

TD-OP-0009



OPERATING PROCEDURE FOR TARKWA SUBSTATION

GHANA GRID COMPANY LTD

TECHNICAL DIRECTIVES

Title: OPERATING PROCEDURE FOR TARKWA SUBSTATION (R9)		
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1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at R9 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 R9 Substation.

3. Procedure

3.0. To take R1T line out of service

SCC shall carry out (or advise the R9 Operator to carry out) the following:

- Open 9L1A and 9L1T4 breakers

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

- Open 8L1A and 8L1T2 breakers
- Check for no potential on R1T line

3.1. To take out, isolate and de-energize R1T line for work

- R9 Operator shall request for Station Guarantee from T8

SCC shall carry out (or advise the R9 Operator to carry out) the following:

- Open 9L1A and 9L1T4 breakers

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

- Open 8L1A and 8L1T2 breakers
- Check for no potential on R1T line

SCC shall advise T8 Operator to carry out the following:

- Open 8L1A-L1 and 8L1T2-L1 disconnect switches and turn off its 125Vdc supply
- Close 8R1T-G ground disconnect switch

SCC shall advise R9 Operator to carry out the following:

- Open 9L1A-L1 and 9L1T4-L1 disconnect switches and turn off its 125Vdc

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supply

- Close 9R1T-G ground disconnect switch

3.2. To restore R1T line to service after work

3.2.1. Prepare R1T line for restoration

R9 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 R1T line

SCC shall advise T8 Operator to carry out the following

- Check opened 8L1A and 8L1T2 breakers
- Open 8R1T-G ground disconnect switch
- Turn on 125Vdc supply and close 8L1A-L1 and 8L1T2-L1 disconnect switches

SCC shall advise R9 Operator to carry out the following:

- Check opened 9L1A and 9L1T4 breakers
- Open 9R1T-G ground disconnect switch
- Turn on 125Vdc supply and close 9L1A-L1 and 9L1T4-L1 disconnect switches

3.2.2. Restoration of R1T line to service:

SCC shall:

- Advise the R9 and T8 Operators of readiness to restore R1T line to service
- Close (or advise the T8 Operator to close) 8L1A and 8L1T2 breakers
- Close (or advise the R9 Operator to close) 9L1A and 9L1T4 breakers

3.3. To restore R1T line to service after automatic outage

If R1T line trips auto due to fault:

R9 Operator shall:

- Advise SCC about the outage

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- 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 8L1A and 8L1T2 breakers
- Close (or advise the R9 Operator to close) 9L1A and 9L1T4 breakers

R9 Operator shall:

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

3.4. To take R3NR line out of service

SCC shall carry out (or advise the R9 Operator to carry out) the following:

- Open 9L3A and 9L3T1 breakers

SCC shall carry out (or advise the NR41 Operator to carry out) the following:

- Open 41L3A1 breaker
- Check for no potential on R3NR line

3.5. To take out, isolate and de-energize R3NR line for work

- R9 Operator shall request for Station Guarantee from NR41

SCC shall carry out (or advise the R9 Operator to carry out) the following:

- Open 9L3A and 9L3T1 breakers

SCC shall carry out (or advise the NR41 Operator to carry out) the following:

- Open 41L3A1 breaker
- Check for no potential on R3NR line

SCC shall advise NR41 Operator to carry out the following:

- Open 41L3A1-L3 disconnect switch and turn off its 125Vdc supply
- Close 41R3NR-G ground disconnect switch

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SCC shall advise R9 Operator to carry out the following:

- Open 9L3A-L3 and 9L3T1-L3 disconnect switches and turn off its 125Vdc supply
- Close 9R3NR-G ground disconnect switch

3.6. To restore R3NR line to service after work

3.6.1. Prepare R3NR line for restoration

R9 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 R3NR line

SCC shall advise NR41 Operator to carry out the following

- Check opened 41L3A1 breaker
- Open 41R3NR-G ground disconnect switch
- Turn on 125Vdc supply and close 41L3A1-L3 disconnect switch

SCC shall advise R9 Operator to carry out the following:

- Check opened 9L3A and 9L3T1 breakers
- Open 9R3NR-G ground disconnect switch
- Turn on 125Vdc supply and close 9L3A-L3 and 9L3T1-L3 disconnect switches

3.6.2. Restoration of R3NR line to service:

SCC shall:

- Advise the R9 and NR41 Operators of readiness to restore R3NR line to service
- Close (or advise the NR41 Operator to close) 41L3A1 breaker
- Close (or advise the R9 Operator to close) 9L3A and 9L3T1 breakers

3.7. To restore R3NR line to service after automatic outage

If R3NR line trips auto due to fault:

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R9 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 NR41 Operator to energize) the line **ONCE** by closing 41L3A1 breaker
- Close (or advise the R9 Operator to close) 9L3A and 9L3T1 breakers

R9 Operator shall:

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

3.8. To take TT5R line out of service

SCC shall carry out (or advise the R9 Operator to carry out) the following:

- Open 9L5A and 9L5T3 breakers

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

- Open 32DL5 and 32TSS2L5 breakers
- Check for no potential on TT5R line

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

- R9 Operator shall request for Station Guarantee from TT32

SCC shall carry out (or advise the R9 Operator to carry out) the following:

- Open 9L5A and 9L5T3 breakers

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

- Open 32DL5 and 32TSS2L5 breakers
- Check for no potential on TT5R line

SCC shall advise TT32 Operator to carry out the following:

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- Open 32DL5-L5 and 32TSS2L5-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

3.10. To restore TT5R line to service after work

3.10.1. Prepare TT5R line for restoration

R9 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 TT32 Operator to carry out the following

- Check opened 32DL5 and 32TSS2L5 breakers
- Open 32TT5R-G ground disconnect switch
- Turn on 125Vdc supply and close 32DL5-L5 and 32TSS2L5-L5 disconnect switches

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

3.10.2. Restoration of TT5R line to service:

SCC shall:

- Advise the R9 and TT32 Operators of readiness to restore TT5R line to service
- Close (or advise the TT32 Operator to close) 32DL5 and 32TSS2L5 breakers
- Close (or advise the R9 Operator to close) 9L5A and 9L5T3 breakers

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3.11. To restore TT5R line to service after automatic outage

If TT5R line trips auto due to fault:

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

R9 Operator shall:

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

3.12. To take R7P line out of service

SCC shall carry out (or advise the R9 Operator to carry out) the following:

- Open 9L7A and 9L7T2 breakers

SCC shall advise P10 Operator to carry out the following:

- Open 10L7A and 10L4L7 breakers
- Check for no potential on R7P line

3.13. To take out, isolate and de-energize R7P line for work

- R9 Operator shall request for Station Guarantee from P10

SCC shall carry out (or advise the R9 Operator to carry out) the following:

- Open 9L7A and 9L7T2 breakers

SCC shall carry out (or advise the P10 Operator to carry out) the following:

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- Open 10L7A and 10L4L7 breaker
- Check for no potential on R7P line

SCC shall advise P10 Operator to carry out the following:

- Open 10L7A-L7 and 10L4L7-L7 disconnect switches and turn off its 125Vdc supply
- Close 10R7P-G ground disconnect switch

SCC shall advise R9 Operator to carry out the following:

- Open 9L7A-L7 and 9L7T2-L7 disconnect switches and turn off its 125Vdc supply
- Close 9R7P-G ground disconnect switch

3.14. To restore R7P line to service after work

3.14.1. Prepare R7P line for restoration

R9 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 R7P line

SCC shall advise P10 Operator to carry out the following

- Check opened 10L7A and 10L4L7 breakers
- Open 10R7P-G ground disconnect switch
- Turn on 125Vdc supply and close 10L7A-L7 and 10L4L7-L7 disconnect switches

SCC shall advise R9 Operator to carry out the following:

- Check opened 9L7A and 9L7T2 breakers
- Open 9R7P-G ground disconnect switch
- Turn on 125Vdc supply and close 9L7A-L7 and 9L7T2-L7 disconnect switches

3.14.2. Restoration of R7P line to service:

SCC shall:

- Advise the R9 and P10 Operators of readiness to restore R7P line to service

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- Close (or advise the P10 Operator to close) 10L7A and 10L4L7 breakers
- Close (or advise the R9 Operator to close) 9L7A and 9L7T2 breakers

3.15. To restore R7P line to service after automatic outage

If R7P line trips auto due to fault:

R9 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 P10 Operator to energize) the line **ONCE** by closing 10L7A and 10L4L7 breakers
- Close (or advise the R9 Operator to close) 9L7A and 9L7T2 breakers

