TD-OP-0072

GRIDCo

OPERATING PROCEDURE FOR FREE ZONE ENCLAVE SUBSTATION

GHANA GRID COMPANY LTD

Title:	**OPERATING PROCEDURE FOR FREE ZONE ENCLAVE SUBSTATION (FZ72)**		
Issued To:	Director, System Operations Director, SNS Manager, SCC Manager, Dispatch Operations Area Manager, Free Zone Operating Staff, Free Zone Maintenance Staff, Free Zone Dispatch Staff, SCC	**Number:**	TD-OP-0072
		Subject Area:	Operating
		Issue Date:	Trial
		Origin:	Technical Services
Key Words:	Take Out, Isolate, Prepare, Energize, Restore, Automatic Outage		

TECHNICAL DIRECTIVES

Contents

TECHNICAL DIRECTIVES

1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at FZ72 Substation to service for planned and auto outages.

2. Scope

The directive will be used by Operators at Free Zone Operating Area and System Control Center (SCC) for operation of equipment at FZ72 Substation.

3. Procedure

3.1. To take V17FZ line out of service

SCC shall carry out (or advise the FZ72 Operator to carry out) the following:

- Open 72L17A and 72L17T1 breakers

SCC shall advise V2 Operator to carry out the following:

- Open 2DL17 and 2L17L18 breakers
- Check for no potential on V17FZ line

3.2. To take out, isolate and de-energize V17FZ line for work

- FZ72 Operator shall request for Station Guarantee from V2

SCC shall carry out (or advise the FZ72 Operator to carry out) the following:

- Open 72L17A and 72L17T1 breakers

SCC shall carry out (or advise the V2 Operator to carry out) the following:

- Open 2DL17 and 2L17L18 breakers
- Check for no potential on V17FZ line

SCC shall advise V2 Operator to carry out the following:

- Open 2DL17-L17 and 2L17L18-L17 disconnect switches and turn off its 125Vdc supply
- Close 2V17FZ-G ground disconnect switch

SCC shall advise FZ72 Operator to carry out the following:

- Open 72L17A-L17 and 72L17T1-L17 disconnect switches and turn off its 125Vdc supply

- Close 72V17FZ-G ground disconnect switch

3.3. To restore V17FZ line to service after work

3.3.1. Prepare V17FZ line for restoration

FZ72 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 V17FZ line

SCC shall advise V2 Operator to carry out the following

- Check opened 2DL17 and 2L17L18 breakers

- Open 2V17FZ-G ground disconnect switch

- Turn on 125Vdc supply and close 2DL17-L17 and 2L17L18-L17 disconnect switches

SCC shall advise FZ72 Operator to carry out the following:

- Check opened 72L17A and 72L17T1 breakers

- Open 72V17FZ-G ground disconnect switch

- Turn on 125Vdc supply and close 72L17A-L17 and 72L17T1-L17 disconnect switches

3.3.2. Restoration of V17FZ line to service:

SCC shall:

- Advise the FZ72 and V2 Operators of readiness to restore V17FZ line to service

- Close (or advise the V2 Operator to close) 2DL17 and 2L17L18 breakers

- Close (or advise the FZ72 Operator to close) 72L17A and 72L17T1 breakers

3.4. To restore V17FZ line to service after automatic outage

If V17FZ line trips auto due to fault:

E72 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 V2 Operator to energize) the line **ONCE** by closing 2DL17 and 2L17L18 breakers
- Close (or advise the FZ72 Operator to close) 72L17A and 72L17T1 breakers

E72 Operator shall:

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

3.5. To isolate 72T1 Transformer for work

- FZ72 Operator shall request for Station Guarantee from Customers on 72Y Bus

SCC shall carry out or advise FZ72 Operator to carry out the following:

- Inform Customers about readiness to take off 72T1 Bank
- Request Customers on 72T1 Bank to take off their load
- Transfer Station Service supply from 72TSS1 to 72TSS2
- Open AC1 Contactor/MCB to take off supply to 72T1 transformer auxiliaries

