

**TD-OP-0059**



# **OPERATING PROCEDURE FOR ACCRA EAST SUBSTATION**

**GHANA GRID COMPANY LTD**

## TECHNICAL DIRECTIVES

<b>Title:</b> OPERATING PROCEDURE FOR AKOSOMBO SUBSTATION (AE59)		
<b>Issued To:</b> Director, System Operations Director, SNS Manager, SCC Manager, Dispatch Operations Area Manager, Accra Operating Staff, Accra Area Maintenance Staff, Accra Area Dispatch Staff, SCC	<b>Number:</b> TD-OP-0059	
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## TECHNICAL DIRECTIVES

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### 1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at AE59 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 AE59 Substation.

### 3. Procedure

#### 1.0. To take A2AE line out of service

SCC shall carry out (or advise the AE59 Operator to carry out) the following:

- Open 59L2A and 59L2L5 breakers

SCC shall carry out (or advise the A1 Operator to carry out) the following:

- Open 1DL2 and 1T2L2 breakers
- Check for no potential on A2AE line

#### 1.1. To take out, isolate and de-energize A2AE line for work

- AE59 Operator shall request for Station Guarantee from A1

SCC shall carry out (or advise the AE59 Operator to carry out) the following:

- Open 59L2A and 59L2L5 breakers

SCC shall carry out (or advise the A1 Operator to carry out) the following:

- Open 1DL2 and 1T2L2 breakers
- Check for no potential on A2AE line

SCC shall advise A1 Operator to carry out the following:

- Open 1DL2-L2 and 1T2L2-L2 disconnect switches and turn off its 125Vdc supply
- Close 1A2AE-G ground disconnect switch

SCC shall advise AE59 Operator to carry out the following:

- Open 59L2A-L2 and 59L2L5 disconnect switches and turn off its 125Vdc supply
- Close 59A2AE-G ground disconnect switch

## **1.2. To restore A2AE line to service after work**

### **1.2.1. Prepare A2AE line for restoration**

AE59 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 A2AE line

SCC shall advise A1 Operator to carry out the following

- Check opened 1DL2 and 1T2L2 breakers
- Open 1A2AE-G ground disconnect switch
- Turn on 125Vdc supply and close 1DL2-L2 and 1T2L2-L2 disconnect switches

SCC shall advise AE59 Operator to carry out the following:

- Check opened 59L2A and 59L2L5 breakers
- Open 59A2AE-G ground disconnect switch
- Turn on 125Vdc supply and close 59L2A-L2 and 59L2L5 disconnect switches

### **1.2.2. Restoration of A2AE line to service:**

SCC shall:

- Advise the AE59 and A1 Operators of readiness to restore A2AE line to service
- Close (or advise the A1 Operator to close) 1DL2 and 1T2L2 breakers
- Close (or advise the AE59 Operator to close) 59L2L5 and 59L2A breakers

## **1.3. To restore A2AE line to service after automatic outage**

If A2AE line trips auto due to fault:

AE59 Operator shall:

- Advise SCC about the outage
- Acknowledge all alarms and record relay operation details
- Reset relay targets

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- Report relay operation details to SCC

SCC shall:

- Energize (or advise the A1 Operator to energize) the line **ONCE** by closing 1DL2 and 1T2L2 breakers
- Close (or advise the AE59 Operator to close) 59L2L5 and 59L2A breakers

AE59 Operator shall:

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

### 4.1. To take AE5H line out of service

SCC shall carry out (or advise the AE59 Operator to carry out) the following:

- Open 59L2L5 and 59DL5 breakers

SCC shall advise H5 Operator to carry out the following:

- Open 5AL5 and 5L4L5 breakers
- Check for no potential on AE5H line

### 4.2. To take out, isolate and de-energize AE5H line for work

- AE59 Operator shall request for Station Guarantee from H5

SCC shall carry out (or advise the AE59 Operator to carry out) the following:

- Open 59L2L5 and 59DL5 breakers

SCC shall advise H5 Operator to carry out the following:

- Open 5AL5 and 5L4L5 breakers
- Check for no potential on AE5H line

SCC shall advise H5 Operator to carry out the following:

- Open 5AL5-L5 and 5L4L5-L5 disconnect switches and turn off 125Vdc supply
- Close 5AE5H-G ground disconnect switch

SCC shall advise AE59 Operator to carry out the following:

- Open 59L2L5-L5 and 59DL5-L5 disconnect switches and turn off 125Vdc supply
- Close 59AE5H-G ground disconnect switch

#### **4.3. To restore AE5H line to service after work**

##### **4.3.1. Prepare AE5H line for restoration**

AE59 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 AE5H line

SCC shall advise H5 Operator to carry out the following

- Check opened 5AL5 and 5L4L5 breakers
- Open 5AE5H-G ground disconnect switch
- Turn on 125Vdc supply and close 5AL5-L5 and 5L4L5-L5 disconnect switches

SCC shall advise AE59 Operator to carry out the following:

- Check opened 59L2L5 and 59DL5 breakers
- Open 59AE5H-G ground disconnect switch
- Turn on 125Vdc supply and close 59L2L5-L5 and 59DL5 disconnect switches

##### **4.3.2. Restoration of AE5H line to service:**

SCC shall:

- Advise the AE59 and H5 Operators of readiness to restore AE5H line to service
- Close (or advise the H5 Operator to close) 5AL5 and 5L4L5 breakers
- Close (or advise the AE59 Operator to close) 59DL5 and 59L2L5 breakers

**4.4. To restore AE5H line to service after automatic outage**

If AE5H line trips auto due to fault:

AE59 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 H5 Operator to energize) the line **ONCE** by closing 5AL5 and 5L4L5 breakers
- Close (or advise the AE59 Operator to close) 59DL5 and 59L2L5 breakers

AE59 Operator shall:

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

**4.5. To take AE6H line out of service**

SCC shall carry out (or advise the AE59 Operator to carry out) the following:

- Open 59L6L8 and 59DL6 breakers

SCC shall advise H5 Operator to carry out the following:

- Open 5AL6 and 5L2L6 breakers
- Check for no potential on AE6H line

**4.6. To take out, isolate and de-energize AE6H line for work**

- AE59 Operator shall request for Station Guarantee from H5

SCC shall carry out (or advise the AE59 Operator to carry out) the following:

- Open 59L6L8 and 59DL6 breakers

SCC shall advise H5 Operator to carry out the following:



- Open 5AL6 and 5L2L6 breakers
- Check for no potential on AE6H line

SCC shall advise H5 Operator to carry out the following:

- Open 5AL6-L6 and 5L2L6-L6 disconnect switches and turn off 125Vdc supply
- Close 5AE6H-G ground disconnect switch

SCC shall advise AE59 Operator to carry out the following:

- Open 59L6L8-L6 and 59DL6-L6 disconnect switches and turn off 125Vdc supply
- Close 59AE6H-G ground disconnect switch

#### **4.7. To restore AE6H line to service after work**

##### **4.7.1. Prepare AE6H line for restoration**

AE59 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 AE6H line

SCC shall advise H5 Operator to carry out the following

- Check opened 5AL6 and 5L2L6 breakers
- Open 5AE6H-G ground disconnect switch
- Turn on 125Vdc supply and close 5AL6-L6 and 5L2L6-L6 disconnect switches

SCC shall advise AE59 Operator to carry out the following:

- Check opened 59L6L8 and 59DL6 breakers
- Open 59AE6H-G ground disconnect switch
- Turn on 125Vdc supply and close 59L6L8-L6 and 59DL6-L6 disconnect switches

##### **4.7.2. Restoration of AE6H line to service:**

SCC shall:

- Advise the AE59 and H5 Operators of readiness to restore AE6H line to

service

- Close (or advise the H5 Operator to close) 5AL6 and 5L2L6 breakers
- Close (or advise the AE59 Operator to close) 59DL6 and 59L6L8 breakers

#### **4.8. To restore AE6H line to service after automatic outage**

If AE6H line trips auto due to fault:

AE59 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 H5 Operator to energize) the line **ONCE** by closing 5AL6 and 5L2L6 breakers
- Close (or advise the AE59 Operator to close) 59DL6 and 59L6L8 breakers

AE59 Operator shall:

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

#### **4.9. To take V7AE line out of service**

SCC shall carry out (or advise the AE59 Operator to carry out) the following:

- Open 59L7A and 59L7T2 breakers

SCC shall advise V2 Operator to carry out the following:

- Open 2L7A and 2L7L1 1 breakers
- Check for no potential on V7AE line

#### **4.10. To take out, isolate and de-energize V7AE line for work**

- AE59 Operator shall request for Station Guarantee from V2

SCC shall carry out (or advise the AE59 Operator to carry out) the following:

- Open 59L7A and 59L7T2 breakers

SCC shall advise V2 Operator to carry out the following:

- Open 2L7A and 2L7L11 breakers
- Check for no potential on V7AE line

SCC shall advise V2 Operator to carry out the following:

- Open 2L7A-L7 and 2L7L11-L7 disconnect switches and turn off its 125Vdc supply
- Close 2V7AE-G ground disconnect switch

SCC shall advise AE59 Operator to carry out the following:

- Open 59L7A-L7 and 59L7T2 disconnect switches and turn off its 125Vdc supply
- Close 59V7AE-G ground disconnect switch

#### **4.11. To restore V7AE line to service after work**

##### **4.11.1. Prepare V7AE line for restoration**

AE59 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 V7AE line

SCC shall advise V2 Operator to carry out the following

- Check opened 2L7A and 2L7L11 breakers
- Open 2V7AE-G ground disconnect switch
- Turn on 125Vdc supply and close 2L7A-L7 and 2L7L11-L7 disconnect switches

SCC shall advise AE59 Operator to carry out the following:

- Check opened 59L7A and 59L7T2 breakers

- Open 59V7AE-G ground disconnect switch
- Turn on 125Vdc supply and close 59L7A-L7 and 59L7T2-L7 disconnect switches

### 4.11.2. Restoration of V7AE line to service:

SCC shall:

- Advise the AE59 and V2 Operators of readiness to restore V7AE line to service
- Close (or advise the V2 Operator to close) 2L7A and 2L7L11 breakers
- Close (or advise the AE59 Operator to close) 59L7T2 and 59L7A breakers

### 4.12. To restore V7AE line to service after automatic outage

If V7AE line trips auto due to fault:

AE59 Operator shall:

- Advise SCC about the outage
- Acknowledge all alarms and record relay operation details
- Reset relay targets
- Report relay operation details to SCC

SCC shall:

- Energize (or advise the V2 Operator to energize) the line **ONCE** by closing 2L7A and 2L7L10 breakers
- Close (or advise the AE59 Operator to close) 59L7T2 and 59L7A breakers

AE59 Operator shall:

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

**4.13. To take V8AE line out of service**

SCC shall carry out (or advise the AE59 Operator to carry out) the following:

- Open 59L8A and 59L6L8 breakers

SCC shall advise V2 Operator to carry out the following:

- Open 2L8A and 2L8L10 breakers
- Check for no potential on V8AE line

**4.14. To take out, isolate and de-energize V8AE line for work**

- AE59 Operator shall request for Station Guarantee from V2

SCC shall carry out (or advise the AE59 Operator to carry out) the following:

- Open 59L8A and 59L6L8 breakers

SCC shall advise V2 Operator to carry out the following:

- Open 2L8A and 2L8L10 breakers
- Check for no potential on V8AE line

SCC shall advise V2 Operator to carry out the following:

- Open 2L8A-L8 and 2L8L10-L8 disconnect switches and turn off its 125Vdc supply
- Close 2V8AE-G ground disconnect switch

SCC shall advise AE59 Operator to carry out the following:

- Open 59L8A-L8 and 59L6L8-L8 disconnect switches and turn off its 125Vdc supply
- Close 59V8AE-G ground disconnect switch

**4.15. To restore V8AE line to service after work**

**4.15.1. Prepare V8AE line for restoration**

AE59 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 V8AE line

SCC shall advise V2 Operator to carry out the following

- Check opened 2L8A and 2L8L10 breakers
- Open 2V8AE-G ground disconnect switch
- Turn on 125Vdc supply and close 2L8A-L8 and 2L8L10-L8 disconnect switches

SCC shall advise AE59 Operator to carry out the following:

- Check opened 59L8A and 59L6L8 breakers
- Open 59V8AE-G ground disconnect switch
- Turn on 125Vdc supply and close 59L8A-L8 and 59L6L8-L8 disconnect switches

#### **4.15.2. Restoration of V8AE line to service:**

SCC shall:

- Advise the AE59 and V2 Operators of readiness to restore V8AE line to service
- Close (or advise the V2 Operator to close) 2L8A and 2L8L10 breakers
- Close (or advise the AE59 Operator to close) 59L6L8 and 59L8A breakers