R9 Operator shall:

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

3.16. To isolate 9T1 Transformer for work

- R9 Operator shall request for Station Guarantee from Customer on 9F1 Feeder

SCC shall carry out or advise R9 Operator to carry out the following:

- Inform Customer about readiness to take off 9T1 Bank
- Request Customer on 9T1 Bank to take off their load
- Transfer Station Service supply from AC1 to AC2
- Open AC1 Contactor/MCB to take off supply to 9T1 transformer auxiliaries

SCC shall carry out (or advise R9 Operator to carry out) the following:

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- Open 9T1SC1 breaker
- Open 9T1F1 breaker
- Open 9DT1 and 9L3T1 breakers
- Check for no potential on 9T1 Bank

R9 Operator shall:

- Open 9T1SC1-T1 disconnect switch
- Open 9DT1-T1 and 9L3T1-T1 disconnect switches
- Open 9T1F1-F1 disconnect switch
- Open AC control MCB to 9T1 auxiliaries and tag
- Open 125Vdc MCB to 9T1 primary and secondary protection and tag with PC13

3.17. To restore 9T1 Bank to service

3.17.1. Prepare 9T1 Bank restoration:

R9 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 9T1 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 9DT1-T1 and 9L3T1-T1 disconnect switches
- Turn on 125Vdc supply and close 9T1F1-F1 disconnect switch
- Turn on 125Vdc supply and close 9T1SC1-T1 disconnect switch
- Close AC control MCB to 9T1 auxiliaries and remove tag
- Close 125Vdc MCB to 9T1 primary and secondary protection and remove PC13 tag
- Advise SCC and Customer of readiness to energize 9T1 bank

3.17.2. Restoration of 9T1 Bank

- SCC shall close (or advise R9 Operator to close) the 9DT1 and 9L3T1 breakers
- R9 Operator shall advise Customer of readiness to restore 9F1 Feeder to service
- SCC shall close (or advise R9 Operator to close) 9T1F1 breaker

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3.18. To restore 9T1 Bank to service after automatic outage

If 9T1 Bank trips auto due to fault:

R9 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 R9 Operator to energize) the bank **ONCE** by closing 9DT1 and 9L3T1 breakers

R9 Operator shall advise Customer of readiness to restore 9F1 Feeder to service

SCC shall close (or advise R9 Operator to close) 9T1F1 breaker

3.19. To isolate 9T2 Transformer for work

- R9 Operator shall request for Station Guarantee from Customer on 9F2 Feeder

SCC shall carry out or advise R9 Operator to carry out the following:

- Inform Customer about readiness to take off 9T2 Bank
- Request Customer on 9T2 Bank to take off their load
- Transfer Station Service supply from AC2 to AC1
- Open AC2 Contactor/MCB to take off supply to 9T2 transformer auxiliaries

SCC shall carry out (or advise R9 Operator to carry out) the following:

- Open 9T2SC2 breaker
- Open 9T2F2 breaker
- Open 9DT2 and 9L7T2 breakers
- Check for no potential on 9T2 Bank

R9 Operator shall:

- Open 9T2F2-F2 disconnect switch
- Open 9T2SC2-T2 disconnect switch

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- Open 9DT2-T2 and 9L7T2-T2 disconnect switches
- Open AC control MCB to 9T2 auxiliaries and tag
- Open 125Vdc MCB to 9T2 primary and secondary protection and tag with PC13

3.20. To restore 9T2 Bank to service

3.20.1. Prepare 9T2 Bank restoration:

R9 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 9T2 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 9DT2-T2 and 9L7T2-T2 disconnect switches
- Turn on 125Vdc supply and close 9T2F2-F2 disconnect switch
- Turn on 125Vdc supply and close 9T2SC2-T2 disconnect switch
- Close AC control MCB to 9T2 auxiliaries and remove tag
- Close 125Vdc MCB to 9T2 primary and secondary protection and remove PC13 tag
- Advise SCC and Customer of readiness to energize 9T2 bank

3.20.2. Restoration of 9T2 Bank

- SCC shall close (or advise R9 Operator to close) the 9DT2 and 9L7T2 breakers
- R9 Operator shall advise Customer of readiness to restore 9F2 Feeder to service
- SCC shall close (or advise R9 Operator to close) 9T2F2 breaker

3.21. To restore 9T2 Bank to service after automatic outage

If 9T2 Bank trips auto due to fault:

R9 Operator shall:

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

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- Report relay operation details to SCC

SCC shall energize (or advise the R9 Operator to energize) the bank **ONCE** by closing 9DT2 and 9L7T2 breakers

R9 Operator shall advise Customer of readiness to restore 9F2 Feeder to service

SCC shall close (or advise R9 Operator to close) 9T2F2 breaker

R9 Operator shall:

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

3.22. To isolate 9T3 Transformer for work

- R9 Operator shall request for Station Guarantee from Customer on 9F3 Feeder

SCC shall carry out or advise R9 Operator to carry out the following:

- Inform Customer about readiness to take off 9T3 Bank
- Request Customer on 9T3 Bank to take off their load
- Open AC3 Contactor/MCB to take off supply to 9T3 transformer auxiliaries

SCC shall carry out (or advise R9 Operator to carry out) the following:

- Open 9T3F2 breaker
- Open 9DT3 and 9L5T3 breakers
- Check for no potential on 9T3 Bank

R9 Operator shall:

- Open 9T3F3-F3 disconnect switch
- Open 9DT3-T3 and 9L5T3-T3 disconnect switches
- Open AC control MCB to 9T3 auxiliaries and tag
- Open 125Vdc MCB to 9T3 primary and secondary protection and tag with PC13

3.23. To restore 9T3 Bank to service

3.23.1. Prepare 9T3 Bank restoration:

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R9 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 9T3 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 9DT3-T3 and 9L5T3-T3 disconnect switches
- Turn on 125Vdc supply and close 9T3F3-F3 disconnect switch
- Close AC control MCB to 9T3 auxiliaries and remove tag
- Close 125Vdc MCB to 9T3 primary and secondary protection and remove PC13 tag
- Advise SCC and Customer of readiness to energize 9T3 bank

3.23.2. Restoration of 9T3 Bank

- SCC shall close (or advise R9 Operator to close) the 9DT3 and 9L5T3 breakers
- R9 Operator shall advise Customer of readiness to restore 9F3 Feeder to service
- SCC shall close (or advise R9 Operator to close) 9T3F3 Breaker

3.24. To restore 9T3 Bank to service after automatic outage

If 9T3 Bank trips auto due to fault:

R9 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 R9 Operator to energize) the bank **ONCE** by closing 9DT3 and 9L5T3 breakers

R9 Operator shall advise Customer of readiness to restore 9F3 Feeder to service

SCC shall close (or advise R9 Operator to close) 9T3F3 breaker

R9 Operator shall:

- Advise the Supervisor/Area Manager of operation above

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

3.25. To isolate 9T4 Transformer for work

- R9 Operator shall request for Station Guarantee from Customer on 9F4 Feeder

SCC shall carry out or advise R9 Operator to carry out the following:

- Inform Customer about readiness to take off 9T4 Bank
- Request Customer on 9T4 Bank to take off their load
- Open AC4 Contactor/MCB to take off supply to 9T4 transformer auxiliaries

SCC shall carry out (or advise R9 Operator to carry out) the following:

- Open 9T4F2 breaker
- Open 9DT4 and 9L1T4 breakers
- Check for no potential on 9T4 Bank

R9 Operator shall:

- Open 9DT4-T4 and 9L1T4-T4 disconnect switches and turn off its 125Vdc supply
- Open 9T4F4-F4 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 9T4 auxiliaries and tag
- Open 125Vdc MCB to 9T4 primary and secondary protection and tag with PC13

3.26. To restore 9T4 Bank to service

3.26.1. Prepare 9T4 Bank restoration:

R9 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 9T4 Bank and temporary grounds removed
- Turn on 125Vdc supply and close 9DT4-T4 and 9L1T4-T4 disconnect switches
- Turn on 125Vdc supply and close 9T4F4-F4 disconnect switch
- Close AC control MCB to 9T4 auxiliaries and remove tag

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- Close 125Vdc MCB to 9T4 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to energize 9T4 bank

3.26.2. Restoration of 9T4 Bank

- SCC shall close (or advise R9 Operator to close) the 9DT4 and 9L1T4 breakers
- R9 Operator shall advise Customer of readiness to restore 9F4 Feeder to service
- SCC shall close (or advise R9 Operator to close) 9T4F4 Breaker

3.27. To restore 9T4 Bank to service after automatic outage

If 9T4 Bank trips auto due to fault:

R9 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 R9 Operator to energize) the bank **ONCE** by closing 9DT4 and 9L1T4 breakers

R9 Operator shall advise Customer of readiness to restore 9F4 Feeder to service

SCC shall close (or advise R9 Operator to close) 9T4F4 breaker

R9 Operator shall:

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

3.28. To isolate 9SC1 Capacitor Bank for work

SCC shall carry out (or advise R9 Operator to carry out) the following:

- Open 9T1SC1 breaker

SCC shall advise R9 Operator to carry out the following:

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- Open 9T1SC1-SC1 disconnect switch and turn off its 125Vdc supply
- Close 9SC1-G ground disconnect switch

3.29. To restore 9SC1 Capacitor Bank to service after work

3.29.1. Prepare 9SC1 Capacitor Bank for restoration:

R9 Operator shall:

- Advise SCC when work on the 9SC1 Capacitor Bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 9SC1 Capacitor Bank and temporary grounds removed
- Open 9SC1-G ground disconnect switch
- Turn on 125Vdc supply and close 9T1SC1-SC1 disconnect switch

3.29.2. Restoration of 9SC1 Capacitor Bank to service:

- SCC shall close (or advise R9 Operator to close) 9T1SC1 breaker if the voltage is below 32.8kV

3.30. To isolate 9SC2 Capacitor Bank for work

SCC shall carry out (or advise R9 Operator to carry out) the following:

- Open 9T2SC2 breaker

SCC shall advise R9 Operator to carry out the following:

- Open 9T2SC2-SC2 disconnect switch and turn off its 125Vdc supply
- Close 9SC2-G ground disconnect switch

3.31. To restore 9SC2 Capacitor Bank to service after work

3.31.1. Prepare 9SC2 Capacitor Bank for restoration:

R9 Operator shall:

- Advise SCC when work on the 9SC2 Capacitor Bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 9SC2 Capacitor Bank and temporary grounds removed
- Open 9SC2-G ground disconnect switch

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- Turn on 125Vdc supply and close 9T2SC2-SC2 disconnect switch

3.31.2. Restoration of 9SC2 Capacitor Bank to service:

- SCC shall close (or advise R9 Operator to close) 9T2SC2 breaker if the voltage is below 32.8kV

3.32. To Isolate 9T1F1 Breaker for work

- R9 Operator shall request for Station Guarantee from Customer on 9F1 Feeder

SCC shall advise R9 Operator to carry out the following:

- Inform Customer about readiness to take off 9T1 bank
- Request Customer on 9T1 Bank to take off their load
- Transfer station service supply from AC1 to AC2

SCC shall carry out (or advise R9 Operator to carry out) the following:

- Open 9T1F1 breaker
- Open 9L3T1 and 9DT1

SCC shall advise R9 Operator to carry out the following:

- Open 9T1F1-F1 disconnect switch and turn off its 125Vdc supply
- Open 9L3T1-T1 and 9DT1-T1 disconnect switch and turn off its 125Vdc supply

3.33. To restore 9T1F1 Breaker to service after work

3.33.1. Prepare 9T1F1 breaker for restoration:

R9 Operator shall:

- Advise SCC when work on the 9T1F1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 9T1F1 Breaker and temporary grounds removed
- Turn on 125Vdc supply and close 9L3T1-T1 and 9DT1-T1 disconnect switches
- Turn on 125Vdc supply and close 9T1F1-F1 disconnect switch

TECHNICAL DIRECTIVES

3.33.2. Restoration of 9T1F1 Breaker to service:

- SCC shall close (or advise R9 Operator to close) the 9L3T1 and 9DT1 breakers
- T8 Operator shall advise Customer of readiness to restore 9F1 Feeder
- SCC shall close (or advise R9 Operator to close) the 9T1F1 breaker

3.34. To Isolate 9T2F2 Breaker for work

- R9 Operator shall request for Station Guarantee from Customer on 9F2 Feeder

SCC shall advise R9 Operator to carry out the following:

- Inform Customer about readiness to take off 9T2 bank
- Request Customer on 9T2 Bank to take off their load
- Transfer station service supply from AC2 to AC1

SCC shall carry out (or advise R9 Operator to carry out) the following:

- Open 9T2F2 breaker
- Open 9L7T2 and 9DT2 breakers

SCC shall advise R9 Operator to carry out the following:

- Open 9T2F2-F2 disconnect switch and turn off its 125Vdc supply
- Open 9L7T2-T2 and 9DT2-T2 disconnect switches and turn off its 125Vdc supply

3.35. To restore 9T2F2 Breaker to service after work

3.35.1. Prepare 9T2F2 breaker for restoration:

R9 Operator shall:

- Advise SCC when work on the 9T2F2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 9T2F2 Breaker and temporary grounds removed
- Turn on 125Vdc supply and close 9L7T2-T2 and 9DT2-T2 disconnect switches
- Turn on 125Vdc supply and close 9T2F2-F2 disconnect switch

TECHNICAL DIRECTIVES

3.35.2. Restoration of 9T2F2 Breaker to service:

- SCC shall close (or advise R9 Operator to close) the 9L7T2 and 9DT2 breakers
- R9 Operator shall advise Customer of readiness to restore 9F2 Feeder
- SCC shall close (or advise R9 Operator to close) the 9T2F2 breaker

3.36. To Isolate 9T3F3 Breaker for work

- R9 Operator shall request for Station Guarantee from Customer on 9F3 Feeder

SCC shall advise R9 Operator to carry out the following:

- Inform Customer about readiness to take off 9T3 bank
- Request Customer on 9T3 Bank to take off their load

SCC shall carry out (or advise R9 Operator to carry out) the following:

- Open 9T3F3 breaker
- Open 9L5T3 and 9DT3 breakers

SCC shall advise R9 Operator to carry out the following:

- Open 9T3F3-F3 disconnect switch and turn off its 125Vdc supply
- Open 9L5T3-T3 and 9DT3-T3 disconnect switches and turn off its 125Vdc supply

3.37. To restore 9T3F3 Breaker to service after work

3.37.1. Prepare 9T3F3 breaker for restoration:

R9 Operator shall:

- Advise SCC when work on the 9T3F3 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 9T3F3 Breaker and temporary grounds removed
- Turn on 125Vdc supply and close 9L5T3-T3 and 9DT3-T3 disconnect switches
- Turn on 125Vdc supply and close 9T3F3-F3 disconnect switch

3.37.2. Restoration of 9T3F3 Breaker to service:

TECHNICAL DIRECTIVES

- SCC shall close (or advise R9 Operator to close) the 9L5T3 and 9DT3 breakers
- R9 Operator shall advise Customer of readiness to restore 9F3 Feeder
- SCC shall close (or advise R9 Operator to close) the 9T3F3 breaker

3.38. To Isolate 9T4F4 Breaker for work

- R9 Operator shall request for Station Guarantee from Customer on 9F4 Feeder

SCC shall advise R9 Operator to carry out the following:

- Inform Customer about readiness to take off 9T4 bank
- Request Customer on 9T4 Bank to take off their load

SCC shall carry out (or advise R9 Operator to carry out) the following:

- Open 9T4F4 breaker
- Open 9L1T4 and 9DT4 breakers

SCC shall advise R9 Operator to carry out the following:

- Open 9T4F4-F4 disconnect switch and turn off its 125Vdc supply
- Open 9L1T4-T4 and 9DT4-T4 disconnect switches and turn off its 125Vdc supply

3.39. To restore 9T4F4 Breaker to service after work

3.39.1. Prepare 9T4F4 breaker for restoration:

R9 Operator shall:

- Advise SCC when work on the 9T4F4 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 9T4F4 Breaker and temporary grounds removed
- Turn on 125Vdc supply and close 9L1T4-T4 and 9DT4-T4 disconnect switches
- Turn on 125Vdc supply and close 9T4F4-F4 disconnect switch

3.39.2. Restoration of 9T4F4 Breaker to service:

- SCC shall close (or advise R9 Operator to close) the 9DT4 and 9L1T4 breakers

TECHNICAL DIRECTIVES

- R9 Operator shall advise Customer of readiness to restore 9F4 Feeder
- SCC shall close (or advise R9 Operator to close) the 9T4F4 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 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.

TECHNICAL DIRECTIVES

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' and 'D' buses, a breaker and half configuration provide the normal points of supply to all circuits/equipment such as R1T, R3NR, TT5R, R7P lines, 9T1, 9T2, 9T3, 9T4 transformers 9SC1 and 9SC2 Capacitor Banks.

5. Approval

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Director, Technical Services