TD-OP-0032

GRIDCo

OPERATING PROCEDURE FOR TAKORADI THERMAL POWER SUBSTATION (161KkV)

GHANA GRID COMPANY LTD

TECHNICAL DIRECTIVES

Title:	**OPERATING PROCEDURE FOR TAKORADI THERMAL POWER SUBSTATION (TT32)**		
Issued To:	Director, System Operations Director, SNS Manager, SCC Manager, Dispatch Operations Area Manager, Takoradi Thermal Operating Staff, Takoradi Thermal Maintenance Staff, Takoradi Thermal Dispatch Staff, SCC	**Number:**	TD-OP-0032
		Subject Area:	Operating
		Issue Date:	Trial
		Origin:	Technical Services
Key Words:	Take Out, Isolate, Prepare, Energize, Restore, Automatic Outage		

Contents

TECHNICAL DIRECTIVES

1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at TT32 Substation to service for planned and auto outages.

2. Scope

The directive will be used by Operators at Takoradi Thermal Operating Area and System Control Center (SCC) for operation of equipment at TT32 Substation.

3. Procedure

3.1. To take AG1TT line out of service

SCC shall carry out (or advise the TT32 Operator to carry out) the following:

- Open 32L1D and 32L1T4 breakers

SCC shall advise AG74 Operator to carry out the following:

- Open 74AL1 breaker
- Check for no potential on AG1TT line

3.2. To take out, isolate and de-energize AG1TT line for work

- TT32 Operator shall request for Station Guarantee from AG74

SCC shall carry out (or advise the TT32 Operator to carry out) the following:

- Open 32L1D and 32L1T4 breakers

SCC shall advise AG74 Operator to carry out the following:

- Open 74AL1 breaker
- Check for no potential on AG1TT line

SCC shall advise AG74 Operator to carry out the following:

- Open 74AL1-L1 disconnect switch and turn off its125Vdc supply
- Close 74AG1TT-G ground disconnect switch

SCC shall advise TT32 Operator to carry out the following:

- Open 32L1D-L1 and 32L1T4-L1 disconnect switches and turn off its125Vdc supply
- Close 1AG1TT-G ground disconnect switch

3.3. To restore AG1TT line to service after work

3.3.1. Prepare AG1TT line for restoration

TT32 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 AG1TT line

SCC shall advise AG74 Operator to carry out the following

- Check opened 74AL1 breaker
- Open 74AG1TT-G ground disconnect switch
- Turn on 125Vdc supply and close 74AL1-L1 disconnect switch

SCC shall advise TT32 Operator to carry out the following:

- Check opened 32L1D and 32L1T4 breakers
- Open 32AG1TT-G ground disconnect switch
- Turn on 125Vdc supply and close 32L1D-L1 and 32L1T4-L1 disconnect switches

3.3.2. Restoration of AG1TT line to service:

SCC shall:

- Advise the TT32 and AG74 Operators of readiness to restore AG1TT line to service
- Close (or advise the AG74 Operator to close) 74AL1 breaker
- Close (or advise the TT32 Operator to close) 32L1D and 32L1T4 breakers

3.4. To restore AG1TT line to service after automatic outage

If AG1TT line trips auto due to fault:

TT32 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 AG74 Operator to energize) the line **ONCE** by closing 74AL1 breaker

- Close (or advise the TT32 Operator to close) 32L1D and 32L1T4 breakers

TT32 Operator shall:

- Advise the Supervisor/Manager of operation above

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

3.5. To take AG2TT line out of service

SCC shall carry out (or advise the TT32 Operator to carry out) the following:

- Open 32L2D and 32L2T9 breakers

SCC shall carry out (or advise the AG74 Operator to carry out) the following:

- Open 74AL2 breaker

- Check for no potential on AG2TT line

3.6. To take out, isolate and de-energize AG2TT line for work

- TT32 Operator shall request for Station Guarantee from AG74

SCC shall carry out (or advise the TT32 Operator to carry out) the following:

- Open 32L2T9 and 32L2D breakers

SCC shall carry out (or advise the AG74 Operator to carry out) the following:

- Open 74AL2 breaker

- Check for no potential on AG2TT line

SCC shall advise AG74 Operator to carry out the following:

- Open 74AL2-L2 disconnect switch and turn off its 125Vdc supply

- Close 74AG2TT-G ground disconnect switch

SCC shall advise TT32 Operator to carry out the following:

- Open 32L2T9-L2 and 32L2D-L2 disconnect switches and turn off 125Vdc supply
- Close 32AG2TT-G ground disconnect switch

3.7. To restore AG2TT line to service after work

3.7.1. Prepare AG2TT line for restoration

TT32 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 AG2TT line

SCC shall advise AG74 Operator to carry out the following:

- Check opened 74AL2 breaker
- Open 59AG2TT-G ground disconnect switch
- Turn on 125Vdc supply and close 74AL2-L2 disconnect switch

SCC shall advise TT32 Operator to carry out the following:

