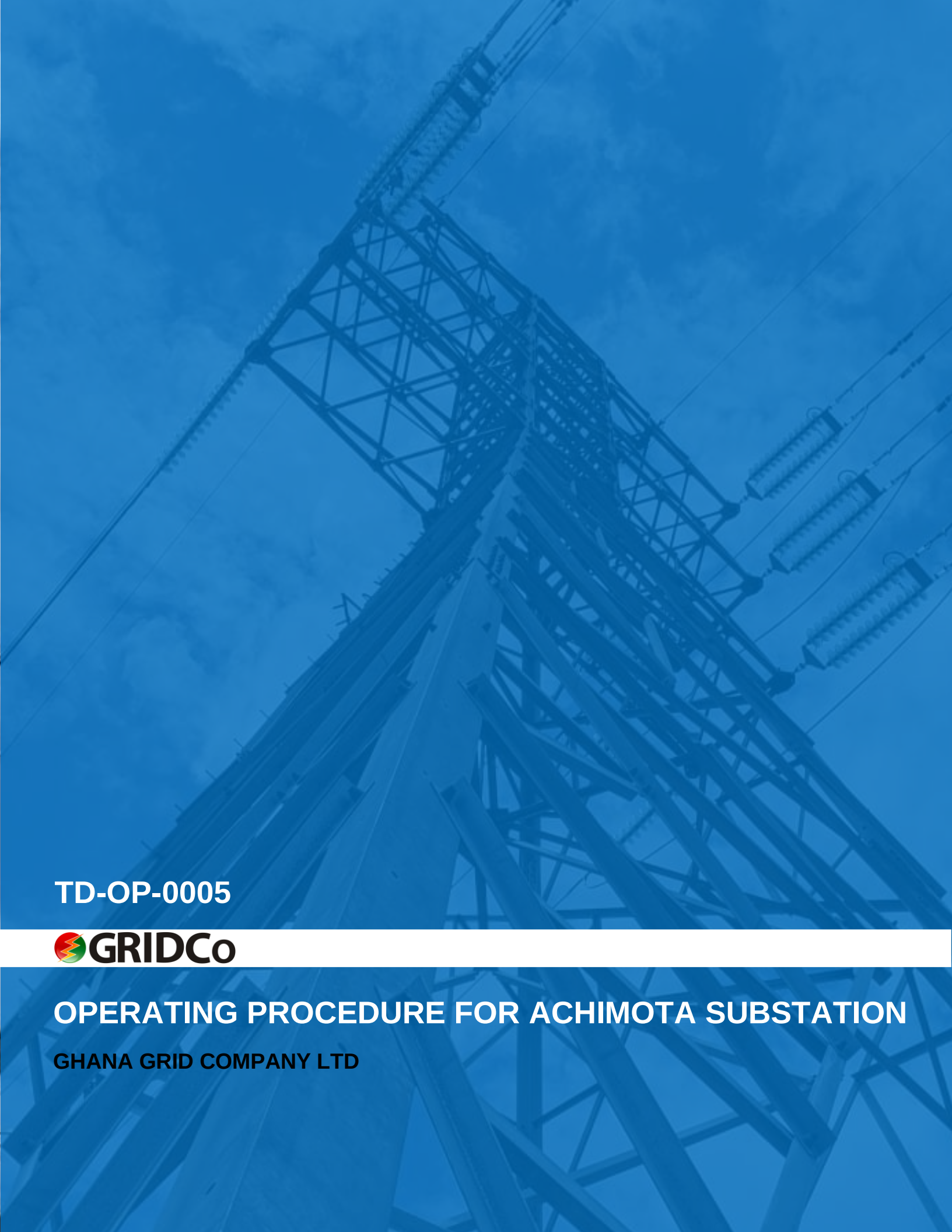

TD-OP-0005

GRIDCo

OPERATING PROCEDURE FOR ACHIMOTA SUBSTATION

GHANA GRID COMPANY LTD

TECHNICAL DIRECTIVES

Title:	**OPERATING PROCEDURE FOR ACHIMOTA SUBSTATION (H5)**		
Issued To:	Director, System Operations Director, SNS Manager, SCC Manager, Dispatch Operations Area Manager, Akosombo Operating Staff, Akosombo Area Maintenance Staff, Akosombo Area Dispatch Staff, SCC	**Number:**	TD-OP-0005
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TECHNICAL DIRECTIVES

1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at H5 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 H5 Substation.

3. Procedure

1.0. To take V24H line out of service

SCC shall carry out (or advise the H5 Operator to carry out) the following:

- Open 5L24A and 5L24T2 breakers

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

- Open 2L24A and 2L24L9 breakers

- Check for no potential on V24H line

1.1. To take out, isolate and de-energize V24H line for work

- H5 Operator shall request for Station Guarantee from V2

SCC shall carry out (or advise the H5 Operator to carry out) the following:

- Open 5L24A and 5L24T2 breakers

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

- Open 2L24A and 2L24L9 breakers

- Check for no potential on V24H line

SCC shall advise V2 Operator to carry out the following:

- Open 2L24A-L24 and 2L24L9-L24 disconnect switches and turn off its 125Vdc supply

- Close 2V24H-G ground disconnect switch

SCC shall advise H5 Operator to carry out the following:

- Open 5L24T2-L24 and 5L24A-L24 disconnect switches and turn off its 125Vdc supply
- Close 5V24H-G ground disconnect switch

