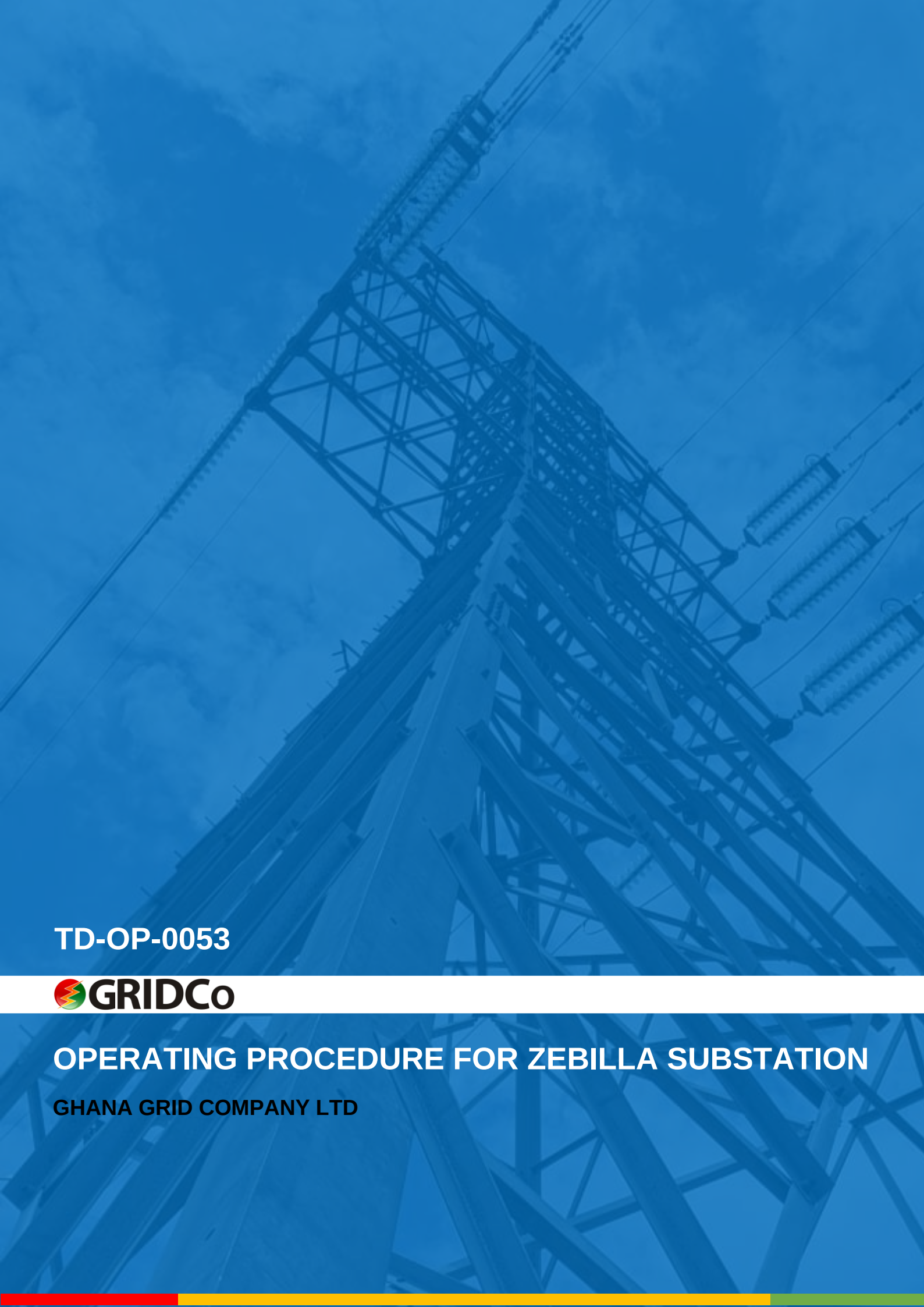

TD-OP-0053

GRIDCo

OPERATING PROCEDURE FOR ZEBILLA SUBSTATION

GHANA GRID COMPANY LTD

Title:	**OPERATING PROCEDURE FOR ZEBILLA SUBSTATION (ZB53)**		
Issued To:	Director, System Operations Director, NNS Manager, SCC Manager, Dispatch Operations Area Manager, Bolga Operating Staff, Bolga Area Maintenance Staff, Bolga Area Dispatch Staff, SCC	**Number:**	TD-OP-0053
		Subject Area:	Operating
		Issue Date:	Trial
		Origin:	Technical Services
Key Words:	Take Out, Isolate, Prepare, Energize, Restore, Automatic Outage		

