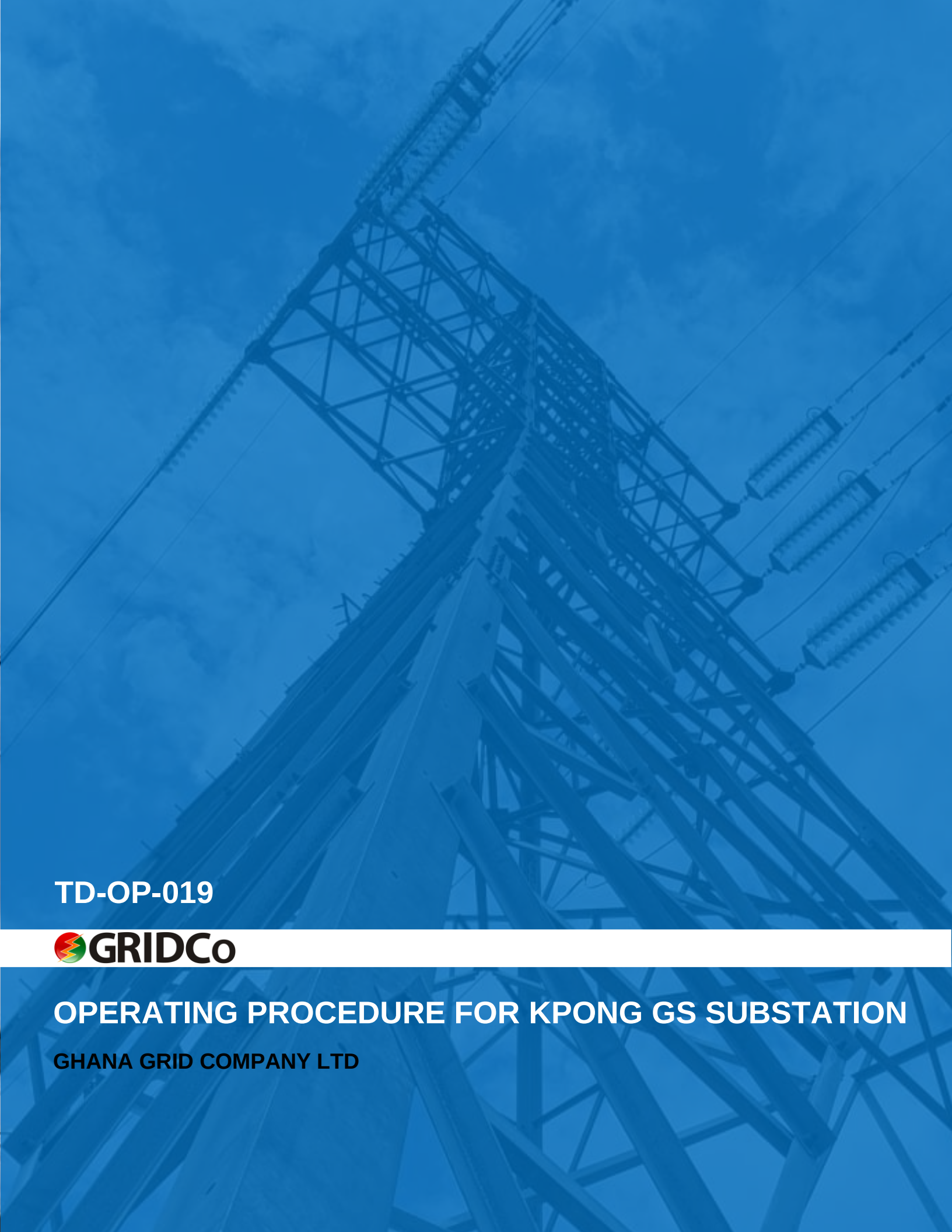

TD-OP-019

GRIDCo

OPERATING PROCEDURE FOR KPONG GS SUBSTATION

GHANA GRID COMPANY LTD

TECHNICAL DIRECTIVES

Title:	**OPERATING PROCEDURE FOR KPONG GS SUBSTATION (Z19)**		
Issued To:	Director, System Operations Director, SNS Manager, SCC Manager, Dispatch Operations Area Manager, Akosombo Operating Staff, Akosombo Area Maintenance Staff, Akosombo Area Dispatch Staff, SCC	**Number:**	TD-OP-019
		Subject Area:	Operating
		Issue Date:	Trial
		Origin:	Technical Services
Key Words:	Take Out, Isolate, Prepare, Energize, Restore, Automatic Outage		

Contents

1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at Z19 Substation to service for planned and auto outages.

