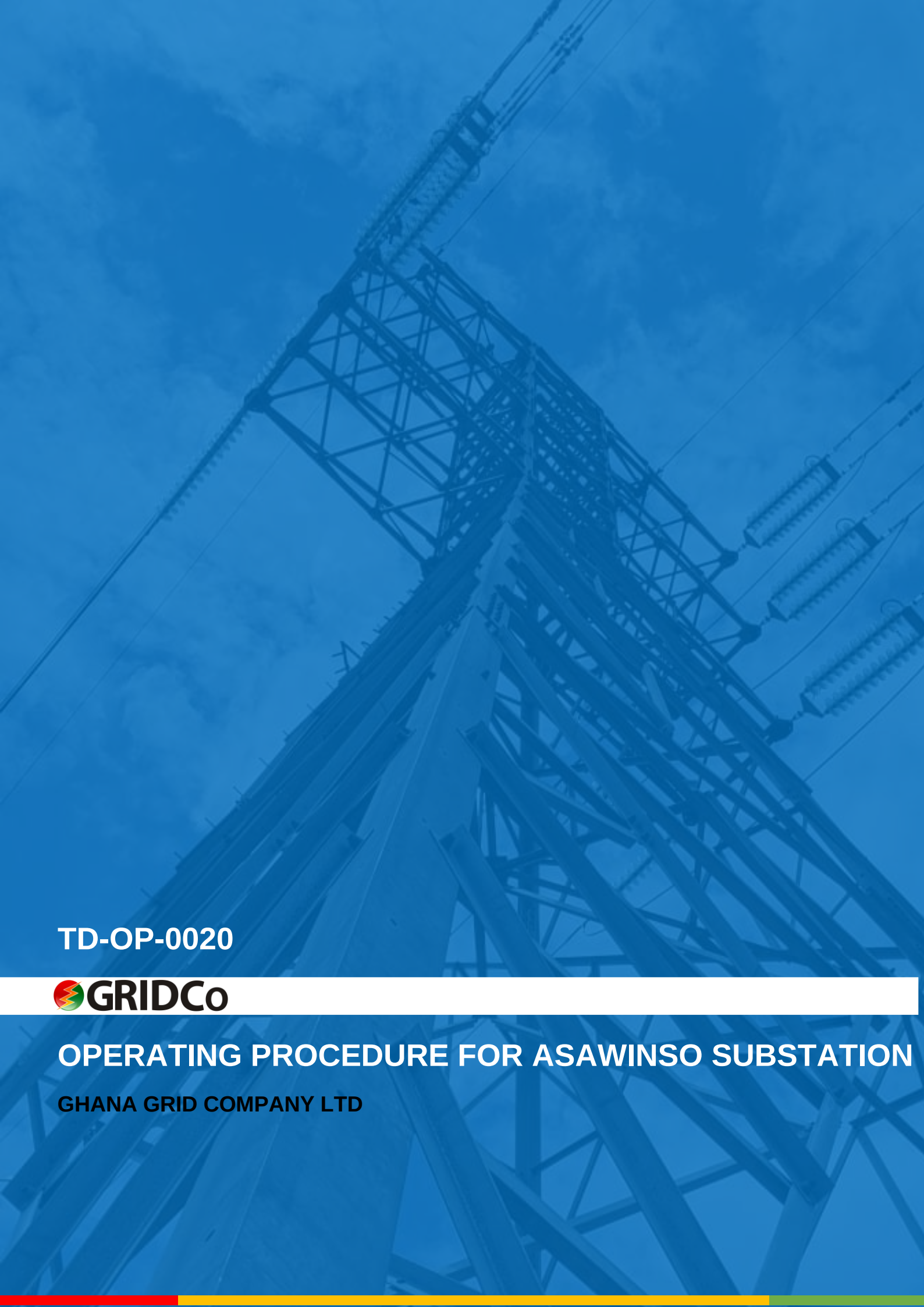

TD-OP-0020

GRIDCo

OPERATING PROCEDURE FOR ASAWINSO SUBSTATION

GHANA GRID COMPANY LTD

Title:	**OPERATING PROCEDURE FOR ASAWINSO SUBSTATION (AS20)**		
Issued To:	Director, System Operations Director, SNS Manager, SCC Manager, Dispatch Operations Area Manager, Kumasi Operating Staff, Kumasi Area Maintenance Staff, Kumasi Area Dispatch Staff, SCC	**Number:**	TD-OP-0020
		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 AS20 Substation to service for planned and auto outages.

