63T2 auxiliaries and tag
- Open 125V DC MCB to 63T2 primary and secondary protection and tag with PC13

3.11. To restore 63T2 Bank to service after work

3.11.1. Prepare 63T2 Bank for restoration:

BR63 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 63T2 Bank and temporary grounds removed
- Close 63T2F2-T2 disconnect switch
- Turn on 125Vdc supply and close 63T2-D and 63T2-A disconnect switches
- Close AC control MCB to 63T2 auxiliaries and remove tag
- Close 125V DC MCB to 63T2 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 63T2 Bank to service

3.11.2. Restoration of 63T2 Bank to service:

- SCC shall close (or advise BR63 Operator to close) the 63L1A and 63DT1 breakers
- BR63 Operator shall advise customers of readiness to restore 63F2 feeder to service

- SCC shall close (or advise BR63 Operator to close) the 63T2F2 breaker

3.12. To restore 63T2 Bank to service after automatic outage

If 63T2 bank trips auto due to fault:

BR63 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 BR63 Operator to energize) the bank ONCE by closing 63L1A and 63DT1 breakers

BR63 Operator shall advise Customer of readiness to restore 63F2 feeder to service

SCC shall close (or advise BR63 Operator to close) 63T2F2 breaker

BR63 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.

3.13. To isolate 63T2F2 Breaker for work

- BR63 Operator shall request Station Guarantee from Customer on 63F2 Feeder

SCC shall advise BR63 Operator to carry out the following:

- Inform Customer about readiness to take off 63T2 bank
- Request Customer on 63T2 Bank to take off their load

SCC shall carry out (or advise BR63 Operator to carry out) the following:

- Open 63T2F2 breaker
- Open 63DT1 breaker
- Open 63L1A breaker

- Open 63T2F2-F2 disconnect switch
- Open 63T2F2-T2 disconnect switch
- Open 63T2-A disconnect switch and turn off its 125Vdc supply
- Open 63T2-D disconnect switch and turn off its 125Vdc supply

3.14. To restore 63T2F2 Breaker to service after work

3.14.1. Prepare 63T2F2 Breaker for restoration:

BR63 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 63T2 Bank and temporary grounds removed
- Close 63T2F2-F2 disconnect switch
- Close 63T2F2-T2 disconnect switch
- Turn on 125Vdc supply and close 63T2-D and 63L1A-A disconnect switches
- Advise SCC of readiness to restore 63T2F2 breaker to service

3.14.2. Restoration of 63T2F2 breaker to service:

- SCC shall close (or advise BR63 Operator to close) the 63L1A and 63DT1 breakers
- BR63 Operator shall advise Customer of readiness to restore 63F2 feeder to service
- SCC shall close (or advise BR63 Operator to close) the 63T2F2 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 the Maintenance team have inspected and meggered the Transformer.

The station has two 161Kv buses. The main 'A' bus provides the normal points of supply to all circuits such as SN1BR (Sunyani-Berekum) lines, 63T1 and 63T2 transformers. The 'D' bus provides the necessary by-pass route.

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 station 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. 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 on, a permanent ground switches a PC 14 to close the ground switch is not required.

5. Approval

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Director, Technical Services