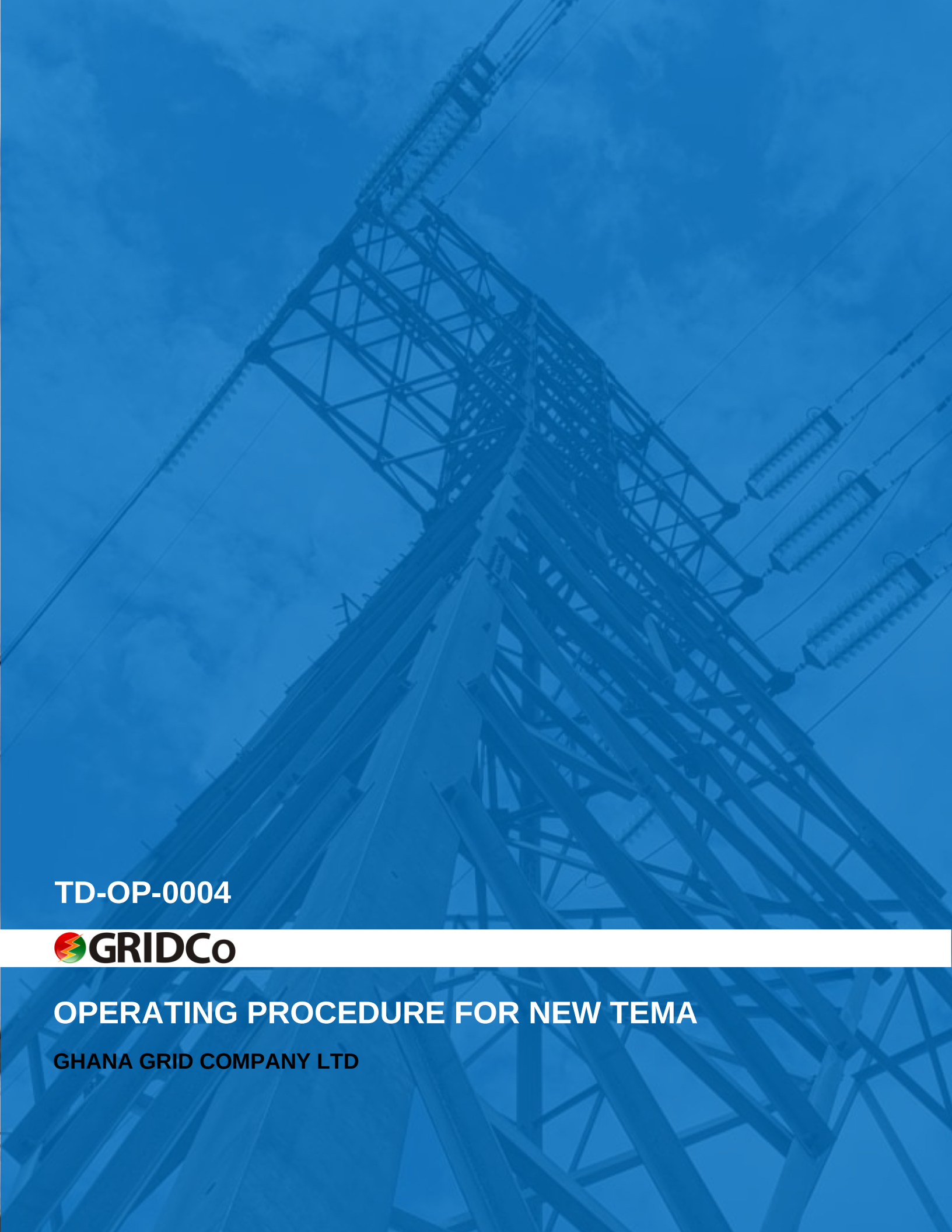

TD-OP-0004

GRIDCo

# OPERATING PROCEDURE FOR NEW TEMA

## GHANA GRID COMPANY LTD

**TECHNICAL DIRECTIVES**

| | | | |
|---|---|---|---|
| **Title:** | **OPERATING PROCEDURE FOR NEW TEMA (E4)** | | |
| **Issued To:** | Director, System Operations<br>Director, SNS<br>Manager, SCC<br>Manager, Dispatch Operations<br>Area Manager, Tema<br>Operating Staff, Tema Area<br>Maintenance Staff, Tema Area<br>Dispatch Staff, SCC | **Number:** | TD-OP-0004 |
| | | **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 E4 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 E4 Substation.