SCC shall carry out (or advise FZ72 Operator to carry out) the following:

- Open 72T1B1 breaker

- Open 72DT1 and 72L17T1 breakers

FZ72 Operator shall:

- Check for no potential on 72T1 Bank
- Open 72DT1-T1 and 72L17T1-T1 disconnect switches and turn off 125Vdc supply
- Checked opened 72T1B1-S bypass disconnect switch and turn off its 125Vdc supply
- Open 72T1B1-T1 disconnect switch
- Open AC control MCB to 72T1 auxiliaries and tag
- Open 125Vdc MCB to 72T1 primary and secondary protection and tag with PC13

3.6. To restore 72T1 Bank to service

3.6.1. Prepare 72T1 Bank restoration:

FZ72 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 72T1 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 72DT1-T1 and 72L17T1-T1 disconnect switches
- Checked opened 72T1B1-S bypass disconnect switch and turn off its 125Vdc supply
- Close 72T1B1-T1 disconnect switch
- Close AC control MCB to 72T1 auxiliaries and remove tag
- Close 125Vdc MCB to 72T1 primary and secondary protection and remove PC13 tag
- Advise SCC and Customers of readiness to energize 72T1 bank

3.6.2. Restoration of 72T1 Bank:

- SCC shall close (or advise FZ72 Operator to close) the 72DT1 and 72L17T1 breakers
- Transfer Station Service supply from Standby generator to 72TSS1

- FZ72 Operator shall advise Customers of readiness to restore 72B1 feeder to service
- SCC shall close (or advise FZ72 Operator to close) 72T1B1 breaker

3.7. To restore 72T1 Bank to service after automatic outage

If 72T1 Bank trips auto due to fault:

FZ72 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 FZ72 Operator to energize) the bank **ONCE** by closing 72DT1 and 72L17T1 breakers

FZ72 Operator shall advise Customers of readiness to restore 72B1 feeder to service

SCC shall close (or advise FZ72 Operator to close) 72T1B1 breaker

FZ72 Operator shall:

- Advise the Supervisor/Manager of operation above
- Isolate the Transformer for maintenance men to work on the equipment if operation above is not successful. See Explanation.

3.8. To isolate 72T2 Transformer for work

- FZ72 Operator shall request for Station Guarantee from Customers on 72B2 Bus

SCC shall carry out or advise FZ72 Operator to carry out the following:

- Inform Customers about readiness to take off 72T2 Bank
- Request Customers on 72T2 Bank to take off their load
- Transfer Station Service supply from 72TSS2 to 72TSS1
- Open AC1 Contactor/MCB to take off supply to 72T2 transformer auxiliaries

SCC shall carry out (or advise FZ72 Operator to carry out) the following:

- Open 72T2B2 breaker
- Open 72DT2 and 72L7T2 breakers

FZ72 Operator shall:

- Check for no potential on 72T2 Bank
- Open 72DT2-T2 and 72L7T2-T2 disconnect switches and turn off 125Vdc supply
- Checked opened 72T2B2-S bypass disconnect switch and turn off its 125Vdc supply
- Open 72T2B2-T2 disconnect switch
- Open AC control MCB to 72T2 auxiliaries and tag
- Open 125Vdc MCB to 72T2 primary and secondary protection and tag with PC13

3.9. To restore 72T2 Bank to service

3.9.1. Prepare 72T2 Bank restoration:

FZ72 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 72T2 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 72DT2-T2 and 72L7T2-T2 disconnect switches
- Checked opened 72T2B2-S bypass disconnect switch and turn off its 125Vdc supply
- Close 72T2B2-T1 disconnect switch
- Close AC control MCB to 72T2 auxiliaries and remove tag
- Close 125Vdc MCB to 72T2 primary and secondary protection and remove PC13 tag
- Advise SCC and Customers of readiness to energize 72T2 bank