- Check opened 32L2T9 and 32L2D breakers
- Open 32AG2TT-G ground disconnect switch
- Turn on 125Vdc supply and close 32L2T9-L2 and 32L2D-L2 disconnect switches

3.7.2. Restoration of AG2TT line to service:

SCC shall:

- Advise the TT32 and AG74 Operators of readiness to restore AG2TT line to service
- Close (or advise the TT32 Operator to close) 32L2T9 and 32L2D breakers
- Close (or advise the AG74 Operator to close) 74AL2 breaker

3.8. To restore AG2TT line to service after automatic outage

If AG2TT line trips auto due to fault:

TT32 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 AG74 Operator to energize) the line **ONCE** by closing 74AL2 breaker
- Close (or advise the TT32 Operator to close) 32L2T9 and 32L2D breakers

TT32 Operator shall:

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

3.9. To take TT3T line out of service

SCC shall carry out (or advise the TT32 Operator to carry out) the following:

- Open 32DL3 and 32T2L3 breakers

SCC shall carry out (or advise the T8 Operator to carry out) the following:

- Open 8L3A and 8L3T1 breakers
- Check for no potential on TT3T line

3.10. To take out, isolate and de-energize TT3T line for work

- TT32 Operator shall request for Station Guarantee from T8

SCC shall carry out (or advise the TT32 Operator to carry out) the following:

- Open 32T2L3 and 32DL3 breakers

SCC shall carry out (or advise the T8 Operator to carry out) the following:

- Open 8L3A and 8L3T1 breakers
- Check for no potential on TT3T line

SCC shall advise TT32 Operator to carry out the following:

- Open 32T2L3-L3 and 32DL3-L3 disconnect switches and turn off its125Vdc supply
- Close 32TT3T-G ground disconnect switch

SCC shall advise T8 Operator to carry out the following:

- Open 8L3A-L3 and 8L3T1 –L3 disconnect switches and turn off its 125Vdc supply

- Close 8TT3T-G ground disconnect switch

3.11. To restore TT3T line to service after work

3.11.1. Prepare TT3T line for restoration

TT32 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 TT3T line

SCC shall advise T8 Operator to carry out the following:

- Check opened 8L3A and 8L3T1 breakers

- Open 8TT3T-G ground disconnect switch

- Turn on 125Vdc supply and close 8L3A–L3 and 8L3T1–L3 disconnect switches

SCC shall advise TT32 Operator to carry out the following:

- Check opened 32T2L3 and 32DL3 breakers

- Open 32TT3T-G ground disconnect switch

- Turn on 125Vdc supply and close 32T2L3-L3 and 32DL3-L3 disconnect switches

3.11.2. Restoration of TT3T line to service:

SCC shall:

- Advise the TT32 and T8 Operators of readiness to restore TT3T line to service

- Close (or advise the T8 Operator to close) 8L3A and 8L3T1 breakers

- Close (or advise the TT32 Operator to close) 32T2L3 and 32DL3 breakers

3.12. To restore TT3T line to service after automatic outage

If TT3T line trips auto due to fault:

TT32 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 TT32 Operator to energize) the line **ONCE** by closing 32T2L3 and 32DL3 breakers
- Close (or advise the T8 Operator to close) 8L3A and 8L3T1 breakers

TT32 Operator:

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

3.13. To take TT4T line out of service

SCC shall carry out (or advise the TT32 Operator to carry out) the following:

- Open 32DL4 and 32T3L4 breakers

SCC shall carry out (or advise the T8 Operator to carry out) the following:

- Open 8L4A and 8L4T3 breakers
- Check for no potential on TT4T line

3.14. To take out, isolate and de-energize TT4T line for work

- TT32 Operator shall request for Station Guarantee from T8

SCC shall carry out (or advise the TT32 Operator to carry out) the following:

- Open 32DL4 and 32T3L4 breakers

SCC shall carry out (or advise the T8 Operator to carry out) the following:

- Open 8L4A and 8L4T3 breakers
- Check for no potential on TT4T line

SCC shall advise TT32 Operator to carry out the following:

- Open 32DL4-L4 and 32T3L4-L4 disconnect switches and turn off its125Vdc supply

- Close 32TT4T-G ground disconnect switch

SCC shall advise T8 Operator to carry out the following:

- Open 8L4A-L4 and 8L4T3-L4 disconnect switches and turn off its125Vdc supply

- Close 8TT4T-G ground disconnect switch

3.15. To restore TT4T line to service after work

3.15.1. Prepare TT4T line for restoration

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

- Check for no potential on TT4T line

SCC shall advise T8 Operator to carry out the following:

- Check opened 8L4A and 8L4T3 breakers

- Open 8TT4T-G ground disconnect switch

- Turn on 125Vdc supply and close 8L4A-L4 and 8L4T3-L4 disconnect switches

SCC shall advise TT32 Operator to carry out the following:

- Check opened 32T3L4 and 32DL4 breakers

- Open 32TT4T-G ground disconnect switch

- Turn on 125Vdc supply and close 32DL4-L4 and 32T3L4-L4 disconnect switches

3.15.2. Restoration of TT4T line to service:

SCC shall:

- Advise the TT32 and T8 Operators of readiness to restore TT4T line to service

- Close (or advise the T8 Operator to close) 8L4A and 8L4T3 breakers

- Close (or advise the TT32 Operator to close) 32T3L4 and 32DL4 breakers

3.16. To restore TT4T line to service after automatic outage

If TT4T line trips auto due to fault:

TT32 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 T8 Operator to energize) the line **ONCE** by closing 8L4A and 8L4T3 breakers
- Close (or advise the TT32 Operator to close) 32T3L4 and 32DL4 breakers

TT32 Operator shall:

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

3.17. To take TT5R line out of service

SCC shall carry out (or advise the TT32 Operator to carry out) the following:

- Open 32DL5 and 32TSS2L5 breakers

SCC shall advise R9 Operator to carry out the following:

- Open 9L5A and 9L5T3 breakers
- Check for no potential on TT5R line

3.18. To take out, isolate and de-energize TT5R line for work

- TT32 Operator shall request for Station Guarantee from T8

SCC shall carry out (or advise the TT32 Operator to carry out) the following:

- Open 32TSS2L5 and 32DL5 breakers

SCC shall advise R9 Operator to carry out the following:

- Open 9L5A and 9L5T3 breakers

- Check for no potential on TT5R line

SCC shall advise TT32 Operator to carry out the following:

- Open 32TSS2L5-L5 and 32DL5-L5 disconnect switches and turn off its 125Vdc supply

- Close 32TT5R-G ground disconnect switch

SCC shall advise R9 Operator to carry out the following:

- Open 9L5A-L5 and 9L5T3-L5 disconnect switches and turn off its 125Vdc supply

- Close 9TT5R-G ground disconnect switch

3.19. To restore TT5R line to service after work

3.19.1. Prepare TT5R line for restoration

TT32 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 TT5R line

SCC shall advise R9 Operator to carry out the following

- Check opened 9L5A and 9L5T3 breakers

- Open 9TT5R-G ground disconnect switch

- Turn on 125Vdc supply and close 9L5A-L5 and 9L5T3-L5 disconnect switches

SCC shall advise TT32 Operator to carry out the following:

- Check opened 32TSS2L5 and 32DL5 breakers

- Open 32TT5R-G ground disconnect switch

- Turn on 125Vdc supply and close 32TSS2L5-L5 and 32DL5-L5 disconnect switches

3.19.2. Restoration of TT5R line to service:

SCC shall:

- Advise the TT32 and R9 Operators of readiness to restore TT5R line to service

- Close (or advise the R9 Operator to close) 9L5A and 9L5T3 breakers
- Close (or advise the TT32 Operator to close) 32TSS2L5 and 32DL5 breakers

3.20. To restore TT5R line to service after automatic outage

If TT5R line trips auto due to fault:

TT32 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 TT32 Operator to energize) the line **ONCE** by closing 32TSS2L5 and 32DL5 breakers
- Close (or advise the R9 Operator to close) 9L5A and 9L5T3 breakers

TT32 Operator shall:

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

3.21. To take TT6TE line out of service

SCC shall carry out (or advise the TT32 Operator to carry out) the following:

- Open 32L6D and 32T1L6 breakers

SCC shall advise TE66 Operator to carry out the following:

- Open 66DL6 breaker
- Check for no potential on TT6TE line

3.22. To take out, isolate and de-energize TT6TE line for work

- TT32 Operator shall request for Station Guarantee from T8

SCC shall carry out (or advise the TT32 Operator to carry out) the following:

- Open 32T1L6 and 32L6D breakers

SCC shall carry out (or advise TE66 Operator to carry out) the following:

- Open 66DL6 breaker
- Check for no potential on TT6TE line

SCC shall advise TT32 Operator to carry out the following:

- Open 32T1L6-L6 and 32L6D-L6 disconnect switches and turn off its 125Vdc supply
- Close 32TT6TE-G ground disconnect switch

SCC shall advise TE66 Operator to carry out the following:

- Open 66DL6-L6 disconnect switch and turn off its 125Vdc supply
- Close 66TT6TE-G ground disconnect switch

3.23. To restore TT6TE line to service after work

3.23.1. Prepare TT6TE line for restoration

TT32 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 TT6TE line

SCC shall advise TE66 Operator to carry out the following

- Check opened 66DL6 breaker
- Open 66TT6TE-G ground disconnect switch
- Turn on 125Vdc supply and close 66DL6-L6 disconnect switch

SCC shall advise TT32 Operator to carry out the following:

- Check opened 32T1L6 and 32L6D breakers
- Open 32TT6TE-G ground disconnect switch
- Turn on 125Vdc supply and close 32T1L6-L6 and 32L6D-L6 disconnect switches