## 3. Procedure

### 3.1. To take E1MR line out of service

SCC shall carry out (or advise the E4 Operator to carry out) the following:

- Open 4A1L3 breaker

SCC shall carry out (or advise the MR46 Operator to carry out) the following:

- Open 46L3 breakers
- Check for no potential on E1MR line

### 3.2. To take out, isolate and de-energize E1MR line for work

SCC shall carry out (or advise the E4 Operator to carry out) the following:

- Open 4A1L3 breaker

SCC shall carry out (or advise the MR46 Operator to carry out) the following:

- Open 46L3 breakers
- Check for no potential on E1MR line

SCC shall advise E4 Operator to carry out the following:

- Open 4A1L3-L3 disconnect switch and turn off its 125Vdc supply
- Close 4E1MR-G ground disconnect switch

SCC shall advise E4 Operator to carry out the following:

- Open 46L3-L3 disconnect switch and turn off 125Vdc supply
- Close -G ground disconnect switch

## 3.3. To restore E1MR line to service after work

### 3.3.1. Prepare E1MR line for restoration

E4 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 E1MR line

SCC shall advise E4 Operator to carry out the following

- Check opened 4A1L3 breaker
- Open 4E1MR-G ground disconnect switch
- Turn on 125Vdc supply and close 4A1L3-L12 disconnect switch

SCC shall advise MR46 Operator to carry out the following:

- Open 46E1MR-G ground disconnect switch
- Turn on 125Vdc supply and close 46L3-L3 disconnect switch

### 3.3.2. Restoration of E1MR line to service:

SCC shall:

- Advise the E4 and MR46 Operators of readiness to restore E1MR line to service
- Close (or advise the E4 Operator to close) 4A1L3 breaker
- Close (or advise the MR46 Operator to close) 46L3 breaker

## 3.4. To restore E1MR line to service after automatic outage

If BDIIE line trips auto due to fault:

E4 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 E4 Operator to energize) the line **ONCE** by closing

4A1L3 breaker

- Close (or advise the MR46 Operator to close) 46L3 breaker

E4 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 E2TP line out of service

SCC shall carry out (or advise the E4 Operator to carry out) the following:

- Open 4A2L2 breaker

SCC shall carry out (or advise the TP47 Operator to carry out) the following:

- Open 47T1A and 47T2A breakers
- Check for no potential on E2TP line

### 3.6. To take out, isolate and de-energize E2TP line for work

SCC shall carry out (or advise the E4 Operator to carry out) the following:

- Open 4A2L2 breaker

SCC shall carry out (or advise the TP47 Operator to carry out) the following:

- Open 47T1A and 47T2A breakers
- Check for no potential on E2TP line

SCC shall advise E4 Operator to carry out the following:

- Open 4A2L2-L2 disconnect switch and turn off its 125Vdc supply
- Close 4E2TP-G ground disconnect switch

SCC shall advise E4 Operator to carry out the following:

- Open 47T1A-L2 and 47T2A-L-2disconnect switch and turn off 125Vdc supply
- Close 47E2TP-G ground disconnect switch

### 3.7. To restore E2TP line to service after work

#### 3.7.1. Prepare E2TP line for restoration

E4 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 E2TP line

SCC shall advise E4 Operator to carry out the following

- Check opened 4A2L2 breaker
- Open 4E2TP-G ground disconnect switch

- Turn on 125Vdc supply and close 4A2L2-L12 disconnect switch

SCC shall advise TP47 Operator to carry out the following:

- Open 47E2TP-G ground disconnect switch
- Turn on 125Vdc supply and close 47T1A-L2 and 47T2A-L2 disconnect switch

### 3.7.2. Restoration of E2TP line to service:

SCC shall:

- Advise the E4 and TP47 Operators of readiness to restore E2TP line to service
- Close (or advise the E4 Operator to close) 4A2L2 breaker
- Close (or advise the TP47 Operator to close) 47T1A and 47T2A breaker

## 3.8. To restore E2TP line to service after automatic outage

If BDIIE line trips auto due to fault:

E4 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 E4 Operator to energize) the line **ONCE** by closing 4A2L2 breaker
- Close (or advise the TP47 Operator to close) 47T1A and 47T2A breaker

E4 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 take V9E line out of service

SCC shall carry out (or advise the E4 Operator to carry out) the following:

- Open 4A1L9 breaker

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

- Open 2L24L9 and 2DL9 breakers
- Check for no potential on V9E line

### 3.10. To take out, isolate and de-energize V9E line for work

SCC shall carry out (or advise the E4 Operator to carry out) the following:

- Open 4A1L9 breaker

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

- Open 2L24L9 and 2DL9 breakers
- Check for no potential on V9E line

SCC shall advise E4 Operator to carry out the following:

- Open 4A1L9-L9 disconnect switch and turn off its 125Vdc supply
- Close 4V9E-G ground disconnect switch

SCC shall advise E4 Operator to carry out the following:

- Open 2L24L9-L9 and 2DL9-L9 disconnect switches and turn off 125Vdc supply
- Close 2V9E-G ground disconnect switch

### 3.11. To restore V9E line to service after work

#### 3.11.1. Prepare V9E line for restoration

E4 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 V9E line

SCC shall advise E4 Operator to carry out the following

- Check opened 4A1L9 breaker
- Open 4V9E-G ground disconnect switch

- Turn on 125Vdc supply and close 4A1L9-L9 disconnect switch

SCC shall advise V2 Operator to carry out the following:

- Check opened 2L24L9 and 2DL9 breakers
- Open 2V9E-G ground disconnect switch
- Turn on 125Vdc supply and close 2L24L9-L9 and 2DL9-L9 disconnect switches

### 3.11.2. Restoration of V9E line to service:

SCC shall:

- Advise the E4 and V2 Operators of readiness to restore V9E line to service
- Close (or advise the E4 Operator to close) 7V9E breaker
- Close (or advise the V2 Operator to close) 2L24L9 and 2DL9 breakers

## 3.12. To restore V9E line to service after automatic outage

If V9E line trips auto due to fault:

E4 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 E4 Operator to energize) the line **ONCE** by closing 4A1L9 breaker
- Close (or advise the V2 Operator to close) 2L24L9 and 2DL9 breakers

E4 Operator shall:

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

### 3.13. To take V10E line out of service

SCC shall carry out (or advise the E4 Operator to carry out) the following:

- Open 4A2L10 breaker

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

- Open 2L8L10 and 2DL10 breakers
- Check for no potential on V10E line

### 3.14. To take out, isolate and de-energize V10E line for work

SCC shall carry out (or advise the E4 Operator to carry out) the following:

- Open 4A2L10 breaker

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

- Open 2L8L10 and 2DL10 breakers
- Check for no potential on V10E line

SCC shall advise E4 Operator to carry out the following:

- Open 4A2L10-L10 disconnect switch and turn off its 125Vdc supply
- Close 4V10E-G ground disconnect switch

SCC shall advise E4 Operator to carry out the following:

- Open 2L8L10-L10 and 2DL10-L10 disconnect switches and turn off 125Vdc supply
- Close 2V10E-G ground disconnect switch

### 3.15. To restore V10E line to service after work

#### 3.15.1. Prepare V10E line for restoration

E4 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 V10E line

SCC shall advise E4 Operator to carry out the following

- Check opened 4A2L10 breaker
- Open 4V10E-G ground disconnect switch
- Turn on 125Vdc supply and close 4A2L10-L10 disconnect switch

SCC shall advise V2 Operator to carry out the following:

- Check opened 2L8L10 and 2DL10 breakers
- Open 2V10E-G ground disconnect switch
- Turn on 125Vdc supply and close 2L8L10-L10 and 2DL10-L10 disconnect switches

### 3.15.2. Restoration of V10E line to service:

SCC shall:

- Advise the E4 and V2 Operators of readiness to restore V10E line to service
- Close (or advise the E4 Operator to close) 7V10E breaker
- Close (or advise the V2 Operator to close) 2L8L10 and 2DL10 breakers

## 3.16. To restore V10E line to service after automatic outage

If V10E line trips auto due to fault:

E4 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 E4 Operator to energize) the line **ONCE** by closing 4A2L10 breaker
- Close (or advise the V2 Operator to close) 2L8L10 and 2DL10 breakers

E4 Operator shall:

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

### 3.17. To take BDIIE line out of service

SCC shall carry out (or advise the E4 Operator to carry out) the following:

- Open 4A2L11 breaker

SCC shall carry out (or advise the BD85 Operator to carry out) the following:

- Open 85T5L11 breakers
- Check for no potential on BDIIE line

### 3.18. To take out, isolate and de-energize BDIIE line for work

SCC shall carry out (or advise the E4 Operator to carry out) the following:

- Open 4A2L11 breaker

SCC shall carry out (or advise the BD85 Operator to carry out) the following:

- Open 85T5L11 breakers
- Check for no potential on BDIIE line

SCC shall advise E4 Operator to carry out the following:

- Open 4A2L11-L11 disconnect switch and turn off its 125Vdc supply
- Close 4BD11E-G ground disconnect switch

SCC shall advise E4 Operator to carry out the following:

- Open 85T5L11-L11 disconnect switch and turn off 125Vdc supply
- Close 85BD11E-G ground disconnect switch

### 3.19. To restore BDIIE line to service after work

#### 3.19.1. Prepare BDIIE line for restoration

E4 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 BD11E line

SCC shall advise E4 Operator to carry out the following

- Check opened 4A2L11 breaker
- Open 4BDIIE-G ground disconnect switch
- Turn on 125Vdc supply and close 4A2L11-L11 disconnect switch