1.2. To restore V24H line to service after work

1.2.1. **Prepare** V24H line for restoration

H5 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 V24H line

SCC shall advise V2 Operator to carry out the following

- Check opened 2L24A and 2L24L9 breakers
- Open 2V24H-G ground disconnect switch
- Turn on 125Vdc supply and close 2L24A-L24 and 2L24L9-L24 disconnect switches

SCC shall advise H5 Operator to carry out the following:

- Check opened 5L24A and 5L24T2 breakers
- Open 5V24H-G ground disconnect switch
- Turn on 125Vdc supply and close 5L24T2-L24 and 5L24A-L24 disconnect switches

1.2.2. **Restoration of V24H line to service:**

SCC shall:

- Advise the H5 and V2 Operators of readiness to restore V24H line to service
- Close (or advise the V2 Operator to close) 2L24A and 2L24L9 breakers
- Close (or advise the H5 Operator to close) 5L24A and 5L24T2 breakers

1.3. To restore V24H line to service after automatic outage

If V24H line trips auto due to fault:

H5 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 2L24A and 2L24L9 breakers
- Close (or advise the H5 Operator to close) 5L24A and 5L24T2 breakers

H5 Operator shall:

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

1.4. To take H2AC line out of service

SCC shall carry out (or advise the H5 Operator to carry out) the following:

- Open 5DL2 and 5L2L6 breakers

SCC shall carry out (or advise the AC83 Operator to carry out) the following:

- Open 83H2AC breaker
- Check for no potential on H2AC line

1.5. To take out, isolate and de-energize H2AC line for work

- H5 Operator shall request for Station Guarantee from AC83

SCC shall carry out (or advise the H5 Operator to carry out) the following:

- Open 5L2L6 and 5DL2 breakers

SCC shall carry out (or advise the AC83 Operator to carry out) the following:

- Open 83H2AC breaker

- Check for no potential on H2AC line

SCC shall advise AC83 Operator to carry out the following:

- Open 83H2AC-L2 disconnect switch and turn off its 125Vdc supply

- Close 83H2AC-G ground disconnect switch

SCC shall advise H5 Operator to carry out the following:

- Open 5L2L6-L2 and 5DL2-L2 disconnect switches and turn off its 125Vdc supply

Close 5H2AC-G ground disconnect switch

1.6. To restore H2AC line to service after work

1.6.1. Prepare H2AC line for restoration

H5 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 H2AC line

SCC shall advise AC83 Operator to carry out the following

- Check opened 83H2AC breaker

- Open 83H2AC-G ground disconnect switch

- Turn on 125Vdc supply and close 83H2AC-L2 disconnect switch

SCC shall advise H5 Operator to carry out the following:

- Check opened 5L2L6 and 5DL2 breakers

- Open 5H2AC-G ground disconnect switch

- Turn on 125Vdc supply and close 5L2L6-L2 and 5DL2-L2 disconnect switches

1.6.2. Restoration of H2AC line to service:

SCC shall:

- Advise the H5 and AC83 Operators of readiness to restore H2AC line to service

- Close (or advise the AC83 Operator to close) 83H2AC breaker

Close (or advise the H5 Operator to close) 5L2L6 and 5DL2 breakers

1.7. To restore H2AC line to service after automatic outage

If H2AC line trips auto due to fault:

H5 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 AC83 Operator to energize) the line ONCE by closing 83H2AC breaker
- Close (or advise the H5 Operator to close) 5L2L6 and 5DL2 breakers

H5 Operator shall:

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

1.8. To take AA3H line out of service

SCC shall carry out (or advise the H5 Operator to carry out) the following:

- Open 5L3A and 5L3T6 breakers

SCC shall carry out (or advise the AA71 Operator to carry out) the following:

- Open 71L1L3 and 71A3L3 breakers
- Check for no potential on AA3H line

1.9. To take out, isolate and de-energize AA3H line for work

- H5 Operator shall request for Station Guarantee from AA71

SCC shall carry out (or advise the H5 Operator to carry out) the following:

- Open 5L3A and 5L3T6 breakers

SCC shall carry out (or advise the AA71 Operator to carry out) the following:

- Open 71L1L3 and 71A3L3 breakers

- Check for no potential on AA3H line

SCC shall advise AA71 Operator to carry out the following:

- Open 71L1L3-L3 and 71A3L3-L3 disconnect switches and turn off its 125Vdc supply
- Close 2AA3H-G ground disconnect switch

SCC shall advise H5 Operator to carry out the following:

- Open 5L3T6-L3 and 5L3A-L3 disconnect switches and turn off its 125Vdc supply
- Close 5AA3H-G ground disconnect switch

1.10. To restore AA3H line to service after work

1.10.1. **Prepare** AA3H line for restoration

H5 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 AA3H line

SCC shall advise AA71 Operator to carry out the following

- Check opened 71L1L3 and 71A3L3 breakers
- Open 71AA3H-G ground disconnect switch
- Turn on 125Vdc supply and close 71L1L3-L3 and 71A3L3-L3 disconnect switches

SCC shall advise H5 Operator to carry out the following:

- Check opened 5L3A and 5L3T6 breakers
- Open 5AA3H-G ground disconnect switch
- Turn on 125Vdc supply and close 5L3T6-L3 and 5L3A-L3 disconnect switches

