TD-OP-0066

GRIDCo

OPERATING PROCEDURE FOR TAKORADI THERMAL POWER EXPANSION STATION

GHANA GRID COMPANY LTD

Title:	**OPERATING PROCEDURE FOR TAKORADI THERMAL EXPANSION STATION (TE66)**		
Issued To:	Director, System Operations Director, SNS Manager, SCC Manager, Dispatch Operations Area Manager, Takoradi Operating Staff, Takoradi Area Maintenance Staff, Takoradi Area Dispatch Staff, SCC	**Number:**	TD-OP-0066
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CONTENTS

1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at TE66 Substation to service for planned and auto outages.

2. Scope

The directive will be used by Operators at Takoradi Operating Area and System Control Center (SCC) for operation of equipment at TE66 Substation.

3. Procedure

3.1. To take TE1W line out of service

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

- Open 66DL1 breaker

SCC shall carry out (or advise the W6 Operator to carry out) the following:

- Open 6TE1W breaker
- Check for no potential on TE1W line

3.2. To take out, isolate and de-energize TE1W line for work

- TE66 Operator request for Station Guarantee from W6

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

- Open 66DL1 breaker

SCC shall carry out (or advise W6 Operator to carry out) the following:

- Open 6TE1W breaker
- Check for no potential on TE1W line

SCC shall advise W6 Operator to carry out the following:

- Verify opened 6TE1W-S by-pass disconnect switch and turn off its 125Vdc supply
- Open 6TE1W-L1 disconnect switch and turn off its 125Vdc supply
- Close 6TE1W-G ground disconnect switch

SCC shall advise TE66 Operator to carry out the following:

- Open 66DL1-L1 disconnect switch and turn off its125Vdc supply
- Close 6TE1W-G ground disconnect switch

3.3. To restore TE1W line to service after work

3.3.1. Prepare TE1W line for restoration:

TE66 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 TE1W line

SCC shall advise W6 Operator to carry out the following:

- Check opened 6TE1W breaker
- Open 6TE1W-G ground disconnect switch
- Check opened 6TE1W-S by-pass disconnect switch and turn on its 125Vdc supply
- Turn on 125Vdc supply and close 6TE1W-L1 disconnect switch

SCC shall advise TE66 Operator to carry out the following:

- Check opened 66DL1 breaker
- Open 66TE1W-G ground disconnect switch
- Turn on 125Vdc supply and close 66DL1-L1 disconnect switch

3.3.2. Restoration of TE1W line to service:

SCC shall:

- Advise the W6 and TE66 Operators of readiness to restore TE1W line to service
- Close (or advise the TE66 Operator to close) 66DL1 breaker
- Close (or advise the W6 Operator to close) 6TE1W breaker

3.4. To restore TE1W line to service after automatic outage

If TE1W line trips auto due to fault on the line:

TE66 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 TE66 Operator to energize) the line **ONCE** by closing 66DL1 breaker
- Close (or advise the W6 Operator to close) 6TE1W breaker

TE66 Operator shall:

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

3.5. To take TE2C line out of service

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

- Open 66DL2 breaker.

SCC shall carry out (or advise the C7 Operator to carry out) the following:

- Open 7TE2C breaker
- Check for no potential on TE2C line

3.6. To take out, isolate and de-energize TE2C line for work

- TE66 Operator shall request for Station Guarantee from C7

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

- Open 66DL2 breaker

SCC shall carry out (or advise the C7 Operator to carry out) the following:

- Open 7TE2C breaker

- Check for no potential on TE2C line

SCC shall advise C7 Operator to carry out the following:

- Verify opened 7TE2C-S by-pass disconnect switch and turn off its 125Vdc supply

- Open 7TE2C–L2 disconnect switch and turn off its125Vdc supply

- Close 7TE2C-G ground disconnect switch

SCC shall advise TE66 operator to carry out the following:

- Open 66DL2-L2 disconnect switch and turn off its 125Vdc supply

- Close 66TE2C-G ground disconnect switch

3.7. To restore TE2C line to service after work

3.7.1. Prepare TE2C line for restoration:

TE66 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 TE2C line

SCC shall advise C7 Operator to carry out the following:

- Check opened 7TE2C breaker

- Open 7TE2C-G ground disconnect switch

- Verify opened 7TE2C-S by-pass disconnect switch and turn on its 125Vdc supply

- Turn on 125Vdc supply and close 7TE2C-L2 disconnect switch

SCC shall advise TE66 Operator to carry out the following:

- Check opened 66DL2 breaker

- Open 66TE2C-G ground disconnect switch

- Turn on 125Vdc supply and close 66DL2-L2 disconnect switch

3.7.2. Restoration of TE2C line to service:

SCC shall:

- Advise the TE66 and C7 Operators of readiness to restore TE2C line to service
- Close (or advise the TE66 Operator to close) 66DL2 breaker
- Close (or advise the C7 Operator to close) 7TE2C breaker

3.8. To restore TE2C line to service after automatic outage

If TE2C line trips auto due to fault on the line:

TE66 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 TE66 Operator to energize) the line **ONCE** by closing 66DL2 breaker
- Close (or advise the C7 Operator to close) 7TE2C breaker

TE66 Operator shall:

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

3.9. To take TT6TE line out of service

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

- Open 66L6D breaker

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

- Open 32DL6 and 32T1L6 breakers
- Check for no potential on TT6TE line

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

- TE66 Operator request for Station Guarantee from T8

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

- Open 66L6D breaker

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

- Open 32DL6 and 32T1L6 breakers
- Check for no potential on TT6TE line

SCC shall advise TT32 Operator to carry out the following:

- Open 32TT6TE-D disconnect switch and turn off 125Vdc supply
- Close 32TT6TE-G ground disconnect switch

SCC shall advise TE66 Operator to carry out the following:

- Open 66L6D-L6 disconnect switch and turn off its 125Vdc supply
- Close 66TT6TE-G ground disconnect switch

3.11. To restore TT6TE line to service after work

3.11.1. Prepare TT6TE line for restoration:

TE66 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 TT32 Operator to carry out the following:

- Check opened 32DL6 and 32T1L6 breakers
- Open 32TT6TE-G ground disconnect switch
- Turn on 125Vdc supply and close 32TT6TE-L6 disconnect switch

SCC shall advise TE66 Operator to carry out the following:

- Check opened 66L6D breaker
- Open 66TT6TE-G ground disconnect switch

- Turn on 125Vdc supply and close 66DL6-L6 disconnect switch

3.11.2. Restoration of TT6TE line to service:

SCC shall:

- Advise the TT32 and TTE66 Operators of readiness to restore TT6TE line to service
- Close (or advise the TT32 Operator to close) 32DL6 and 32T1L6 breakers
- Close (or advise the TE66 Operator to close) 66L6D breaker

3.12. To restore TT6TE line to service after automatic outage

If TT6TE line trips auto due to fault on the line:

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

TE66 Operator shall:

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

3.13. To take TT7TE line out of service

SCC shall carry out (or advise the T66 Operator to carry out) the following:

- Open 66L7D breaker

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

- Open 32DL7 and 32TSS1L7 breakers
- Check for no potential on TT7TE line

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

- TE66 Operator request for Station Guarantee from TT32

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

- Open 66L7D breaker

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

- Open 32DL7 and 32TSS1L7 breakers
- Check for no potential on TT7TE line

SCC shall advise TT32 **Operator** to carry out the following:

- Open 32TT7TE-D disconnect switch and turn off 125Vdc supply
- Close 32TT7TE-G ground disconnect switch

SCC shall advise TE66 Operator to carry out the following:

- Open 66L7D-L7 disconnect switch and turn off its 125Vdc supply
- Close 66TT7TE-G ground disconnect switch

3.15. To restore TT7TE line to service after work

3.15.1. Prepare TT7TE line for restoration:

TE66 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 TT32 Operator to carry out the following:

- Check opened 32DL7 and 32TSS1L7 breakers
- Open 32TT7TE -G ground disconnect switch
- Turn on 125Vdc supply and close 32TT7TE-D disconnect switch

SCC shall advise TE66 Operator to carry out the following:

- Check opened 66L7D breaker
- Open 66TT7TE-G ground disconnect switch
- Turn on 125Vdc supply and close 66L7D **–L7** disconnect switch

3.15.2. Restoration of TT7TE line to service:

SCC shall:

- Advise the TT32 and TE66 Operators of readiness to restore AD5TM line to service
- Close (or advise the TT32 Operator to close) 32DL7 and 32TSS1L7 breakers
- Close (or advise the TE66 Operator to close) 66L7D breaker

3.16. To restore TT7TE line to service after automatic outage

If TT7TE **line** trips auto due to fault on the line:

TE66 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 32DL7 and 32TSS1L7 breakers
- Close (or advise the TE66 Operator to close) 66L7D breaker

TE66 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 isolate 66DL1 Breaker for work

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

- Open 66DL1 breaker

SCC shall carry out (or advise W6 Operator to carry out) the following:

- Open 6TE1W breaker
- Check for no potential on TE1W line

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

- Open 66DL1-L1 disconnect switch and turn off its 125Vdc supply
- Open 66DL1-D disconnect switch and turn off its 125Vdc supply

3.18. To restore 66DL1 Breaker to service after work

3.18.1. Prepare 66DL1 breaker for restoration:

TE66 Operator shall:

- Advise SCC when work on the breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on TE1W line and temporary grounds removed
- Check 66DL1 breaker opened
- Turn on 125Vdc supply and close 66DL1-L1 disconnect switch
- Turn on 125Vdc supply and close 66DL1-D disconnect switch

3.18.2. Restoration of 66DL1 breaker and TE1W line to service:

SCC shall:

- advise TE66 and W6 Operators of readiness to restore 66DL1 breaker and TE1W line to service
- Close (or advise the TE66 Operator to close) 66DL1 breaker
- Close (or advise the W6 Operator to close) 6TE1W breaker

3.19. To isolate 66DL2 Breaker for work

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

- Open 66DL2 breaker

SCC shall carry out (or advise C7 Operator to carry out) the following:

- Open 7TE2C breaker

- Check for no potential on TE2C line

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

- Open 66DL2-L2 disconnect switch and turn off its 125Vdc supply

- Open 66DL2-D disconnect switch and turn off its 125Vdc supply
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3.20. To Prepare 66DL2 Breaker for service after work

3.20.1. Prepare 66DL2 breaker for restoration:

TE66 Operator shall:

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

- Check for no potential on TE2C line and temporary grounds removed

- Check 66DL2 breaker opened

- Turn on 125Vdc supply and close 66DL2-L2 disconnect switch

- Turn on 125Vdc supply and close 66DL2-D disconnect switch

3.20.2. Restoration of 66DL2 breaker and TE2C line to service

SCC shall:

- advise TE66 and C7 Operators of readiness to restore 66DL2 breaker and TE2C line to service

- Close (or advise the TE66 Operator to close) 66DL2 breaker

- Close (or advise the C7 Operator to close) 7TE2C breaker

3.21. To isolate 66L6D Breaker for work

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

- Open 66DL6 breaker

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

- Open 32DL6 and 32T1L6 breakers

- Check for no potential on TT6TE line

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

- Open 66L6D-L6 disconnect switch and turn off its 125Vdc supply
- Open 66L6D-D disconnect switch and turn off its 125Vdc supply

3.22. To restore 66L6D Breaker to service after work

3.22.1. Prepare 66L6D breaker for restoration:

TE66 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 TT6TE line and temporary grounds removed
- Check opened 66L6D breaker
- Turn on 125Vdc supply and close 66L6D-L6 disconnect switch
- Turn on 125Vdc supply and close 66L6D-D disconnect switch

3.22.2. Restoration of 66L6D Breaker to service:

SCC shall:

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

3.23. To isolate 66L7D Breaker for work

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

- Open 66L7D breaker

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

- Open 32DL7 and 32TSS1L7 breakers
- Check for no potential on TT7TE line

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

- Open 66L7D-L7 disconnect switch and turn off its 125Vdc supply

- Open 66L7D-D disconnect switch and turn off its 125Vdc supply

3.24. To restore 66L7D Breaker to service after work

3.24.1. Prepare 66L7D breaker for restoration:

TE66 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 TT6TE line and temporary grounds removed
- Check opened 66L7D breaker
- Turn on 125Vdc supply and close 66L7D-L7 disconnect switch
- Turn on 125Vdc supply and close 66L7D-D disconnect switch