SCC shall advise BD85 Operator to carry out the following:

- Check opened 85T5L11breakers
- Open 85BDIIE-G ground disconnect switch
- Turn on 125Vdc supply and close 85T5L11-11 disconnect switch

### 3.19.2. Restoration of BD11E line to service:

SCC shall:

- Advise the E4 and BD85 Operators of readiness to restore BDIIE line to service
- Close (or advise the E4 Operator to close) 4A2L11 breaker
- Close (or advise the BD85 Operator to close) 85T5L11breakers

## 3.20. To restore BD11E line to service after automatic outage

If BDIIE line trips auto due to fault:

E4 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 E4 Operator to energize) the line **ONCE** by closing 4A2L11 breaker
- Close (or advise the BD85 Operator to close) 85T5L11 breakers

E4 Operator shall:

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

## 3.21. To take BD12E line out of service

SCC shall carry out (or advise the E4 Operator to carry out) the following:

- Open 4A1L12 breaker

SCC shall carry out (or advise the BD85 Operator to carry out) the following:

- Open 85T6L12 breakers
- Check for no potential on BD12E line

### 3.22. To take out, isolate and de-energize BD12E line for work

SCC shall carry out (or advise the E4 Operator to carry out) the following:

- Open 4A1L12 breaker

SCC shall carry out (or advise the BD85 Operator to carry out) the following:

- Open 85T6L12 breakers
- Check for no potential on BD12E line

SCC shall advise E4 Operator to carry out the following:

- Open 4A1L12-L12 disconnect switch and turn off its 125Vdc supply
- Close 4BD12E-G ground disconnect switch

SCC shall advise E4 Operator to carry out the following:

- Open 85T6L12-L12 disconnect switch and turn off 125Vdc supply
- Close 85BDI2E-G ground disconnect switch

### 3.23. To restore BD12E line to service after work

#### 3.23.1. Prepare BD12E line for restoration

E4 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 BD12E line

SCC shall advise E4 Operator to carry out the following

- Check opened 4A1L12 breaker
- Open 4BD12E-G ground disconnect switch
- Turn on 125Vdc supply and close 4A1L12-L12 disconnect switch

SCC shall advise BD85 Operator to carry out the following:

- Check opened 85T6L12breakers
- Open 85BD12E-G ground disconnect switch
- Turn on 125Vdc supply and close 85T6L12-12 disconnect switch

### 3.23.2. Restoration of BD12E line to service:

SCC shall:

- Advise the E4 and BD85 Operators of readiness to restore BD12E line to service
- Close (or advise the E4 Operator to close) 4A1L12 breaker
- Close (or advise the BD85 Operator to close) 85T6L12breakers

## 3.24. To restore BD12E line to service after automatic outage

If BDIIE line trips auto due to fault:

E4 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 E4 Operator to energize) the line **ONCE** by closing 4A1L12 breaker
- Close (or advise the BD85 Operator to close) 85T6L12 breakers

E4 Operator shall:

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

## 3.25. Isolate 4T1 Transformer for work

H5 Operator shall request for Station Guarantee from Customer on 4F1 Feeder

SCC shall advise E4 operator to carry out the following:

- Inform Customer about readiness to take off 4T1 bank
- Request Customer on 4T1 Bank to take off their load
- Transfer Station Service from AC1 to AC2
- Open AC1 Contactor/MCB to take off supply to 4T1 transformer

auxiliaries

SCC shall carry out (or advise E4 operator to carry out) the following:

- Open 4T1F1 breaker
- Open 4A2T1 breaker
- Check for no potential on 4T1 Bank

SCC shall advise E4 operator to carry out the following:

- Open 4A2T1-A1 disconnect switch and turn off 125Vdc supply
- Open 4T1F1-F1 disconnect switch
- Open AC control MCB to 4T1 auxiliaries
- Open 125Vdc MCB to 4T1 primary and secondary protection and tag with PC13

**3.26. To restore 4T1 Bank to service after work**

**3.26.1. Prepare 4T1 bank for restoration:**

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 4T1 Bank and temporary grounds removed
- Check opened 4T1F1 breaker
- Check opened 4A2T1 breaker
- Turn on 125Vdc supply and close 4A2T1-A1 disconnect switch
- Close 4T1F1-F1 disconnect switch
- Close AC control MCB to 4T1 auxiliaries
- Close 125Vdc MCB to 4T1 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 4T1 Bank to service

**3.26.2. Restoration of 4T1 bank to service:**

- SCC shall close (or advise E4 operator to close) 4A2T1 breaker
- E4 Operator shall advise Customer of readiness to restore 4T1 Bank to service

