TD-OP-0069

GRIDCo

# OPERATING PROCEDURE FOR TUMU SUBSTATION

**GHANA GRID COMPANY LTD**

| | | | |
|---|---|---|---|
| **Title:** | **OPERATING PROCEDURE FOR TUMU SUBSTATION (TU69 )** | | |
| **Issued To:** | Director, System Operations<br>Director, NNS<br>Manager, SCC<br>Manager, Dispatch Operations<br>Area Manager, Tamale<br>Operating Staff, Tamale Area<br>Maintenance Staff, Tamale Area<br>Dispatch Staff, SCC | **Number:** | TD-OP-0069 |
| | | **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 TU69 Substation to service for planned and auto outages.

## 2. Scope

The directive will be used by Operators at Tamale Operating Area and System Control Center (SCC) for operation of equipment at TU69 Substation.

## 3. Procedure

### 3.1. To take WA1TU line out of service

SCC shall carry out (or advise the TU69 Operator to carry out) the following:

- Open 69L1D and 69L1L3 breakers

SCC shall carry out (or advise the WA68 Operator to carry out) the following:

- Open 68AL1 and 68L1L2 breakers
- Check for no potential on WA1TU line

### 3.2. To take out, isolate and de-energize WA1TU line for work

- TU69 Operator request for Station Guarantee from WA68

SCC shall carry out (or advise the TU69 Operator to carry out) the following:

- Open 69L1D and 69L1L3 breakers

SCC shall carry out (or advise WA68 Operator to carry out) the following:

- Open 68AL1 and 68L1L2 breakers
- Check for no potential on WA1TU line

SCC shall advise WA68 Operator to carry out the following:

- Open 68AL1-L1 and 68L1L2-L1 disconnect switches and turn off its 125Vdc supply
- Close 68WA1TU-G ground disconnect switch

SCC shall advise TU69 Operator to carry out the following:

- Open 69L1D-L1 and 69L1L3-L1 disconnect switches and turn off its 125Vdc supply

- Close 69WA1TU-G ground disconnect switch

### 3.3. To restore WA1TU line to service after work

#### 3.3.1. Prepare WA1TU line for restoration:

TU69 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 WA1TU line

SCC shall advise WA68 Operator to carry out the following:

- Check opened 68AL1 and 68L1L2 breakers

- Open 68WA1TU-G ground disconnect switch

- Turn on 125Vdc supply and close 68AL1-L1 and 68L1L2-L1 disconnect switches

SCC shall advise TU69 Operator to carry out the following:

- Check opened 69L1D and 69L1L3 breakers

- Open 69WA1TU-G ground disconnect switch

- Turn on 125Vdc supply and close 69L1D-L1 and 69L1L3-L1 disconnect switches

#### 3.3.2. Restoration of WA1TU line to service:

SCC shall:

- Advise the WA68 and TU69 Operators of readiness to restore WA1TU line to service

- Close (or advise the WA68 Operator to close) 68AL1 and 68L1L2 breakers

- Close (or advise the TU69 Operator to close) 69L1D and 69L1L3 breakers

### 3.4. To restore WA1TU line to service after automatic outage

If WA1TU line trips auto due to fault:

TU69 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 WA68 Operator to energize) the line **ONCE** by closing 68AL1 and 68L1L2 breakers
- Close (or advise the TU69 Operator to close) 69L1D and 69L1L3 breakers

TU69 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 NY3TU line out of service

SCC shall carry out (or advise the TU69 Operator to carry out) the following:

- Open 69L3A and 69L1L3 breakers

SCC shall carry out (or advise the NY82 Operator to carry out) the following:

- Open 82AL3 and 82L3T2 breakers
- Check for no potential on NY3TU line

### 3.6. To take out, isolate and de-energize NY3TU line for work

- TU69 Operator shall request for Station Guarantee from NY82

SCC shall carry out (or advise the TU69 Operator to carry out) the following:

- Open 69L3A and 69L1L3 breakers

SCC shall carry out (or advise the NY82 Operator to carry out) the following:

- Open 82AL3 and 82L3T2 breakers
- Check for no potential on NY3TU line

SCC shall advise NY82 operator to carry out the following:

- Open 82AL3-L3 and 82L3T2-L3 disconnect switches and turn off its 125Vdc supply
- Close 82NY3TU-G ground disconnect switch

SCC shall advise TU69 operator to carry out the following:

- Open 69L3A-L3 and 69L1L3-L3 disconnect switches and turn off its 125Vdc supply
- Close 69NY3TU-G ground disconnect switch

