TD-OP-0041

GRIDCo

OPERATING PROCEDURE FOR NEW TARKWA SUBSTATION

GHANA GRID COMPANY LTD

TECHNICAL DIRECTIVES

Title:	**OPERATING PROCEDURE FOR NEW TARKWA SUBSTATION (NR41)**		
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-0041
		Subject Area:	Operating
		Issue Date:	Trial
		Origin:	Technical Services
Key Words:	Take Out, Isolate, Prepare, Energize, Restore, Automatic Outage		

Contents

TECHNICAL DIRECTIVES

1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at NR41 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 NR41 Substation.

3. Procedure

3.1. To take P2NR line out of service

SCC shall carry out (or advise the NR41 Operator to carry out) the following:

- Open 41L2A2 breaker

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

- Open 10L2L6 and 10L2A breakers
- Check for no potential on P2NR line

3.2. To take out, isolate and de-energize P2NR line for work

- NR41 Operator shall request for Station Guarantee from P10

SCC shall carry out (or advise the NR41 Operator to carry out) the following:

- Open 41L2A2 breaker

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

- Open 10L2L6 and 10L2A breakers
- Check for no potential on P2NR line

SCC shall advise P10 Operator to carry out the following:

- Open 10L2L6-L2 and 10L2A-L2 disconnect switches and turn off its 125Vdc supply
- Close 10P2NR-G ground disconnect switch

SCC shall advise NR41 Operator to carry out the following:

- Open 41L2A2-L2 disconnect switch and turn off its 125Vdc supply
- Close 41L2A2-G ground disconnect switch

3.3. To restore P2NR line to service after work

3.3.1. Prepare P2NR line for restoration

NR41 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 P2NR line

SCC shall advise P10 Operator to carry out the following

- Check opened 10L2L6 and 10AL2 breakers
- Open 10P2NR-G ground disconnect switch
- Turn on 125Vdc supply and close 10L2L6-L2 and 10AL2-L2 disconnect switches

SCC shall advise NR41 Operator to carry out the following:

- Check opened 41L2A2 breaker
- Open 41L2A2-G ground disconnect switch
- Turn on 125Vdc supply and close 41L2A2-L2 disconnect switch

3.3.2. Restoration of P2NR line to service:

SCC shall:

- Advise the NR41 and P10 Operators of readiness to restore P2NR line to service
- Close (or advise the P10 Operator to close) 10L2L6 and 10AL2 breakers
- Close (or advise the NR41 Operator to close) 41L2A2 breaker

3.4. To restore P2NR line to service after automatic outage

If P2NR line trips auto due to fault:

NR41 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 10L2L6 and 10AL2 breakers
- Close (or advise the NR41 Operator to close) 41L2A2 breaker

NR41 Operator shall:

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

3.4. To take R3NR line out of service

SCC shall carry out (or advise the NR41 Operator to carry out) the following:

- Open 41L3A1 breaker

SCC shall carry out (or advise the R9 Operator to carry out) the following:

- Open 9L3A and 9L3T1 breakers
- Check for no potential on R3NR line

3.5. To take out, isolate and de-energize R3NR line for work

- NR41 Operator shall request for Station Guarantee from R9

SCC shall carry out (or advise the NR41 Operator to carry out) the following:

- Open 41L3A1 breaker

SCC shall carry out (or advise the R9 Operator to carry out) the following:

- Open 9L3A and 9L3T1 breakers

- Check for no potential on R3NR line

SCC shall advise NR41 Operator to carry out the following:

- Open 41L3A1-L3 disconnect switch and turn off its 125Vdc supply

- Close 41R3NR-G ground disconnect switch

SCC shall advise R9 Operator to carry out the following:

- Open 9L3A-L3 and 9L3T1-L3 disconnect switches and turn off its 125Vdc supply

- Close 9R3NR-G ground disconnect switch

3.6. To restore R3NR line to service after work

3.6.1. Prepare R3NR line for restoration

NR41 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 R3NR line

SCC shall advise R9 Operator to carry out the following

- Check opened 9L3A and 9L3T1 breakers

- Open 9R3NR-G ground disconnect switch

- Turn on 125Vdc supply and close 9L3A-L3 and 9L3T1-L3 disconnect switches

SCC shall advise NR41 Operator to carry out the following:

- Check opened 41L3A1 breaker

- Open 41R3NR-G ground disconnect switch

- Turn on 125Vdc supply and close 41L3A1-L3 disconnect switch

3.6.2. Restoration of R3NR line to service:

SCC shall:

- Advise the R9 and NR41 Operators of readiness to restore R3NR line to service

- Close (or advise the R9 Operator to close) 9L3A and 9L3T1 breakers
- Close (or advise the NR41 Operator to close) 41L3A1 breaker

3.7. To restore R3NR line to service after automatic outage

If R3NR line trips auto due to fault:

NR41 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 R9 Operator to energize) the line **ONCE** by closing 9L3A and 9L3T1 breakers
- Close (or advise the NR41 Operator to close) 41L3A1 breaker

NR41 Operator shall:

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

3.8. To isolate 41T1 Transformer for work

- NR41 Operator shall request for Station Guarantee from Customer on 41F1 Feeder

SCC shall carry out (or advise NR41 Operator to carry out) the following:

- Inform Customer about readiness to take off 41T1 Bank
- Request Customer on 41T1 Bank to take off their load
- Transfer Station Service supply from 41TSS1 to 41TSS2
- Open AC1 Contactor/MCB to take off supply to 41T1 transformer auxiliaries

- Open AC control MCB to 41T1 auxiliaries and tag

SCC shall carry out (or advise NR41 Operator to carry out) the following:

- Open 41T1F1 breaker
- Open 41A1T1 breaker
- Check for no potential on 41T1 Bank

NR41 Operator shall:

- Open 41T1-F1 disconnect switch
- Open 41A1T1-A1 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 41T1 auxiliaries and tag
- Open 125Vdc MCB to 41T1 primary and secondary protection and tag with PC13
- Close 41F1-F2 disconnect switch
- Close 41T1F1 breaker to restore supply to Customer on 41F1 Feeder

3.9. To restore 41T1 Bank to service

3.9.1. Prepare 41T1 Bank for restoration:

NR41 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 41T1 Bank and temporary grounds removed
- Open 41T1F1 breaker to take off supply to Customer on 41F1 Feeder
- Open 41F1-F2 disconnect switch
- Close 41T1-F1 disconnect switch
- Turn on 125Vdc supply and close 41A1T1-A1 disconnect switch
- Close AC control MCB to 41T1 auxiliaries and remove tag
- Close 125Vdc MCB to 41T1 primary and secondary protection and remove PC13 tag

- Advise SCC and Customer of readiness to energize 41T1 bank

3.9.2. Restoration of 41T1 Bank:

- SCC shall close (or advise NR41 Operator to close) the 41A1T1 breaker
- NR41 Operator shall advise Customer of readiness to restore 41F1 feeder to service
- SCC shall close (or advise NR41 Operator to close) 41T1F1 breaker
- Transfer Station Service supply from 41TSS2 to 41TSS1

3.10. To restore 41T1 Bank to service after automatic outage

If 41T1 Bank trips auto due to fault:

NR41 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 NR41 Operator to energize) the bank **ONCE** by closing 41A1T1 breaker

NR41 Operator shall advise Customer of readiness to restore 41F1 feeder to service

SCC shall close (or advise NR41 Operator to close) 41T1F1 breaker

NR41 Operator shall:

- Advise the Supervisor/Area Manager and SCC of item above
- If not successful, isolate the Transformer for maintenance men to work on the equipment. (Refer to **4. Explanation**.)

3.11. To isolate 41T2 Transformer for work

- NR41 Operator shall request for Station Guarantee from Customer on 41F2 Feeder

SCC shall carry out or advise NR41 Operator to carry out the following:

- Inform Customer about readiness to take off 41T2 Bank
- Request Customer on 41T2 Bank to take off their load
- Transfer Station Service supply from 41TSS2 to 41TSS1
- Open AC2 Contactor/MCB to take off supply to 41T2 transformer auxiliaries

SCC shall carry out (or advise NR41 Operator to carry out) the following:

- Open 41T2F2 breaker
- Open 41A1T2 breaker
- Check for no potential on 41T2 Bank

SCC shall advise NR41 Operator to carry out the following:

- Open 41T2-F2 disconnect switch
- Open 41A1T2-A1 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 41T2 auxiliaries and tag
- Open 125Vdc MCB to 41T2 primary and secondary protection and tag with PC13
- Close 41F1-F2 disconnect switch
- Close 41T2F2 breaker to restore supply to Customer on 41F2 Feeder

3.12. To restore 41T2 Bank to service

3.12.1. Prepare 41T2 Bank for restoration:

NR41 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 41T2 Bank and temporary grounds removed
- Open 41T2F2 breaker to take off supply to Customer on 41F2 Feeder
- Open 41F1-F2 disconnect switch
- Close 41T2-F2 disconnect switch

- Turn on 125Vdc supply and close 41A1T2-A1 disconnect switch
- Close AC control MCB to 41T2 auxiliaries and remove tag
- Close 125Vdc MCB to 41T2 primary and secondary protection and remove PC13 tag
- Advise SCC and Customer of readiness to energize 41T2 bank

3.12.2. Restoration of 41T2 Bank:

- SCC shall close (or advise NR41 Operator to close) the 41A1T2 breaker
- NR41 Operator shall advise Customer of readiness to restore 41F2 feeder to service
- SCC shall close (or advise NR41 Operator to close) 41T2F2 breaker
- Transfer Station Service supply from 41TSS1 to 41TSS2

3.13. To restore 41T2 Bank to service after automatic outage

If 41T2 Bank trips auto due to fault:

NR41 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 NR41 Operator to energize) the bank **ONCE** by closing 41A1T2 breaker

NR41 Operator shall advise Customer of readiness to restore 41F2 feeder to service

SCC shall close (or advise NR41 Operator to close) 41T2F2 breaker

NR41 Operator shall:

- Advise the Supervisor/Area Manager of item above
- If not successful, isolate the Transformer for maintenance men to work on

the equipment. (Refer to **4. Explanation.**)

3.14. To isolate 41T3 Transformer for work

- NR41 Operator shall request for Station Guarantee from Customer on 41F3 Feeder

SCC shall carry out or advise NR41 Operator to carry out the following:

- Inform Customer about readiness to take off 41T3 Bank
- Request Customer on 41T3 Bank to take off their load
- Open AC3 Contactor/MCB to take off supply to 41T3 transformer auxiliaries

SCC shall carry out (or advise NR41 Operator to carry out) the following:

- Open 41T3F3 breaker
- Open 41A2T3 breaker
- Check for no potential on 41T3 Bank

NR41 Operator shall:

- Open 41T3-F3 disconnect switch
- Open 41A2T3-A2 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 41T3 auxiliaries and tag
- Open 125Vdc MCB to 41T3 primary and secondary protection and tag with PC13

3.15. To restore 41T3 Bank to service

3.15.1. Prepare 41T3 Bank for restoration:

NR41 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 41T3 Bank and temporary grounds removed
- Close 41T3F3-F3 disconnect switch

- Turn on 125Vdc supply and close 41A2T3-A2 disconnect switch
- Close AC control MCB to 41T3 auxiliaries and remove tag
- Close 125Vdc MCB to 41T3 primary and secondary protection and remove PC13 tag
- Advise SCC and Customer of readiness to energize 41T3 bank

3.15.2. Restoration of 41T3 Bank:

- SCC shall close (or advise NR41 Operator to close) the 41A2T3 breaker
- NR41 Operator shall advise Customer of readiness to restore 41F3 feeder to service
- SCC shall close (or advise NR41 Operator to close) 41T3F3 breaker

3.16. To restore 41T3 Bank to service after automatic outage

If 41T3 Bank trips auto due to fault:

NR41 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 NR41 Operator to energize) the bank **ONCE** by closing 41A2T3 breaker

NR41 Operator shall advise Customer of readiness to restore 41F3 feeder to service

SCC shall close (or advise NR41 Operator to close) 41T3F3 breaker

NR41 Operator shall:

- Advise the Supervisor/Area Manager of item above
- If not successful, isolate the Transformer for maintenance men to work on the equipment. (Refer to **4. Explanation**.)