#### **4.16. To restore V8AE line to service after automatic outage**

If V8AE line trips auto due to fault:

AE59 Operator shall:

- Advise SCC about the outage
- Acknowledge all alarms and record relay operation details

- Reset relay targets
- Report relay operation details to SCC

SCC shall:

- Energize (or advise the V2 Operator to energize) the line **ONCE** by closing 2L8A and 2L8L11 breakers
- Close (or advise the AE59 Operator to close) 59L6L8 and 59L8A breakers

AE59 Operator shall:

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

#### **4.17. To isolate 59T1 Bank for work**

##### **4.17.1. Isolate 59T1 Transformer for work**

AE59 Operator shall request for Station Guarantee from Customer on 59F1 feeder

SCC shall advise AE59 operator to carry out the following:

- Inform Customer about readiness to take off 59T1 bank
- Request Customer on 59T1 Bank to take off their load
- Transfer Station Service from AC1 to AC2, if station service is on 59T1 transformer
- Open AC1 Contactor/MCB to take off supply to 59T1 transformer auxiliaries

SCC shall carry out (or advise AE59 operator to carry out) the following:

- Open 59SC1F1 and 59T1F1 breakers
- Open 59AT1 and 59DT1 breakers
- Check for no potential on 59T1 Bank
- Open 59DT1-T1 and 59AT1-T1 disconnect switches and turn off 125Vdc supply

- Open 59T1F1-F1 disconnect switch
- Open AC control MCB to 59T1 auxiliaries and tag
- Open 125Vdc MCB to 59T1 primary and secondary protection and tag with PC13

**4.18. To restore 59T1 Bank to service after work**

**4.18.1. Prepare 59T1 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 59T1 Bank and temporary grounds removed
- Check opened 59T1F1 and 59SC1F1 breakers
- Check opened 59AT1 and 59DT1 breakers
- Turn on 125Vdc supply and close 59AT1-T1 and 59DT1-T1 disconnect switches
- Close 59T1F1-F1 disconnect switch
- Close AC control MCB to 59T1 auxiliaries and remove tag
- Close 125Vdc MCB to 59T1 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 59T1 Bank to service

**4.18.2. Restoration of 59T1 bank to service:**

- SCC shall close (or advise AE59 operator to close) 59AT1 and 59DT1 breakers
- AE59 Operator shall advise Customer of readiness to restore 59T1 Bank to service
- SCC shall close (or advise AE59 operator to close) the 59T1F1 breaker
- SCC shall close (or advise AE59 Operator to close) 59SC1F1 breaker if the voltage is below 32.8kV

**4.19. Restore 59T1 Bank to service after automatic outage**

If 59T1 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 AE59 Operator to energize) the bank **ONCE** by closing 59DT1 and 59AT1 breakers

AE59 Operator shall advise Customer of readiness to restore 59F1 feeder to service

SCC shall close (or advise AE59 Operator to close) 59T1F1 breaker

SCC shall close (or advise AE59 Operator to close) 59SC1F1 breaker if the voltage is below 32.8kV

AE59 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.

#### **4.20. To isolate 59T2 Bank for work**

##### **4.20.1. Isolate 59T2 Transformer for work**

AE59 Operator shall request for Station Guarantee from Customer on 59F2 Feeder

SCC shall advise AE59 operator to carry out the following:

- Inform Customer about readiness to take off 59T2 bank
- Request Customer on 59T2 Bank to take off their load
- Transfer Station Service from AC2 to AC1, if station service is on 59T2 transformer
- Open AC4 Contactor/MCB to take off supply to 59T2 transformer auxiliaries

SCC shall carry out (or advise AE59 operator to carry out) the following:

- Open 59SC2F2 and 59T2F2 breakers
- Open 59AT2 and 59DT2 breakers

- Check for no potential on 59T2 Bank
- Open 59DT2-T2 and 59AT2-T2 disconnect switches and turn off 225Vdc supply
- Open 59T2F2-F2 disconnect switch
- Open 59SC2F2-F2 disconnect switch
- Open AC control MCB to 59T2 auxiliaries and tag
- Open 125Vdc MCB to 59T2 primary and secondary protection and tag with PC23