3.24.2. Restoration of 66L7D Breaker to service:

SCC shall:

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

3.25. To isolate 66AD Breaker for work

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

- Open 66AD breaker
- Open 66T1A breaker
- Open 66T2A breaker
- Open 66T3A breaker
- Check for no potential on 66A bus
- Open 66AD-A disconnect switch and turn off its 125Vdc supply
- Open 66AD-D disconnect switch and turn off its 125Vdc supply

3.26. To restore 66AD Breaker to service after work

3.26.1. Prepare 66AD breaker for restoration:

TE66 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 66A bus
- Check opened 66AD breaker and temporary grounds removed
- Turn on 125Vdc supply and close 66AD-A disconnect switch
- Turn on 125Vdc supply and close 66AD-D disconnect switch

3.26.2. Restoration of 66AD Breaker to service:

SCC shall:

- advise TE66 Operator of readiness to restore 66AD breaker and 66A bus to service
- close (or advise TE66 Operator to close) 66AD breaker

3.27. To isolate 66T1A Breaker for work

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

- Open 66T1A breaker
- Open 66T1A-A disconnect switch and turn off its 125Vdc supply
- Open 66T1A-T1 disconnect switch and turn off its 125Vdc supply

3.28. To restore 66T1A Breaker to service after work

3.28.1. Prepare 66T1A breaker for restoration:

TE66 Operator shall:

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check opened 66T1A breaker and temporary grounds removed
- Turn on 125Vdc supply and close 66T1A-A disconnect switch
- Turn on 125Vdc supply and close 66T1A-T1 disconnect switch

3.28.2. Restoration of 66T1A Breaker to service:

SCC shall:

- advise TE66 Operator of readiness to restore 66T1A breaker and energize 66T1 transformer
- close (or advise TE66 Operator to close) 66T1A breaker
- close (or advise TE66 Operator to close) 66AD breaker

3.29. To isolate 66T2A Breaker for work

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

- Open 66T2A breaker
- Open 66T2A-A disconnect switch and turn off its 125Vdc supply
- Open 66T2A-T2 disconnect switch and turn off its 125Vdc supply

3.30. To restore 66T2A Breaker to service after work

3.30.1. Prepare 66T2A breaker for restoration:

TE66 Operator shall:

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check opened 66T2A breaker and temporary grounds removed
- Turn on 125Vdc supply and close 66T2A-A disconnect switch
- Turn on 125Vdc supply and close 66T2A-T2 disconnect switch

3.30.2. Restoration of 66T2A Breaker to service:

SCC shall:

- advise TE66 Operator of readiness to restore 66T2A breaker and energize 66T2 transformer
- close (or advise TE66 Operator to close) 66T2A breaker
- close (or advise TE66 Operator to close) 66AD breaker

3.31. To isolate 66T3A Breaker for work

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

- Open 66T3A breaker

- Open 66T3A-A disconnect switch and turn off its 125Vdc supply

- Open 66T3A-T3 disconnect switch and turn off its 125Vdc supply

3.32. To restore 66T3A Breaker to service after work

3.32.1. Prepare 66T3A breaker for restoration:

TE66 Operator shall:

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

- Check opened 66T3A breaker and temporary grounds removed

- Turn on 125Vdc supply and close 66T3A-A disconnect switch

- Turn on 125Vdc supply and close 66T3A-T3 disconnect switch

3.32.2. Restoration of 66T3A Breaker to service:

SCC shall:

- advise TE66 Operator of readiness to restore 66T3A breaker and energize 66T3 transformer

- close (or advise TE66 Operator to close) 66T3A 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

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 its 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, A and D buses. The 'A' bus provides the normal points of connection to all circuits such as TE1W, TE2C, TT6TE and TT7TE

lines. The 'D' bus provides the normal points of connection to 66T1, 66T2 and 66TT3transformers

5. Approval

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Director, TSD