3.9.2. Restoration of 72T2 Bank:

- SCC shall close (or advise FZ72 Operator to close) the 72DT2 and 72L7T2 breakers
- Transfer Station Service supply from 72TSS1 to 72TSS2
- FZ72 Operator shall advise Customers of readiness to restore 72B2 feeder to service
- SCC shall close (or advise FZ72 Operator to close) 72T2B2 breaker

3.10. To restore 72T2 Bank to service after automatic outage

If 72T2 Bank trips auto due to fault:

FZ72 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 FZ72 Operator to energize) the bank **ONCE** by closing 72DT2 and 72L7T2 breakers

FZ72 Operator shall advise Customers of readiness to restore 72B1 feeder to service

SCC shall close (or advise FZ72 Operator to close) 72T2B2 breaker

FZ72 Operator shall:

- Advise the Supervisor/Manager of operation above
- Isolate the Transformer for maintenance men to work on the equipment if operation above is not successful. See Explanation.

3.11. To isolate 72T3 Transformer for work

- FZ72 Operator shall request for Station Guarantee from Customers on 72Y1 Bus

SCC shall carry out or advise FZ72 Operator to carry out the following:

- Inform Customers about readiness to take off 72T3 Bank

- Request Customers on 72T3 Bank to take off their load
- Transfer Station Service supply from 72TSS3 to 72TSS4
- Open AC1 Contactor/MCB to take off supply to 72T3 transformer auxiliaries

SCC shall carry out (or advise FZ72 Operator to carry out) the following:

- Open 72T3Y1 breaker
- Open 72DT3 and 72T3T4 breakers

FZ72 Operator shall:

- Check for no potential on 72T3 Bank
- Open 72DT3-T3 and 72T3T4-T3 disconnect switches and turn off 125Vdc supply
- Checked opened 72T3Y1-S bypass disconnect switch and turn off its 125Vdc supply
- Open 72T3Y1-T2 disconnect switch
- Open AC control MCB to 72T3 auxiliaries and tag
- Open 125Vdc MCB to 72T3 primary and secondary protection and tag with PC13

3.12. To restore 72T3 Bank to service

3.12.1. Prepare 72T3 Bank restoration:

FZ72 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 72T3 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 72DT3-T3 and 72T3T4-T3 disconnect switches
- Checked opened 72T3Y1-S bypass disconnect switch and turn off its 125Vdc supply
- Close 72T3Y1-T1 disconnect switch
- Close AC control MCB to 72T3 auxiliaries and remove tag
- Close 125Vdc MCB to 72T3 primary and secondary protection and remove

PC13 tag

- Advise SCC and Customers of readiness to energize 72T3 bank

3.12.2. Restoration of 72T3 Bank:

- SCC shall close (or advise FZ72 Operator to close) the 72DT3 and 72T3T4 breakers
- Transfer Station Service supply from 72TSS1 to 72TSS2
- FZ72 Operator shall advise Customers of readiness to restore 72Y1 feeder to service
- SCC shall close (or advise FZ72 Operator to close) 72T3Y1 breaker

3.13. To restore 72T3 Bank to service after automatic outage

If 72T3 Bank trips auto due to fault:

FZ72 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 FZ72 Operator to energize) the bank **ONCE** by closing 72DT3 and 72T3T4 breakers

FZ72 Operator shall advise Customers of readiness to restore 72Y1 feeder to service

SCC shall close (or advise FZ72 Operator to close) 72T3Y1 breaker

FZ72 Operator shall:

- Advise the Supervisor/Manager of operation above
- Isolate the Transformer for maintenance men to work on the equipment if operation above is not successful. See Explanation.

