TD-OP-0026

GRIDCo

# OPERATING PROCEDURE FOR TECHIMAN SUBSTATION

**GHANA GRID COMPANY LTD**

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| **Title:** | **OPERATING PROCEDURE FOR TECHIMAN SUBSTATION (TH26)** | | |
| **Issued To:** | Director, System Operations<br>Director, NNS<br>Manager, SCC<br>Manager, Dispatch Operations<br>Area Manager, Techiman<br>Operating Staff, Techiman Area<br>Maintenance Staff, Techiman Area<br>Dispatch Staff, SCC | **Number:** | TD-OP-0026 |
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Contents

## 1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at TH26 Substation to service for planned and auto outages.

## 2. Scope

The directive will be used by Operators at Techiman Operating Area and System Control Center (SCC) for operation of equipment at TH26 Substation.

## 3. Procedure

### 3.1. To take TH1KP line out of service

SCC shall carry out (or advise the TH26 Operator to carry out) the following:

- Verify opened 26L1-D transfer disconnect switch
- Open 26AL1 breaker

SCC shall carry out (or advise the KP56 Operator to carry out) the following:

- Open 56L1A and 56L1L2 breakers
- Check for no potential on TH1KP line

### 3.2. To take out, isolate and de-energize TH1KP line for work

- TH26 Operator shall request for Station Guarantee from KP56

SCC shall carry out (or advise the TH26 Operator to carry out) the following:

- Check opened 26L1-D transfer disconnect switch
- Open 26AL1 breaker

SCC shall carry out (or advise KP56 Operator to carry out) the following:

- Open 56L1A and 56L1L2 breakers
- Check for no potential on TH1KP line

SCC shall advise KP56 Operator to carry out the following:

- Open 56L1L2-L1 and 56L1A-L1 disconnect switches and turn off its 125Vdc supply
- Close 56TH1KP-G ground disconnect switch

SCC shall advise TH26 Operator to carry out the following:

- Open 26AL1-L1 disconnect switch and turn off its 125Vdc supply
- Close 26TH1KP-G ground disconnect switch

### 3.3. To restore TH1KP line to service after work

#### 3.3.1. Prepare TH1KP line for restoration:

TH26 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 TH1KP line

SCC shall advise KP56 Operator to carry out the following:

- Check opened 56L1A and 56L1L2 breakers
- Open 56TH1KP-G ground disconnect switch
- Turn on 125Vdc supply and close 56L1L2-L1 and 56L1A-L1 disconnect switches

SCC shall advise TH26 Operator to carry out the following:

- Check opened 26AL1 breaker
- Check opened 26L1-D transfer disconnect switch and turn on 125Vdc supply
- Open 26TH1KP-G ground disconnect switch
- Turn on 125Vdc supply and close 26AL1-L1 disconnect switch

#### 3.3.2. Restoration of TH1KP line to service:

SCC shall:

- Advise the KP56 and TH26 Operators of readiness to restore TH1KP line to service
- Close (or advise the KP56 Operator to close) 56L1A and 56L1L2 breakers
- Close (or advise the TH26 Operator to close) 26AL1 breaker

### 3.4. To take out, isolate and de-energize TH1KP line for work (Along Powered Skywire)

- TH26 Operator shall request for Station Guarantee from KP56 and

NEDCo

SCC shall carry out (or advise the TH26 Operator to carry out) the following:

- Check opened 26L1-D transfer disconnect switch and turn off 125Vdc supply
- Open 26AL1 breaker

SCC shall carry out (or advise KP56 Operator to carry out) the following:

- Open 56L1A and 56L1L2 breakers
- Check for no potential on TH1KP line

SCC shall advise KP56 Operator to carry out the following:

- Open 56L1L2-L1 and 56L1A-L1 disconnect switches and turn off its 125Vdc supply
- Close 56TH1KP-G ground disconnect switch

SCC shall advise TH26 Operator to carry out the following:

- Open 26AL1-L1 disconnect switch and turn off its 125Vdc supply
- Close 26TH1KP-G ground disconnect switch

## 3.5. To restore TH1KP line to service after work (Along Powered Skywire)

### 3.5.1. Prepare TH1KP line for restoration:

TH26 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 TH1KP line

SCC shall advise KP56 Operator to carry out the following:

- Check opened 56L1A and 56L1L2 breakers
- Open 56TH1KP-G ground disconnect switch
- Turn on 125Vdc supply and close 56L1L2-L1 and 56L1A-L1 disconnect switches

SCC shall advise TH26 Operator to carry out the following:

- Check opened 26AL1 breaker

- Check opened 26L1-D transfer disconnect switch and turn on 125Vdc supply

- Open 26TH1KP-G ground disconnect switch

- Turn on 125Vdc supply and close 26AL1-L1 disconnect switch

### 3.5.2. Restoration of TH1KP line to service (Along Powered Skywire)

SCC shall:

- Advise the KP56 and TH26 Operators and NEDCo of readiness to restore TH1KP line to service

- Close (or advise the KP56 Operator to close) 56L1A and 56L1L2 breakers

- Close (or advise the TH26 Operator to close) 26AL1 breaker

## 3.6. To restore TH1KP line to service after automatic outage

If TH1KP line trips auto due to fault:

TH26 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 KP56 Operator to energize) the line **ONCE** by closing 56L1A and 56L1L2 breakers

- Close (or advise the TH26 Operator to close) 26AL1 breaker

TH26 Operator shall:

- Advise the Supervisor/Area Manager of operation above

- Advise maintenance men to patrol the line if the operation above is not successful

## 3.7. To take TH2SN line out of service

SCC shall carry out (or advise the TH26 Operator to carry out) the following:

- Verify opened 26L2-D transfer disconnect switch
- Open 26AL2 breaker.

SCC shall carry out (or advise the SN27 Operator to carry out) the following:

- Verify opened 27L2-D transfer disconnect switch
- Open 27L2A breaker
- Check for no potential on TH2SN line

### 3.8. To take out, isolate and de-energize TH2SN line for work

- TH26 Operator shall request for Station Guarantee from SN27

SCC shall carry out (or advise the TH26 Operator to carry out) the following:

- Check opened 26L2-D transfer disconnect switch and turn off 125Vdc supply
- Open 26AL2 breaker.

SCC shall carry out (or advise the SN27 Operator to carry out) the following:

- Check opened 27L2-D transfer disconnect switch and turn off its 125Vdc supply
- Open 27L2A breaker
- Check for no potential on TH2SN line

SCC shall advise SN27 Operator to carry out the following:

- Open 27L2A–L2 disconnect switch and turn off its 125Vdc supply
- Close 27TH2SN-G ground disconnect switch

SCC shall advise TH26 operator to carry out the following:

- Open 26AL2-L2 disconnect switch and turn off its 125Vdc supply
- Close 26TH2SN-G ground disconnect switch

### 3.9. To restore TH2SN line to service after work

#### 3.9.1. Prepare TH2SN line for restoration:

TH26 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 TH2SN line

SCC shall advise SN27 Operator to carry out the following:

- Check opened 27L2-D transfer disconnect switch and turn on its 125Vdc supply
- Check opened 27L2A breaker
- Open 27TH2SN-G ground disconnect switch
- Turn on 125Vdc supply and close 27L2A-L2 disconnect switch

SCC shall advise TH26 Operator to carry out the following:

- Check opened 26L2-D transfer disconnect switch and turn on its 125Vdc supply
- Check opened 26AL2 breaker
- Open 26TH2SN-G ground disconnect switch
- Turn on 125Vdc supply and close 26AL2-L2 disconnect switch

### 3.9.2. Restoration of TH2SN line to service:

SCC shall:

- Advise the SN27 and TH26 Operators of readiness to restore TH2SN line to service
- Close (or advise the SN27 Operator to close) 27L2A breaker
- Close (or advise the TH26 Operator to close) 26AL2 breaker

## 3.10. To restore TH2SN line to service after automatic outage

If TH2SN line trips auto due to fault:

TH26 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 SN27 Operator to energize) the line **ONCE** by closing 27L2A breaker

- Close (or advise the TH26 Operator to close) 26AL2 breaker

TH26 Operator shall:

- Advise the Supervisor/Area Manager of operation above

- Advise maintenance men to patrol the line if the operation above is not successful

### 3.11. To take K3TH line out of service

SCC shall carry out (or advise the TH26 Operator to carry out) the following:

- Verify opened 26L3-D transfer disconnect switch

- Open 26L3A breaker

SCC shall carry out (or advise the K13 Operator to carry out) the following:

- Open 13L3A and 13L3L4 breakers

- Check for no potential on K3TH line

### 3.12. To take out, isolate and de-energize K3TH line for work

- TH26 Operator shall request for Station Guarantee from K13

SCC shall carry out (or advise the TH26 Operator to carry out) the following:

- Check opened 26L3-D transfer disconnect switch and turn off its 125Vdc supply

- Open 26L3A breaker

SCC shall carry out (or advise K13 Operator to carry out) the following:

- Open 13L3A and 13L3L4 breakers

- Check for no potential on K3TH line

SCC shall advise K13 Operator to carry out the following:

- Open 13L3A-L3 and 13L3L4-L3 disconnect switches and turn off its 125Vdc supply

- Close 13K3TH-G ground disconnect switch

SCC shall advise TH26 Operator to carry out the following:

- Open 26L3A-L3 disconnect switch and turn off its 125Vdc supply
- Close 26K3TH-G ground disconnect switch

## 3.13. To restore K3TH line to service after work

### 3.13.1. Prepare K3TH line for restoration:

TH26 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 K3TH line

SCC shall advise K13 Operator to carry out the following:

- Check opened 13L3A and 13L3L4 breakers
- Open 13K3TH-G ground disconnect switch
- Turn on 125Vdc supply and close 13L3A-L3 and 13L3L4-L3 disconnect switches

SCC shall advise TH26 Operator to carry out the following:

- Check opened 26L3-D transfer disconnect switch and turn on its 125Vdc supply
- Check opened 26L3A breaker
- Open 26K3TH-G ground disconnect switch
- Turn on 125Vdc supply and close 26L3A-L3 disconnect switch

### 3.13.2. Restoration of K3TH line to service:

SCC shall:

- Advise the K13 and TH26 Operators of readiness to restore K3TH line to service
- Close (or advise the K13 Operator to close) 13L3A and 13L3L4 breakers
- Close (or advise the TH26 Operator to close) 26L3A breaker

## 3.14. To take out, isolate and de-energize K3TH line for work (Along Powered Skywire)

- TH26 Operator shall request for Station Guarantee from K13 and NEDCo

SCC shall carry out (or advise the TH26 Operator to carry out) the following:

- Check opened 26L3-D transfer disconnect switch and turn off its 125Vdc supply
- Open 26L3A breaker

SCC shall carry out (or advise K13 Operator to carry out) the following:

- Open 13L3A and 13L3L4 breakers
- Check for no potential on K3TH line

SCC shall advise K13 Operator to carry out the following:

- Open 13L3A-L3 and 13L3L4-L3 disconnect switches and turn off its 125Vdc supply
- Close 13K3TH-G ground disconnect switch

SCC shall advise TH26 Operator to carry out the following:

- Open 26L3A-L3 disconnect switch and turn off its 125Vdc supply
- Close 26K3TH-G ground disconnect switch

## 3.15. To restore K3TH line to service after work (Along Powered Skywire)

### 3.15.1. Prepare K3TH line for restoration:

TH26 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 K3TH line

SCC shall advise K13 Operator to carry out the following:

- Check opened 13L3A and 13L3L4 breakers
- Open 13K3TH-G ground disconnect switch
- Turn on 125Vdc supply and close 13L3A-L3 and 13L3L4-L3 disconnect switches

SCC shall advise TH26 Operator to carry out the following:

- Check opened 26L3-D transfer disconnect switch and turn on its 125Vdc supply

- Check opened 26L3A breaker
- Open 26K3TH-G ground disconnect switch
- Turn on 125Vdc supply and close 26L3A-L3 disconnect switch

### 3.15.2. Restoration of K3TH line to service: (Along Powered Skywire)

SCC shall:

- Advise the K13 and TH26 Operators and NEDCo of readiness to restore K3TH line to service
- Close (or advise the K13 Operator to close) 13L3A and 13L3L4 breakers
- Close (or advise the TH26 Operator to close) 26L3A breaker

## 3.16. To restore K3TH line to service after automatic outage

If K3TH line trips auto due to fault:

TH26 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 K13 Operator to energize) the line **ONCE** by closing 13L3A and 13L3L4 breakers
- Close (or advise the TH26 Operator to close) 26L3A breaker

TH26 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 BU4TH line out of service

SCC shall carry out (or advise the TH26 Operator to carry out) the following:

- Verify opened 26L4-D transfer disconnect switch

- Open 26L4A breaker

SCC shall carry out (or advise the BU54 Operator to carry out) the following:

- Open 54DL4 and 54T1L4 breakers

- Check for no potential on BU4TH line

### 3.18. To take out, isolate and de-energize BU4TH line for work

- TH26 Operator shall request for Station Guarantee from BU54

SCC shall carry out (or advise the TH26 Operator to carry out) the following:

- Check opened 26L4-D transfer disconnect switch and turn off 125Vdc supply

- Open 26L4A breaker

SCC shall carry out (or advise BU54 Operator to carry out) the following:

- Open 54DL4 and 54T1L4 breakers

- Check for no potential on BU4TH line

SCC shall advise BU54 Operator to carry out the following:

- Open 54DL4-L4 and 54T1L4-L4 disconnect switches and turn off its 125Vdc supply

- Close 54BU4TH-G ground disconnect switch

SCC shall advise TH26 Operator to carry out the following:

- Open 26L4A-L4 disconnect switch and turn off its 125Vdc supply

- Close 26BU4TH-G ground disconnect switch

### 3.19. To restore BU4TH line to service after work

#### 3.19.1. Prepare BU4TH line for restoration:

TH26 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 BU4TH line

SCC shall advise BU54 Operator to carry out the following:

- Check opened 54DL4 and 54T1L4 breakers

- Open 54BU4TH-G ground disconnect switch

- Turn on 125Vdc supply and close 54DL4-L4 and 54T1L4-L4 disconnect switches

SCC shall advise TH26 Operator to carry out the following:

- Check opened 26L4-D transfer disconnect switch and turn on 125Vdc supply

- Check opened 26L4A breaker

- Open 26BU4TH-G ground disconnect switch

- Turn on 125Vdc supply and close 26L4A–L4 disconnect switch

### 3.19.2. Restoration of BU4TH line to service:

SCC shall:

- Advise the BU54 and TH26 Operators of readiness to restore BU4TH line to service

- Close (or advise the BU54 Operator to close) 54DL4 and 54T1L4 breakers

- Close (or advise the TH26 Operator to close) 26L4A breaker

## 3.20. To restore BU4TH line to service after automatic outage

If BU4TH line trips auto due to fault:

TH26 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 BU54 Operator to energize) the line **ONCE** by closing 54DL4 and 54T1L4 breakers

- Close (or advise the TH26 Operator to close) 26L4A breaker

TH26 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 isolate 26T1 Transformer for work

TH26 Operator shall request for Station Guarantee from Customers on 26Y1 and 26T1Buses

SCC shall advise TH26 Operator to carry out the following:

- Inform Customers about readiness to take off 26T1 bank
- Request Customers on 26T1 Bank to take off their load
- Transfer Station Service from AC1 to AC2, if Station Service is on 26T1
- Open AC1 Contactor/MCB to take off supply to 26T1 transformer auxiliaries

SCC shall carry out (or advise TH26 Operator to carry out) the following:

- Open 26SC1T1 breaker
- Open 26T1F1 breaker
- Open 26T1F3 breaker
- Open 26AT1 breaker
- Check for no potential on 26T1 Bank

SCC shall advise TH26 Operator to carry out the following:

- Check open 26T1-D transfer disconnect switch and turn off its 125Vdc supply
- Open 26SC1T1-SC1 disconnect switch
- Open 26T1F1-T1disconnect switch
- Open 26T1F3-T1disconnect switch
- Open 26AT1-T1 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 26T1 auxiliaries and tag
- Open 125V DC MCB to 26T1 primary and secondary protection and tag with PC13

## 3.22. To restore 26T1 Bank to service after work

### 3.22.1. Prepare 26T1 Bank for restoration:

TH26 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 26T1 Bank and temporary grounds removed
- Check opened 26D-T1 transfer disconnect switch and turn on its 125Vdc supply
- Close 26SC1T1-SC1 disconnect switch
- Close 26T1F1-T1 disconnect switch
- Close 26T1F3-T1 disconnect switch
- Turn on 125Vdc supply and close 26AT1-T1 disconnect switch
- Close AC control MCB to 26T1 auxiliaries and remove tag
- Close 125V DC MCB to 26T1 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 26T1 Bank to service

