TD-OP-0007

GRIDCo

OPERATING PROCEDURE FOR CAPE COAST SUBSTATION

GHANA GRID COMPANY LTD

TECHNICAL DIRECTIVES

Title:	**OPERATING PROCEDURE FOR CAPE COAST SUBSTATION (C7)**		
Issued To:	Director, System Operations Director, SNS Manager, SCC Manager, Dispatch Operations Area Manager, Takoradi Operating Staff, Takoradi Area Maintenance Staff, Takoradi Area Dispatch Staff, SCC	**Number:**	TD-OP-0007
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CONTENTS

TECHNICAL DIRECTIVES

1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at C7 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 C7 Substation.

3. Procedure

3.1. To take C1M line out of service

SCC shall carry out (or advise the C7 Operator to carry out) the following:

- Open 7C1M breaker

SCC shall carry out (or advise the M37 Operator to carry out) the following:

- Open 37L1A and 37L1T1 breakers
- Check for no potential on C1M line

3.2. To take out, isolate and de-energize C1M line for work

- C7 Operator shall request for Station Guarantee from M37

SCC shall carry out (or advise the C7 Operator to carry out) the following:

- Check opened 7C1M-S bypass disconnect switch and turn off its 125Vdc supply
- Open 7C1M breakers

SCC shall carry out (or advise the M37 Operator to carry out) the following:

- Open 37L1A and 37L1T1 breaker
- Check for no potential on C1M line

SCC shall advise the C7 Operator to carry out the following:

- Check opened 7C1M-S disconnect switch and turn off 125Vdc supply
- Open 7C1M –L1 disconnect switch and turn off 125Vdc supply
- Close 7C1M-G ground disconnect switch

SCC shall advise the M37 Operator to carry out the following:

- Open 37L1A-L1 and 37L1T1-L1 disconnect switches and turn off 125Vdc supply

- Close 37C1M-G ground disconnect switch

3.3. To restore C1M line to service after work

3.3.1. Prepare C1M line for restoration

C7 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 C1M line

SCC shall advise M37 Operator to carry out the following:

- Check opened 37L1A and 37L1T1 breakers

- Open 37C1M-G ground disconnect switch

- Turn on 125Vdc supply and close 37L1A-L1 and 37L1T1-L1 disconnect switches

SCC shall advise C7 Operator to carry out the following:

- Check opened 7C1M breaker

- Check opened 7C1M-S bypass disconnect switch and turn on 125Vdc supply

- Open 7C1M-G ground disconnect switch

- Turn on 125Vdc supply and close 7C1M-L1 disconnect switch

3.3.2. Restoration of C1M line to service:

SCC shall:

- Advise the C7 and M37 Operators of readiness to restore C1M line to service

- Close (or advise M37 operator to close) 37L1A and 37L1T1breakers

- Close (or advise C7 operator to close) 7C1M breaker

3.4. To restore C1M line to service after automatic outage

If C1M line trips auto due to fault:

- 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 C7 Operator to energize) the line **ONCE** by closing 7C1M breaker
- Close (or advise the M37 Operator to close) 37L1A and 37L1T1 breakers
- Advise the Supervisor/Area Manager of operation above
- Advise maintenance men to patrol the line if the above operation is not successful

3.5. To take TE2C line out of service

SCC shall carry out (or advise the C7 Operator to carry out) the following:

- Open 7TE2C breaker

SCC shall carry out (or advise the TE66 Operator to carry out) the following:

- Open 66L2D breaker
- Check for no potential on TE2C line

3.6. To take out, isolate and de-energize TE2C line for work

- C7 Operator shall request for Station Guarantee from TE66

SCC shall carry out (or advise the C7 Operator to carry out) the following:

- Open 7TE2C breaker

SCC shall carry out (or advise the TE66 Operator to carry out) the following:

- Open 66L2D breaker
- Check for no potential on TE2C line

SCC shall carry out (or advise the C7 Operator to carry out) the following:

- Open 7TE2C-L2 disconnect switch and turn off 125Vdc supply
- Close 7TE2C-G ground disconnect switch

SCC shall carry out (or advise the TE66 Operator to carry out) the following:

- Open 66L2D–L2 disconnect switch and turn off 125Vdc supply
- Close 66TE2C-G ground disconnect switch

3.7. To restore TE2C line to service after work

3.7.1. Prepare TE2C line for restoration:

C7 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 TE2C line

SCC shall advise TE66 Operator to carry out the following:

- Check opened 66L2D breaker
- Open 66TE2C-G ground disconnect switch
- Turn on 125Vdc supply and close 66L2D-L2 disconnect switch

SCC shall carry out (or advise the C7 Operator to carry out) the following:

- Check opened 7TE2C breaker
- Check opened 7TE2C-S (bypass) disconnect switches
- Open 7TE2C-G ground disconnect switch
- Turn on 125Vdc supply and close 7TE2C–L2 disconnect switch

3.7.2. Restoration of TE2C line to service:

SCC shall:

- Advise the C7 and TE66 Operators of readiness to restore TE2C line to service
- Close (or advise TE66 Operator to close) 66L2D breaker

- Close (or advise C7 operator to close) 7TE2C breaker

3.8. To restore TE2C line to service after automatic outage

If TE2C line trips auto due to fault:

C7 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 C7 Operator to energize) the line **ONCE** by closing 7TE2C breaker
- Close (or advise the TE66 Operator to close) 66L2D breaker
- Advise the Supervisor/Area Manager of operation above
- Advise maintenance men to patrol the line if the above operation is not successful

3.9. To isolate 7T1 Transformer for work

- C7 Operator shall request Station Guarantee from Customers on 7F1 and 7F3 Feeders

SCC shall carry out or advise C7 operator to carry out the following:

- Inform Customers about readiness to take off 7T1 Bank
- Request Customers on 7T1 Bank to take off their load
- Transfer Station Service from AC1 to AC2, if Station Service is on 7T1
- Open AC1 Contactor/MCB to take off supply to 7T1 transformer auxiliaries

SCC shall carry out (or advise C7 Operator to carry out) the following:

- Open 7AT1 breaker
- Open 7T1F1 and 7T1F3 breakers to take off supply to customer

- Check for no potential on 7T1 Bank
- Open 7AT1-A disconnect switch and turn off its 125Vdc supply
- Open 7T1F1-F1 disconnect switch and turn off its 125Vdc supply
- Open 7T1F3-F3 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 7T1 auxiliaries and tag
- Open 125V DC MCB to 7T1 primary and secondary protection and tag with PC13

3.10. To restore 7T1 Bank to service

3.10.1. Prepare 7T1 Bank for service after work

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 7T1 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 7AT1-A disconnect switch
- Turn on 125Vdc supply and close 7T1F1-F1 disconnect switch
- Turn on 125Vdc supply and close 7T1F3-F3 disconnect switch
- Close AC control MCB to 7T1 auxiliaries and remove tag
- Close 125V DC MCB to 7T1 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 7T1 Bank to service

3.10.2. Restoration of 7T1 Bank to service:

- SCC shall close (or advise C7 Operator to close) 7AT1 breaker
- Advise Customers of readiness to restore 7F1and 7F3 feeders to service
- SCC shall close (or advise C7 Operator to close) 7T1F1 and 7T1F3 breakers

3.11. To restore 7T1 Bank to service after automatic outage

If 7T1 Bank trips auto due to fault:

W6 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 **C7 Operator** to energize) the bank ONCE by closing **7AT1 breaker**

C7 Operator shall advise Customer of readiness to restore 7T1 Bank to service

SCC shall close (or advise **C7 Operator** to close) 7T1F1 and 7T1F3 breakers

C7 Operator shall:

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

3.12. To isolate 7T2 Transformer for work

- C7 Operator shall request Station Guarantee from Customer on 7F2 Feeder

SCC shall advise C7 operator to carry out the following:

- Inform Customer about readiness to take off 7T2 bank
- Request Customer on 7T2 Bank to take off their load
- Transfer Station Service from AC2 to AC1, if Station Service is on 7T2
- Open AC2 Contactor/MCB to take off supply to 7T2 transformer auxiliaries

SCC shall carry out (or advise C7 Operator to carry out) the following:

- Open 7F2SC2 breaker
- Open 7T2F2 breaker
- Open 7AT2 breaker
- Check for no potential on 7T2 Bank
- Open 7F2SC2-F2 disconnect switch and turn off its 125Vdc supply

- Open 7T2F2-F2 disconnect switch and turn off its 125Vdc supply
- Open 7AT2-A disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 7T2 auxiliaries and tag
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- Open 125V DC MCB to 7T2 primary and secondary protection and tag with PC13

3.13. To restore of 7T2 Bank to service

3.13.1. Prepare 7T2 Bank to service after work

C7 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 7T2 Bank and temporary grounds removed
- Turn on its 125Vdc supply and close 7F2SC2-F2 disconnect switch
- Turn on its 125Vdc supply and close 7T2F2-F2 disconnect switch
- Turn on its 125Vdc supply and close 7AT2-A disconnect switch
- Close AC control MCB to 7T2 auxiliaries and remove tag
- Close 125V DC MCB to 7T2 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 7T2 Bank to service

3.13.2. Restoration of 7T2 Bank to service:

- SCC shall close (or advise C7 Operator to close) 7AT2 breaker
- C7 Operator shall advise Customer of readiness to restore 7F2 feeder to service
- SCC shall close (or advise C7 Operator to close) 7T2F2 breaker

3.14. To restore 7T2 Bank to service after automatic outage

If 7T2 Bank trips auto due to fault:

C7 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 **C7 Operator** to energize) the bank ONCE by closing **7AT2 breaker**

C7 Operator shall advise Customer of readiness to restore 7T2 Bank to service

SCC shall close (or advise **C7 Operator** to close) 7T2F2 breaker

C7 Operator shall:

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

3.15. To isolate 7T1F1 Breaker for work

- C7 Operator shall request Station Guarantee from customer on 7F1 Feeder

SCC shall carry out or advise the C7 Operator to carry out the following:

- Inform customers about readiness to take off 7T1 Bank
- Request customers on 7T1 Bank to take off their load
- Transfer Station Service supply from AC1 to AC2, if station service is on 7T1
- Open AC1 Contactor/MCB to take off supply to 7T1 transformer auxiliaries

SCC shall carry out (or advise C7 Operator to carry out) the following:

- Open **7T1F1** breaker
- Open 7AT1 breaker
- Open 7AT1-A disconnect switch and turn off its125Vdc supply
- Open 7T1F1-F1 disconnect switch and turn off 125Vdc supply

- Check for no potential on 7T1 Bank

3.16. To restore 7T1F1 breaker after work

3.16.1. Prepare 7T1F1 Breaker for service after work

C7 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 7T1F1 Breaker and temporary grounds removed
- Turn on its 125Vdc supply and close 7T1F1-F1 disconnect switch
- Turn on 125Vdc supply and close 7AT1-A disconnect switch
- Advise CUSTOMER of readiness to restore 7F1 feeder to service

3.16.2. Restoration of 7T1F1 breaker to service:

- SCC shall close (or advise C7 Operator to close) the 7AT1 breaker
- C7 Operator shall advise Customers of readiness to restore 7F1 feeder to service
- SCC shall close (or advise C7 Operator to close) the 7T1F1 breaker

3.17. To isolate 7T1F3 Breaker for work

- C7 Operator shall request Station Guarantee from customer on 7F1 Feeder

SCC shall carry out or advise the C7 Operator to carry out the following:

- Inform customers about readiness to take off 7T1 Bank
- Request customers on 7T1 Bank to take off their load
- Transfer Station Service supply from AC1 to AC2, if station service is on 7T1
- Open AC1 Contactor/MCB to take off supply to 7T1 transformer auxiliaries