## 3.7. To restore NY3TU line to service after work

### 3.7.1. Prepare NY3TU line for restoration:

TU69 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 NY3TU line

SCC shall advise NY82 Operator to carry out the following:

- Check opened 82AL3 and 82L3T2 breakers
- Open 82NY3TU-G ground disconnect switch
- Turn on 125Vdc supply and close 82AL3-L3 and 82L3T2-L3 disconnect switches

SCC shall advise TU69 Operator to carry out the following:

- Check opened 69L3A and 69L1L3 breakers
- Open 68SA2WA-G ground disconnect switch
- Turn on 125Vdc supply and close 69L3A-L3 and 69L1L3-L3 disconnect switches
- Open 69NY3TU-G ground disconnect switch

### 3.7.2. Restoration of NY3TU line to service:

SCC shall:

- Advise the NY82 and TU69 Operators of readiness to restore NY3TU line to service

- Close (or advise the NY82 Operator to close) 82AL3 and 82L3T2 breakers

- Close (or advise the TU69 Operator to close) 69L3A and 69L1L3 breakers

### 3.8. To restore NY3TU line to service after automatic outage

If NY3TU line trips auto due to fault:

TU69 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:

- Eenergize (or advise the NY82 Operator to energize) the line **ONCE** by closing 82AL3 and 82L3T2 breakers

- Close (or advise the TU69 Operator to close) 69L3A and 69L1L3 breakers

TU69 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 69T1 Bank for work

SCC shall advise TU69 Operator to carry out the following:

- Inform Customer about readiness to take off 68T1 bank

- Request Customer on 69T1 Bank to take off their load

- Transfer Station Service from 69T1 to 69T2 transformer

- Open AC1 Contactor/MCB to take off supply to 69T1 transformer auxiliaries

SCC shall carry out (or advise TU69 Operator to carry out) the following:

- Open 69T1F1 breaker
- Open 69DT1 and 69T1T2 breakers

SCC shall advise TU69 Operator to carry out the following:

- Check opened 69T1F1-S bypass disconnect switch
- Open 69T1F1-T1 disconnect switch
- Open 69DT1-T1 and 69T1T2-T1 disconnect switches and turn off its 125Vdc supply
- Open AC control MCB to 69T1 auxiliaries and tag
- Open 125Vdc MCB to 69T1 primary and secondary protection and tag with PC13
- Check for no potential on 69T1 Bank

## 3.10. To restore 69T1 Bank to service after work

### 3.10.1. Prepare 69T1 bank for restoration:

TU69 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 69T1 Bank and temporary grounds removed
- Check opened 69T1F1-S bypass disconnect switch
- Close 69T1F1-T1 disconnect switch
- Turn on 125Vdc supply and close 69DT1-T1 and 69T1T2-T1 disconnect switches
- Close AC control MCB to 69T1 auxiliaries and remove tag
- Close 125Vdc MCB to 69T1 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 69T1 Bank to service

### 3.10.2. Restoration of 69T1 bank to service:

- SCC shall close (or advise TU69 Operator to close) the 69DT1and 69T1T2 breakers

- TU69 Operator shall advise Customer of readiness to restore 69F1 feeder to service

- SCC shall close (or advise TU69 Operator to close) the 69T1F1 breaker

### 3.11. To restore 69T1 Bank to service after automatic outage

If 69T1 bank trips auto due to fault:

TU69 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 TU69 Operator to energize) the bank ONCEby closing 69DT1and 69T1T2 breakers

TU69 Operator shall advise Customer of readiness to restore 69F1 feeder to service

SCC shall close (or advise TU69 Operator to close) 69T1F1 breaker

TU69 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 68T2 Bank for work

SCC shall advise TU69 Operator to carry out the following:

- Inform Customer about readiness to take off 68T2 bank

- Request Customer on 69T2 Bank to take off their load

- Transfer Station Service from 69T2 to 69T1 transformer

- Open AC1 Contactor/MCB to take off supply to 68T2 transformer auxiliaries

SCC shall carry out (or advise TU69 Operator to carry out) the following:

- Open 69T2F2 breaker

- Open 69AT2 and 69T1T2 breakers

SCC shall advise TU69 Operator to carry out the following:

- Check opened 69T2F2-S bypass disconnect switch
- Open 69T2F2-T2 disconnect switch
- Open 69AT2-T2 and 69T1T2-T2 disconnect switches and turn off its 125Vdc supply
- Open AC control MCB to 69T2 auxiliaries and tag
- Open 125Vdc MCB to 69T2 primary and secondary protection and tag with PC13
- Check for no potential on 69T2 Bank