2. Scope

The directive will be used by Operators at Kumasi Operating Area and System Control Center (SCC) for operation of equipment at AS20 Substation.

3. Procedure

3.1. To take AR1AS line out of service

SCC shall carry out (or advise the AS20 Operator to carry out) the following:

- Verify opened 20AR1AS-S bypass disconnect switch
- Open 20AR1AS breaker

SCC shall carry out (or advise the AR57 Operator to carry out) the following:

- Open 57L1A breaker
- Check for no potential on AR1AS line

3.2. To take out, isolate and de-energize AR1AS line for work

- AS20 Operator shall request for Station Guarantee from AR57

SCC shall carry out (or advise the AS20 Operator to carry out) the following:

- Checked opened 20AR1AS-S bypass disconnect switch and turn off its 125Vdc supply
- Open 20AR1AS breaker

SCC shall carry out (or advise AR57 Operator to carry out) the following:

- Open 57L1A breaker
- Check for no potential on AR1AS line

SCC shall advise the AS20 Operator to carry out the following:

- Open 20AR1AS-L1 and turn off 125Vdc supply its supply
- Close 20AR1AS-G ground disconnect switch

SCC shall advise AR57 Operator to carry out the following:

- Open 57L1A-L1 and turn off its125Vdc supply
- Close 57AR1AS-G ground disconnect switch

3.3. To restore AR1AS line to service after work

3.3.1. Prepare AR1AS line for restoration:

AR1AS 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 AR1AS line

SCC shall advise AR57 Operator to carry out the following:

- Check opened 57L1A breaker
- Open 57AR1AS-G ground disconnect switch
- Turn on 125Vdc supply and close 57L1A-L1 disconnect switch

SCC shall advise AS20 Operator to carry out the following:

- Check opened 20AR1AS-S bypass disconnect switch and turn off its 125Vdc supply
- Check opened 20AR1AS breaker
- Open 20AR1AS-G ground disconnect switch
- Turn on 125Vdc supply and close 20AR1AS-L1 disconnect switch

3.3.2. Restoration of AR1AS line to service:

SCC shall:

- Advise the AR57 and AS20 Operators of readiness to restore AR1AS line to service
- Close (or advise the AR57 Operator to close) 57L1A breaker
- Close (or advise the AS20 Operator to close) 20AR1AS breaker

3.4. To restore AR1AS line to service after automatic outage

If AR1AS line trips auto due to fault:

AS20 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 AR57 Operator to energize) the line **ONCE** by closing 57L1A breaker
- Close (or advise the AS20 Operator to close) 20AR1AS breaker

AS20 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 AS2JB line out of service

SCC shall carry out (or advise the AS20 Operator to carry out) the following:

- Verify opened 20AS2JB-S bypass disconnect switch
- Open 20AS2JB breaker

SCC shall carry out (or advise the JB64 Operator to carry out) the following:

- Open 64L2A and 64L1L2 breakers
- Check for no potential on AS2JB line

3.6. To take, isolate and de-energize AS2JB line for work

- AS20 Operator shall request for Station Guarantee from JB64

SCC shall carry out (or advise the AS20 Operator to carry out) the following:

- Checked open 20AS2JB-S bypass disconnect switch and turn off its 125Vdc supply
- Open 20AS2JB breaker

SCC shall carry out (or advise the JB64 Operator to carry out) the following:

- Open 64L2A and 64L1L2 breakers
- Check for no potential on AS2JB line

SCC shall advise JB64 Operator to carry out the following:

- Open 64L2A-L2 and 64L1L2-L2 disconnect switches and turn off its 125Vdc supply
- Close 64AS2JB-G ground disconnect switch