1.10.2. Restoration of AA3H line to service:

SCC shall:

- Advise the H5 and AA71 Operators of readiness to restore AA3H line to service
- Close (or advise the AA71 Operator to close) 71L1L3 and 71A3L3 breakers

- Close (or advise the H5 Operator to close) 5L3A and 5L3T6 breakers

1.11. To restore AA3H line to service after automatic outage

If AA3H line trips auto due to fault:
H5 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 AA71 Operator to energize) the line **ONCE** by closing 71L1L3 and 71A3L3 breakers
- Close (or advise the H5 Operator to close) 5L3A and 5L3T6 breakers

H5 Operator shall:

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

1.12. To take H4M line out of service

SCC shall carry out (or advise the H5 Operator to carry out) the following:

Open 5DL4 and 5L4L5 breakers

SCC shall carry out (or advise the M37 Operator to carry out) the following:

Open 37DL4 and 37L2L4 breakers

Check for no potential on H4M line

1.13. To take out, isolate and de-energize H4M line for work

H5 Operator shall request for Station Guarantee from M37

SCC shall carry out (or advise the H5 Operator to carry out) the following:

Open 5L4L6 and 5DL4 breakers

SCC shall carry out (or advise the M37 Operator to carry out) the following:

- Open 37DL4 and 37L2L4 breakers

- Check for no potential on H4M line

SCC shall advise M37 Operator to carry out the following:

- Open 37DL4-L4 and 37L2L4-L4 disconnect switches and turn off its 125Vdc supply

- Close 37H4M-G ground disconnect switch

SCC shall advise H5 Operator to carry out the following:

Open 5L4L6-L4 and 5DL4-L4 disconnect switches and turn off its 125Vdc supply

Close 5H4M-G ground disconnect switch

1.14. To restore H4M line to service after work

1.14.1. Prepare H4M line for restoration

H5 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 H4M line

SCC shall advise M37 Operator to carry out the following

- Check opened 37DL4 and 37L2L4 breakers

- Open 37H4M-G ground disconnect switch

- Turn on 125Vdc supply and close 37DL4-L4 and 37L2L4-L4 disconnect switches

SCC shall advise H5 Operator to carry out the following:

Check opened 5L4L6 and 5DL4 breakers

Open 5H4M-G ground disconnect switch

Turn on 125Vdc supply and close 5L4L6-L4 and 5DL4-L4 disconnect switches

1.14.2. Restoration of H4M line to service:

SCC shall:

- Advise the H5 and M37 Operators of readiness to restore H4M line to

service

- Close (or advise the M37 Operator to close) 37DL4 and 37L2L4 breakers

Close (or advise the H5 Operator to close) 5L4L6 and 5DL4 breakers

1.15. To restore H4M line to service after automatic outage

If H4M line trips auto due to fault:

H5 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 M37 Operator to energize) the line ONCE by closing 37DL4 and 37L2L4 breakers
- Close (or advise the H5 Operator to close) 5L4L6 and 5DL4 breakers

H5 Operator shall:

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

- To take AE5H line out of service

SCC shall carry out (or advise the H5 Operator to carry out) the following:

Open 5L5A and 5L4L5 breakers

SCC shall advise AE59 Operator to carry out the following:

Open 59DL5 and 59L5L7 breakers

Check for no potential on AE5H line

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

H5 Operator shall request for Station Guarantee from AE59

SCC shall carry out (or advise the H5 Operator to carry out) the following:

Open 5L5A and 5L4L5 breakers

SCC shall advise AE59 Operator to carry out the following:

Open 59DL5 and 59L5L7 breakers

Check for no potential on AE5H line

SCC shall advise AE59 Operator to carry out the following:

- Open 59DL5-L5 and 59L5L7-L5 disconnect switches and turn off its 125Vdc supply

- Close 59AE5H-G ground disconnect switch

SCC shall advise H5 Operator to carry out the following:

Open 5L4L5-L5 and 5L5A-L5 disconnect switches and turn off its 125Vdc supply

Close 5AE5H-G ground disconnect switch

1.17. To restore AE5H line to service after work

1.17.1. Prepare AE5H line for restoration

H5 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 AE59 Operator to carry out the following

- Check opened 59DL5 and 59L5L7 breakers

- Open 59AE5H-G ground disconnect switch

- Turn on 125Vdc supply and close 59DL5-L5 and 59L5L7-L5 disconnect switches

SCC shall advise H5 Operator to carry out the following:

Check opened 5L4L5 and 5L5A breakers

Open 5AE5H-G ground disconnect switch

Turn on 125Vdc supply and close 5L5L6-L5 and 5L5A-L5 disconnect switches

1.18. Restoration of AE5H line to service:

SCC shall:

- Advise the H5 and AE59 Operators of readiness to restore AE5H line to

service

- Close (or advise the AE59 Operator to close) 59DL5 and 59L5L7 breakers

Close (or advise the H5 Operator to close) 5L5A and 5L4L5 breakers

1.19. To restore AE5H line to service after automatic outage

If AE5H line trips auto due to fault:

H5 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 AE59 Operator to energize) the line ONCE by closing 59DL5 and 59L5L7 breakers
- Close (or advise the H5 Operator to close) 5L4L5 and 5L5A breakers

H5 Operator shall:

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

1.20. To take AE6H line out of service

SCC shall carry out (or advise the H5 Operator to carry out) the following:

Open 5L6A and 5L2L6 breakers

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

Open 59DL6 and 59L6L8 breakers

Check for no potential on AE6H line

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

- H5 Operator shall request for Station Guarantee from AE59

SCC shall carry out (or advise the H5 Operator to carry out) the following:

Open 5L6A and 5L2L6 breakers

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

- Open 59DL6 and 59L6L8 breakers
- Check for no potential on AE6H line

SCC shall advise AE59 Operator to carry out the following:

- Open 59DL6-L6 and 59L6L8-L6 disconnect switches and turn off its 125Vdc supply

Close 59AE6H-G ground disconnect switch

SCC shall advise H5 Operator to carry out the following:

Open 5L2L6-L6 and 5L6A-L6 disconnect switches and turn off its 125Vdc supply

Close 5AE6H-G ground disconnect switch

To restore AE6H line to service after work

Prepare AE6H line for restoration

H5 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 AE59 Operator to carry out the following

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

SCC shall advise H5 Operator to carry out the following:

Check opened 5L2L6 and 5L6A breakers

Open 5AE6H-G ground disconnect switch

Turn on 125Vdc supply and close 5L2L6-L6 and 5L6A-L6 disconnect switches

1.22. Restoration of AE6H line to service:

SCC shall:

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

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

Close (or advise the H5 Operator to close) 5L6A and 5L2L6 breakers

1.23. To restore AE6H line to service after automatic outage

If AE6H line trips auto due to fault:

H5 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 AE59 Operator to energize) the line ONCE by closing 59DL6 and 59L6L8 breakers

- Close (or advise the H5 Operator to close) 5L2L6 and 5L6A breakers

H5 Operator shall:

- Advise the Supervisor/Area Manager of operation above

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

1.24. To take V19H line out of service

SCC shall carry out (or advise the H5 Operator to carry out) the following:

Open 5L19A and 5L19T1 breakers

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

Open 2L19A and 2L19T2 breakers

Check for no potential on V19H line

1.25. To take out, isolate and de-energize V19H line for work

- H5 Operator shall request for Station Guarantee from V2

SCC shall carry out (or advise the H5 Operator to carry out) the following:

Open 5L19A and 5L19T1 breakers

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

- Open 2L19A and 2L19T2 breakers
- Check for no potential on V19H line

SCC shall advise V2 Operator to carry out the following:

- Open 2L19A-L19 and 2L19T2-L19 disconnect switches and turn off its 125Vdc supply
- Close 2V19H-G ground disconnect switch

SCC shall advise H5 Operator to carry out the following:

Open 5L19T-L19 and 5L19A-L19 disconnect switches and turn off its 125Vdc supply

Close 5V19H-G ground disconnect switch

1.26. To restore V19H line to service after work

1.26.1. Prepare V19H line for restoration

H5 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 V19H line

SCC shall advise V2 Operator to carry out the following

- Check opened 2L19A and 2L19T2 breakers
- Open 2V19H-G ground disconnect switch
- Turn on 125Vdc supply and close 2L19A-L19 and 2L19T2-L19 disconnect switches

SCC shall advise H5 Operator to carry out the following:

Check opened 5L19T1 and 5L19A breakers

Open 5V19H-G ground disconnect switch

Turn on 125Vdc supply and close 5L19T1-L19 and 5L19A-L19 disconnect switches

1.27. Restoration of V19H line to service:

SCC shall:

- Advise the H5 and V2 Operators of readiness to restore V19H line to service
- Close (or advise the V2 Operator to close) 2L19A and 2L19T2 breakers

Close (or advise the H5 Operator to close) 5L19A and 5L19T1 breakers

1.28. To restore V19H line to service after automatic outage

If V19H line trips auto due to fault:

H5 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 2L19A and 2L19T2 breakers
- Close (or advise the H5 Operator to close) 5L19T1 and 5L19A breakers

H5 Operator shall:

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

1.29. Isolate 5T1 Transformer for work

H5 Operator shall request for Station Guarantee from Customer on 5F1 Feeder

SCC shall advise H5 operator to carry out the following:

Inform Customer about readiness to take off 5T1 bank

- Request Customer on 5T1 Bank to take off their load

Transfer Station Service from AC1 to AC2

- Open AC1 Contactor/MCB to take off supply to 5T1 transformer auxiliaries

SCC shall carry out (or advise H5 operator to carry out) the following:

- Open 5F1SC1 breaker

Open 5T1F1 breaker

- Open 5L19T1 and 5DT1 breaker

- Check for no potential on 5T1 Bank

SCC shall advise H5 operator to carry out the following:

Open 5DT1-T1 and 5L19T1-T1 disconnect switches and turn off 125Vdc supply

Open 5T1F1-F1 disconnect switch

Open AC control MCB to 5T1 auxiliaries and tag

Open 125Vdc MCB to 5T1 primary and secondary protection and tag with PC13

1.30. To restore 5T1 Bank to service after work

1.30.1. Prepare 5T1 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 5T1 Bank and temporary grounds removed

Check opened 5T1F1 and 5F1SC1 breakers

- Check opened 5L19T1 and 5DT1 breakers

Close 5T1F1-F1 disconnect switch

Turn on 125Vdc supply and close 5L19T1-T1 and 5DT1-T1 disconnect switches

Close AC control MCB to 5T1 auxiliaries and remove tag

Close 125Vdc MCB to 5T1 primary and secondary protection and remove PC13 tag

Advise SCC of readiness to restore 5T1 Bank to service

1.31. Restoration of 5T1 bank to service:

SCC shall close (or advise H5 operator to close) 5L19T1 and 5DT1 breakers

H5 Operator shall advise Customer of readiness to restore 5T1 Bank to service

SCC shall close (or advise H5 operator to close) the 5T1F1 breaker

1.32. Restore 5T1 Bank to service after automatic outage

If 5T1 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 H5 Operator to energize) the bank ONCE by closing 5DT1 and 5L19T1 breakers