CONTENTS

1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at ZB53 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 ZB53 Substation.

3. Procedure

3.1. To take ZB1BK line out of service

SCC shall carry out (or advise the ZB53 Operator to carry out) the following:

- Verify opened 53L1-D transfer disconnect switch
- Open 53AL1breaker

SCC shall carry out (or advise the BK73 Operator to carry out) the following:

- Open 73L1A and 73L1T2 breakers
- Check for no potential on ZB1BK line

3.2. To take out, isolate and de-energize ZB1BK line for work

- ZB53 Operator request for Station Guarantee from BK73

SCC shall carry out (or advise the ZB53 Operator to carry out) the following:

- Check opened 53L1-D transfer disconnect switch and turn off its 125Vdc supply
- Open 53AL1 breaker

SCC shall carry out (or advise BK73 Operator to carry out) the following:

- Open 73L1A and 73L1T2 breakers
- Check for no potential on ZB1BK line

SCC shall advise BK73 Operator to carry out the following:

- Open 73L1A-L1 and 73L1T2-L1 disconnect switches and turn off its 125Vdc supply

- Close 73ZB1BK-G ground disconnect switch

SCC shall advise ZB53 Operator to carry out the following:

- Open 53AL1-L1 disconnect switch and turn off its 125Vdc supply
- Close 53ZB1BK-G ground disconnect switch

3.3. To restore ZB1BK line to service after work

3.3.1. Prepare ZB1BK line for restoration:

ZB53 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 ZB1BK line

SCC shall advise BK73 Operator to carry out the following:

- Check opened 73L1A and 73L1T2 breakers
- Open 73ZB1BK-G ground disconnect switch
- Turn on 125Vdc supply and close 73L1A-L1 and 73L1T2-L1 disconnect switches

SCC shall advise ZB53 Operator to carry out the following:

- Check opened 53L1A breaker
- Check opened 53L1-D transfer disconnect switch and turn on its 125Vdc supply
- Open 53ZB1BK-G ground disconnect switch
- Turn on 125Vdc supply and close 53AL1-L1 disconnect switches

3.3.2. Restoration of ZB1BK line to service:

SCC shall:

- Advise the BK73 and ZB53 Operators of readiness to restore ZB1BK line to service
- Close (or advise the BK73 Operator to close) 73L1A and 73L1T2 breakers
- Close (or advise the ZB53 Operator to close) 53AL1 breaker

3.4. To restore ZB1BK line to service after automatic outage

If ZB1BK line trips auto due to fault:

ZB53 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 BK73 Operator to energize) the line **ONCE** by closing 73L1A and 73L1T2 breakers
- Close (or advise the ZB53 Operator to close) 53L1A breaker

ZB53 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 BG3ZB line out of service

SCC shall carry out (or advise the ZB53 Operator to carry out) the following:

- Verify opened 53L3-D transfer disconnect switch
- Open 53L3A breaker.