SCC shall advise AS20 Operator to carry out the following:

- Open 20AS2JB-L2 and turn off its 125Vdc supply
- Close 20AS2JB-G ground disconnect switch

3.7. To restore AS2JB line to service after work

3.7.1. Prepare AS2JB 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 AS2JB line

SCC shall advise JB64 Operator to carry out the following:

- Check opened 64L2A and 64L1L2 breakers
- Open 64AS2JB-G ground disconnect switch
- Turn on 125Vdc supply and close 64L2A-L2 and 64L1L2-L2 disconnect switches

SCC shall advise AS20 Operator to carry out the following:

- Check opened 20AS2JB breaker
- Open 20AS2JB-G ground disconnect switch
- Turn on 125Vdc supply and close 20AS2JB-L2 disconnect switch

3.7.2. Restoration of AS2JB line to service:

SCC shall:

- Advise the AS20 and JB64 Operators of readiness to restore AR1AS line to service

- Close (or advise the JB64 Operator to close) 64L2A and 64L1L2 breakers

- Close (or advise the AS20 Operator to close) 20AS2JB breaker

3.8. To restore AS2JB line to service after automatic outage

If AS2JB line trips auto due to fault:

- 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 JB64 Operator to energize) the line **ONCE** by closing 64L2A and 64L1L2 breakers

- Close (or advise the AS20 Operator to close) 20AS2JB breaker

AS20 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 AS3BT line out of service

SCC shall carry out (or advise the AS20 Operator to carry out) the following:

- Verify opened 20AS3BT-S bypass disconnect switch

- Open 20AS3BT breaker

SCC shall carry out (or advise the BT78 Operator to carry out) the following:

- Verify opened 78AS3BT-S bypass disconnect switch

- Open 78AS3BT breaker

- Check for no potential on AS3BT line

3.10. To take out, isolate and de-energize AS3BT line for work

- AS20 Operator shall request for Station Guarantee from BT78

SCC shall carry out (or advise the AS20 Operator to carry out) the following:

- Checked opened 20AS3BT-S bypass disconnect switch and turn off its 125Vdc supply
- Open 20AS3BT breaker

SCC shall carry out (or advise BT78 Operator to carry out) the following:

- Checked opened 78AS3BT-S bypass disconnect switch and turn off its 125Vdc supply
- Open 78AS3BT breaker
- Check for no potential on AS3BT line

SCC shall advise the AS20 Operator to carry out the following:

- Open 20AS3BT-L3 and turn off 125Vdc supply its supply
- Close 20AS3BT-G ground disconnect switch

SCC shall advise BT78 Operator to carry out the following:

- Open 78AS3BT-L3 and turn off its125Vdc supply
- Close 78AS3BT-G ground disconnect switch

3.11. To restore AS3BT line to service after work

3.11.1. Prepare AS3BT line for restoration:

AS3BT 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 AS3BT line

SCC shall advise BT78 Operator to carry out the following:

- Check opened 78AS3BT-S bypass disconnect switch and turn off its 125Vdc supply
- Check opened 78AS3BT breaker
- Open 78AS3BT-G ground disconnect switch
- Turn on 125Vdc supply and close 78AS3BT-L3 disconnect switch

SCC shall advise AS20 Operator to carry out the following:

- Check opened 20AS3BT-S bypass disconnect switch and turn off its 125Vdc supply
- Check opened 20AS3BT breaker
- Open 20AS3BT-G ground disconnect switch
- Turn on 125Vdc supply and close 20AS3BT-L3 disconnect switch

3.11.2. Restoration of AS3BT line to service:

SCC shall:

- Advise the BT78 and AS20 Operators of readiness to restore AS3BT line to service
- Close (or advise the BT78 Operator to close) 78AS3BT breaker
- Close (or advise the AS20 Operator to close) 20AS3BT breaker

3.12. To restore AS3BT line to service after automatic outage

If AS3BT line trips auto due to fault:

AS20 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 BT78 Operator to energize) the line **ONCE** by closing 78AS3BT breaker
- Close (or advise the AS20 Operator to close) 20AS3BT breaker

AS20 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 isolate 20T1 Transformer for work

- AS20 Operator shall request for Station Guarantee from Customer(s) on 20F1 Feeder

SCC shall advise AS20 Operator to carry out the following:

- Inform Customer(s) about readiness to take off 20T1 bank
- Request Customer(s) on 20T1 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 20T1 transformer auxiliaries
- Transfer Station Service from AC1 to AC2

SCC shall carry out (or advise AS20 Operator to carry out) the following:

- Open 20T1F1 breaker
- Open 20AT1 breaker
- Check for no potential on 20T1 Bank

SCC shall advise AS20 Operator to carry out the following:

- Open 20T1F1-F1 disconnect switch
- Open 20AT1-A disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 20T1 auxiliaries and tag
- Open 125V DC MCB to 20T1 primary and secondary protection and tag with PC13

3.14. To restore 20T1 Bank to service after work

3.14.1. Prepare 20T1 bank for restoration:

AS20 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 20T1 Bank and temporary grounds removed
- Close 20T1F1-F1 disconnect switch
- Close 20AT1-A disconnect switch

- Close AC control MCB to 20T1 auxiliaries and remove tag

- Close 125V DC MCB to 20T1 primary and secondary protection and remove PC13 tag

- Advise SCC of readiness to restore 20T1 Bank to service

3.14.2. Restoration of 20T1 Bank to service:

- SCC shall close (or advise AS20 Operator to close) the 20AT1 breaker

- AS20 Operator shall advise Customer(s) of readiness to restore 20T1 Bank to service

- SCC shall close (or advise AS20 Operator to close) the 20T1F1 breaker

3.15. To restore 20T1 Bank to service after automatic outage

If 20T1 bank trips auto due to fault:

- 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 AS20 Operator to energize) the bank **ONCE** by closing 20AT1 breaker

AS20 Operator shall advise Customer(s) of readiness to restore 20F1 feeder to service
SCC shall close (or advise AS20 Operator to close) 20T1F1 breaker

AS20 Operator shall:

- Advise the Supervisor/Area Manager of item above

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

3.16. To isolate 20T2 Transformer for work

- AS20 Operator shall request for Station Guarantee from Customer(s) on 20F2 Feeder

SCC shall advise AS20 Operator to carry out the following:

- Inform Customer(s) about readiness to take off 20T2 bank
- Request Customer(s) on 20T2 Bank to take off their load
- Transfer Station Service from AC2 to AC1
- Open AC2 Contactor/MCB to take off supply to 20T2 transformer auxiliaries

SCC shall carry out (or advise AS20 Operator to carry out) the following:

- Open 20T2F2 breaker
- Open 20AT2 breaker
- Check for no potential on 20T2 Bank
- Open 20T2F2-F2 disconnect switch
- Open 20AT2-A disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 20T2 auxiliaries and tag
- Open 125V DC MCB to 20T2 primary and secondary protection and tag with PC13

3.17. To restore 20T2 Bank to service after work

3.17.1. Prepare 20T2 Bank for restoration:

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 20T2 Bank and temporary grounds removed
- Close 20T2F2-F2 disconnect switch
- SCC shall close (or advise AS20 Operator to close) 20AT2-A disconnect switch
- Close AC control MCB to 20T2 auxiliaries and remove tag
- Close 125V DC MCB to 20T2 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 20T2 Bank to service

3.17.2. Restoration of 20T2 bank to service:

- SCC shall close (or advise AS20 Operator to close) the 20AT2 breaker

- AS20 Operator shall advise Customer(s) of readiness to restore 20T2 Bank to service

- SCC shall close (or advise AS20 Operator to close) the 20T2F2 breaker

3.18. To restore 20T2 Bank to service after automatic outage

If 20T1 bank trips auto due to fault:

AS20 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 AS20 Operator to energize) the bank **ONCE** by closing 20AT2 breaker

AS20 Operator shall advise Customer(s) of readiness to restore 20F2 feeder to service