3.23.2. Restoration of TT6TE line to service:

SCC shall:

- Advise the TT32 and TE66 Operators of readiness to restore TT6TE line to service
- Close (or advise the TE66 Operator to close) 66DL6 breaker
- Close (or advise the TT32 Operator to close) 32T1L6 and 32L6D breakers

3.24. To restore TT6TE line to service after automatic outage

If TT6TE line trips auto due to fault:

TT32 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 TT32 Operator to energize) the line **ONCE** by closing 32T1L6 and 32L6D breakers
- Close (or advise the TE66 Operator to close) 66DL6 breaker

TT32 Operator shall:

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

3.25. To take TT7TE line out of service

SCC shall carry out (or advise the TT32 Operator to carry out) the following:

- Open 32L7D and 32TSS1L7 breakers

SCC shall advise TE66 Operator to carry out the following:

- Open 66DL7 breaker
- Check for no potential on TT7TE line

3.26. To take out, isolate and de-energize TT7TE line for work

- TT32 Operator shall request for Station Guarantee from TE66

SCC shall carry out (or advise the TT32 Operator to carry out) the following:

- Open 32TSS1L7 and 32L7D breakers

SCC shall advise TE66 Operator to carry out the following:

- Open 66DL7 breaker
- Check for no potential on TT7TE line

SCC shall advise TT32 Operator to carry out the following:

- Open 32TSS1L7-L7 and 32L7D-L7 disconnect switches and turn off its 125Vdc supply
- Close 32TT7TE-G ground disconnect switch

SCC shall advise TE66 Operator to carry out the following:

- Open 66DL7-L7 disconnect switch and turn off its 125Vdc supply
- Close 66TT7TE-G ground disconnect switch

3.27. To restore TT7TE line to service after work

3.27.1. Prepare TT7TE line for restoration

TT32 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 TT7TE line

SCC shall advise TE66 Operator to carry out the following

- Check opened 66DL7 breaker
- Open 66TT7TE-G ground disconnect switch
- Turn on 125Vdc supply and close 66DL7-L7 disconnect switch

SCC shall advise TT32 Operator to carry out the following:

- Check opened 32TSS1L7 and 32L7D breakers
- Open 32TT7TE-G ground disconnect switch

- Turn on 125Vdc supply and close 32TSS1L7-L7 and 32L7D-L7 disconnect switches

3.27.2. Restoration of TT7TE line to service:

SCC shall:

- Advise the TT32 and TE66 Operators of readiness to restore TT7TE line to service
- Close (or advise the TE66 Operator to close) 66DL7 breaker
- Close (or advise the TT32 Operator to close) 32TSS1L7 and 32L7D breakers

3.28. To restore TT7TE line to service after automatic outage

If TT7TE line trips auto due to fault:

TT32 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 TT32 Operator to energize) the line **ONCE** by closing 32TSS1L7 and 32L7D breakers
- Close (or advise the TE66 Operator to close) 66DL7 breaker

TT32 Operator shall:

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

3.29. To isolate 32T1 Transformer for work

- TT32 Operator shall request Station Guarantee from Customers on 32T1

SCC shall carry out or advise TT32 operator to carry out the following:

- Inform customers about readiness to take off 32T1 Bank

- Request customers on 32T1 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 32T1 transformer auxiliaries

SCC shall carry out (or advise TT32 Operator to carry out) the following:

- Open 32T1A and 32T1L6 breakers
- Shut down 32G1

TT32 Operator shall:

- Check for no potential on 32T1 Bank
- Open 32T1A-T1 and 32T1L6-T1 disconnect switches
- Open AC control MCB to 32T1 auxiliaries and tag
- Open 125V DC MCB to 32T1 primary and secondary protection and tag with PC13

3.30. To restore 32T1 Bank to service

3.30.1. Prepare 32T1 Bank restoration:

TT32 Operation shall:

- Advise SCC when work on the bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 32T1 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 32T1A-T1 and 32T1L6-T1 disconnect switches
- Close AC control MCB to 32T1 auxiliaries and remove tag
- Close 125V DC MCB to 32T1 primary and secondary protection and remove PC13 tag
- Advise SCC and Customers of readiness to energize 32T1 bank

3.30.2. Restoration of 32T1 Bank:

- Start 32G1
- SCC shall close (or advise TT32 Operator to close) the 32T1A and 32T1L6 breakers
- TT32 Operator shall advise Customer of restoration of 32T1 to service

3.31. To restore 32T1 Bank to service after automatic outage

If 32T1 Bank trips auto due to fault:

TT32 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 TT32 Operator to energize) the bank **ONCE** by closing 32T1A and 32T1L6 breakers
- Advise Customer of restoration of 32T1 to service

TT32 Operator shall:

- Advise the Supervisor/ Manager and SCC of operation above
- Isolate the Transformer for maintenance men to work on the equipment if operation above is not successful. See Explanation.