- SCC shall close (or advise E4 operator to close) the 4T1F1 breaker

### 3.27. Restore 4T1 Bank to service after automatic outage

If 4T1 bank 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 E4 Operator to energize) the bank **ONCE** by closing 4A2T1 breaker

E4 Operator shall advise Customer of readiness to restore 4F1 feeder to service

SCC shall close (or advise E4 Operator to close) 4T1F1 breaker

E4 Operator shall:

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

### 3.28. Isolate 4T3 Transformer for work

H5 Operator shall request for Station Guarantee from Customer on 4F3 Feeder

SCC shall advise E4 operator to carry out the following:

- Inform Customer about readiness to take off 4T3 bank
- Request Customer on 4T3 Bank to take off their load
- Transfer Station Service from AC1 to AC2
- Open AC1 Contactor/MCB to take off supply to 4T3 transformer auxiliaries

SCC shall carry out (or advise E4 operator to carry out) the following:

- Open 4T3F3 breaker
- Open 4A2T3 breaker
- Check for no potential on 4T3 Bank

SCC shall advise E4 operator to carry out the following:

- Open 4A2T3-A2 disconnect switch and turn off 125Vdc supply

- Open 4T3F3-F3 disconnect switch
- Open AC control MCB to 4T3 auxiliaries
- Open 125Vdc MCB to 4T3 primary and secondary protection and tag with PC13

### 3.29. To restore 4T3 Bank to service after work

#### 3.29.1. Prepare 4T3 bank for restoration:

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 4T3 Bank and temporary grounds removed
- Check opened 4T3F3 breaker
- Check opened 4A2T3 breaker
- Turn on 125Vdc supply and close 4A2T3-A2 disconnect switch
- Close 4T3F3-F3 disconnect switch
- Close AC control MCB to 4T3 auxiliaries
- Close 125Vdc MCB to 4T3 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 4T3 Bank to service

#### 3.29.2. Restoration of 4T3 bank to service:

- SCC shall close (or advise E4 operator to close) 4A2T3 breaker
- E4 Operator shall advise Customer of readiness to restore 4T3 Bank to service
- SCC shall close (or advise E4 operator to close) the 4T3F3 breaker

### 3.30. Restore 4T3 Bank to service after automatic outage

If 4T3 bank 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 E4 Operator to energize) the bank **ONCE** by closing 4A2T3 breaker

E4 Operator shall advise Customer of readiness to restore 4F3 feeder to service

SCC shall close (or advise E4 Operator to close) 4T3F3 breaker

E4 Operator shall:

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

### 3.31. Isolate 4T5 Transformer for work

H5 Operator shall request for Station Guarantee from Customer on 4F5 Feeder

SCC shall advise E4 operator to carry out the following:

- Inform Customer about readiness to take off 4T5 bank
- Request Customer on 4T5 Bank to take off their load
- Transfer Station Service from AC1 to AC2
- Open AC1 Contactor/MCB to take off supply to 4T5 transformer auxiliaries

SCC shall carry out (or advise E4 operator to carry out) the following:

- Open 4T5F5 breaker
- Open 4A1T5 breaker
- Check for no potential on 4T5 Bank

SCC shall advise E4 operator to carry out the following:

- Open 4A1T5-A1 disconnect switch and turn off 125Vdc supply
- Open 4T5F5-F5 disconnect switch
- Open AC control MCB to 4T5 auxiliaries
- Open 125Vdc MCB to 4T5 primary and secondary protection and tag with PC13

## 3.32. To restore 4T5 Bank to service after work

### 3.32.1. Prepare 4T5 bank for restoration:

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 4T5 Bank and temporary grounds removed
- Check opened 4T5F5 breaker
- Check opened 4A1T5 breaker
- Turn on 125Vdc supply and close 4A1T5-A1 disconnect switch
- Close 4T5F5-F5 disconnect switch
- Close AC control MCB to 4T5 auxiliaries
- Close 125Vdc MCB to 4T5 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 4T5 Bank to service

### 3.32.2. Restoration of 4T5 bank to service:

- SCC shall close (or advise E4 operator to close) 4A1T5 breaker
- E4 Operator shall advise Customer of readiness to restore 4T5 Bank to service
- SCC shall close (or advise E4 operator to close) the 4T5F5 breaker

## 3.33. Restore 4T5 Bank to service after automatic outage

If 4T5 bank 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 E4 Operator to energize) the bank **ONCE** by closing 4A1T5 breaker

E4 Operator shall advise Customer of readiness to restore 4F5 feeder to service

SCC shall close (or advise E4 Operator to close) 4T5F5 breaker

E4 Operator shall:

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

### 3.34. Isolate 4T6 Transformer for work

H5 Operator shall request for Station Guarantee from Customer on 4F9 and 4F11 Feeder

SCC shall advise E4 operator to carry out the following:

- Inform Customer about readiness to take off 4T6 bank
- Request Customer on 4T6 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 4T6 transformer auxiliaries

SCC shall carry out (or advise E4 operator to carry out) the following:

- Open 4A1T6 breaker
- Open 4T6B2 breaker
- Check for no potential on 4T6 Bank

SCC shall advise E4 operator to carry out the following:

- Open 4A1T6-A1 disconnect switch and turn off 125Vdc supply
- Open 4T6B2-T6 disconnect switch
- Open AC control MCB to 4T6 auxiliaries
- Open 125Vdc MCB to 4T6 primary and secondary protection and tag with PC13

### 3.35. To restore 4T6 Bank to service after work

#### 3.35.1. Prepare 4T6 bank for restoration:

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 4T6 Bank and temporary grounds removed
- Check opened 4T6B2 breaker
- Check opened 4A1T6 breaker
- Turn on 125Vdc supply and close 4A1T6-A1 disconnect switch

- Close 4T6B2-T6 disconnect switch
- Close AC control MCB to 4T6 auxiliaries
- Close 125Vdc MCB to 4T6 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 4T6 Bank to service

### 3.35.2. Restoration of 4T6 bank to service:

- SCC shall close (or advise E4 operator to close) 4A1T6 breaker
- E4 Operator shall advise Customer of readiness to restore 4T6 Bank to service
- SCC shall close (or advise E4 operator to close) the 4T6B2 breaker

## 3.36. Restore 4T6 Bank to service after automatic outage

If 4T6 bank 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 E4 Operator to energize) the bank **ONCE** by closing 4A1T5 breaker

E4 Operator shall advise Customer of readiness to restore 4F9 and 4F11 feeder to service

SCC shall close (or advise E4 Operator to close) 4T6B2 breaker

E4 Operator shall:

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

**3.37. Isolate 4T7 Transformer for work**

E4 Operator shall request Station Guarantee from Customer on 4T7 Transformer

SCC shall advise E4 operator to carry out the following:

- Inform Customer about readiness to take off 4T7 bank
- Request Customer on 4T7 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 4T7 transformer auxiliaries

SCC shall carry out (or advise E4 operator to carry out) the following:

- Open 4T7A2 breaker
- Check for no potential on 4T7 Bank

SCC shall advise E4 operator to carry out the following:

- Open 4T7A2-A2 disconnect switch and turn off 125Vdc supply
- Open 4B2-T7 disconnect switch and turn off 125Vdc supply
- Open AC control MCB to 4T7 auxiliaries
- Open 125Vdc MCB to 4T7 primary and secondary protection and tag with PC13

**3.38. To restore 4T7 Bank to service after work**

**3.38.1. Prepare 4T7 bank for restoration:**

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 4T7 Bank and temporary grounds removed
- Check opened 4T7A2 breaker
- Turn on 125Vdc supply and close 4T7A2-A2 disconnect switch
- Turn on 125Vdc supply and close 4B2-T7 disconnect switch
- Close AC control MCB to 4T7 auxiliaries
- Close 125Vdc MCB to 4T7 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 4T7 Bank to service

**3.38.2. Restoration of 4T7 bank to service:**

- SCC shall close (or advise E4 operator to close) 4T7A2 breaker

- E4 Operator shall advise Customer of readiness to restore 4T7 Bank to service

### 3.39. Restore 4T7 Bank to service after automatic outage

If 4T7 bank 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 E4 Operator to energize) the bank **ONCE** by closing 4T7A2 breaker

E4 Operator shall advise Customer of readiness to restore 4T7 Transformerto service

SCC shall close (or advise E4 Operator to close) 4T7B2 breaker

E4 Operator shall:

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

### 3.40. Isolate 4T8 Transformer for work

SCC shall advise E4 operator to carry out the following:

- Inform Customer about readiness to take off 4T8 bank
- Request Customer on 4T8 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 4T8 transformer auxiliaries

SCC shall carry out (or advise E4 operator to carry out) the following:

- Open 4T8A2 breaker
- Check for no potential on 4T8 Bank

SCC shall advise E4 operator to carry out the following:

- Open 4T8A2-A2 disconnect switch and turn off 125Vdc supply
- Open 4TB1-T8 disconnect switch and turn off 125Vdc supply
- Open AC control MCB to 4T8 auxiliaries