SCC shall carry out (or advise C7 Operator to carry out) the following:

- Open 7T1F3 breaker

- Open 7AT1 breaker
- Open 7AT1-A disconnect switch and turn off its125Vdc supply
- Open 7T1F3-F3 disconnect switch and turn off 125Vdc supply
- Check for no potential on 7T1 Bank

3.18. To restore 7T1F3 breaker after work

3.18.1. Prepare 7T1F3 Breaker for service after work

C7 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 and grounds removed on 7T1F3 Breaker
- Turn on 125Vdc supply and close 7T1F3-F3 disconnect switch
- Turn on 125Vdc supply and close 7AT1-A disconnect switch
- Advise customer of readiness to restore 7F3 feeder to service

3.18.2. Restoration of 7T1F3 breaker to service:

- SCC shall close (or advise C7 Operator to close) the 7AT1 breaker
- C7 Operator shall advise Customers of readiness to restore 7F3 feeder to service
- SCC shall close (or advise C7 Operator to close) the 7T1F3 breaker

3.19. To isolate 7T2F2 Breaker for work

- C7 Operator shall request Station Guarantee from customer on 7F2 Feeder

SCC shall carry out or advise C7 operator to carry out the following:

- Inform customers about readiness to take off 7T2 bank
- Request customers on 7T2 Bank to take off their load
- Transfer Station Service from AC2 to AC1, if Station Service is on 7T2
- Open AC2 Contactor/MCB to take off supply to 7T2 transformer auxiliaries

SCC shall carry out (or advise C7 Operator to carry out) the following:

- Open 7SC2F2 breaker
- Open 7T2F2 breaker
- Open 7AT2 breaker
- Open 7SC2F2-F2 disconnect switch
- Open 7T2F2-F2 disconnect switch and turn off its 125Vdc supply
- Open 7AT2-A disconnect switch and turn off its 125Vdc supply

3.20. To restore 7T2F2 breaker to service after work

3.20.1. Prepare 7T2F2 breaker to service after work

C7 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 7T2 Bank and temporary grounds removed
- Close 7SC2F2-F2 disconnect switch
- Turn on 125Vdc supply and 7T2F2-F2 disconnect switch
- Turn on 125Vdc supply and close 7AT2-A disconnect switch
- Advise SCC of readiness to restore 7T2F2 breaker to service

3.20.2. Restoration of 7T2F2 Breaker to service:

- SCC shall close (or advise C7 Operator to close) 7AT2 breaker
- C7 Operator shall advise customers of readiness to restore 7F2 feeder to service
- SCC shall close (or advise C7 Operator to close) 7T2F2 breaker
- SCC shall close (or advise C7 Operator to close) 7SC2F2 breaker, if the voltage is below 32.8kV

3.21. To isolate 7SC2 Capacitor Bank for work

SCC shall carry out or advise the C7 Operator to carry out the following:

- Open 7F2SC2 breaker

- Open 7F2SC2-SC2 disconnect switch

- Close 7SC2F2-G ground disconnect switch

3.22. To restore 7SC2 Capacitor Bank to service after work

3.22.1. Prepare 7SC2 Capacitor Bank to service after work

- Advise SCC when work on the 7SC2 Capacitor Bank has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 7SC2 Bank

- Check opened the 7SC2F2 Breaker

- Open 7SC2F2-G ground disconnect switch

- Close 7F2SC2-SC2 disconnect switch

- Advise SCC of readiness to restore 7SC2 Capacitor Bank to service

3.22.2. Restoration of 7SC2 Capacitor Bank to service:

- SCC shall close (or advise C7 Operator to close) 7F2SC2 breaker if the voltage is below 32.8kV
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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:

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 66 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 C1M (Cape Coast-Mallam) and TE2C (Takoradi Thermal Power Expansion- Cape Coast) lines, 7T1

and 7T2 transformers.

5. Approval

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Director, Technical Services