### 3.22.2. Restoration of 26T1 bank to service:

- SCC shall close (or advise TH26 Operator to close) the 26AT1 breaker
- TH26 Operator shall advise customers of readiness to restore 26T1 bank to service
- SCC shall close (or advise TH26 Operator to close) the 26T1F1 and 26T1F3breakers
- SCC shall close (or advise TH26 Operator to close) 26SC1T1 breaker, if the voltage is below 32.8kV

## 3.23. To restore 26T1 Bank to service after automatic outage

If 26T1 bank trips auto due to fault:

TH26 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 TH26 Operator to energize) the bank ONCE by closing 26AT1 breaker

TH26 Operator shall advise Customers of readiness to restore 26T1and 26Y1 buses to service

SCC shall close (or advise TH26 Operator to close) 26T1F1 and 26T1F3 breakers

TH26 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. (Refer to **4. Explanation**.)

### 3.24. To isolate 26T2 Transformer for work

TH26 Operator shall request for Station Guarantee from customer on 26Y2 and 26B2 Buses

SCC shall advise TH26 Operator to carry out the following:

- Inform customers about readiness to take off 26T2 bank

- Request Customers on 26T2 Bank to take off their load

- Transfer Station Service from AC2 to AC1, if Station Service is on 26T2

- Open AC1 Contactor/MCB to take off supply to 26T2 transformer auxiliaries

SCC shall carry out (or advise TH26 Operator to carry out) the following:

- Open 26SC2T2 breaker

- Open 26SC3T2 breaker

- Open 26T2F2 breaker

- Open 26T2F4 breaker

- Open 26AT2 breaker

- Check for no potential on 26T2 Bank

SCC shall advise TH26 Operator to carry out the following:

- Check open 26D-T2 transfer disconnect switch and turn off its 125Vdc supply

- Open 26SC2T2-SC2 disconnect switch
- Open 26SC3T2-SC3 disconnect switch
- Open 26T2F2-T2 disconnect switch
- Open 26T2F4-T2 disconnect switch
- Open 26AT2-T2 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 26T2 auxiliaries and tag
- Open 125V DC MCB to 26T2 primary and secondary protection and tag with PC13

### 3.25. To restore 26T2 Bank to service after work

#### 3.25.1. Prepare 26T2 Bank for restoration:

TH26 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 26T2 Bank and temporary grounds removed
- Check opened 26D-T2 transfer disconnect switch and turn on its 125Vdc supply
- Close 26SC2T2-SC2 disconnect switch
- Close 26SC3T2-SC3 disconnect switch
- Close 26T2F2-T2 disconnect switch
- Close 26T2F4-T2 disconnect switch
- Turn on 125Vdc supply and close 26AT2-T2 disconnect switch
- Close AC control MCB to 26T2 auxiliaries and remove tag
- Close 125V DC MCB to 26T2 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 26T2 Bank to service

#### 3.25.2. Restoration of 26T2 bank to service:

- SCC shall close (or advise TH26 Operator to close) the 26AT2 breaker
- TH26 Operator shall advise customers of readiness to restore 26T2 bank to service

- SCC shall close (or advise TH26 Operator to close) the 26T2F2and 26T2F4breakers

- SCC shall close (or advise TH26 Operator to close) 26SC2T2 or 26SC3T2 breaker, if the voltage is below 10.45kV or 32.8kV respectively

### 3.26. To restore 26T2 Bank to service after automatic outage

If 26T2 bank trips auto due to fault:

TH26 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 TH26 Operator to energize) the bank **ONCE** by closing 26AT2 breaker

TH26 Operator shall advise Customers of readiness to restore 26B2 and 26Y2 buses to service

SCC shall close (or advise TH26 Operator to close) 26T2F2and 26T2F4 breakers

TH26 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. (Refer to **4. Explanation**.)