- Open 125Vdc MCB to 4T8 primary and secondary protection and tag with PC13

## 3.41. To restore 4T8 Bank to service after work

### 3.41.1. Prepare 4T8 bank for restoration:

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 4T8 Bank and temporary grounds removed
- Check opened 4T8A2 breaker
- Turn on 125Vdc supply and close 4T8A2-A2 disconnect switch
- Turn on 125Vdc supply and close 4B1-T8 disconnect switch
- Close AC control MCB to 4T8 auxiliaries
- Close 125Vdc MCB to 4T8 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 4T8 Bank to service

### 3.41.2. Restoration of 4T8 bank to service:

- SCC shall close (or advise E4 operator to close) 4T8A2 breaker
- E4 Operator shall advise Customer of readiness to restore 4T8 Bank to service

## 3.42. Restore 4T8 Bank to service after automatic outage

If 4T8 bank 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 E4 Operator to energize) the bank **ONCE** by closing 4T8A2 breaker

E4 Operator shall:

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

work on the equipment. See explanation.

### 3.43. To isolate 4T1F1 Breaker for work

- E4 Operator shall request Station Guarantee from Customer on 4F1 Feeder

SCC shall carry out or advise E4 Operator to carry out the following:

- Inform Customer about readiness to take off 4T1 bank
- Request Customer on 4T1 Bank to take off their load
- Transfer Station Service from AC2 to AC1, if Station Service is on 4T1
- Open AC1 Contactor/MCB to take off supply to 4T1 transformer auxiliaries

SCC shall carry out (or advise E4 Operator to carry out) the following:

- Open 4T1F1 breaker
- Open 4A2T1 breaker
- Open 4T1F1-F1disconnect switch and turn off its 125Vdc supply
- Open 4A2T1-A2 disconnect switch and turn off its 125Vdc supply

### 3.44. To restore 4T1F1 breaker to service after work

#### 3.44.1. Prepare 4T1F1 breaker to service after work

E4 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 4T1 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 4T1F1-F1 disconnect switch
- Turn on 125Vdc supply and close 4A2T1-A2 disconnect switch
- Advise SCC of readiness to restore 4T1F1 breaker to service

#### 3.44.2. Restoration of 4T1F1 Breaker to service:

- SCC shall close (or advise M37 Operator to close) 4A2T1 breaker
- M37 Operator shall advise Customer of readiness to restore 4F1 feeder to service

- SCC shall close (or advise E4 Operator to close) 4T1F1 breaker

**3.45. To isolate 4T3F3 Breaker for work**

- E4 Operator shall request Station Guarantee from Customer on 4F3 Feeder

SCC shall carry out or advise E4 Operator to carry out the following:

- Inform Customer about readiness to take off 4T3 bank
- Request Customer on 4T3 Bank to take off their load
- Transfer Station Service from AC2 to AC1, if Station Service is on 4T3
- Open AC1 Contactor/MCB to take off supply to 4T3 transformer auxiliaries

SCC shall carry out (or advise E4 Operator to carry out) the following:

- Open 4T3F3 breaker
- Open 4A2T3 breaker
- Open 4T3F3-F3disconnect switch and turn off its 125Vdc supply
- Open 4A2T3-A2 disconnect switch and turn off its 125Vdc supply

**3.46. To restore 4T3F3 breaker to service after work**

**3.46.1. Prepare 4T3F3 breaker to service after work**

E4 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 4T3 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 4T3F3-F3 disconnect switch
- Turn on 125Vdc supply and close 4A2T3-A2 disconnect switch
- Advise SCC of readiness to restore 4T3F3 breaker to service

**3.46.2. Restoration of 4T3F3 Breaker to service:**

- SCC shall close (or advise M37 Operator to close) 4A2T3 breaker

- M37 Operator shall advise Customer of readiness to restore 4F3 feeder to service

- SCC shall close (or advise E4 Operator to close) 4T3F3 breaker

### 3.47. To isolate 4T5F5 Breaker for work

- E4 Operator shall request Station Guarantee from Customer on 4F5 Feeder

SCC shall carry out or advise E4 Operator to carry out the following:

- Inform Customer about readiness to take off 4T5 bank
- Request Customer on 4T5 Bank to take off their load
- Transfer Station Service from AC2 to AC1, if Station Service is on 4T5
- Open AC1 Contactor/MCB to take off supply to 4T5 transformer auxiliaries

SCC shall carry out (or advise E4 Operator to carry out) the following:

- Open 4T5F5 breaker
- Open 4A2T5 breaker
- Open 4T5F5-F5 disconnect switch and turn off its 125Vdc supply

- Open 4A2T5-A1 disconnect switch and turn off its 125Vdc supply

### 3.48. To restore 4T5F5 breaker to service after work

#### 3.48.1. Prepare 4T5F5 breaker to service after work

E4 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 4T5 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 4T5F5-F5 disconnect switch