SCC shall carry out (or advise the BG29 Operator to carry out) the following:

- Verify opened 29L3-D transfer disconnect switch
- Open 29AL3 breaker
- Check for no potential on BG3ZB line

3.6. To take out, isolate and de-energize BG3ZB line for work

- ZB53 Operator shall request for Station Guarantee from BG29

SCC shall carry out (or advise the ZB53 Operator to carry out) the following:

- Check opened 53L3-D transfer disconnect switch and turn off its 125Vdc supply

- Open 53L3A breaker

SCC shall carry out (or advise the BG29 Operator to carry out) the following:

- Check opened 29L3-D transfer disconnect switch and turn off its 125Vdc supply

- Open 29AL3 breaker

- Check for no potential on BG3ZB line

SCC shall advise BG29 Operator to carry out the following:

- Open 29AL3-L3 disconnect switch and turn off its 125Vdc supply

- Close 29BG3ZB-G ground disconnect switch

SCC shall advise ZB53 operator to carry out the following:

- Open 53L3A-L3 disconnect switch and turn off its 125Vdc supply

- Close 53BG3ZB-G ground disconnect switch

3.7. To restore BG3ZB line to service after work

3.7.1. Prepare BG3ZB line for restoration:

ZB53 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 BG3ZB line

SCC shall advise BG29 Operator to carry out the following:

- Check opened 29AL3 breaker

- Check opened 29L3-D transfer disconnect switch and turn on its 125Vdc supply

- Open 29BG3ZB-G ground disconnect switch

- Turn on 125Vdc supply and close 29AL3-L3 disconnect switch

SCC shall advise ZB53 Operator to carry out the following:

- Check opened 53L3A breaker

- Check opened 53L3-D transfer disconnect switch and turn on its 125Vdc supply
- Open 53BG3ZB-G ground disconnect switch
- Turn on 125Vdc supply and close 53L3A-L3 disconnect switch

3.7.2. Restoration of BG3ZB line to service:

SCC shall:

- Advise the BG29 and ZB53 Operators of readiness to restore BG3ZB line to service
- Close (or advise the BG29 Operator to close) 29AL3 breaker
- Close (or advise the ZB53 Operator to close) 53L3A breaker

3.8. To restore BG3ZB line to service after automatic outage

If BG3ZB line trips auto due to fault:

ZB53 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 BG29 Operator to energize) the line **ONCE** by closing 29AL3 breaker
- Close (or advise the ZB53 Operator to close) 53L3A breaker

ZB53 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 isolate 53T1 Transformer for work

SCC shall advise ZB53 Operator to carry out the following:

- Inform Customer about readiness to take off 53T1 bank
- Request Customer on 53T1 Bank to take off their load
- If the station service is on 53T1 transfer supply to 53T2 by switching from AC1 to AC2
- Open AC1 Contactor/MCB to take off supply to 53T1 transformer auxiliaries

SCC shall carry out (or advise ZB53 Operator to carry out) the following:

- Open 53T1F1 breaker
- Open 53AT1 breaker

SCC shall advise ZB53 Operator to carry out the following:

- Check opened 53D-T1 transfer disconnect switch and turn off its 125Vdc supply
- Open 53T1F1-F1 disconnect switch
- Open 53AT1-T1 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 53T1 auxiliaries
- Open 125Vdc MCB to 53T1 primary and secondary protection and tag with PC13
- Check for no potential on 53T1 Bank

3.10. To restore 53T1 Bank to service after work

3.10.1. Prepare 53T1 bank for restoration:

ZB53 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 53T1 Bank and temporary grounds removed
- Close 53T1F1-F1 disconnect switch
- Check opened 53D-T1 transfer disconnect switch and turn on its 125Vdc supply
- Close AC control MCB to 53T1 auxiliaries

- Close 125Vdc MCB to 53T1 primary and secondary protection and remove PC13 tag

- Advise SCC of readiness to restore 53T1 Bank to service

3.10.2. Restoration of 53T1 bank to service:

- SCC shall close (or advise ZB53 Operator to close) the 53AT1 breaker

- ZB53 Operator shall advise Customer of readiness to restore 53T1 bank to service

- SCC shall close (or advise ZB53 Operator to close) the 53T1F1 breaker

3.11. To restore 53T1 Bank to service after automatic outage

If 53T1 bank trips auto due to fault:

ZB53 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 ZB53 Operator to energize) the bank **ONCE** by closing 53AT1 breaker

ZB53 Operator shall advise Customer of readiness to restore 53T1 bank to service

SCC shall close (or advise ZB53 Operator to close) 53T1F1 breaker

ZB53 Operator shall:

- Advise the Supervisor/Area Manager of item above

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

3.12. To isolate 53T2 Bank for work

SCC shall advise ZB53 Operator to carry out the following:

- Inform Customer about readiness to take off 53T2 bank

- Request Customer on 53T1 Bank to take off their load
- If the station service is on 53T2 transfer supply to 53T1 by switching from AC2 to AC1
- Open AC2 Contactor/MCB to take off supply to 53T2 transformer auxiliaries
-

SCC shall carry out (or advise ZB53 Operator to carry out) the following:

- Open 53T2F2 breaker
- Open 53AT2 breaker

SCC shall advise ZB53 Operator to carry out the following:

- Check opened 53D-T2 transfer disconnect switch and turn off its 125Vdc supply
- Open 53T2F2-F2 disconnect switch
- Open 53AT2-T2 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 53T2 auxiliaries
- Open 125Vdc MCB to 53T2 primary and secondary protection and tag with PC13
- Check for no potential on 53T2 Bank

3.13. To restore 53T2 Bank to service after work

3.13.1. Prepare 53T2 bank for restoration:

ZB53 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 53T2 Bank and temporary grounds removed
- Check opened 53D-T2 transfer disconnect switch and turn on its 125Vdc supply
- Close 53T2F2-F2 disconnect switch
- Turn on 125Vdc supply and close 53AT2-T2 disconnect switch
- Close AC control MCB to 53T2 auxiliaries

- Close 125Vdc MCB to 53T2 primary and secondary protection and remove PC13 tag

- Advise SCC of readiness to restore 53T2 Bank to service

3.13.2. Restoration of 53T2 bank to service:

- SCC shall close (or advise ZB53 Operator to close) the 53AT2 breaker

- ZB53 Operator shall advise Customer of readiness to restore 53T2 bank to service

- SCC shall close (or advise ZB53 Operator to close) the 53T2F2 breaker

3.14. To restore 53T2 Bank to service after automatic outage

If 53T2 bank trips auto due to fault:

ZB53 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 ZB53 Operator to energize) the bank **ONCE** by closing 53AT2 breaker

ZB53 Operator shall advise Customer of readiness to restore 53T2 bank to service

SCC shall close (or advise ZB53 Operator to close) 53T2F2 breaker

ZB53 Operator shall:

- Advise the Supervisor/Area Manager of item above

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

3.15. To Isolate 53T1F1 Breaker for work

If supply to 53Y1 Bus is from 53T1 Bank:

ZB53 Operator shall:

- Inform Customer about readiness to take off 53T1 bank

- Request Customer on 53T1 Bank to take off their load, to facilitate transfer of supply to 53T2 Bank

- Open AC1 Contactor/MCB to take off supply to 53T1 transformer auxiliaries

- If the station service is on 53T1 transfer supply to 53T2 by switching from AC2 to AC1

SCC shall carry out (or advise ZB53 Operator to carry out) the following:

- Check closed 53Y1Y2 breaker

- Open 53AT1 breaker

- Open 53T1F1 breaker

- Close 53T2Y2 breaker, to transfer supply to 53T2 Bank

SCC shall advise ZB53 Operator to carry out the following:

- Check opened 53D-T1 transfer disconnect switch and turn off its 125Vdc supply

- Open 53T1F1-F1 disconnect switch

- Open 53AT1-T1 disconnect switch and turn off its 125Vdc supply

- Check for no potential on 53T1 Bank

3.16. To restore 53T1F1 Breaker to service after work

3.16.1. Prepare 53T1F1 breaker for restoration:

ZB53 Operator shall:

- Advise SCC when work on the 53T1F1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 53T1F1 breaker and temporary grounds removed

- Check opened 53D-T1 transfer disconnect switch and turn on its 125Vdc supply

- Close 53T1F1-F1 disconnect switch

- Turn on 125Vdc supply and close 53AT1-T1 disconnect switch

3.16.2. Restoration of 53T1F1 breaker to service:

- SCC shall close (or advise ZB53 Operator to close) the 53AT1 breaker
- ZB53 Operator shall advise Customer of readiness to restore 53F1 feeder to service
- SCC shall close (or advise ZB53 Operator to close) the 53T1F1 breaker