### 3.27. To isolate 26R1 Reactor for work

SCC shall carry out (or advise TH26 Operator to carry out) the following:

- Place 26R1 Reactor at tap position 1

- Open AC1 Contactor/MCB to take off supply to 26R1 Reactor auxiliaries

- Open 26AR1 breaker

- Check for no potential on 26R1 Reactor

SCC shall advise TH26 Operator to carry out the following:

- Check opened 26D-R1 transfer disconnect switch and turn off its 125Vdc supply
- Open 26AR1-R1 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 26R1 auxiliaries and tag
- Open 125V DC MCB to 26R1 primary and secondary protection and tag with PC13

## 3.28. To restore 26R1 Reactor to service after work

### 3.28.1. Prepare 26R1 Reactor for restoration:

TH26 Operator shall:

- Check for no potential on 26R1 Reactor and temporary grounds removed
- Check open 26D-R1 transfer disconnect switch and turn on its 125Vdc supply
- Turn on 125Vdc supply and close 26AR1-R1 disconnect switch
- Close AC control MCB to 26R1 auxiliaries and remove tag
- Close 125V DC MCB to 26R1 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 26R1 Reactor to service

### 3.28.2. Restoration of 26R1 Reactor to service:

- SCC shall close (or advise TH26 Operator to close) 26AR1 breaker if the voltage is above 174.28kV

## 3.29. To Isolate 26T1F1 Breaker for work

- TH26 Operator shall request for Station Guarantee from customer on 26T1Bus

SCC shall carry out (or advise TH26 Operator to carry out) the following:

- Open 26T1F1 breaker

SCC shall advise TH26 Operator to carry out the following:

- Open 26T1F1-T1 disconnect switch
- Open 26T1F1-F1 disconnect switch

- Check for no potential on 26T1F1 Breaker

### 3.30. To restore 26T1F1 Breaker to service after work

#### 3.30.1. Prepare 26T1F1 breaker for restoration:

TH26 Operator shall:

- Advise SCC when work on the 26T1F1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 26T1F1 Breaker and temporary grounds removed
- Close 26T1F1-T1 disconnect switch
- Close 26T1F1-F1 disconnect switch

#### 3.30.2. Restoration of 26T1F1 breaker to service:

- TH26 Operator shall advise customers of readiness to restore 26T1F1 Bus to service
- SCC shall close (or advise TH26 Operator to close) the 26T1F1 breaker

### 3.31. To Isolate 26T1F3 Breaker for work

- TH26 Operator shall request for Station Guarantee from customer on 26Y1 Bus

SCC shall carry out (or advise TH26 Operator to carry out) the following:

- Open 26T1F3 breaker

SCC shall advise TH26 Operator to carry out the following:

- Open 26T1F3-T1 disconnect switch
- Open 26T1F3-F3 disconnect switch
- Check for no potential on 26T1F3 Breaker

### 3.32. To restore 26T1F3 Breaker to service after work

#### 3.32.1. Prepare 26T1F3 breaker for restoration:

TH26 Operator shall:

- Advise SCC when work on the 26T1F3 breaker has been completed

and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 26T1F3Breaker and temporary grounds removed

- Close 26T1F3-T1 disconnect switch

- Close 26T1F3-F3 disconnect switch

**3.32.2. Restoration of 26T1F3 breaker to service:**

- TH26 Operator shall advise customers of readiness to restore 26T1F3Bus to service

- SCC shall close (or advise TH26 Operator to close) the 26T1F3 breaker

- SCC shall close (or advise TH26 Operator to close) 26SC1T1 breaker, if the voltage is below 32.8kV

## 3.33. To Isolate 26T2F2 Breaker for work

- TH26 Operator shall request for Station Guarantee from Customer on 26B2 Bus

SCC shall carry out (or advise TH26 Operator to carry out) the following:

- Open 26T2F2breaker

SCC shall advise TH26 Operator to carry out the following:

- Open 26T2F2-T2 disconnect switch

- Open 26T2F2-F2 disconnect switch

- Check for no potential on 26T2F2 Breaker

## 3.34. To restore 26T2F2 Breaker to service after work

**3.34.1. Prepare 26T2F2 breaker for restoration:**

TH26 Operator shall:

- Advise SCC when work on the 26T2F2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 26T2F2 Breaker and temporary grounds removed

- Close 26T2F2-T2 disconnect switch

- Close 26T2F2-F2 disconnect switch

**3.34.2. Restoration of 26T2F2 breaker to service:**

- TH26 Operator shall advise customers of readiness to restore 26T2F2 Bus to service
- SCC shall close (or advise TH26 Operator to close) the 26T2F2 breaker
- SCC shall close (or advise TH26 Operator to close) 26SC2T2 breaker, if the voltage is below 10.45kV

## 3.35. To Isolate 26T2F4 Breaker for work

- TH26 Operator shall request for Station Guarantee from customer on 26Y2 Bus

SCC shall carry out (or advise TH26 Operator to carry out) the following:

- Open 26T2F4 breaker

SCC shall advise TH26 Operator to carry out the following:

- Open 26T2F4-T2 disconnect switch
- Open 26T2F4-F4 disconnect switch
- Check for no potential on 26T2F4 Breaker

## 3.36. To restore 26T2F4 Breaker to service after work

**3.36.1. Prepare 26T2F4 breaker for restoration:**

TH26 Operator shall:

- Advise SCC when work on the 26T2F4 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 26T2F4 Breaker and temporary grounds removed
- Close 26T2F4-T2 disconnect switch
- Close 26T2F4-F4 disconnect switch

**3.36.2. Restoration of 26T2F4 breaker to service:**

- TH26 Operator shall advise customers of readiness to restore 26Y2 Bus to service
- SCC shall close (or advise TH26 Operator to close) the 26T2F4 breaker
- SCC shall close (or advise TH26 Operator to close) 26SC3T2 breaker, if the voltage is below 32.8kV

### 3.37. To isolate 26SC1 Capacitor Bank for work

SCC shall carry out (or advise TH26 Operator to carry out) the following:

- Open 26SC1T1 breaker

SCC shall advise TH26 Operator to carry out the following:

- Open 26SC1T1-SC1 disconnect switch
- Close 26SC1-G ground disconnect switch

### 3.38. To restore 26SC1 Capacitor Bank to service after work

#### 3.38.1. Prepare 26SC1 Capacitor Bank for restoration:

TH26 Operator shall:

- Advise SCC when work on the 26SC1 Capacitor Bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 26SC1 Capacitor Bank and temporary grounds removed
- Open 26SC2-G disconnect switch
- Close 26SC1T1-SC1 disconnect switch

#### 3.38.2. Restoration of 26SC1 Capacitor Bank to service:

- SCC shall close (or advise TH26 Operator to close) 26SC1T1 breaker if the voltage is below 32.8kV

### 3.39. To isolate 26SC2 Capacitor Bank for work

SCC shall carry out (or advise TH26 Operator to carry out) the following:

- Open 26SC2T2 breaker

SCC shall advise TH26 Operator to carry out the following:

- Open 26SC2T2-SC2 disconnect switch
- Close 26SC1-G ground disconnect switch

### 3.40. To restore 26SC2 Capacitor Bank to service after work

**3.40.1. Prepare 26SC2 Capacitor Bank for restoration:**

TH26 Operator shall:

- Advise SCC when work on the 26SC2 Capacitor Bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 26SC2 Capacitor Bank and temporary grounds removed
- Open 26SC2-G ground disconnect switch
- Close 26SC2T2-SC2 disconnect switch

**3.40.2. Restoration of 26SC2 Capacitor Bank to service:**

- SCC shall close (or advise TH26 Operator to close) 26SC2T2 breaker if the voltage is below 10.45kV

## 3.41. To isolate 26SC3 Capacitor Bank for work

SCC shall carry out (or advise TH26 Operator to carry out) the following:

- Open 26SC3T2 breaker

SCC shall advise TH26 Operator to carry out the following:

- Open 26SC3T2-SC3 disconnect switch
- Close 26SC1-G ground disconnect switch

## 3.42. To restore 26SC3 Capacitor Bank to service after work

**3.42.1. Prepare 26SC3 Capacitor Bank for restoration:**

TH26 Operator shall:

- Advise SCC when work on the 26SC3 Capacitor Bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 26SC3 Capacitor Bank and temporary grounds removed
- Open 26SC2-G ground disconnect switch
- Close 26SC3T2-SC3 disconnect switch

**3.42.2. Restoration of 26SC3 Capacitor Bank to service:**

- SCC shall close (or advise TH26 Operator to close) 26SC3T2 breaker if the voltage is below 32.8kV

## 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' bus provides the normal points of supply to all circuits such as TH1KP, TH2SN, K3TH and BU4TH lines and 26T1 and 26T2 transformers and 26SC1, 26SC2 and 26SC3 Capacitor Banks and 26R1 Reactor. The 'D' bus provides the necessary transfer route for only one circuit at a time.

The Reactor with its tap at position 10 allows each line to be shunt compensated and avoid voltage jumps occurring at the receiving end.

## 5. Approval

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**Director, TSD**