### **4.21. To restore 59T2 Bank to service after work**

#### **4.21.1. Prepare 59T2 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 59T2 Bank and temporary grounds removed
- Check opened 59T2F2 and 59SC2F2 breakers
- Check opened 59AT2 and 59DT2 breakers
- Turn on 125Vdc supply and close 59AT2-T2 and 59DT2-T2 disconnect switches
- Close 59SC2F2-F2 disconnect switch
- Close 59T2F2-F2 disconnect switch
- Close AC control MCB to 59T2 auxiliaries and remove tag
- Close 125Vdc MCB to 59T2 primary and secondary protection and remove PC23 tag
- Advise SCC of readiness to restore 59T2 Bank to service

#### **4.21.2. Restoration of 59T2 bank to service:**

- SCC shall close (or advise AE59 operator to close) 59AT2 and 59DT2 breakers

- AE59 Operator shall advise Customer of readiness to restore 59T2 Bank to service
- SCC shall close (or advise AE59 operator to close) the 59T2F2 breaker  
SCC shall close (or advise AE59 Operator to close) 59SC2F2 breaker if the voltage is below 32.8kV

**4.22. Restore 59T2 Bank to service after automatic outage**

If 59T2 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 AE59 Operator to energize) the bank **ONCE** by closing 59DT2 and 59AT2 breakers

AE59 Operator shall advise Customer of readiness to restore 59F2 feeder to service

SCC shall close (or advise AE59 Operator to close) 59T2F2 breaker

SCC shall close (or advise AE59 Operator to close) 59SC2F2 breaker if the voltage is below 32.8kV

AE59 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.

**4.23. To isolate 59T3 Bank for work**

AE59 Operator shall request for Station Guarantee from Customer on 59F3 feeder

SCC shall advise AE59 operator to carry out the following:

- Inform Customer about readiness to take off 59T3 bank
- Request Customer on 59T3 Bank to take off their load
- Open AC3 Contactor/MCB to take off supply to 59T3 transformer auxiliaries

SCC shall carry out (or advise AE59 operator to carry out) the following:

- Open 59SC3F3 and 59T3F3 breakers
- Open 59AT3 and 59DT3 breakers
- Check for no potential on 59T3 Bank
- Open 59DT3-T3 and 59AT3-T3 disconnect switches and turn off 125Vdc supply
- Open 59T3F3-F3 disconnect switch
- Open 59SC3F3-F3 disconnect switch
- Open AC control MCB to 59T3 auxiliaries and tag
- Open 125Vdc MCB to 59T3 primary and secondary protection and tag with PC13

**4.24. To restore 59T3 Bank to service after work**

**4.24.1. Prepare 59T3 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 59T3 Bank and temporary grounds removed
- Check opened 59T3F3 and 59SC3F3 breakers
- Check opened 59AT3 and 59DT3 breakers
- Turn on 125Vdc supply and close 59AT3-T3 and 59DT3-T3 disconnect switches
- Close 59SC3F3-F3 disconnect switch
- Close 59T3F3-F3 disconnect switch
- Close AC control MCB to 59T3 auxiliaries and remove tag
- Close 125Vdc MCB to 59T3 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 59T3 Bank to service

**4.24.2. Restoration of 59T3 bank to service:**

- SCC shall close (or advise AE59 operator to close) 59AT3 and 59DT3 breakers
- AE59 Operator shall advise Customer of readiness to restore 59T3 Bank to service
- SCC shall close (or advise AE59 operator to close) the 59T3F3 breaker  
SCC shall close (or advise AE59 Operator to close) 59SC3F3 breaker if the voltage is below 32.8kV

**4.24.3. Restore 59T3 Bank to service after automatic outage**

If 59T3 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 AE59 Operator to energize) the bank **ONCE** by closing 59DT3 and 59AT3 breakers

AE59 Operator shall advise Customer of readiness to restore 59F3 feeder to service

SCC shall close (or advise AE59 Operator to close) 59T3F3 breaker

SCC shall close (or advise AE59 Operator to close) 59SC3F3 breaker if the voltage is below 32.8kV

AE59 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.