SCC shall close (or advise AS20 Operator to close) 20T2F2 breaker

AS20 Operator shall:

- Advise the Supervisor/Area Manager of item above

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

3.19. To isolate 20T1F1 Breaker for work

- AS20 Operator shall request for Station Guarantee from Customer(s) on 20F1 feeder

SCC shall carry out (or advise AS20 Operator to carry out) the following:

- Open 20T1F1 breaker

- Open 20AT1 breaker

- Check for no potential on 20T1 Bank

SCC shall advise AS20 Operator to carry out the following:

- Open 20AT1-A disconnect switch and turn off its 125Vdc supply
- Open 20T1F1-F1 disconnect switch

3.20. To restore 20T1F1 Breaker to service after work

3.20.1. Prepare 20T1F1 breaker for restoration:

AS20 Operator shall:

- Advise SCC when work on the feeder breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 20T1 Bank and temporary grounds removed
- Turn on 125Vdc supply and Close 20AT1-A disconnect switch
- Close 20T1F1-F1 disconnect switch
- Advise SCC of readiness to restore 20T1F1 breaker to service

3.20.2. Restoration of 20T1F1 Feeder breaker to service:

- SCC shall close (or advise AS20 Operator to close) the 20AT1 breaker
- AS20 Operator shall advise Customer(s) of readiness to restore 20F1 feeder to service
- SCC shall close (or advise AS20 Operator to close) the 20T1F1 breaker

3.21. To isolate 20T2F2 Breaker for work

- AS20 Operator shall request for Station Guarantee from Customer(s) on 20F2 feeder

SCC shall carry out (or advise AS20 Operator to carry out) the following:

- Open 20F2SC1 breaker
- Open 20AT2 breaker
- Open 20T2F2 breaker

SCC shall advise AS20 Operator to carry out the following:

- Open 20AT2-A disconnect switch and turn off its 125Vdc supply
- Open 20T2F2-F2 disconnect switch

3.22. To restore 20T2F2 Breaker to service after work

3.22.1. Prepare 20T2F2 breaker for restoration:

AS20 Operator shall:

- Advise SCC when work on the feeder breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 20T2 Bank and temporary grounds removed
- Turn on 125vdc supply and Close 20AT2-A disconnect switch
- Close 20T2F2-F2 disconnect switch
- Advise SCC of readiness to restore 20T2F2 breaker to service

3.22.2. Restoration of 20T2F2 Feeder breaker to service:

- SCC shall close (or advise AS20 Operator to close) the 20AT2 breaker
- AS20 Operator shall advise Customer(s) of readiness to restore 20F2 Feeder to service
- SCC shall close (or advise AS20 Operator to close) the 20T2F2 breaker

3.23. To isolate 20SC1 Capacitor Bank for work

SCC shall carry out (or advise AS20 Operator to carry out) the following:

- Open 20F2SC1 breaker

SCC shall advise AS20 Operator to carry out the following:

- Open 20F2SC1-SC1 disconnect switch
- Close 20F2SC1-G ground disconnect switch

3.24. To restore 20SC1 Capacitor Bank to service after work

3.24.1. Prepare 20SC1 Capacitor Bank for restoration:

AS20 Operator shall:

- Advise SCC when work on the 20SC1 Capacitor Bank has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 20SC1 Capacitor Bank and temporary grounds removed

- Check opened 20F2SC1 breaker
- Open 20F2SC1-G ground disconnect switch
- Close 20F2SC1-SC1 disconnect switch
- Advise SCC of readiness to restore 20SC1 Capacitor Bank to service

3.25. Restoration of 20SC1 Capacitor Bank to service:

- SCC shall close (or advise AS20 Operator to close) 20F2SC1 breaker if the voltage is below 32.8kV

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 station is only one 161Kv bus arrangement. The main 'A' bus provides the normal points of supply to all circuits/equipment such as AR1AS, AS2JB, AS3BT lines, 20T1, 20T2 transformers and 20SC1 Capacitor Bank.

5. Approval

.....

Director, Technical Services