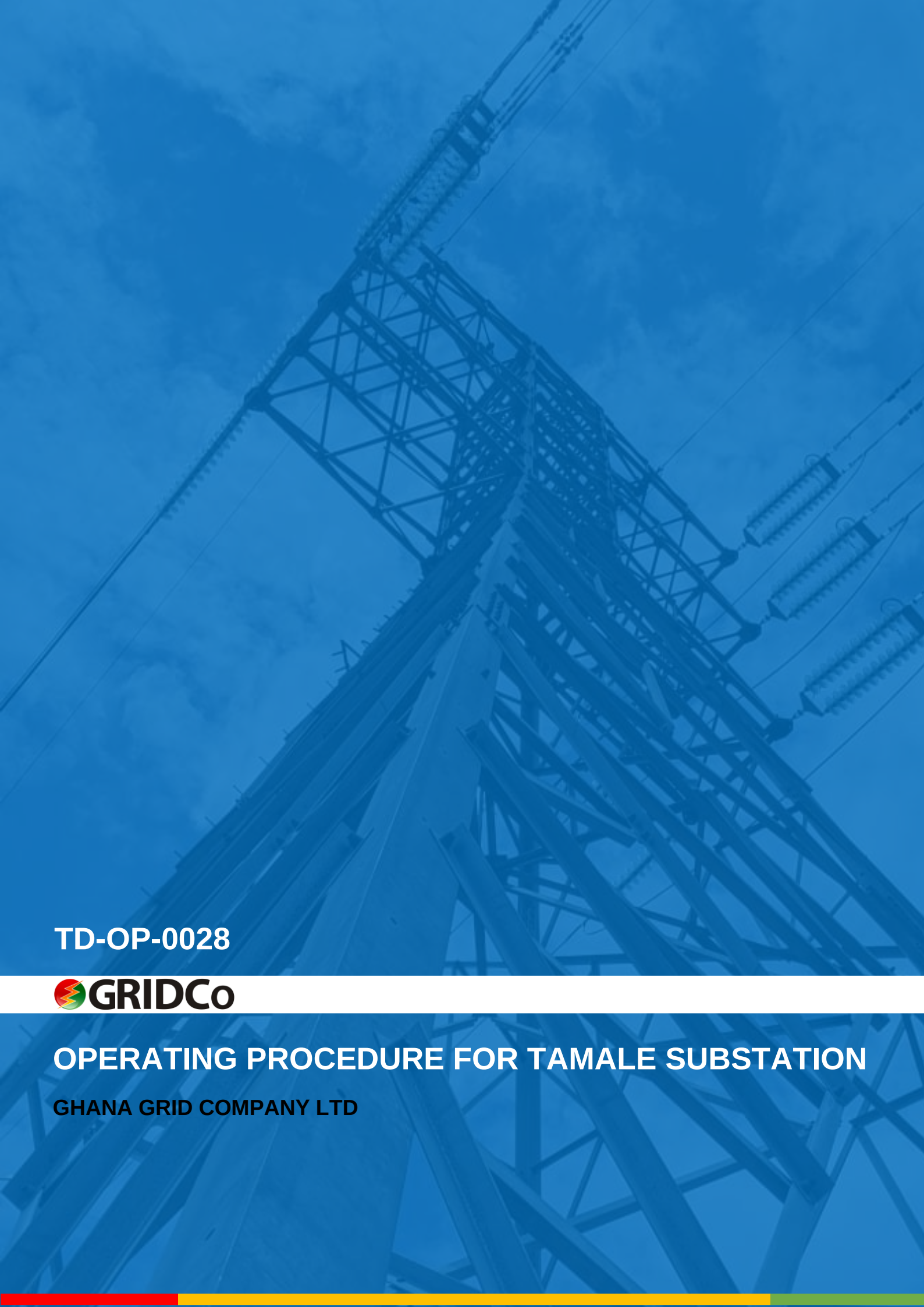

TD-OP-0028

GRIDCo

OPERATING PROCEDURE FOR TAMALE SUBSTATION

GHANA GRID COMPANY LTD

Title:	**OPERATING PROCEDURE FOR TAMALE SUBSTATION (TM28)**		
Issued To:	Director, System Operations Director, NNS Manager, SCC Manager, Dispatch Operations Area Manager, Tamale Operating Staff, Tamale Area Maintenance Staff, Tamale Area Dispatch Staff, SCC	**Number:**	TD-OP-0028
		Subject Area:	Operating
		Issue Date:	Trial
		Origin:	Technical Services
Key Words:	Take Out, Isolate, Prepare, Energize, Restore, Automatic Outage		

CONTENTS

1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at TM28 Substation to service for planned and auto outages.

2. Scope

The directive will be used by Operators at Tamale Operating Area and System Control Center (SCC) for operation of equipment at TM28 Substation.

3. Procedure

3.1. To take TM2BG line out of service

SCC shall carry out (or advise the TM28 Operator to carry out) the following:

- Open 28AL2 breaker

SCC shall carry out (or advise the BG29 Operator to carry out) the following:

- Open 29L2A breaker
- Check for no potential on TM2BG line

3.2. To take out, isolate and de-energize TM2BG line for work

- TM28 Operator request for Station Guarantee from BG29

SCC shall carry out (or advise the TM28 Operator to carry out) the following:

- Open 28AL2 breaker

SCC shall carry out (or advise BG29 Operator to carry out) the following:

- Open 29L2A breaker
- Check for no potential on TM2BG line

SCC shall advise BG29 Operator to carry out the following:

- Verify opened **29L2-D** transfer disconnect switch and turn off its 125Vdc supply
- Open 29L2A-L2 disconnect switch and turn off its 125Vdc supply
- Close 29TM2BG-G ground disconnect switch

SCC shall advise TM28 Operator to carry out the following:

- Verify opened **28L1-D** transfer disconnect switch and turn off its125Vdc supply