**4.25. To isolate 59T4 Bank for work**

AE59 Operator shall request for Station Guarantee from Customer on 59F4 feeder

SCC shall advise AE59 operator to carry out the following:

- Inform Customer about readiness to take off 59T4 bank
- Request Customer on 59T4 Bank to take off their load
- Open AC4 Contactor/MCB to take off supply to 59T4 transformer auxiliaries

SCC shall carry out (or advise AE59 operator to carry out) the following:

- Open 59SC4F4 and 59T4F4 breakers
- Open 59AT4 and 59DT4 breakers
- Check for no potential on 59T4 Bank
- Open 59DT4-T4 and 59AT4-T4 disconnect switches and turn off 125Vdc supply
- Open 59T4F4-F4 disconnect switch
- Open 59SC4F4-F4 disconnect switch
- Open AC control MCB to 59T4 auxiliaries and tag
- Open 125Vdc MCB to 59T4 primary and secondary protection and tag with PC13

#### **4.26. To restore 59T4 Bank to service after work**

##### **4.26.1. Prepare 59T4 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 59T4 Bank and temporary grounds removed
- Check opened 59T4F4 and 59SC4F4 breakers
- Check opened 59AT4 and 59DT4 breakers
- Turn on 125Vdc supply and close 59AT4-T4 and 59DT4-T4 disconnect switches
- Close 59SC4F4-F4 disconnect switch
- Close 59T4F4-F4 disconnect switch
- Close AC4 control MCB to 59T4 auxiliaries and remove tag

- Close 125Vdc MCB to 59T4 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 59T4 Bank to service

### 4.26.2. Restoration of 59T4 bank to service:

- SCC shall close (or advise AE59 operator to close) 59AT4 and 59DT4 breakers
- AE59 Operator shall advise Customer of readiness to restore 59T4 Bank to service
- SCC shall close (or advise AE59 operator to close) the 59T4F4 breaker  
SCC shall close (or advise AE59 Operator to close) 59SC4F4 breaker if the voltage is below 32.8kV

### 4.27. Restore 59T4 Bank to service after automatic outage

If 59T4 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 AE59 Operator to energize) the bank **ONCE** by closing 59DT4 and 59AT4 breakers

AE59 Operator shall advise Customer of readiness to restore 5F4 feeder to service

SCC shall close (or advise AE59 Operator to close) 59T4F4 breaker

SCC shall close (or advise AE59 Operator to close) 59SC4F4 breaker if the voltage is below 32.8kV

AE59 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.

**4.28. To isolate 59SC1 Capacitor Bank for work**

SCC shall carry out (or advise AE59 operator to carry out) the following:

- Open 59SC1F1 breaker

SCC shall advise AE59 operator to carry out the following:

- Open 59SC1FI-SC1 disconnect switch
- Close 59SC1-G ground disconnect switch

**4.29. To restore 59SC1 Capacitor bank to service after work**

**4.29.1. Prepare 59SC1 Capacitor bank for restoration:**

H5 Operator shall:

- Advise SCC when work on the Capacitor bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check opened 59F1SC1 breaker
- Open 59SC1-G ground disconnect switch
- Close 59SC1F1-SC1 disconnect switch

**4.29.2. Restoration of 59SC1 Capacitor Bank to service:**

- SCC shall close (or advise AE59 Operator to close) 59F1SC1 breaker if the voltage is below 32.8kV

**4.29.3. To isolate 59SC2 Capacitor Bank for work**

SCC shall carry out (or advise AE59 operator to carry out) the following:

- Open 59SC2F2 breaker

SCC shall advise H5 operator to carry out the following:

- Open 59SC2F2-SC2 disconnect switch
- Close 59SC2-G ground disconnect switch

**4.30. To restore 59SC2 Capacitor bank to service after work**

**4.30.1. Prepare 59SC2 Capacitor bank for restoration:**



H5 Operator shall:

- Advise SCC when work on the Capacitor bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check opened 59SC2F2 breaker
- Open 59SC2-G ground disconnect switch
- Close 59SC2F2-SC2 disconnect switch

**4.30.2. Restoration of 59SC2 Capacitor Bank to service:**

- SCC shall close (or advise H5 Operator to close) 59SC2F2 breaker if the voltage is below 32.8kV

**4.31. To isolate 59SC3 Capacitor Bank for work**

SCC shall carry out (or advise AE59 operator to carry out) the following:

- Open 59SC3F3 breaker

SCC shall advise AE59 operator to carry out the following:

- Open 59SC3F3-SC3 disconnect switch
- Close 59SC3-G ground disconnect switch

**4.32. To restore 59SC3 Capacitor bank to service after work**

**4.32.1. Prepare 59SC3 Capacitor bank for restoration:**

AE59 Operator shall:

- Advise SCC when work on the Capacitor bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check opened 59SC3F3 breaker
- Open 59SC3-G ground disconnect switch
- Close 59SC3F3-SC3 disconnect switch