3.17. To Isolate 41T1F1 Breaker for work

- NR41 Operator shall request for Station Guarantee from Customer on 41F1 feeder

SCC shall advise NR41 Operator to carry out the following:

- Inform Customer about readiness to take off 41T1 bank
- Request Customer on 41T1 Bank to take off their load
- Transfer station service supply from 41TSS1 to 41TSS2

SCC shall carry out (or advise NR41 Operator to carry out) the following:

- Open 41T1F1 breaker
- Open 41A1T1 breaker

SCC shall advise NR41 Operator to carry out the following:

- Open 41T1-F1 disconnect switch
- Open 41T1F1-A1 disconnect switch and turn off its 12Vdc supply

3.18. To restore 41T1F1 Breaker to service after work

3.18.1. Prepare 41T1F1 breaker for restoration:

NR41 Operator shall:

- Advise SCC when work on the 41T1F1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 41T1 Bank and temporary grounds removed
- Turn on 125Vdc and close 41T1F1-A1 disconnect switch
- Close 41T1-F1 disconnect switch

3.18.2. Restoration of 41T1F1 Breaker to service:

- SCC shall close (or advise NR41 Operator to close) 41A1T1 breaker
- Transfer Station Service supply from 41TSS2 to 41TSS1
- NR41 Operator shall advise Customer of readiness to restore 41F1 feeder

- SCC shall close (or advise NR41 Operator to close) 41T1F1 breaker

3.19. To Isolate 41T2F2 Breaker for work

- NR41 Operator shall request for Station Guarantee from Customer on 41F2 feeder

SCC shall advise NR41 Operator to carry out the following:

- Inform Customer about readiness to take off 41T2 bank
- Request Customer on 41T2 Bank to take off their load
- Transfer station service supply from 41TSS2 to 41TSS1

SCC shall carry out (or advise NR41 Operator to carry out) the following:

- Open 41T2F2 breaker
- Open 41A1T2 breaker

SCC shall advise NR41 Operator to carry out the following:

- Open 41T2-F2 disconnect switch
- Open 41A1T2-A1 disconnect switch and turn off its 125Vdc supply

3.20. To restore 41T2F2 Breaker to service after work

3.20.1. Prepare 41T2F2 breaker for restoration:

NR41 Operator shall:

- Advise SCC when work on the 41T2F2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 41T2 Bank and temporary grounds removed
- Close 41T2-F2 disconnect switch
- Turn on 125Vdc and close 41A1T2-A1 disconnect switch

3.20.2. Restoration of 41T2F2 Breaker to service:

- SCC shall close (or advise NR41 Operator to close) 41A1T2 breaker

- Transfer Station Service supply from 41TSS1 to 41TSS2
-
- NR41 Operator shall advise Customer of readiness to restore 41F2 feeder
- SCC shall close (or advise NR41 Operator to close) 41T2F2 breaker

3.21. To Isolate 41T3F3 Breaker for work

- NR41 Operator shall request for Station Guarantee from Customer on 41F3 feeder

SCC shall advise NR41 Operator to carry out the following:

- Inform Customer about readiness to take off 41T3 bank
- Request Customer on 41T3 Bank to take off their load

SCC shall carry out (or advise NR41 Operator to carry out) the following:

- Open 41T3F3 breaker
- Open 41A2T3 breaker

SCC shall advise NR41 Operator to carry out the following:

- Open 41T3-F3 disconnect switch
- Open 41A2T3-A2 disconnect switch and turn off its 125Vdc supply

3.22. To restore 41T3F3 Breaker to service after work

3.22.1. Prepare 41T3F3 breaker for restoration:

NR41 Operator shall:

- Advise SCC when work on the 41T3F3 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 41T3 Bank and temporary grounds removed
- Close 41T3-F3 disconnect switch
- Turn on 125Vdc supply and close 41A2T3-A2 disconnect switch

3.22.2. Restoration of 41T3F3 Breaker to service:

- SCC shall close (or advise NR41 Operator to close) 41A2T3 breaker

- NR41 Operator shall advise Customer of readiness to restore 41F3 feeder
- SCC shall close (or advise NR41 Operator to close) 41T3F3 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 two 161Kv bus arrangement. The main 'A1' and 'A2' bus provides the normal points of supply to all circuits/equipment such as P2NR (Prestea-New Tarkwa), R3NR (Tarkwa- New Tarkwa), lines, 41T1,41T2 and 41T3 transformers.

5. Approval

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Director, Technical Services