TD-OP-02

GRIDCo

OPERATING PROCEDURE FOR VOLTA 330kV SUBSTATION

GHANA GRID COMPANY LTD

Title:	**OPERATING PROCEDURE FOR VOLTA 330kV SUBSTATION (V2)**		
Issued To:	Director, System Operations Director, NNS Manager, SCC Manager, Dispatch Operations Area Manager, Tema Operating Staff, Tema Area Maintenance Staff, Tema Area Dispatch Staff, SCC	**Number:**	TD-OP-02
		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 M37 Substation to service for planned and auto outages.

2. Scope

The directive will be used by Operators at Accra Operating Area and System Control Center (SCC) for operation of equipment at M37 Substation.

3. Procedure

3.1. To take PK21V line out of service

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

Open 2L21E and 2L21P breakers

SCC shall carry out (or advise the PK86 Operator to carry out) the following:

- Open 86EL21 and 86PL21 breakers
- Check for no potential on PK21V line

3.2. To take out, isolate and de-energize PK21V line for work

V2 Operator shall request for Station Guarantee from PK21V

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

- Open 2L21E and 2L21P breakers

SCC shall carry out (or advise the PK86 Operator to carry out) the following:

- Open 86EL21 and 86PL21 breakers
- Check for no potential on PK21V line

SCC shall advise PK86 Operator to carry out the following:

- Open 86EL21-L21 and 86PL21-L21 disconnect switches and turn off 125Vdc supply

- Close 86PK21V-G ground disconnect switch

SCC shall advise V2 Operator to carry out the following:

- Open 2L21E-L21 and 2L21P-L21 disconnect switches and turn off 125Vdc supply
- Close 2PK21V-G ground disconnect switch

3.3. To restore PK21V line to service after work

3.3.1. Prepare PK21V line for restoration:

V2 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 PK21V line

SCC shall advise PK86 Operator to carry out the following:

- Check opened 86EL21 and 86PL21 breakers
- Open 86PK21V-G ground disconnect switch
- Turn on 125Vdc supply and close 86EL21-L21 and 86PL21-L21 disconnect switches

SCC shall advise V2 Operator to carry out the following:

- Check opened 2L21E and 2L21P breakers
- Open 2PK21V-G ground disconnect switch
- Turn on 125Vdc supply and close 2L21E-L21 and 2L21P-L21 disconnect switches

3.3.2. Restoration of PK21V line to service:

SCC shall:

- Advise the V2 and PK86 Operators of readiness to restore PK21V line to service

- Close (or advise the V2 Operator to close) 2L21E and 2L21P breakers
- SCC shall close (or advise PK86 Operator to close) 86EL21 and 86PL21breakers

3.4. To restore PK21V line to service after automatic outage

If PK21V line trips auto due to fault on the line:

V2 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 2L21E and 2L21P breakers
- Close (or advise the PK86 Operator to close) 86EL21 and 86PL21breakers

V2 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 2T1 Bank for work

SCC shall advise V2 Operator to carry out the following:

- Open AC1 Contactor/MCB to take off supply to 2T1 transformer auxiliaries

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

- Open 2ET1 and 2T1T2 breakers
- Open 2AT1 and 2DT1 breakers
- Open 2ET1-T1 and 2T1T2-T1 disconnect switches and turn off

125vdc supply

- Open 2AT1-T1 and 2DT1-T1 disconnect switches and turn off 125vdc supply
- Open AC control MCB to 2T1 auxiliaries and tag
- Open 125V DC breaker to 2T1 primary and secondary protection and tag with PC13
- Check for no potential on 2T1 Bank

3.6. To restore 2T1 Bank to service after work

3.6.1. Prepare 2T1 bank for restoration:

V2 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 2T1 Bank and temporary grounds removed
- Turn on 125vdc supply and close 2ET1-T1 and 2T1T2-T1 disconnect switches
- Turn on 125vdc supply and close 2AT1-T1 and 2DT1-T1 disconnect switches
- Close AC control MCB to 2T1 auxiliaries and remove tag
- Close 125V DC breaker to 2T1 primary and secondary protection and remove tag PC13
- Advise SCC of readiness to restore 2T1 Bank to service

3.6.2. Restoration of 2T1 bank to service:

- SCC shall close (or advise V2 Operator to close) the 2ET1 and 2T1T2 breakers (330kV)
- SCC shall close (or advise V2 Operator to close) the 2AT1 and 2DT1 (161kV) to tie to 161kV Bus

3.7. To restore 2T1 Bank to service after automatic outage

If 2T1 bank trips auto due to fault:

V2 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 transformer **ONCE** by closing 2ET1 and 2T1T2 breakers (330kV)

V2 Operator shall:

- Check for potential on 2T1 and advice SCC

SCC shall:

- Energize (or advise the V2 Operator to energize) the transformer **ONCE** by closing 2AT1 and 2DT1 breakers (161kV)

V2 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.

3.7.1. Isolate 2T2 Bank for work

SCC shall advise V2 Operator to carry out the following:

- Inform customers about readiness to take off 2T2 bank
- Open AC1 Contactor/MCB to take off supply to 2T2 transformer auxiliaries

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

- Open 2PT2 and 2T1T2 breakers
- Open 2DT2 and 2L19T2 breakers

- Open 2PT2-T2 and 2T1T2-T2 disconnect switches and turn off its 125vdc supply to MOD

- Open 2DT2-T2 and 2L19T2-T2 disconnect switches and turn off its 125vdc supply

- Open AC control MCB to 2T2 auxiliaries and tag

- Open 125V DC breaker to 2T2 primary and secondary protection and tag with PC13

- Check for no potential on 2T2 Bank

3.8. To restore 2T2 Bank to service after work

3.8.1. Prepare 2T2 bank for restoration:

V2 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 2T2 Bank and temporary grounds removed
- Turn on 125vdc supply and close 58PT2-T2 and 58L8T2-T2 disconnect switches
- Turn on 125vdc supply and close 58AT2-T2 and 58DT2-T2 disconnect switches
- Close AC control MCB to 2T2 auxiliaries and remove tag
- Close 125V DC breaker to 2T2 primary and secondary protection and remove tag PC13
- Advise SCC of readiness to restore 2T2 Bank to service

3.8.2. Restoration of 2T2 bank to service:

- SCC shall close (or advise V2 Operator to close) the 2PT2 and 2T1T2 breakers (330kV)

- SCC shall close (or advise V2 Operator to close) the 2DT2 and 2L19T2 (161kV) to tie to 161kV Bus

3.9. To restore 2T2 Bank to service after automatic outage

If 2T2 bank trips auto due to fault:

V2 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 transformer **ONCE** by closing 2PT2 and 2T1T2 breakers (330kV)

V2 Operator shall:

- Check for potential on 2T2 and advice SCC

SCC shall:

- Energize (or advise the V2 Operator to energize) the transformer **ONCE** by closing 56AT2 and 5DT2 breakers (161kV)

V2 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.

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 330kV buses. The main 'E' and 'P' buses, a breaker and half configuration provides the normal points of supply to all circuits/equipment such as PK21V line, 2T1 and 2T2 transformers.

5. Approval

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Director, TSD

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