**4.32.2. Restoration of 59SC3 Capacitor Bank to service:**

- SCC shall close (or advise AE59 Operator to close) 59SC3F3 breaker if the voltage is below 32.8kV

**4.33. To isolate 59SC4 Capacitor Bank for work**

SCC shall carry out (or advise AE59 operator to carry out) the following:

- Open 59SC4F4 breaker

SCC shall advise AE59 operator to carry out the following:

- Open 59SC4F4-SC4 disconnect switch
- Close 59SC4-G ground disconnect switch

#### **4.34. To restore 59SC4 Capacitor bank to service after work**

##### **4.34.1. Prepare 59SC4 Capacitor bank for restoration:**

AE59 Operator shall:

- Advise SCC when work on the Capacitor bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check opened 59SC4F4 breaker
- Open 59SC4-G ground disconnect switch
- Close 59SC4F4-SC4 disconnect switch

##### **4.34.2. Restoration of 59SC4 Capacitor Bank to service:**

- SCC shall close (or advise AE59 Operator to close) 59SC4F4 breaker if the voltage is below 32.8kV

#### **4.35. To isolate 59T1F1 Breaker for work**

- AE59 Operator shall request for Station Guarantee from Customer on 59F1 Feeder

SCC shall advise AE59 Operator to carry out the following:

- Inform Customer about readiness to take off 59T1 bank
- Request Customer on 59T1 Bank to take off their load
- Transfer station service supply from AC1 to AC2

SCC shall carry out (or advise AE59 Operator to carry out) the following:

- Open 59SC1F1 breaker
- Open 59T1F1 breaker

- Open 59AT1 and 5DT1 breakers

SCC shall advise AE59 Operator to carry out the following:

- Open 59T1F1-F1 disconnect switch and turn off its 125Vdc supply
- Open 59SC1F1-F1 disconnect switch and turn off its 125Vdc supply
- Open 59AT1-T1 and 5DT1-T1 disconnect switches and turn off 125Vdc supply

#### **4.36. To restore 59T1F1 Breaker to service after work**

##### **4.36.1. Prepare 59T1F1 breaker for restoration:**

AE59 Operator shall:

- Advise SCC when work on the 59T1F1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 59T1F1 Breaker and temporary grounds removed
- Turn on 125Vdc supply and close 59AT1-T1 and 5DT1-T1 disconnect switches
- Turn on 125Vdc supply and close 59T1F1-F1 disconnect switch
- Turn on 125Vdc supply and close 59SC1F1-F1 disconnect switch

##### **4.36.2. Restoration of 59T1F1 Breaker to service:**

- SCC shall close (or advise AE59 Operator to close) the 59AT1 and 5DT1 breakers
- AE59 Operator shall advise Customer of readiness to restore 59F1 Feeder
- SCC shall close (or advise AE59 Operator to close) the 59T1F1 breaker
- SCC shall close (or advise AE59 Operator to close) 59SC1F1 breaker if the voltage is below 32.8kV

#### **4.37. To isolate 59T2F2 Breaker for work**

- AE59 Operator shall request for Station Guarantee from Customer on 59F2 Feeder

SCC shall advise AE59 Operator to carry out the following:

- Inform Customer about readiness to take off 59T2 bank
- Request Customer on 59T2 Bank to take off their load
- Transfer station service supply from AC2 to AC1

SCC shall carry out (or advise AE59 Operator to carry out) the following:

- Open 59SC2F2 breaker
- Open 59T2F2 breaker
- Open 59AT2 and 5DT2 breakers

SCC shall advise AE59 Operator to carry out the following:

- Open 59T2F2-F2 disconnect switch and turn off its 125Vdc supply
- Open 59SC2F2-F2 disconnect switch and turn off its 125Vdc supply
- Open 59AT2-T2 and 5DT2-T2 disconnect switches and turn off its 125Vdc supply

### **4.38. To restore 59T2F2 Breaker to service after work**

#### **4.38.1. Prepare 59T2F2 breaker for restoration:**

AE59 Operator shall:

- Advise SCC when work on the 59T2F2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 59T2F2 Breaker and temporary grounds removed
- Turn on 125Vdc supply and close 59AT2-T2 and 5DT2-T2 disconnect switches
- Turn on 125Vdc supply and close 59T2F2-F2 disconnect switch
- Turn on 125Vdc supply and close 59SC2F2-F2 disconnect switch