- Open **28AL2-L2** disconnect switch and turn off its125Vdc supply
- Close 28TM2BG-G ground disconnect switch

3.3. To restore TM2BG line to service after work

3.3.1. Prepare TM2BG line for restoration:

TM28 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 TM2BG line

SCC shall advise BG29 Operator to carry out the following:

- Check opened 29L2A breaker
- Open 29TM2BG-G ground disconnect switch
- Check opened **29L2-D** transfer disconnect switch and turn on its 125Vdc supply
- Turn on 125Vdc supply and close 29L2A-L2 disconnect switch

SCC shall advise TM28 Operator to carry out the following:

- Check opened 28AL2 breaker
- Open 28TM2BG-G ground disconnect switch
- Check opened **29L2-D** transfer disconnect switch and turn on its125Vdc supply
- Turn on 125Vdc supply and close **28AL2-L2** disconnect switch

3.3.2. Restoration of TM2BG line to service:

SCC shall:

- Advise the BG29 and TM28 Operators of readiness to restore TM2BG line to service

- Close (or advise the BG29 Operator to close) 29L2A breaker
- Close (or advise the TM28 Operator to close) 28AL2 breaker

3.4. To take out, isolate and de-energize TM2BG line for work (Along Skywire)

- TM28 Operator request for Station Guarantee from BG29 and NEDCo

SCC shall carry out (or advise the TM28 Operator to carry out) the following:

- Open 28AL2 breaker

SCC shall carry out (or advise BG29 Operator to carry out) the following:

- Open 29L2A breaker
- Check for no potential on TM2BG line

SCC shall advise BG29 Operator to carry out the following:

- Open 29L2A-L2 disconnect switch and turn off its 125Vdc supply
- Close 29TM2BG-G ground disconnect switch

SCC shall advise TM28 Operator to carry out the following:

- Verify opened 28L2-D transfer disconnect switch and turn off its125Vdc supply
- Open 28AL2-L2 disconnect switch and turn off its 125Vdc supply
- Close 28TM2BG-G ground disconnect switch