3.32. To isolate 32T2 Transformer for work

- TT32 Operator shall request Station Guarantee from Customers on 32T2

SCC shall carry out or advise TT32 operator to carry out the following:

- Inform customers about readiness to take off 32T2 Bank
- Request customers on 32T2 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 32T2 transformer auxiliaries

SCC shall carry out (or advise TT32 Operator to carry out) the following:

- Open 32T2A and 32T2L3 breakers
- Shut down 32G2

TT32 Operator shall:

- Check for no potential on 32T2 Bank
- Open 32T2A-T2 and 32T2L3-T2 disconnect switches

- Open AC control MCB to 32T2 auxiliaries and tag
- Open 125V DC MCB to 32T2 primary and secondary protection and tag with PC13

3.33. To restore 32T2 Bank to service

3.33.1. Prepare 32T2 Bank restoration:

TT32 Operation shall:

- Advise SCC when work on the bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 32T2 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 32T2A-T2 and 32T2L3-T2 disconnect switches
- Close AC control MCB to 32T2 auxiliaries and remove tag
- Close 125V DC MCB to 32T2 primary and secondary protection and remove PC13 tag
- Advise SCC and Customers of readiness to energize 32T2 bank

3.33.2. Restoration of 32T2 Bank:

- Start 32G2
- SCC shall close (or advise TT32 Operator to close) the 32T2A and 32T2L3 breakers
- TT32 Operator shall advise Customer of restoration of 32T2 to service

3.34. To restore 32T2 Bank to service after automatic outage

If 32T2 Bank trips auto due to fault:

TT32 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 TT32 Operator to energize) the bank **ONCE** by

closing 32T2A and 32T2L3 breakers

- Advise Customer of restoration of 32T2 to service

TT32 Operator shall:

- Advise the Supervisor/Manager and SCC of operation above
- Isolate the Transformer for maintenance men to work on the equipment if operation above is not successful. See Explanation.

3.35. To isolate 32T3 Transformer for work

- TT32 Operator shall request Station Guarantee from Customers on 32T3

SCC shall carry out or advise TT32 operator to carry out the following:

- Inform customers about readiness to take off 32T3 Bank
- Request customers on 32T3 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 32T3 transformer auxiliaries

SCC shall carry out (or advise TT32 Operator to carry out) the following:

- Open 32T3A and 32T3L4 breakers
- Shut down 32G3

TT32 Operator shall:

- Check for no potential on 32T3 Bank
- Open 32T3A-T3 and 32T3L4-T3 disconnect switches
- Open AC control MCB to 32T3 auxiliaries and tag
- Open 125V DC MCB to 32T3 primary and secondary protection and tag with PC13

3.36. To restore 32T3 Bank to service

3.36.1. Prepare 32T3 Bank restoration:

TT32 Operation shall:

- Advise SCC when work on the bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 32T3 Bank and temporary grounds removed

- Turn on 125Vdc supply and close 32T3A-T3 and 32T3L4-T3 disconnect switches
- Close AC control MCB to 32T3 auxiliaries and remove tag
- Close 125V DC MCB to 32T3 primary and secondary protection and remove PC13 tag
- Advise SCC and Customers of readiness to energize 32T3 bank

3.36.2. Restoration of 32T3 Bank:

- Start 32G3
- SCC shall close (or advise TT32 Operator to close) the 32T3A and 32T3L4 breakers
- TT32 Operator shall advise Customer of restoration of 32T3 to service

3.37. To restore 32T3 Bank to service after automatic outage

If 32T3 Bank trips auto due to fault:

TT32 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 TT32 Operator to energize) the bank **ONCE** by closing 32T3A and 32T3L4 breakers
- Advise Customer of restoration of 32T3 to service

TT32 Operator shall:

- Advise the Supervisor/Manager and SCC of operation above
- Isolate the Transformer for maintenance men to work on the equipment if operation above is not successful. See Explanation.

3.38. To isolate 32T4 Transformer for work

- TT32 Operator shall request Station Guarantee from Customers on 32T4

SCC shall carry out or advise TT32 operator to carry out the following:

- Inform customers about readiness to take off 32T4 Bank
- Request customers on 32T4 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 32T4 transformer auxiliaries

SCC shall carry out (or advise TT32 Operator to carry out) the following:

- Open 32T4A and 32L1T4 breakers
- Shut down 32G4

TT32 Operator shall:

- Check for no potential on 32T4 Bank
- Open 32T4A-T4 and 32L1T4-T4 disconnect switches
- Open AC control MCB to 32T4 auxiliaries and tag
- Open 125V DC MCB to 32T4 primary and secondary protection and tag with PC13

3.39. To restore 32T4 Bank to service

3.39.1. Prepare 32T4 Bank restoration:

TT32 Operation shall:

- Advise SCC when work on the bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 32T4 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 32T4A-T4 and 32L1T4-T4 disconnect switches
- Close AC control MCB to 32T4 auxiliaries and remove tag
- Close 125V DC MCB to 32T4 primary and secondary protection and remove PC13 tag
- Advise SCC and Customers of readiness to energize 32T4 bank