- Turn on 125Vdc supply and close 4A2T5-A1 disconnect switch

- Advise SCC of readiness to restore 4T5F5 breaker to service

### 3.48.2. Restoration of 4T5F5 Breaker to service:

- SCC shall close (or advise M37 Operator to close) 4A2T5 breaker

- M37 Operator shall advise Customer of readiness to restore 4F5 feeder to service

- SCC shall close (or advise E4 Operator to close) 4T5F5 breaker

## 3.49. To isolate 4B2F4 Breaker for work

- E4 Operator shall request Station Guarantee from Customer on 4F4 Feeder

SCC shall carry out or advise E4 Operator to carry out the following:

- Inform Customer about readiness to take off 4T6 bank

- Request Customer on 4T6 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 4T6 transformer auxiliaries

SCC shall carry out (or advise E4 Operator to carry out) the following:

- Open 4B2F4 breaker
- Open 4B2T6 breaker
- Open 4B2F4-F4 disconnect switch and turn off its 125Vdc supply
- Open 4B2T6-B2 disconnect switch and turn off its 125Vdc supply

## 3.50. To restore 4B2F4 breaker to service after work

### 3.50.1. Prepare 4B2F4 breaker to service after work

E4 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 4T6 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 4B2F4-F4 disconnect switch

- Turn on 125Vdc supply and close 4B2T6-B2 disconnect switch

- Advise SCC of readiness to restore 4B2F4 breaker to service

#### 3.50.2. Restoration of 4B2F4 Breaker to service:

- E4 Operator shall advise Customer of readiness to restore 4F4 feeder to service

- SCC shall close (or advise E4 Operator to close) 4B2T6 and 4B2F4 breakers

### 3.51. To isolate 4B2F9 Breaker for work

- E4 Operator shall request Station Guarantee from Customer on 4F9 Feeder

SCC shall carry out or advise E4 Operator to carry out the following:

- Inform Customer about readiness to take off 4T6 bank

- Request Customer on 4T6 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 4T6 transformer auxiliaries

SCC shall carry out (or advise E4 Operator to carry out) the following:

- Open 4B2F9 breaker
- Open 4B2T6 breaker
- Open 4B2F9-F9 disconnect switch and turn off its 125Vdc supply

- Open 4B2T6-B2 disconnect switch and turn off its 125Vdc supply

### 3.52. To restore 4B2F9 breaker to service after work

#### 3.52.1. Prepare 4B2F9 breaker to service after work

E4 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 4T6 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 4B2F9-F9 disconnect switch

- Turn on 125Vdc supply and close 4B2T6-B2 disconnect switch

- Advise SCC of readiness to restore 4B2F9 breaker to service

#### 3.52.2. Restoration of 4B2F9 Breaker to service:

- E4 Operator shall advise Customer of readiness to restore 4F9 feeder to service

- SCC shall close (or advise E4 Operator to close) 4B2T6 and 4B2F9 breakers

### 3.53. To isolate 4B2F11 Breaker for work

- E4 Operator shall request Station Guarantee from Customer on 4F11 Feeder

SCC shall carry out or advise E4 Operator to carry out the following:

- Inform Customer about readiness to take off 4T6 bank

- Request Customer on 4T6 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 4T6 transformer auxiliaries

SCC shall carry out (or advise E4 Operator to carry out) the following:

- Open 4B2F11 breaker
- Open 4B2T6 breaker
- Open 4B2F11-F11 disconnect switch and turn off its 125Vdc supply

- Open 4B2T6-B2 disconnect switch and turn off its 125Vdc supply

### 3.54. To restore 4B2F11 breaker to service after work

#### 3.54.1. Prepare 4B2F11 breaker to service after work

E4 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 4T6 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 4B2F11-F11 disconnect switch
- Turn on 125Vdc supply and close 4B2T6-B2 disconnect switch
- Advise SCC of readiness to restore 4B2F11 breaker to service

### 3.54.2. Restoration of 4B2F11 Breaker to service:

- E4 Operator shall advise Customer of readiness to restore 4F11 feeder to service
- SCC shall close (or advise E4 Operator to close) 4B2T6 and 4B2F11 breakers

## 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**

## TECHNICAL DIRECTIVES

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 'A1' and 'A2' buses, a breaker configuration provides the normal points of supply to all circuits/equipment such as E1MR (New Tema –MRP46), E2TP (New Tema –TP47), V9E (Volta – New Tema), V10E (Volta- New Tema), BD11E (Bridge Power – New Tema), BD12E (Bridge Power – New Tema), lines, 4T1, 4T3, 4T5 4T6,4T7 and 4T8 transformers.

**5. Approval**

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**Director, Technical Services**