H5 Operator shall advise Customer of readiness to restore 5F1 feeder to service

SCC shall close (or advise H5 Operator to close) 5T1F1 breaker

H5 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.

1.33. Isolate 5T2 Transformer for work

H5 Operator shall request for Station Guarantee from Customer on 5F2 Feeder

SCC shall advise H5 operator to carry out the following:

- Inform Customer about readiness to take off 5T2 bank
- Request Customer on 5T2 Bank to take off their load

Transfer Station Service from AC2 to AC1

- Open AC2 Contactor/MCB to take off supply to 5T2 transformer auxiliaries

SCC shall carry out (or advise H5 operator to carry out) the following:

- Open 5F2SC2 breaker

Open 5T2F2 breaker

- Open 5T2T5 and 5DT2 breakers
- Check for no potential on 5T2 Bank

SCC shall advise H5 operator to carry out the following:

Open 5DT2-T2 and 5T2T5-T2 disconnect switches and turn off 125Vdc supply

Open 5T2F2-F2 disconnect switch

Open AC control MCB to 5T2 auxiliaries and tag

Open 125Vdc MCB to 5T2 primary and secondary protection and tag with PC13

1.34. To restore 5T2 Bank to service after work

1.34.1. Prepare 5T2 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 5T2 Bank and temporary grounds removed

Check opened 5T2F2 and 5F2SC2 breakers

- Check opened 5T2T5 and 5DT2 breakers

Turn on 125Vdc supply and close 5T2T5-T2 and 5DT2-T2 disconnect switches

Close 5T2F2-F2 disconnect switch

Close AC control MCB to 5T2 auxiliaries and remove tag

Close 125Vdc MCB to 5T2 primary and secondary protection and remove PC13 tag

Advise SCC of readiness to restore 5T2 Bank to service

1.35. Restoration of 5T2 bank to service:

SCC shall close (or advise H5 operator to close) 5T2T5 and 5DT2 breakers

H5 Operator shall advise Customer of readiness to restore 5T2 Bank to service

SCC shall close (or advise H5 operator to close) the 5T2F2 breaker

1.36. Restore 5T2 Bank to service after automatic outage

If 5T2 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 H5 Operator to energize) the bank ONCE by closing 5DT2 and 5T2T5 breaker

H5 Operator shall advise Customer of readiness to restore 5F2 feeder to service

SCC shall close (or advise H5 Operator to close) 5T2F2 breaker

H5 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.

1.37. Isolate 5T3 Bank for work

H5 Operator shall request for Station Guarantee from Customer on 5F3 Feeder

SCC shall advise H5 operator to carry out the following:

Inform Customer about readiness to take off 5T3 bank

- Request Customer on 5T3 Bank to take off their load
- Open AC3 Contactor/MCB to take off supply to 5T3 transformer auxiliaries

SCC shall carry out (or advise H5 operator to carry out) the following:

- Open 5F3SC3 and 5T3F3 breakers
- Open 5T3T4 and 5DT3 breakers
- Check for no potential on 5T3 Bank

SCC shall advise H5 operator to carry out the following:

Open 5DT3-T3 and 5T3T4-T3 disconnect switches and turn off 125Vdc supply

Open 5T3F3-F3 disconnect switch

Open AC control MCB to 5T3 auxiliaries and tag

Open 125V DC MCB to 5T3 primary and secondary protection and tag with PC13

1.38. To restore 5T3 Bank to service after work

1.38.1. Prepare 5T3 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 5T3 Bank and temporary grounds removed

Check opened 5T3F3 and 5F3SC3 breakers

- Check opened 5T3T4 and 5DT3 breakers

Turn on 125Vdc supply and close 5T3T4-T3 and 5DT3-T3 disconnect switches

Close 5T3F3-F3 disconnect switch

Close AC control MCB to 5T3 auxiliaries and remove tag

Close 125Vdc MCB to 5T3 primary and secondary protection and remove PC13 tag

Advise SCC of readiness to restore 5T3 Bank to service

1.39. Restoration of 5T3 bank to service:

SCC shall close (or advise H5 operator to close) 5T3T4 and 5DT3 breakers

H5 Operator shall advise Customer of readiness to restore 5T3 Bank to service

SCC shall close (or advise H5 operator to close) the 5T3F3 breaker

1.40. Restore 5T3 Bank to service after automatic outage

If 5T3 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 H5 Operator to energize) the bank ONCE by closing 5DT3 and 5T3T4 breakers

H5 Operator shall advise Customer of readiness to restore 5F3 feeder to service

SCC shall close (or advise H5 Operator to close) 5T3F3 breaker

H5 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.