#### **4.38.2. Restoration of 59T2F2 Breaker to service:**

- SCC shall close (or advise AE59 Operator to close) the 59AT2 and 5DT2 breakers
- AE59 Operator shall advise Customer of readiness to restore 59F2 Feeder

- SCC shall close (or advise AE59 Operator to close) the 59T2F2 breaker
- SCC shall close (or advise AE59 Operator to close) 59SC2F2 breaker if the voltage is below 32.8kV

### **4.39. To isolate 59T3F3 Breaker for work**

- AE59 Operator shall request for Station Guarantee from Customer on 59F3 Feeder

SCC shall advise AE59 Operator to carry out the following:

- Inform Customer about readiness to take off 59T3 bank
- Request Customer on 59T3 Bank to take off their load

SCC shall carry out (or advise AE59 Operator to carry out) the following:

- Open 59SC3F3 breaker
- Open 59T3F3 breaker
- Open 59AT3 and 5DT3 breakers

SCC shall advise AE59 Operator to carry out the following:

- Open 59T3F3-F3 disconnect switch and turn off its 125Vdc supply
- Open 59SC3F3-F3 disconnect switch and turn off its 125Vdc supply
- Open 59AT3-T3 and 5DT3-T3 disconnect switches and turn off its 125Vdc supply

### **4.40. To restore 59T3F3 Breaker to service after work**

#### **4.40.1. Prepare 59T3F3 breaker for restoration:**

AE59 Operator shall:

- Advise SCC when work on the 59T3F3 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 59T3F3 Breaker and temporary grounds removed
- Turn on 125Vdc supply and close 59AT3-T3 and 5DT3-T3 disconnect switches
- Turn on 125Vdc supply and close 59T3F3-F3 disconnect switch

- Turn on 125Vdc supply and close 59SC3F3-F3 disconnect switch

**4.40.2. Restoration of 59T3F3 Breaker to service:**

- SCC shall close (or advise AE59 Operator to close) the 59AT3 and 5DT3 breakers
- AE59 Operator shall advise Customer of readiness to restore 59F3 Feeder
- SCC shall close (or advise AE59 Operator to close) the 59T3F3 breaker
- SCC shall close (or advise AE59 Operator to close) 59SC3F3 breaker if the voltage is below 32.8kV

**4.41. To Isolate 59T4F4 Breaker for work**

- AE59 Operator shall request for Station Guarantee from Customer on 59F4 Feeder

SCC shall advise AE59 Operator to carry out the following:

- Inform Customer about readiness to take off 59T4 bank
- Request Customer on 59T4 Bank to take off their load

SCC shall carry out (or advise AE59 Operator to carry out) the following:

- Open 59SC4F4 breaker
- Open 59T4F4 breaker
- Open 59AT4 and 5DT4 breakers

SCC shall advise AE59 Operator to carry out the following:

- Open 59T4F4-F4 disconnect switch and turn off its 125Vdc supply
- Open 59SC4F4-F4 disconnect switch and turn off its 125Vdc supply
- Open 59AT4-T4 and 5DT4-T4 disconnect switches and turn off its 125Vdc supply

**4.42. To restore 59T4F4 Breaker to service after work**

**4.42.1. Prepare 59T4F4 breaker for restoration:**

AE59 Operator shall:

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- Advise SCC when work on the 59T4F4 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 59T4F4 Breaker and temporary grounds removed
- Turn on 125Vdc supply and close 59AT4-T4 and 5DT4-T4 disconnect switches
- Turn on 125Vdc supply and close 59T4F4-F4 disconnect switch
- Turn on 125Vdc supply and close 59SC4F4-F4 disconnect switch

### 4.42.2. Restoration of 59T4F4 Breaker to service:

- SCC shall close (or advise AE59 Operator to close) the 59AT4 and 5DT4 breakers
- AE59 Operator shall advise Customer of readiness to restore 59F4 Feeder
- SCC shall close (or advise AE59 Operator to close) the 59T4F4 breaker
- SCC shall close (or advise AE59 Operator to close) 59SC4F4 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 on 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 provides the normal points of supply to all circuits/equipment such as AE5H, AE6H, V7AE, V8AE lines and 59T1, 59T2, 59T3 and 59T4 transformers.



5. Approval

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**Director, Technical Services**