2. Scope

The directive will be used by Operators at Akosombo Operating Area and System Control Center (SCC) for operation of equipment at Z19 Substation.

3. Procedure

3.1. To take Z10A line out of service

SCC shall carry out (or advise the Z19 Operator to carry out the) following:

- Open 19ADL10 breaker

SCC shall carry out (or advise the A1 Operator to carry out) the following:

- Open 1DL10 and 1L8L10 breakers

- Check for no potential on Z10A line

3.2. To take out, isolate and de-energize Z10A line for work

- Z19 Operator shall request for Station Guarantee from A1

SCC shall carry out (or advise the Z19 Operator to carry out) the following:

- Open 19ADL10 breaker

SCC shall carry out (or advise the A1 Operator to carry out) the following:

- Open 1DL10 and 1L8L10 breakers

- Check for no potential on Z10A line

SCC shall advise Z19 Operator to carry out the following:

- Open 19ADL10-L10 disconnect switch and turn off its 125Vdc supply

- Close 19Z10A-G ground disconnect switch

SCC shall advise A1 Operator to carry out the following:

- Open 1DL10–L10 and 1L8L10-L10 disconnect switches and turn off its 125Vdc supply

- Close 1Z10A-G ground disconnect switch

3.3. To restore Z10A line to service after work

3.3.1. Prepare Z10A line for restoration

Z19 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 Z10A line

SCC shall advise A1 Operator to carry out the following:

- Check opened 1L8L10 and 1DL10 breakers

- Open 1Z10A-G ground disconnect switch
- Turn on 125Vdc supply and close 1DL10-L10 and 1L8L10-L10 disconnect switches

SCC shall advise Z19 Operator to carry out the following:

- Check opened 19ADL10 breaker
- Open 19ADL10-G ground disconnect switch
- Turn on 125Vdc supply and close 19ADL10-L10 disconnect switch

3.3.2. Restoration of Z10A line to service:

SCC shall:

- Advise the Z19 and A1 Operators of readiness to restore Z10A line to service
- Close (or advise the Z19 Operator to close) 19ADL10 breaker
- Close (or advise the A1 Operator to close) 1L8L10 and 1DL10 breakers

3.4. To restore Z10A line to service after automatic outage

If Z10A line trips auto due to fault:

Z19 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 A1 Operator to energize) the line **ONCE** by closing 1L8L10 and 1DL10 breakers
- Close (or advise the Z19 Operator to close) 19ADL10 breaker

Z19 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 Z18V line out of service

SCC shall carry out (or advise the Z19 Operator to carry out) the following:

- Open 19ADL10 breaker

SCC shall advise V2 Operator to carry out the following:

- Open 2L18A and 2L18L17 breakers
- Check for no potential on Z18V line

3.6. To take out, isolate and de-energize Z18V line for work

- Z19 Operator shall request for Station Guarantee from V2

SCC shall carry out (or advise the Z19 Operator to carry out) the following:

- Open 19ADL18 breaker

SCC shall advise V2 Operator to carry out the following:

- Open 2L18A and 2L18L17 breakers
- Check for no potential on Z18V line

SCC shall advise Z19 Operator to carry out the following:

- Open 19ADL18-L18 disconnect switch and turn off its 125Vdc supply
- Close 19Z18V-G ground disconnect switch

SCC shall advise V2 Operator to carry out the following:

- Open 2L18A-L18 and 2L18L17-L18 disconnect switches and turn off its 125Vdc supply
- Close 2Z18V-G ground disconnect switch

3.7. To restore Z18V line to service after work

3.7.1. Prepare Z18V line for restoration

Z19 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 Z18V line

SCC shall advise V2 Operator to carry out the following:

- Check opened 2L18A and 2L18L17 breakers
- Open 2Z18V-G ground disconnect switch
- Turn on 125Vdc supply and close 2L18A-L18 and 2L18L17-L18 disconnect switches

SCC shall advise Z19 Operator to carry out the following:

- Check opened 19ADL18 breaker
- Open 19Z18V-G ground disconnect switch
- Turn on 125Vdc supply and close 19ADL18-L18 disconnect switches

3.7.2. Restoration of Z18V line to service:

SCC shall:

- Advise the Z19 and V2 Operators of readiness to restore Z18V line to service
- Close (or advise the Z19 Operator to close) 19ADL18 breaker
- Close (or advise the V2 Operator to close) 2L18A and 2L18L17 breakers

3.8. To restore Z18V line to service after automatic outage

If Z18V line trips auto due to fault:

Z19 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 Z19 Operator to energize) the line **ONCE** by closing 19ADL18 breaker

- Close (or advise the V2 Operator to close) 2L18A and 2L18L17 breakers

A1 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 isolate 19T5 Transformer for work

- Z19 Operator shall request Station Guarantee from Customers on 19F1 and 1F2 Feeders

SCC shall carry out or advise Z19 operator to carry out the following:

- Inform customers about readiness to take off 19T5 Bank
- Request customers on 19T5 Bank to take off their load
- Transfer Station Service supply from AC Contactor to Standby Generator
- Open AC Contactor/MCB to take off supply to 19T5 transformer auxiliaries

SCC shall carry out (or advise Z19 Operator to carry out) the following:

- Check open 19B2F2-S and 19B3F3-S disconnect switches
- Open 19B2F2 and 19B3F3 feeder breakers
- Open 19AT5 breaker

Z19 Operator shall:

- Check for no potential on 19T5 Bank
- Check open 19B2F2-S and 19B3F3-S disconnect switches
- Open 19AT5-A disconnect switch
- Open 19T5-B2 disconnect switch
- Open AC control MCB to 19T5 auxiliaries and tag
- Open 125V DC MCB to 19T5 primary and secondary protection and tag with PC13

3.10. To restore 19T5 Bank to service

3.10.1. Prepare 19T5 Bank restoration:

Z19 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 19T5 Bank and temporary grounds removed
- Check open 19B2F2-S and 19B3F3-S disconnect switches
- Turn on 125Vdc supply and close 19AT5-A disconnect switch
- Turn on 125Vdc supply and close 19T5-B2 disconnect switch
- Close AC control MCB to 19T5 auxiliaries and remove tag
- Close 125V DC MCB to 19T5 primary and secondary protection and remove PC13 tag
- Advise SCC and Customers of readiness to energize 19T5 bank

3.10.2. Restoration of 19T5 Bank:

- SCC shall close (or advise Z19 Operator to close) the 19AT5 breaker
- A1 Operator shall advise Customers of readiness to restore 19F2 and 1F3 feeders to service
- SCC shall close (or advise Z19 Operator to close) 19B2F2 and 19B3F3 breakers

3.11. To restore 19T5 Bank to service after automatic outage

If 19T5 Bank trips auto due to fault:

Z19 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 Z19 Operator to energize) the bank **ONCE** by closing 19AT5 breaker
- Advise Customer of readiness to restore 19F2 and 19F3 feeders to service
- Close 19B2F2 and 19B3F3 breakers

A1 Operator shall:

- Advise the Supervisor/Area 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.

3.12. To isolate 19T6 Transformer for work

- Z19 Operator shall request Station Guarantee from Customers on 19F1 and 1F2 Feeders

SCC shall carry out or advise Z19 operator to carry out the following:

- Inform customers about readiness to take off 19T6 Bank
- Request customers on 19T6 Bank to take off their load
- Transfer Station Service supply from AC Contactor to Standby Generator
- Open AC Contactor/MCB to take off supply to 19T6 transformer auxiliaries

SCC shall carry out (or advise Z19 Operator to carry out) the following:

- Check open 19B19F1-S and 19B3F3-S disconnect switches
- Open 19B19F1 and 19B3F3 feeder breakers
- Open 19DT6 breaker

Z19 Operator shall:

- Check for no potential on 19T6 Bank
- Check open 19B19F1-S and 19B3F3-S disconnect switches
- Open 19DT6-A disconnect switch
- Open 19T6-B1 disconnect switch
- Open AC control MCB to 19T6 auxiliaries and tag
- Open 125V DC MCB to 19T6 primary and secondary protection and tag with PC13