1.41. Isolate 5T4 Transformer for work

H5 Operator shall request for Station Guarantee from Customer on 5F4 Feeder

SCC shall advise H5 operator to carry out the following:

Inform Customer about readiness to take off 5T4 bank

- Request Customer on 5T4 Bank to take off their load
- Open AC4 Contactor/MCB to take off supply to 5T4 transformer auxiliaries

SCC shall carry out (or advise H5 operator to carry out) the following:

- Open 5F4SC4 and 5T4F4 breakers
- Open 5T3T4 and 5AT4 breakers
- Check for no potential on 5T4 Bank

Open 5AT4-T4 and 5T3T4-T4 disconnect switches and turn off 125Vdc supply

Open 5T4F4-F4 disconnect switch

Open AC control MCB to 5T4 auxiliaries and tag

Open 125Vdc MCB to 5T4 primary and secondary protection and tag with PC13

1.42. To restore 5T4 Bank to service after work

1.42.1. Prepare 5T4 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 5T4 Bank and temporary grounds removed

Check opened 5T4F4 and 5F4SC4 breakers

- Check opened 5T3T4 and 5AT4 breakers

Turn on 125Vdc supply and close 5T3T4-T4 and 5AT4-T4 disconnect switches

Close 5T4F4-F4 disconnect switch

Close AC control MCB to 5T4 auxiliaries and remove tag

Close 125Vdc MCB to 5T4 primary and secondary protection and remove PC13 tag

Advise SCC of readiness to restore 5T4 Bank to service

1.43. Restoration of 5T4 bank to service:

SCC shall close (or advise H5 operator to close) 5T3T4 and 5AT4 breakers

H5 Operator shall advise Customer of readiness to restore 5T4 Bank to service

SCC shall close (or advise H5 operator to close) the 5T4F4 breaker

1.44. Restore 5T4 Bank to service after automatic outage

If 5T4 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 H5 Operator to energize) the bank ONCE by closing 5AT4 and 5T3T4 breakers

H5 Operator shall advise Customer of readiness to restore 5F4 feeder to service

SCC shall close (or advise H5 Operator to close) 5T4F4 breaker

H5 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.

1.45. Isolate 5T6 Transformer for work

H5 Operator shall request for Station Guarantee from Customer on 5F6 Feeder

SCC shall advise H5 operator to carry out the following:

Inform Customer about readiness to take off 5T6 bank

- Request Customer on 5T6 Bank to take off their load

- Open AC6 Contactor/MCB to take off supply to 5T6 transformer auxiliaries

SCC shall carry out (or advise H5 operator to carry out) the following:

- Open 5L1T6 and 5DT6 breakers

Open 5T6F6 breaker

- Check for no potential on 5T6 Bank

Open 5DT6-T6 and 5L1T6-T6 disconnect switches and turn off 125Vdc supply

Open 5T6F6-T6 disconnect switch

Open AC control MCB to 5T6 auxiliaries and tag

Open 125Vdc MCB to 5T6 primary and secondary protection and tag with PC13

1.46. To restore 5T6 Bank to service after work

1.46.1. Prepare 5T6 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 5T6 Bank and temporary grounds removed

Check opened 5T6F6 breaker

- Check opened 5L1T6 and 5DT6 breakers

Turn on 125Vdc and close 5L1T6-T6 and 5DT6-T6 disconnect switches

Close 5T6F6-F6 and disconnect switch

Close AC control MCB to 5T6 auxiliaries and remove tag

Close 125Vdc MCB to 5T6 primary and secondary protection and remove PC13 tag

Advise SCC of readiness to restore 5T6 Bank to service

1.47. Restoration of 5T6 bank to service:

SCC shall close (or advise H5 operator to close) 5L1T6 and 5DT6 breakers

H5 Operator shall advise Customer of readiness to restore 5T6 Bank to service

SCC shall close (or advise H5 operator to close) the 5T6F6 breaker

1.48. Restore 5T6 Bank to service after automatic outage

If 5T6 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 H5 Operator to energize) the bank ONCE by closing 5DT6 and 5L1T6 breakers

H5 Operator shall advise Customer of readiness to restore 5F6 feeder to service

SCC shall close (or advise H5 Operator to close) 5T6F6 breaker

H5 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.

1.49. To isolate 5SC1 Capacitor Bank for work

SCC shall carry out (or advise H5 operator to carry out) the following:

- Open 5F1SC1 breaker

SCC shall advise H5 operator to carry out the following:

Open 5F1SC1-SC1 disconnect switch

Close 5SC1-G ground disconnect switch

1.50. To restore 5SC1 Capacitor bank to service after work

1.50.1. Prepare 5SC1 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 5F1SC1 breaker

Open 5SC1-G ground disconnect switch

Close 5F1SC1-SC1 disconnect switch

Restoration of 5SC1Capacitor Bank to service:

SCC shall close (or advise H5 Operator to close) 5F1SC1 breaker if the voltage is below 32.8kV

1.51. To isolate 5SC2 Capacitor Bank for work

SCC shall carry out (or advise H5 operator to carry out) the following:

- Open 5F2SC2 breaker

SCC shall advise H5 operator to carry out the following:

Open 5F2SC2-SC2 disconnect switch

Close 5SC2-G ground disconnect switch

1.52. To restore 5SC2 Capacitor bank to service after work

1.52.1. Prepare 5SC2 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 5F2SC2 breaker

Open 5SC2-G ground disconnect switch

Close 5F2SC2-SC2 disconnect switch

1.53. Restoration of 5SC2 Capacitor Bank to service:

SCC shall close (or advise H5 Operator to close) 5F2SC2 breaker if the voltage is below 32.8kV

1.54. To isolate 5SC3 Capacitor Bank for work

SCC shall carry out (or advise H5 operator to carry out) the following:

- Open 5F3SC3 breaker

SCC shall advise H5 operator to carry out the following:

Open 5F3SC3-SC3 disconnect switch

Close 5SC3-G ground disconnect switch

1.55. To restore 5SC3 Capacitor bank to service after work

1.55.1. Prepare 5SC3 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 5F3SC3 breaker

Open 5SC3-G ground disconnect switch

Close 5F3SC3-SC3 disconnect switch

1.56. Restoration of 5SC3 Capacitor Bank to service:

SCC shall close (or advise H5 Operator to close) 5F3SC3 breaker if the voltage is below 32.8kV

1.57. To isolate 5SC4 Capacitor Bank for work

SCC shall carry out (or advise H5 operator to carry out) the following:

- Open 5F4SC4 breaker

SCC shall advise H5 operator to carry out the following:

Open 5F4SC4-SC4 disconnect switch

Close 5SC4-G ground disconnect switch

1.58. To restore 5SC4 Capacitor bank to service after work

1.58.1. Prepare 5SC4 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 5F4SC4 breaker

Open 5SC4-G ground disconnect switch

Close 5F4SC4-SC4 disconnect switch

1.59. Restoration of 5SC4 Capacitor Bank to service:

SCC shall close (or advise H5 Operator to close) 5F4SC4 breaker if the voltage is

below 32.8kV

1.60. To Isolate 5T1F1 Breaker for work

- H5 Operator shall request for Station Guarantee from Customer on 5F1 Feeder

SCC shall advise H5 Operator to carry out the following:

Inform Customer about readiness to take off 5T1 bank

- Request Customer on 5T1 Bank to take off their load
- Transfer station service supply from AC1 to AC2

SCC shall carry out (or advise H5 Operator to carry out) the following:

Open 5F1SC1 breaker

Open 5T1F1 breaker

Open 5T1L19 and 5DT1 breakers

SCC shall advise H5 Operator to carry out the following:

Open 5T1F1-F1 disconnect switch and turn off its 125Vdc supply

Open 5T1L19-T1 and 5DT1-T1 disconnect switches and turn off its 125Vdc supply

1.61. To restore 5T1F1 Breaker to service after work

1.61.1. Prepare 5T1F1 breaker for restoration:

H5 Operator shall:

- Advise SCC when work on the 5T1F1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 5T1F1 Breaker and temporary grounds removed

Turn on 125Vdc supply and close 5T1L19-T1 and 5DT1-T1 disconnect switches

Turn on 125Vdc supply and close 5T1F1-F1 disconnect switch

1.62. Restoration of 5T1F1 Breaker to service:

SCC shall close (or advise H5 Operator to close) the 5T1L19 and 5DT1 breakers

H5 Operator shall advise Customer of readiness to restore 5F1 Feeder

SCC shall close (or advise H5 Operator to close) the 5T1F1 breaker

1.63. To Isolate 5T2F2 Breaker for work

- H5 Operator shall request for Station Guarantee from Customer on 5F2 Feeder

SCC shall advise H5 Operator to carry out the following:

Inform Customer about readiness to take off 5T2 bank

- Request Customer on 5T2 Bank to take off their load

- Transfer station service supply from AC2 to AC1

SCC shall carry out (or advise H5 Operator to carry out) the following:

Open 5F2SC2 breaker

Open 5T2F2 breaker

Open 5T2T5 and 5DT2 breakers

SCC shall advise H5 Operator to carry out the following:

Open 5T2F2-F2 disconnect switch and turn off its 125Vdc supply

Open 5T2T5-T2 and 5DT2-T2 disconnect switches and turn off its 125Vdc supply

1.64. To restore 5T2F2 Breaker to service after work

1.64.1. Prepare 5T2F2 breaker for restoration:

H5 Operator shall:

- Advise SCC when work on the 5T2F2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 5T2F2 Breaker and temporary grounds removed

Turn on 125Vdc supply and close 5T2T5-T2 and 5DT2-T2 disconnect switches

Turn on 125Vdc supply and close 5T2F2-F2 disconnect switch

1.65. Restoration of 5T2F2 Breaker to service:

SCC shall close (or advise H5 Operator to close) the 5T2T5 and 5DT2 breakers

H5 Operator shall advise Customer of readiness to restore 5F2 Feeder

SCC shall close (or advise H5 Operator to close) the 5T2F2 breaker

1.66. To Isolate 5T3F3 Breaker for work

- H5 Operator shall request for Station Guarantee from Customer on 5F3 Feeder

SCC shall advise H5 Operator to carry out the following:

Inform Customer about readiness to take off 5T3 bank

- Request Customer on 5T3 Bank to take off their load

SCC shall carry out (or advise H5 Operator to carry out) the following:

Open 5F3SC3 breaker

Open 5T3F3 breaker

Open 5T3T4 and 5DT3 breakers

SCC shall advise H5 Operator to carry out the following:

Open 5T3F3-F3 disconnect switch and turn off its 125Vdc supply

Open 5T3T4-T3 and 5DT3-T3 disconnect switches and turn off its 125Vdc supply

1.67. To restore 5T3F3 Breaker to service after work

1.67.1. Prepare 5T3F3 breaker for restoration:

H5 Operator shall:

- Advise SCC when work on the 5T3F3 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 5T3F3 Breaker and temporary grounds removed

Turn on 125Vdc supply and close 5T3T4-T3 and 5DT3-T3 disconnect switches

Turn on 125Vdc supply and close 5T3F2-F3 disconnect switch

1.68. Restoration of 5T3F3 Breaker to service:

SCC shall close (or advise H5 Operator to close) the 5T3T4 and 5DT3 breakers

H5 Operator shall advise Customer of readiness to restore 5F3 Feeder

SCC shall close (or advise H5 Operator to close) the 5T3F3 breaker

1.69. To Isolate 5T4F4 Breaker for work

- H5 Operator shall request for Station Guarantee from Customer on 5F4 Feeder

SCC shall advise H5 Operator to carry out the following:

Inform Customer about readiness to take off 5T4 bank

- Request Customer on 5T4 Bank to take off their load

SCC shall carry out (or advise H5 Operator to carry out) the following:

Open 5F4SC4 breaker

Open 5T4F4 breaker

Open 5T3T4 and 5AT4 breakers

SCC shall advise H5 Operator to carry out the following:

Open 5T4F4-F4 disconnect switch and turn off its 125Vdc supply

Open 5T3T4-T4 and 5AT4-T4 disconnect switches and turn off its 125Vdc supply

1.70. To restore 5T4F4 Breaker to service after work

1.70.1. Prepare 5T4F4 breaker for restoration:

H5 Operator shall:

- Advise SCC when work on the 5T4F4 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 5T4F4 Breaker and temporary grounds removed

Turn on 125Vdc supply and close 5T3T4-T4 and 5AT4-T4 disconnect switches

Turn on 125Vdc supply and close 5T4F4-F4 disconnect switch

1.71. Restoration of 5T4F4 Breaker to service:

SCC shall close (or advise H5 Operator to close) the 5T3T4 and 5AT4 breakers

H5 Operator shall advise Customer of readiness to restore 5F4 Feeder

SCC shall close (or advise H5 Operator to close) the 5T4F4 breaker

1.72. To Isolate 5T6F6 Breaker for work

- H5 Operator shall request for Station Guarantee from Customer on 5F6 Feeder

SCC shall advise H5 Operator to carry out the following:

Inform Customer about readiness to take off 5T6 bank

- Request Customer on 5T6 Bank to take off their load

SCC shall carry out (or advise H5 Operator to carry out) the following:

Open 5T6F6 breaker

Open 5L1T6 and 5DT6 breakers

SCC shall advise H5 Operator to carry out the following:

Open 5T6F6-F6 disconnect switch and turn off its 125Vdc supply

Open 5L1T6-T6 and 5DT6-T6 disconnect switches and turn off its 125Vdc supply

1.73. To restore 5T6F6 Breaker to service after work

1.73.1. Prepare 5T6F6 breaker for restoration:

H5 Operator shall:

- Advise SCC when work on the 5T6F6 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 5T6F6 Breaker and temporary grounds removed

Turn on 125Vdc supply and close 5L1T6-T6 and 5DT6-T6 disconnect switches

Turn on 125Vdc supply and close 5T6F6-F6 disconnect switch

1.74. Restoration of 5T6F6 Breaker to service:

SCC shall close (or advise H5 Operator to close) the 5L1T6 and 5DT6 breakers

H5 Operator shall advise Customer of readiness to restore 5F6 Feeder

SCC shall close (or advise H5 Operator to close) the 5T6F6 breaker

4. EXPLANATION

Transformer and Bus automatic outages may be caused by the following relay operations:

Transformer differential lockout relay-86T

Transformer Bucholtz relay or high temperature lockout relay-86G

Transformer overcurrent back up relays

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

86T can be reset manually immediately after an automatic outage if the station is attended.

86G cannot be reset unless transformer gas and / or temperature conditions are normal or the MCB to the transformer protective relays is off.

NOTE:

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.

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

Open the necessary breaker(s) to take the line off potential.

Check all three phases off potential using the Multifunction meter or Analog Voltmeter or for Pole discrepancies on the panel.

Open the necessary disconnect switches or MODS to isolate the line from all sources of supply.

Close the Grounding Switch.

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.

Issue Work or Work and Test Permit to the workman.

ORDER TO OPERATE

An O.TO. (Order-To-Operate) to isolate a line is as follows:

Line Voltage - Check all three phases off potential
Line Breaker - Check Open
Line Disconnect Switches - Open, lock and Tag (MCB to MOD Turn-off)

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.

If work is to be done a permanent ground switches a PC 14 to close the ground switch is not required.

The station has two 161Kv buses. The main 'A' and 'D' buses, a breaker and half configuration provides the normal points of supply to all circuits/equipment such as V1H (Volta-Achimota), H2AC (Achimota-Accra Central), H4M (Achimota-Mallam), AE5H (Accra East-Achimota), AE6H (Accra East-Achimota) and V19H (Volta-Achimota) lines, 5T1, 5T2, 5T3,5T4,5T5 and 5T6 transformers.

5. Approval

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Director, Technical Services