3.5. To restore TM2BG line to service after work (Along Skywire)

3.5.1. Prepare TM2BG line for restoration:

TM28 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 TM2BG line

SCC shall advise BG29 Operator to carry out the following:

- Check opened 29L2A breaker
- Open 29TM2BG-G ground disconnect switch

- Turn on 125Vdc supply and close 29L2A-L2 disconnect switch

SCC shall advise TM28 Operator to carry out the following:

- Check opened 28AL2 breaker
- Open 28TM2BG-G ground disconnect switch
- Check opened 28L2-D transfer disconnect switch and turn on its125Vdc supply
- Turn on 125Vdc supply and close 28AL2-L2 disconnect switch

3.5.2. Restoration of TM2BG line to service: (Along Skywire)

SCC shall:

- Advise the BG29 and TM28 Operators of readiness to restore TM2BG line to service
- Close (or advise the BG29 Operator to close) 29L2A breaker
- Close (or advise the TM28 Operator to close) 28AL2 breaker

3.6. To restore TM2BG line to service after automatic outage

If TM2BG line trips auto due to fault on the line:

TM28 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 BG29 Operator to energize) the line **ONCE** by closing 29L2A breaker
- Close (or advise the TM28 Operator to close) 28AL2 breaker

TM28 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 TM3YD line out of service

SCC shall carry out (or advise the TM28 Operator to carry out) the following:

- Open 28AL3 breaker.

SCC shall carry out (or advise the YD35 Operator to carry out) the following:

- Open YD35 breaker
- Check for no potential on TM3YD line

3.8. To take out, isolate and de-energize TM3YD line for work

- TM28 Operator shall request for Station Guarantee from YD35

SCC shall carry out (or advise the TM28 Operator to carry out) the following:

- Open 28AL3 breaker

SCC shall carry out (or advise the YD35 Operator to carry out) the following:

- Open 35L3T1 breaker
- Check for no potential on TM3YD line

SCC shall advise YD35 Operator to carry out the following:

- Open 35L3T1–L3 disconnect switch and turn off its125Vdc supply
- Close 35TM3YD-G ground disconnect switch

SCC shall advise TM28 operator to carry out the following:

- Verify opened **28L3-D** transfer disconnect switch and turn off its 125Vdc supply
- Open 28AL3-L3 disconnect switch and turn off its 125Vdc supply
- Close 28TM3YD-G ground disconnect switch

3.9. To restore TM3YD line to service after work

3.9.1. Prepare TM3YD line for restoration:

TM28 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 TM3YD line

SCC shall advise YD35 Operator to carry out the following:

- Check opened 35L3T1 breaker
- Open 35TM3YD-G ground disconnect switch
- Turn on 125Vdc supply and close YD35-L28AL3 disconnect switch

SCC shall advise TM28 Operator to carry out the following:

- Check opened 28AL3 breaker
- Open 28TM3YD-G ground disconnect switch
- Check opened **28L3-D** transfer disconnect switch and turn on its 125Vdc supply
- Turn on 125Vdc supply and close **28AL3-L3** disconnect switch
- Open 28TM3YD-G ground disconnect switch

3.9.2. Restoration of TM3YD line to service:

SCC shall:

- Advise the YD35 and TM28 Operators of readiness to restore TM3YD line to service
- Close (or advise the YD35 Operator to close) 35L3T1 breaker
- Close (or advise the TM28 Operator to close) 28AL3 breaker

3.10. To restore TM3YD line to service after automatic outage

If TM3YD line trips auto due to fault on the line:

TM28 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 YD35 Operator to energize) the line **ONCE** by closing 35L3T1 breaker

- Close (or advise the TM28 Operator to close) 28AL3 breaker

TM28 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 AD4TM line out of service

SCC shall carry out (or advise the TM28 Operator to carry out) the following:

- Open 28L4A breaker

SCC shall carry out (or advise the AD81 Operator to carry out) the following:

- Open 81L4D and 81L4T1 breakers

- Check for no potential on AD4TM line

3.12. To take out, isolate and de-energize AD4TM line for work

- TM28 Operator request for Station Guarantee from AD81

SCC shall carry out (or advise the TM28 Operator to carry out) the following:

- Open 28L4A breaker

- Open 28L4R1 breaker

SCC shall carry out (or advise AD81 Operator to carry out) the following:

- Open 81L4D and 81L4T1 breakers

- Check for no potential on AD4TM line

SCC shall advise AD81 Operator to carry out the following:

- Open 81L4D-L4 and 81L4T1-L4 disconnect switches and turn off 125Vdc supply

- Close 81AD4TM-G ground disconnect switch

SCC shall advise TM28 Operator to carry out the following:

- Verify opened 28L4-D transfer disconnect switch and turn off its 125Vdc supply

- Open 28L4A-L4 disconnect switch and turn off its 125Vdc supply

- Close 28AD4TM-G ground disconnect switch

3.13. To restore AD4TM line to service after work

3.13.1. Prepare AD4TM line for restoration:

TM28 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 AD4TM line

SCC shall advise AD81 Operator to carry out the following:

- Check opened 81L4D and 81L4T1 breakers

- Open 81AD4TM-G ground disconnect switch

- Turn on 125Vdc supply and close 81L4D-L4 and 81L4T1-L4 disconnect switches

SCC shall advise TM28 Operator to carry out the following:

- Check opened 28L4R1 breaker

- Check opened 28L4A breaker

- Open 28AD4TM-G ground disconnect switch

- Check opened 28L4-D transfer disconnect switch and turn on its 125Vdc supply

- Turn on 125Vdc supply and close 28L4A-L4 disconnect switch

3.13.2. Restoration of AD4TM line to service:

SCC shall:

- Advise the AD81 and TM28 Operators of readiness to restore AD4TM line to service

- Close (or advise the AD81 Operator to close) 81L4D and 81L4T1

breakers

- Close (or advise the TM28 Operator to close) 28L4A breaker
- Close (or advise the TM28 Operator to close) 28L4R1 breaker, if system voltage is high (170kV).

3.14. To restore AD4TM line to service after automatic outage

If AD4TM line trips auto due to fault on the line:

TM28 Operator shall:

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

SCC shall:

- Eenergize (or advise the AD81 Operator to energize) the line **ONCE** by closing 81L4D and 81L4T1 breakers
- Close (or advise the TM28 Operator to close) 28L4A breaker
- Close (or advise the TM28 Operator to close) 28L4R1 breaker, if system voltage is high (170kV).

TM28 Operator shall:

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

3.15. To take AD5TM line out of service

SCC shall carry out (or advise the TM28 Operator to carry out) the following:

- Open 28L5A breaker

SCC shall carry out (or advise the AD81 Operator to carry out) the following:

- Open 81L5D and 81L5A breakers
- Check for no potential on AD5TM line

3.16. To take out, isolate and de-energize AD5TM line for work

- TM28 Operator request for Station Guarantee from AD81

SCC shall carry out (or advise the TM28 Operator to carry out) the following:

- Open 28L5A breaker

SCC shall carry out (or advise AD81 **Operator** to carry out) the following:

- Open 81L5D and 81L5A breakers
- Check for no potential on AD5TM line

SCC shall advise AD81 **Operator** to carry out the following:

- Open 81L5D-L5 and 81L5A-L5 disconnect switches and turn off 125Vdc supply
- Close 81AD5TM-G ground disconnect switch

SCC shall advise TM28 Operator to carry out the following:

- Verify opened 28L5-D transfer disconnect switch and turn off its 125Vdc supply
- Open 28L5A-L5 disconnect switch and turn off its 125Vdc supply
- Close 28AD5TM-G ground disconnect switch

3.17. To restore AD5TM line to service after work

3.17.1. Prepare AD5TM line for restoration:

TM28 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 AD5TM line

SCC shall advise AD81 Operator to carry out the following:

- Check opened 81L5D and 81L5A breakers

- Open 81AD5TM -G ground disconnect switch
- Turn on 125Vdc supply and close 81L5D-L5 and 81L5A-L5 disconnect switches

SCC shall advise TM28 Operator to carry out the following:

- Check opened 28L5A breaker
- Open 28AD5TM-G ground disconnect switch
- Turn on 125Vdc supply and close **28L4-D** transfer disconnect switch
- Turn on 125Vdc supply and close **28L5A–L5** disconnect switch

3.17.2. Restoration of AD5TM line to service:

SCC shall:

- Advise the AD81 and TM28 Operators of readiness to restore AD5TM line to service
- Close (or advise the AD81 Operator to close) 81L5D and 81L5A breakers
- Close (or advise the TM28 Operator to close) 28L5A breaker

3.18. To restore AD5TM line to service after automatic outage

If AD5TM **line** trips auto due to fault on the line:

TM28 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 81L5D and 81L5A breakers
- Close (or advise the TM28 Operator to close) 28L5A breaker

TM28 Operator shall:

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

3.19. To isolate 28T1 Bank for work

SCC shall advise TM28 Operator to carry out the following:

- Inform customers about readiness to take off 28T1 bank
- Request customers on 28T1 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 28T1 transformer auxiliaries
- Transfer Station Service from AC1 to AC2

SCC shall carry out (or advise TM28 Operator to carry out) the following:

- Open 28T1F1breaker
- Open 28T1F3breaker
- Open 28AT1 breaker
- Open 28AT1-T1 disconnect switch
- Open 28T1F1-T1 disconnect switch
- Open 28T1F3-T1 disconnect switch
- Verify opened 28D-T1 disconnect switch and turn off its 125Vdc supply
- Open 28AT1-T1 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 28T1 auxiliaries and tag
- Open 125VDC MCB to 28T1 primary and secondary protection and tag with PC128AL3
- Check for no potential on 28T1 Bank

3.20. To restore 28T1 Bank to service after work

3.20.1. Prepare 28T1 bank for restoration:

TM28 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 28T1 Bank and temporary grounds removed
- Close 28T1F1-T1 disconnect switch
- Close 28T1F3-T1 disconnect switch
- Check opened 28D-T1 disconnect switch and turn on its 125Vdc supply
- Turn on 125Vdc supply and close 28AT1-T1 disconnect switch
- Close AC control MCB to 28T1 auxiliaries and tag
- Close 125VDC MCB to 28T1 primary and secondary protection and tag with PC128AL3
- Advise SCC of readiness to restore 28T1 Bank to service

3.20.2. Restoration of 28T1 bank to service:

- SCC shall close (or advise TM28 Operator to close) the 28AT1 breaker
- TM28 Operator shall advise customers of readiness to restore 28T1 feeders to service
- SCC shall close (or advise TM28 Operator to close) the 28T1F1 and 28T1F3 breakers

3.21. To restore 28T1 Bank to service after automatic outage

If 28T1 bank trips auto due to fault:

TM28 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 TM28 Operator to energize) the transformer ONCE by closing 28AT1 breaker
- Advise customer of readiness to restore 28F1 and 28F3 Bus to service

- Close 28T1F1 and 28T1F3 breakers

TM28 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. See explanation.

3.22. To isolate 28T2 Bank for work

SCC shall advise TM28 Operator to carry out the following:

- Inform customers about readiness to take off 28T2 bank
- Request customers on 28T2 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 28T2 transformer auxiliaries
- Transfer Station Service from AC2 to AC1

SCC shall carry out (or advise TM28 Operator to carry out) the following:

- Open 28T2F2 breaker
- Open 28T2F4 breaker
- Open 28AT2 breaker
- Open 28AT2-T2 disconnect switch
- Open 28T2F2-T2 disconnect switch
- Open 28T2F4-T2 disconnect switch
- Verify opened 28D-T2 transfer disconnect switch and turn off its 125Vdc supply
- Open 28AT2-T2 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 28T2 auxiliaries and tag
- Open 125VDC MCB to 28T2 primary and secondary protection and tag with PC128AL3
- Check for no potential on 28T2 Bank