3.39.2. Restoration of 32T4 Bank:

- Start 32G4
- SCC shall close (or advise TT32 Operator to close) the 32T4A and 32L1T4 breakers

- TT32 Operator shall advise Customer of restoration of 32T4 to service

3.40. To restore 32T4 Bank to service after automatic outage

If 32T4 Bank trips auto due to fault:

TT32 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 TT32 Operator to energize) the bank **ONCE** by closing 32T4A and 32L1T4 breakers
- Advise Customer of restoration of 32T4 to service

TT32 Operator shall:

- Advise the Supervisor/Manager and SCC of operation above
- Isolate the Transformer for maintenance men to work on the equipment if operation above is not successful. See Explanation.

3.41. To isolate 32T5 Transformer for work

- TT32 Operator shall request Station Guarantee from Customers on 32T5

SCC shall carry out or advise TT32 operator to carry out the following:

- Inform customers about readiness to take off 32T5 Bank
- Request customers on 32T5 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 32T5 transformer auxiliaries

SCC shall carry out (or advise TT32 Operator to carry out) the following:

- Open 32T5A and 32T5T7 breakers
- Shut down 32G5

TT32 Operator shall:

- Check for no potential on 32T5 Bank

- Open 32T5A-T5 and 32T5T7-T5 disconnect switches
- Open AC control MCB to 32T5 auxiliaries and tag
- Open 125V DC MCB to 32T5 primary and secondary protection and tag with PC13

3.42. To restore 32T5 Bank to service

3.42.1. Prepare 32T5 Bank restoration:

TT32 Operation shall:

- Advise SCC when work on the bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 32T5 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 32T5A-T5 and 32T5T7-T5 disconnect switches
- Close AC control MCB to 32T5 auxiliaries and remove tag
- Close 125V DC MCB to 32T5 primary and secondary protection and remove PC13 tag
- Advise SCC and Customers of readiness to energize 32T5 bank

3.42.2. Restoration of 32T5 Bank:

- Start 32G5
- SCC shall close (or advise TT32 Operator to close) the 32T5A and 32T5T7 breakers
- TT32 Operator shall advise Customer of restoration of 32T5 to service

3.43. To restore 32T5 Bank to service after automatic outage

If 32T5 Bank trips auto due to fault:

TT32 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 TT32 Operator to energize) the bank **ONCE** by closing 32T5A and 32T5T7 breakers

- Advise Customer of restoration of 32T5 to service

TT32 Operator shall:

- Advise the Supervisor/Manager and SCC of operation above

- Isolate the Transformer for maintenance men to work on the equipment if operation above is not successful. See Explanation.

3.44. To isolate 32T6 Transformer for work

- TT32 Operator shall request Station Guarantee from Customers on 32T6

SCC shall carry out or advise TT32 operator to carry out the following:

- Inform customers about readiness to take off 32T6 Bank

- Request customers on 32T6 Bank to take off their load

- Open AC1 Contactor/MCB to take off supply to 32T6 transformer auxiliaries

SCC shall carry out (or advise TT32 Operator to carry out) the following:

- Open 32T6A and 32T6T8 breakers

- Shut down 32G6

TT32 Operator shall:

- Check for no potential on 32T6 Bank

- Open 32T6A-T6 and 32T6T8-T6 disconnect switches

- Open AC control MCB to 32T6 auxiliaries and tag

- Open 125V DC MCB to 32T6 primary and secondary protection and tag with PC13

3.45. To restore 32T6 Bank to service

3.45.1. Prepare 32T6 Bank restoration:

TT32 Operation shall:

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

- Check for no potential on 32T6 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 32T6A-T6 and 32T6T8-T6 disconnect switches
- Close AC control MCB to 32T6 auxiliaries and remove tag
- Close 125V DC MCB to 32T6 primary and secondary protection and remove PC13 tag
- Advise SCC and Customers of readiness to energize 32T6 bank

3.45.2. Restoration of 32T6 Bank:

- Start 32G6
- SCC shall close (or advise TT32 Operator to close) the 32T6A and 32T6T8 breakers
- TT32 Operator shall advise Customer of restoration of 32T6 to service

3.46. To restore 32T6 Bank to service after automatic outage

If 32T6 Bank trips auto due to fault:

TT32 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 TT32 Operator to energize) the bank **ONCE** by closing 32T6A and 32T6T8 breakers
- Advise Customer of restoration of 32T6 to service

TT32 Operator shall:

- Advise the Supervisor/Manager and SCC of operation above
- Isolate the Transformer for maintenance men to work on the equipment if operation above is not successful. See Explanation.