3.13. To restore 19T6 Bank to service

3.13.1. Prepare 19T6 Bank restoration:

Z19 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 19T6 Bank and temporary grounds removed
- Check open 19B19F1-S and 19B3F3-S disconnect switches
- Turn on 125Vdc supply and close 19DT6-D disconnect switch
- Turn on 125Vdc supply and close 19T6-B1 disconnect switch
- Close AC control MCB to 19T6 auxiliaries and remove tag
- Close 125V DC MCB to 19T6 primary and secondary protection and remove PC13 tag
- Advise SCC and Customers of readiness to energize 19T6 bank

3.13.2. Restoration of 19T6 Bank:

- SCC shall close (or advise Z19 Operator to close) the 19DT6 breaker
- A1 Operator shall advise Customers of readiness to restore 19F1 and 1F3 feeders to service
- SCC shall close (or advise Z19 Operator to close) 19B19F1 and 19B3F3 breakers

3.14. To restore 19T6 Bank to service after automatic outage

If 19T6 Bank trips auto due to fault:

Z19 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 Z19 Operator to energize) the bank **ONCE** by closing 19DT6 breaker
- Advise Customer of readiness to restore 19F1 and 19F3 feeders to service
- Close 19B19F1 and 19B3F3 breakers

A1 Operator shall:

- Advise the Supervisor/Area 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.

3.15. To isolate 19F1 Feeder for work

- A1 Operator shall request for Station Guarantee from Customer on 19F1 Feeder

SCC shall carry out or advise the Z19 Operator to carry out the following:

- Open 19B1F1 breaker

Z19 Operator shall:

- Check open 19B1F1-S disconnect switch
- Open 19B1F1-B1 and 19B1F1-F1 disconnect switches

3.16. To restore 19F1 Feeder for service after work

3.16.1. Prepare 19F1 Feeder for service after work

- A1 Operator shall advise SCC and Customer when work on the feeder has been completed and permit surrendered (including all Station Guarantees)
- Check opened 19B1F1 breaker
- Check open 19B1F1-S disconnect switch
- Close 19B1F1-B1 and 19B1F1-F1 disconnect switches
- Advise SCC of readiness to restore I9F1 feeder to service
- SCC shall close (or advise Z19 Operator to close)19B1F1 breaker

3.17. To isolate 19F2 Feeder for work

- A1 Operator shall request for Station Guarantee from Customer on 19F2 Feeder

SCC shall carry out or advise the Z19 Operator to carry out the following:

- Open 19B2F2 breaker

Z19 Operator shall:

- Check open 19B2F2-S disconnect switch
- Open 19B2F2-B2 and 19B2F2-F2 disconnect switches

3.18. To restore 19F2 Feeder for service after work

3.18.1. Prepare 19F2 Feeder for service after work

- A1 Operator shall advise SCC and Customer when work on the feeder has been completed and permit surrendered (including all Station Guarantees)
- Check opened 19B2F2 breaker
- Check open 19B2F2-S disconnect switch
- Close 19B2F2-B2 and 19B2F2-F2 disconnect switches
- Advise SCC of readiness to restore I9F2 feeder to service
- SCC shall close (or advise Z19 Operator to close)19B2F2 breaker

3.19. To isolate 19F3 Feeder for work

- A1 Operator shall request for Station Guarantee from Customer on 19F3 Feeder

SCC shall carry out or advise the Z19 Operator to carry out the following:

- Open 19B3F3 breaker

Z19 Operator shall:

- Check open 19B3F3-S disconnect switch
- Open 19B3F3-B3 and 19B3F3-F3 disconnect switches

3.20. To restore 19F3 Feeder for service after work

3.20.1. Prepare 19F3 Feeder for service after work

- A1 Operator shall advise SCC and Customer when work on the feeder has been completed and permit surrendered (including all Station Guarantees)
- Check opened 19B3F3 breaker
- Check open 19B3F3-S disconnect switch
- Close 19B3F3-B3 and 19B3F3-F3 disconnect switches
- Advise SCC of readiness to restore I9F3 feeder to service
- SCC shall close (or advise Z19 Operator to close)19B3F3 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.
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 Z10A, Z18V lines, 19T1, 19T2, 19T3, 19T4,19T5 and 19T6 transformers.

5. Approval

…….

Director, Technical Services