3.23. To restore 28T2 Bank to service after work

3.23.1. Prepare 28T2 bank for restoration:

TM28 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 28T2 Bank and temporary grounds removed
- Close 28T2F2-T2 disconnect switch
- Close 28T2F4-T2 disconnect switch
- Verify opened 28D-T2 transfer disconnect switch and turn on its 125Vdc supply
- Turn on 125Vdc supply and close 28AT2-T2 disconnect switch
- Close AC control MCB to 28T2 auxiliaries and tag
- Close 125VDC MCB to 28T2 primary and secondary protection and tag with PC128AL3
- Advise SCC of readiness to restore 28T2 Bank to service

3.23.2. Restoration of 28T2 bank to service:

- SCC shall close (or advise TM28 Operator to close) the 28AT2 breaker
- TM28 Operator shall advise customers of readiness to restore 28T2 feeder to service
- SCC shall close (or advise TM28 Operator to close) the 28T2F2 and 28T2F4 breakers

3.24. To restore 28T2 Bank to service after automatic outage

If 28T2 bank trips auto due to fault:

TM28 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 TM28 Operator to energize) the transformer ONCE by closing 28AT2 breaker
- Advise customer of readiness to restore 28F2 and 28F4 Bus to service
- Close 28T2F2 and 28T2F4 breakers

TM28 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. See explanation.

3.25. To isolate 28T3 Bank for work

SCC shall advise TM28 Operator to carry out the following:

- Inform customers about readiness to take off 28T3 bank
- Request customers on 28T3 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 28T3 transformer auxiliaries

SCC shall carry out (or advise TM28 Operator to carry out) the following:

- Open 28SCV1T3 breaker
- Open 28AT3 breaker
- Verify opened 28D-T3 transfer disconnect switch and turn off its 125Vdc supply
- Open 28AT3-T3 disconnect switch and turn off its 125Vdc supply
- Close 28SCV1T3-G ground disconnect switch
- Open AC control MCB to 28T3auxiliaries and tag
- Open 125VDC MCB to 28T3 primary and secondary protection and tag with PC13
- Check for no potential on 28T3 Bank

3.26. To restore 28T3 Bank to service after work

3.26.1. Prepare 28T3 bank for restoration:

TM28 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 28T3Bank and temporary grounds removed
- Check opened 28D-T3 transfer disconnect switch and turn on its 125Vdc supply
- Turn on 125Vdc supply and close 28AT3-T3 disconnect switch
- Close AC control MCB to 28T3 auxiliaries and tag
- Close 125VDC MCB to 28T3 primary and secondary protection and tag with PC13
- Advise SCC of readiness to restore 28T3 Bank to service

3.26.2. Restoration of 28T3 bank to service:

- SCC shall close (or advise TM28 Operator to close) the 28AT3 breaker
- TM28 Operator shall advise customers of readiness to restore 28T3 bank to service

3.27. To restore 28T3 Bank to service after automatic outage

If 28T3 bank trips auto due to fault:

TM28 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 TM28 Operator to energize) the transformer ONCE by closing 28AT3 breaker

TM28 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. See explanation.

3.28. To isolate 28R1 Bank for work

SCC shall carry out (or advise TM28 Operator to carry out) the following:

- Open AC1 Contactor/MCB to take off supply to 28R1 Reactor auxiliaries
- Place 28R1 Reactor at tap position 9
- Open 28L4R1 breaker
- Open 28L4R1-R1 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 28R1 auxiliaries and tag
- Open 125VDC MCB to 28R1 primary and secondary protection and tag with PC13
- Check for no potential on 28R1

3.29. To restore 28R1 Bank to service after work

3.29.1. Prepare 28R1 bank for restoration:

TM28 Operator shall:

- Check for no potential on 28R1 Reactor and temporary grounds removed
- Turn on 125Vdc supply and close 28L4R1-R1 disconnect switch
- Close AC control MCB to 28R1 auxiliaries and tag
- Close 125VDC MCB to 28R1 primary and secondary protection and tag with PC13
- Advise SCC of readiness to restore 28R1 Reactor to service

3.29.2. Restoration of 28R1 bank to service:

- SCC shall close (or advise TM28 Operator to close) the 28L4R1 breaker
- TM28 Operator shall advise customers of readiness to restore 28R1 Reactor to service
- Close the Reactor breaker, if feeder voltage is +8.25% of 161kV

3.30. To isolate 28R2 Bank for work

SCC shall carry out (or advise TM28 Operator to carry out) the following:

- Open AC1 Contactor/MCB to take off supply to 28R2 Reactor auxiliaries
- Place 28R2 Reactor at tap position 9
- Open 28AR2 breaker
- Open 28AR2-R2 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 28R2 auxiliaries and tag
- Open 125VDC MCB to 28R2 primary and secondary protection and tag with PC13
- Check for no potential on 28R2 Reactor

3.31. To restore 28R2 Bank to service after work

3.31.1. Prepare 28R2 bank for restoration:

TM28 Operator shall:

- Check for no potential on 28R1 Reactor and temporary grounds removed
- Turn on 125Vdc supply and close 28AR2-R2 disconnect switch
- Close AC control MCB to 28R2 auxiliaries and tag
- Close 125VDC MCB to 28R2 primary and secondary protection and tag with PC13
- Advise SCC of readiness to restore 28R2 Reactor to service

3.31.2. Restoration of 28R1 bank to service:

- SCC shall close (or advise TM28 Operator to close) the 28AR2 breaker
- Close the Reactor breaker, if feeder voltage is +8.25% of 161kV

3.32. To Isolate 28T1F1 Breaker for work

- TM28 Operator shall request Station Guarantee from customer on 28T1F1 Bus

SCC shall carry out (or advise TM28 Operator to carry out) the following:

- Open 28T1F1 breaker

SCC shall advise TM28 Operator to carry out the following:

- Open 28T1F1-T1 disconnect switch
- Open 28T1F1-F1 disconnect switch
- Check for no potential on 28T1F1 breaker

3.33. To restore 28T1F1 Breaker to service after work

3.33.1. Prepare 28T1F1 breaker for restoration:

TM28 Operator shall:

- Advise SCC when work on the 28T1F1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 28T1F1 Breaker and temporary grounds removed
- Close 28T1F1-T1 disconnect switch
- Close 28T1F1-F1 disconnect switch

3.33.2. Restoration of 28T1F1 breaker to service:

- TM28 Operator shall advise customers of readiness to restore 28T1F1 Bus to service
- SCC shall close (or advise TM28 Operator to close) the 28T1F1 breaker

3.34. To Isolate 28T1F3 Breaker for work

- TM28 Operator shall request Station Guarantee from customer on 28T1F3 Bus

SCC shall carry out (or advise TM28 Operator to carry out) the following:

- Open 28T1F3 breaker

SCC shall advise TM28 Operator to carry out the following:

- Open 28T1F3-T1 disconnect switch
- Open 28T1F3-F3 disconnect switch

- Check for no potential on 28T1F3 Breaker

3.35. To restore 28T1F3 Breaker to service after work

3.35.1. Prepare 28T1F3 breaker for restoration:

TM28 Operator shall:

- Advise SCC when work on the 28T1F3 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 28T1F3 Breaker and temporary grounds removed
- Close 28T1F3-T1 disconnect switch
- Close 28T1F3-F3 disconnect switch

3.35.2. Restoration of 28T1F3 breaker to service:

- TM28 Operator shall advise customers of readiness to restore 28T1F3 Bus to service
- SCC shall close (or advise TM28 Operator to close) the 28T1F3 breaker

3.36. To Isolate 28T2F2 Breaker for work

- TM28 Operator shall request Station Guarantee from customer on 28T2F2 Bus

SCC shall carry out (or advise TM28 Operator to carry out) the following:

- Open 28T2F2 breaker

SCC shall advise TM28 Operator to carry out the following:

- Open 28T2F2-T2 disconnect switch
- Open 28T2F2-F2 disconnect switch
- Check for no potential on 28T2F2 Breaker

3.37. To restore 28T2F2 Breaker to service after work

3.37.1. Prepare 28T2F2 breaker for restoration:

TM28 Operator shall:

- Advise SCC when work on the 28T2F2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 28T2F2 Breaker and temporary grounds removed

- Close 28T2F2-T2 disconnect switch

- Close 28T2F2-F2 disconnect switch

3.37.2. Restoration of 28T2F2 breaker to service:

- TM28 Operator shall advise customers of readiness to restore 28T2F2 Bus to service

- SCC shall close (or advise TM28 Operator to close) the 28T2F2 breaker

3.38. To Isolate 28T2F4 Breaker for work

- TM28 Operator shall request Station Guarantee from customer on 28T2F4 Bus

SCC shall carry out (or advise TM28 Operator to carry out) the following:

- Open 28T2F4 breaker

SCC shall advise TM28 Operator to carry out the following:

- Open 28T2F4-T2 disconnect switch

- Open 28T2F4-F4 disconnect switch

- Check for no potential on 28T2F4 Breaker

3.39. To restore 28T2F4 Breaker to service after work

3.39.1. Prepare 28T2F4 breaker for restoration:

TM28 Operator shall:

- Advise SCC when work on the 28T2F4 breaker has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 28T2F4 Breaker and temporary grounds removed

- Close 28T2F4-T2 disconnect switch

- Close 28T2F4-F4 disconnect switch

3.39.2. Restoration of 28T2F4 breaker to service:

- TM28 Operator shall advise customers of readiness to restore 28T2F4 Bus to service

- SCC shall close (or advise TM28 Operator to close) the 28T2F4 breaker

3.40. To isolate 28SVC1 for work

SCC shall carry out (or advise TM28 Operator to carry out) the following:

- Open 28SVC1T3 breaker

- Open 28AT3 breaker

SCC shall advise TM28 Operator to carry out the following:

- Verify opened 28D-T3 transfer disconnect switch and turn off its 125Vdc supply

- Open 28AT3-T3 disconnect switch

- Close 28SVC1T3-G ground disconnect switch

3.41. To restore 28SVC1 to service after work

3.41.1. Prepare 28SC1 Cap Bank for restoration:

TM28 Operator shall:

- Advise SCC when work on the 28SVC1 has been completed and permit(s) surrendered (including all Station Guarantees)

- Check for no potential on 28SVC1 and temporary grounds removed

- Open 28SVC1T3-G ground disconnect switch

- Check opened 28D-T3 transfer disconnect switch and turn on its 125Vdc supply

- Turn on 125Vdc supply and close 28AT3-T3 disconnect switch

3.41.2. Restoration of 28SVC1 to service:

- TM28 Operator shall advise customers of readiness to restore 28SVC1 to service

- SCC shall close (or advise TM28 Operator to close) the 28AT3 and 28SVC1T3 breakers

4. Explanation

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

- Transformer differential lockout relay-86T
- Transformer Bucholtz relay or high temperature lockout relay-86G
- Transformer overcurrent back up relays

a. If 86T operates, the breakers which have opened auto, cannot be reclosed until the lockout relay has been reset or the lockout feature has been by-passed.

- Carry out thorough inspection of the Transformer and the 28AL34kV 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 AD4TM, AD5TM, TM2BG and TM3YD lines, 28T1, 28T2 and 28T3transformers, 28SVC1, 28R1 and 28R2 Reactors. The 'D' bus provides the necessary by-pass route for only one circuit at a time.

The Static Var Compensator (28SVC1) injects VARs into the system to improve the voltage profile and is connected through the 28T3 transformer.

5. Approval

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Director, TSD