## 3.13. To restore 69T2 Bank to service after work

### 3.13.1. Prepare 69T2 bank for restoration:

TU69 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 69T2 Bank and temporary grounds removed
- Check open 69T2F2-S bypass disconnect switch
- Close 69T2F2-T2 disconnect switch
- Turn on 125Vdc supply and close 69AT2-T2 and 69T1T2-T2 disconnect switches
- Close AC control MCB to 69T2 auxiliaries and remove tag
- Close 125Vdc MCB to 69T2 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 69T2 Bank to service

### 3.13.2. Restoration of 69T2 bank to service:

- SCC shall close (or advise TU69 Operator to close) the Open 69AT2 and 69T1T2 breakers
- TU69 Operator shall advise Customer of readiness to restore 69F2 feeder to service

- SCC shall close (or advise TU69 Operator to close) the 69T2F2 breaker

### 3.14. To restore 69T2 Bank to service after automatic outage

If 69T2 bank trips auto due to fault:

TU69 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 TU69 Operator to energize) the bank **ONCE** by closing 69AT2 and 69T1T2 breakers

TU69 Operator shall advise Customer of readiness to restore 69F2 feeder to service

SCC shall close (or advise TU69 Operator to close) 69T2F2 breaker

TU69 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 69T1F1 Breaker for work

- TU69 Operator shall request Station Guarantee from Customer on 69F1 Feeder

SCC shall advise TU69 Operator to carry out the following:

- Inform Customer about readiness to take off 69T1 bank
- Request Customer on 69T1 Bank to take off their load
- Transfer Station Service from 69T1 to 69T2 transformer
- Open AC1 Contactor/MCB to take off supply to 69T1 transformer auxiliaries

SCC shall carry out (or advise TU69 Operator to carry out) the following:

- Open 69T1F1 breaker

- Open 69DT1 and 69T1T2 breakers
- Check for no potential on 69T1 Bank

SCC shall advise TU69 Operator to carry out the following:

- Check opened 69T1F1-S bypass disconnect switch

- Open 69T1F1-T1 disconnect switch

- Open 69T1F1-F1 disconnect switch

## 3.16. To restore 69T1F1 Breaker to service after work

### 3.16.1. Prepare 69T1F1 breaker for restoration:

TU69 Operator shall:

- Advise SCC when work on the 69T1F1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 69T1F1 Breaker and temporary grounds removed

- Check opened 69T1F1-S bypass disconnect switch

- Close 69T1F1-T1 disconnect switch

- Close 69T1F1-F1 disconnect switch

### 3.16.2. Restoration of 69T1F1 breaker to service:

- SCC shall close (or advise TU69 Operator to close) the 69DT1 and 69T1T2 breakers

- TU69 Operator shall advise Customer of readiness to restore 69F1 feeder to service

- SCC shall close (or advise TU69 Operator to close) the 69T1F1 breaker

## 3.17. To Isolate 69T2F2 Breaker for work

- TU69 Operator shall request Station Guarantee from Customer on 69F2 Feeder

SCC shall carry out (or advise TU69 Operator to carry out) the following:

- Open 69T2F2 breaker

- Open 69AT2 and 69T1T2 breakers
- Check for no potential on 69T2 Bank

SCC shall advise TU69 Operator to carry out the following:

- Check open 69T2F2-S bypass disconnect switch
- Open 69T2F2-T2 disconnect switch
- Open 69T2F2-F2 disconnect switch

### 3.18. To restore 69T2F2 Breaker to service after work

#### 3.18.1. Prepare 69T2F2 breaker for restoration:

TU69 Operator shall:

- Advise SCC when work on the 69T2F2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 69T2F2 Breaker and temporary grounds removed
- Check opened 69T2F2-S bypass disconnect switch
- Close 69T2F2-T2 disconnect switch
- Close 69T2F2-F2 disconnect switch

#### 3.18.2. Restoration of 69T2F2 breaker to service:

- SCC shall close (or advise TU69 Operator to close) the 69AT2 and 69T1T2 breakers
- TU69 Operator shall advise Customer of readiness to restore 69F2 feeder to service
- SCC shall close (or advise TU69 Operator to close) the 69T2F2 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 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 WA1TU, NY3TU, 69T1 and 69T2 transformers.

## 5. Approval

……

**Director, TSD**