3.17. To Isolate 53T2F2 Breaker for work

If supply to 53Y2 Bus is from 53T2 Bank:

ZB53 Operator shall:

- Inform Customer about readiness to take off 53T2 bank
- Request Customer on 53T2 Bank to take off their load, to facilitate transfer of supply to 53T1 Bank
- Open AC1 Contactor/MCB to take off supply to 53T2 transformer auxiliaries
- If the station service is on 53T2 transfer supply to 53T1 by switching from AC1 to AC2

SCC shall carry out (or advise ZB53 Operator to carry out) the following:

- Check closed 53Y1Y2 breaker
- Open 53AT2 breaker
- Open 53T2F2 breaker
- Close 53T1Y1 breaker, to transfer supply to 53T1 Bank

SCC shall advise ZB53 Operator to carry out the following:

- Check opened 53D-T2 transfer disconnect switch and turn off its 125Vdc supply
- Open 53T2F2-F2 disconnect switch
- Open 53AT2-T2 disconnect switch and turn off its 125Vdc supply
- Check for no potential on 53T2 Bank

3.18. To restore 53T2F2 Breaker to service after work

3.18.1. Prepare 53T2F2 breaker for restoration:

ZB53 Operator shall:

- Advise SCC when work on the 53T2Y2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 53T2Y2 Breaker and temporary grounds removed
- Check opened 53D-T2 transfer disconnect switch and turn on its 125Vdc supply
- Close 53T2Y2-Y2 disconnect switch
- Turn on 125Vdc supply and close 53AT2-T2 disconnect switch

3.18.2. Restoration of 53T2Y2 breaker to service:

- SCC shall close (or advise ZB53 Operator to close) the 53AT2 breaker
- ZB53 Operator shall advise Customer of readiness to restore 53F2 feeder to service
- SCC shall close (or advise ZB53 Operator to close) the 53T2F2 breaker

3.19. To isolate 53SC1 Capacitor Bank for work

SCC shall carry out (or advise ZB53 Operator to carry out) the following:

- Open 53SC1Y1breaker

SCC shall advise ZB53 Operator to carry out the following:

- Open 53SC1Y1-Y1 disconnect switch
- Close 53SC1-G ground disconnect switch

3.20. To restore 53SC1 Capacitor Bank to service after work

3.20.1. Prepare 53SC1 Capacitor Bank for restoration:

ZB53 Operator shall:

- Advise SCC when work on the 53SC1 Capacitor Bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 53SC1 Capacitor Bank and temporary grounds removed

- Open 53SC1-G ground disconnect switch

- Close 53SC1Y1-Y1 disconnect switch

3.20.2. Restoration of 53SC1 Capacitor Bank to service:

- SCC shall close (or advise ZB53 Operator to close) 53SC1Y1 breaker if the voltage is below 32.8kV

3.21. To isolate 53SC2 Capacitor Bank for work

SCC shall carry out (or advise ZB53 Operator to carry out) the following:

- Open 53Y2SC2 breaker

SCC shall advise ZB53 Operator to carry out the following:

- Open 53Y2SC2-Y2 disconnect switch

- Close 53SC1-G ground disconnect switch

3.22. To restore 53SC2 Capacitor Bank to service after work

3.22.1. Prepare 53SC2 Capacitor Bank for restoration:

ZB53 Operator shall:

- Advise SCC when work on the 53SC2 Capacitor Bank has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 53SC2 Capacitor Bank and temporary grounds removed

- Open 53SC2-G ground disconnect switch

- Close 53Y2SC2-Y2 disconnect switch

3.22.2. Restoration of 53SC2 Capacitor Bank to service:

- SCC shall close (or advise ZB53 Operator to close) 53Y2SC2 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 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 has two 161kV buses. The main 'A' bus provides the normal points of supply to all circuits such as ZB1BK and BG3ZB lines. The 'D' bus provides the normal points of supply to 53T1 transformer and 53T2 transformers.

5. Approval

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Director, TSD