3.47. To isolate 32TSS1 Transformer for work

- TT32 Operator shall request Station Guarantee from Customers on 32TSS1

SCC shall carry out or advise TT32 operator to carry out the following:

- Inform customers about readiness to take off 32TSS1 Bank
- Request customers on 32TSS1 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 32TSS1 transformer auxiliaries

SCC shall carry out (or advise 32TSS1 Operator to carry out) the following:

- Open 32ATSS1 and 32TSS2L7 breakers

TT32 Operator shall:

- Check for no potential on 32TSS1 Bank
- Open 32ATSS1-TSS1 and 32TSS2L7-TSS1 disconnect switches
- Open AC control MCB to 32TSS1 auxiliaries and tag
- Open 125V DC MCB to 32TSS1 primary and secondary protection and tag with PC13

3.48. To restore 32TSS1 Bank to service

3.48.1. Prepare 32TSS1 Bank restoration:

TT32 Operation shall:

- Advise SCC when work on the bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 32TSS1 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 32ATSS1-TSS1 and 32TSS2L7-TSS1 disconnect switches
- Close AC control MCB to 32TSS1 auxiliaries and remove tag
- Close 125V DC MCB to 32TSS1 primary and secondary protection and remove PC13 tag
- Advise SCC and Customers of readiness to energize 32TSS1 bank

3.48.2. Restoration of 32TSS1 Bank:

- SCC shall close (or advise 32TSS1 Operator to close) the 32ATSS1 and 32TSS2L7 breakers
- TT32 Operator shall advise Customer of restoration of 32TSS1 to service

3.49. To restore 32TSS1 Bank to service after automatic outage

If 32TSS1 Bank trips auto due to fault:

TT32 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 32TSS1 Operator to energize) the bank **ONCE** by closing 32ATSS1 and 32TSS2L7 breakers
- Advise Customer of restoration of 32TSS1 to service

TT32 Operator shall:

- Advise the Supervisor/Manager and SCC of operation above
- Isolate the Transformer for maintenance men to work on the equipment if operation above is not successful. See Explanation.

3.50. To isolate 32TSS2 Transformer for work

- TT32 Operator shall request Station Guarantee from Customers on 32TSS2

SCC shall carry out or advise TT32 operator to carry out the following:

- Inform customers about readiness to take off 32TSS2 Bank
- Request customers on 32TSS2 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 32TSS2 transformer auxiliaries

SCC shall carry out (or advise TT32 Operator to carry out) the following:

- Open 32ATSS2 and 32TSS2L5 breakers

TT32 Operator shall:

- Check for no potential on 32TSS2 Bank
- Open 32ATSS2-TSS2 and 32TSS2L5-TSS2 disconnect switches

- Open AC control MCB to 32TSS2 auxiliaries and tag

- Open 125V DC MCB to 32TSS2 primary and secondary protection and tag with PC13

3.51. To restore 32TSS2 Bank to service

3.51.1. Prepare 32TSS2 Bank restoration:

TT32 Operation shall:

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

- Check for no potential on 32TSS2 Bank and temporary grounds removed

- Turn on 125Vdc supply and close 32ATSS2-TSS2 and 32TSS2L5-TSS2 disconnect switches

- Close AC control MCB to 32TSS2 auxiliaries and remove tag

- Close 125V DC MCB to 32TSS2 primary and secondary protection and remove PC13 tag

- Advise SCC and Customers of readiness to energize 32TSS2 bank

3.51.2. Restoration of 32TSS2 Bank:

- SCC shall close (or advise TT32 Operator to close) the 32ATSS2 and 32TSS2L5 breakers

- TT32 Operator shall advise Customer of restoration of 32TSS2 to service

3.52. To restore 32TSS2 Bank to service after automatic outage

If 32TSS2 Bank trips auto due to fault:

TT32 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 TT32 Operator to energize) the bank **ONCE** by closing 32ATSS2 and 32TSS2L5 breakers

- Advise Customer of restoration of 32TSS2 to service

TT32 Operator shall:

- Advise the Supervisor/Manager and SCC of operation above
- Isolate the Transformer for maintenance men to work on the equipment if operation above is not successful. See Explanation.

3.53. To isolate 32TSS2 Transformer for work

- TT32 Operator shall request Station Guarantee from Customers on 32TSS2

SCC shall carry out or advise TT32 operator to carry out the following:

- Inform customers about readiness to take off 32TSS2 Bank
- Request customers on 32TSS2 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 32TSS2 transformer auxiliaries

SCC shall carry out (or advise TT32 Operator to carry out) the following:

- Open 32ATSS2 and 32TSS2L5 breakers

TT32 Operator shall:

- Check for no potential on 32TSS2 Bank
- Open 32ATSS2-TSS2 and 32TSS2L5-TSS2 disconnect switches
- Open AC control MCB to 32TSS2 auxiliaries and tag
- Open 125V DC MCB to 32TSS2 primary and secondary protection and tag with PC13

3.54. To restore 32TSS2 Bank to service

3.54.1. Prepare 32TSS2 Bank restoration:

TT32 Operation shall:

- Advise SCC when work on the bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 32TSS2 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 32ATSS2-TSS2 and 32TSS2L5-TSS2 disconnect switches
- Close AC control MCB to 32TSS2 auxiliaries and remove tag

- Close 125V DC MCB to 32TSS2 primary and secondary protection and remove PC13 tag

- Advise SCC and Customers of readiness to energize 32TSS2 bank

3.54.2. Restoration of 32TSS2 Bank:

- SCC shall close (or advise TT32 Operator to close) the 32ATSS2 and 32TSS2L5 breakers

- TT32 Operator shall advise Customer of restoration of 32TSS2 to service

3.55. To restore 32TSS2 Bank to service after automatic outage

If 32TSS2 Bank trips auto due to fault:

TT32 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 TT32 Operator to energize) the bank **ONCE** by closing 32ATSS2 and 32TSS2L5 breakers

- Advise Customer of restoration of 32TSS2 to service

TT32 Operator shall:

- Advise the Supervisor/Manager and SCC of operation above

- Isolate the Transformer for maintenance men to work on the equipment if operation above is not successful. See Explanation.

3.56. To isolate 32TSS2 Transformer for work

- TT32 Operator shall request Station Guarantee from Customers on 32TSS2

SCC shall carry out or advise TT32 operator to carry out the following:

- Inform customers about readiness to take off 32TSS2 Bank

- Request customers on 32TSS2 Bank to take off their load

- Open AC1 Contactor/MCB to take off supply to 32TSS2 transformer

auxiliaries

SCC shall carry out (or advise TT32 Operator to carry out) the following:

- Open 32ATSS2 and 32TSS2L5 breakers

TT32 Operator shall:

- Check for no potential on 32TSS2 Bank
- Open 32ATSS2-TSS2 and 32TSS2L5-TSS2 disconnect switches
- Open AC control MCB to 32TSS2 auxiliaries and tag
- Open 125V DC MCB to 32TSS2 primary and secondary protection and tag with PC13

3.57. To restore 32TSS2 Bank to service

3.57.1. Prepare 32TSS2 Bank restoration:

TT32 Operation shall:

- Advise SCC when work on the bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 32TSS2 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 32ATSS2-TSS2 and 32TSS2L5-TSS2 disconnect switches
- Close AC control MCB to 32TSS2 auxiliaries and remove tag
- Close 125V DC MCB to 32TSS2 primary and secondary protection and remove PC13 tag
- Advise SCC and Customers of readiness to energize 32TSS2 bank

3.57.2. Restoration of 32TSS2 Bank:

- SCC shall close (or advise TT32 Operator to close) the 32ATSS2 and 32TSS2L5 breakers
- TT32 Operator shall advise Customer of restoration of 32TSS2 to service

3.58. To restore 32TSS2 Bank to service after automatic outage

If 32TSS2 Bank trips auto due to fault:

TT32 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 TT32 Operator to energize) the bank **ONCE** by closing 32ATSS2 and 32TSS2L5 breakers

- Advise Customer of restoration of 32TSS2 to service

TT32 Operator shall:

- Advise the Supervisor/Manager and SCC of operation above

- Isolate the Transformer for maintenance men to work on the equipment if operation above is not successful. See Explanation.

4. Explanation

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

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

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

- Carry out thorough inspection of the Transformer and the 34kV and 11kV Structures looking for oil leakage, shattered insulators on the structures and dead birds or reptiles

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

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

NOTE:

I. If it has been necessary to restore the MCB to the transformer relay in order to reset 86G and restore a healthy bank to service, they shall not be restored until the gas and /or temperature conditions on the faulted bank is rectified.

II. Operation of 86T or 86G lockout relays may be due to major transformer faults hence No attempt should be made to re-energize the bank until Electrical Maintenance staff have inspected and meggered the Transformer.

ISOLATION AND DE-ENERGIZING

1. Open the necessary breaker(s) to take the line off potential.
2. Check all three phases off potential using the Multifunction meter or Analog Voltmeter or for Pole discrepancies on the panel.
3. Open the necessary disconnect switches or MODS to isolate the line from all sources of supply.
4. Close the Grounding Switch.
5. Report completion of the isolation and de-energizing at all assisting stations, to the where the Protection Guarantee is to be issued and to System Control Centre.
6. Issue Work or Work and Test Permit to the workman.

ORDER TO OPERATE

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

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

2. Due to communication difficulties arising when grounds are placed on a line it is necessary to issue a Protection Guarantee on the line before grounds are placed. A work and Test Permit allows for closing and opening permanent grounds switches while the Permit is in effect.

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

The Generating station has two 161kV buses. The main 'A' and 'D' buses, a breaker and half configuration provide the normal points of supply to all circuits/equipment such as AG1TT, AG2TT, TT3T, TT4T, TT5R, TT6TE, TT7TE lines, 32T1,32T2,32T3,32T4,32T,32T6,32TSS1 32TSS2 transformers.

5. Approval

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Director, Technical Services