3.14. To isolate 72T4 Transformer for work

- FZ72 Operator shall request for Station Guarantee from Customers on 72Y1 Bus

SCC shall carry out or advise FZ72 Operator to carry out the following:

- Inform Customers about readiness to take off 72T4 Bank
- Request Customers on 72T4 Bank to take off their load
- Transfer Station Service supply from 72TSS4 to 72TSS3
- Open AC1 Contactor/MCB to take off supply to 72T4 transformer auxiliaries

SCC shall carry out (or advise FZ72 Operator to carry out) the following:

- Open 72T4Y2 breaker
- Open 724T4 and 72T3T4 breakers

FZ72 Operator shall:

- Check for no potential on 72T4 Bank
- Open 724T4-T4 and 72T3T4-T4 disconnect switches and turn off 125Vdc supply
- Checked opened 72T4Y2-S bypass disconnect switch and turn off its 125Vdc supply
- Open 72T4Y2-T2 disconnect switch
- Open AC control MCB to 72T4 auxiliaries and tag
- Open 125Vdc MCB to 72T4 primary and secondary protection and tag with PC13

3.15. To restore 72T4 Bank to service

3.15.1. Prepare 72T4 Bank restoration:

FZ72 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 72T4 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 724T4-T4 and 72T3T4-T4 disconnect switches
- Checked opened 72T4Y2-S bypass disconnect switch and turn off its 125Vdc supply
- Close 72T4Y2-T4 disconnect switch

- Close AC control MCB to 72T4 auxiliaries and remove tag
- Close 125Vdc MCB to 72T4 primary and secondary protection and remove PC13 tag
- Advise SCC and Customers of readiness to energize 72T4 bank

3.15.2. Restoration of 72T4 Bank:

- SCC shall close (or advise FZ72 Operator to close) the 724T4 and 72T3T4 breakers
- Transfer Station Service supply from 72TSS3 to 72TSS4
- FZ72 Operator shall advise Customers of readiness to restore 72Y2 feeder to service
- SCC shall close (or advise FZ72 Operator to close) 72T4Y2 breaker

3.16. To restore 72T4 Bank to service after automatic outage

If 72T4 Bank trips auto due to fault:

FZ72 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 FZ72 Operator to energize) the bank **ONCE** by closing 724T4 and 72T3T4 breakers

FZ72 Operator shall advise Customers of readiness to restore 72Y2 feeder to service

SCC shall close (or advise FZ72 Operator to close) 72T4Y2 breaker

FZ72 Operator shall:

- Advise the Supervisor/Manager of operation above
- Isolate the Transformer for maintenance men to work on the equipment if operation above is not successful. See Explanation.

3.17. To isolate 72T1B1 Breaker for work

- FZ72 Operator shall request for Station Guarantee from Customer on 72F1 and 72F2 feeders

SCC shall carry out (or advise FZ72 Operator to carry out) the following:

- Open 72T1B1 breaker

SCC shall advise FZ72 Operator to carry out the following:

- Checked opened 72T1B1-S bypass disconnect switch and turn off its 125Vdc supply
- Open 72T1B1-T1 disconnect switch
- Open 72T1B1-B1 disconnect switch and turn off its 125Vdc supply

3.18. To restore 72T1B1 Breaker to service

3.18.1. Prepare 72T1B1 Breaker restoration:

FZ72 Operation shall:

- Advise SCC when work on the breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check 72T1B1 Breaker in the opened position and temporary grounds removed
- Checked opened 72T1B1-S bypass disconnect switch and turn off its 125Vdc supply
- Close 72T1B1-B1 disconnect switch
- Close 72T1B1-T1 disconnect switch

3.18.2. Restoration of 72T1B1 Breaker:

- SCC shall close (or advise FZ72 Operator to close) the 72T1B1 breaker
- FZ72 Operator shall advise Customers of readiness to restore 72B1 feeder to service
- SCC shall close (or advise FZ72 Operator to close) 72T1B1 breaker

3.19. To isolate 72T2B2 Breaker for work

- FZ72 Operator shall request for Station Guarantee from Customer on 72F1 and 72F2 feeders

SCC shall carry out (or advise FZ72 Operator to carry out) the following:

- Open 72T2B2 breaker

SCC shall advise FZ72 Operator to carry out the following:

- Checked opened 72T2B2-S bypass disconnect switch and turn off its 125Vdc supply
- Open 72T2B2-T2 disconnect switch
- Open 72T2B2-B2 disconnect switch and turn off its 125Vdc supply

3.20. To restore 72T2B2 Breaker to service

3.20.1. Prepare 72T2B2 Breaker restoration:

FZ72 Operation shall:

- Advise SCC when work on the breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check 72T2B2 Breaker in the opened position and temporary grounds removed
- Checked opened 72T2B2-S bypass disconnect switch and turn off its 125Vdc supply
- Close 72T2B2-B2 disconnect switch
- Close 72T2B2-T2 disconnect switch

3.20.2. Restoration of 72T2B2 Breaker:

- SCC shall close (or advise FZ72 Operator to close) the 72T2B2 breaker
- FZ72 Operator shall advise Customers of readiness to restore 72B2 feeder to service
- SCC shall close (or advise FZ72 Operator to close) 72T2B2 breaker

3.21. To isolate 72T3Y1 Breaker for work

- FZ72 Operator shall request for Station Guarantee from Customer on 72F1 and 72F2 feeders

SCC shall carry out (or advise FZ72 Operator to carry out) the following:

- Open 72T3Y1 breaker

SCC shall advise FZ72 Operator to carry out the following:

- Checked opened 72T3Y1-S bypass disconnect switch and turn off its 125Vdc supply

- Open 72T3Y1-T3 disconnect switch

- Open 72T3Y1-Y1 disconnect switch and turn off its 125Vdc supply

3.22. To restore 72T3Y1 Breaker to service

3.22.1. Prepare 72T3Y1 Breaker restoration:

FZ72 Operation shall:

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

- Check 72T3Y1 Breaker in the opened position and temporary grounds removed

- Checked opened 72T3Y1-S bypass disconnect switch and turn off its 125Vdc supply

- Close 72T3Y1-Y1 disconnect switch

- Close 72T3Y1-T3 disconnect switch

3.22.2. Restoration of 72T3Y1 Breaker:

- SCC shall close (or advise FZ72 Operator to close) the 72T3Y1 breaker

- FZ72 Operator shall advise Customers of readiness to restore 72Y1 feeder to service

- SCC shall close (or advise FZ72 Operator to close) 72T3Y1 breaker

3.23. To isolate 72T4Y2 Breaker for work

- FZ72 Operator shall request for Station Guarantee from Customer on 72F1 and 72F2 feeders

SCC shall carry out (or advise FZ72 Operator to carry out) the following:

- Open 72T4Y2 breaker

SCC shall advise FZ72 Operator to carry out the following:

- Checked opened 72T4Y2-S bypass disconnect switch and turn off its 125Vdc supply

- Open 72T4Y2-T4 disconnect switch

- Open 72T4Y2-Y2 disconnect switch and turn off its 125Vdc supply

3.24. To restore 72T4Y2 Breaker to service

3.24.1. Prepare 72T4Y2 Breaker restoration:

FZ72 Operation shall:

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

- Check 72T4Y2 Breaker in the opened position and temporary grounds removed

- Checked opened 72T4Y2-S bypass disconnect switch and turn off its 125Vdc supply

- Close 72T4Y2-Y2 disconnect switch

- Close 72T4Y2-T4 disconnect switch

3.24.2. Restoration of 72T4Y2 Breaker:

- SCC shall close (or advise FZ72 Operator to close) the 72T4Y2 breaker

- FZ72 Operator shall advise Customers of readiness to restore 72Y2 feeder to service

- SCC shall close (or advise FZ72 Operator to close) 72T4Y2 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 72kV 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' and 'D' buses, a breaker and half configuration provide the normal points of supply to all circuits/equipment such as V17FZ line, 72T1, 72T2, 72T3 and 72T4 Transformers.

5. Approval

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Director, Technical Services