TD-OP-0018

GRIDCo

OPERATING PROCEDURE FOR KONONGO SUBSTATION

GHANA GRID COMPANY LTD

Title:	**OPERATING PROCEDURE FOR KONONGO SUBSTATION (JI8)**		
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-0018
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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 J18 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 J18 Substation.

3. Procedure

3.1. To take J2K line out of service

SCC shall carry out (or advise the J18 Operator to carry out) the following:

Verify opened 18J2K-S bypass disconnect

- Open 18J2K breaker

SCC shall carry out (or advise the K13 Operator to carry out) the following:

- Open 13L2A and 13L2T3 breakers
- Check for no potential on J2K line

3.2. To take out, isolate and de-energize J2K line for work

- J18 Operator shall request for Station Guarantee from K13

SCC shall carry out (or advise the J18 Operator to carry out) the following:

- Checked opened 18J2K-S bypass disconnect switch and turn off its 125Vdc supply
- Open 18J2K breaker

SCC shall carry out (or advise K13 operator to carry out) the following:

- Open 13L2A and 13L2T3 breakers
- Check for no potential on J2K line

SCC shall advise the J18 Operator to carry out the following:

- Open 18J2K-L2 and turn off 125Vdc supply its supply
- Close 18J2K-G ground disconnect switch

SCC shall advise K13 Operator to carry out the following:

- Open 13L2A-L2 and turn off its125Vdc supply
- Open 13L2T3-L2 and turn off its 125Vdc supply
- Close 13J2K-G ground disconnect switch

3.3. To restore J2K line to service after work

3.3.1. Prepare J2K line for restoration:

J2K 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 J2K line

SCC shall advise K13 Operator to carry out the following:

- Check opened 13L2A and 13L2T3 breakers
- Open 13J2K-G ground disconnect switch
- Turn on 125Vdc supply and close 13L2A-L2 and 13L2T3-L2 disconnect switches

SCC shall advise J18 Operator to carry out the following:

- Check opened 18J2K-S bypass disconnect switch and turn off its 125Vdc supply
- Check opened 18J2K breaker
- Open 18J2K-G ground disconnect switch
- Turn on 125Vdc supply and close 18J2K-L2 disconnect switch

3.3.2. Restoration of J2K line to service:

SCC shall:

- Advise the K13 and J18 Operators of readiness to restore J2K line to service
- Close (or advise the K13 Operator to close) 13L2A and 13L2T3 breakers
- Close (or advise the J18 Operator to close) 18J2K breaker

3.4. To restore J2K line to service after automatic outage

If J2K line trips auto due to fault:

J18 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 K13 Operator to energize) the line **ONCE** by closing 13L2A and 13L2T3 breakers
- Close (or advise the J18 Operator to close) 18J2K breaker

J18 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 N3J line out of service

- J18 Operator shall request for Station Guarantee from N14

SCC shall carry out (or advise the J18 Operator to carry out) the following:

- Verify opened 18N3J-S bypass disconnect switch
- Open 18N3J breaker

SCC shall carry out (or advise the N14 Operator to carry out) the following:

- Open 14DL3 and 14L1L3 breakers
- Check for no potential on N3J line

3.6. To take, isolate and de-energize N3J line for work

SCC shall carry out (or advise the J18 Operator to carry out) the following:

- Checked opened 18N3J-S bypass disconnect switch and turn off its 125Vdc supply
- Open 18N3J breaker

SCC shall carry out (or advise the N14 Operator to carry out) the following:

- Open 14DL3 and 14L1L3 breakers
- Check for no potential on N3J line

SCC shall advise N14 Operator to carry out the following:

- Check opened 18N3J-S bypass disconnect switches
- Open 14DL3-L3 and turn off its 125Vdc supply
- Open 14L1L3-L3 and turn off its 125Vdc supply
- Close 14N3J-G ground disconnect switch

SCC shall advise J18 Operator to carry out the following:

- Open 18N3J-L3 and turn off its 125Vdc supply
- Close 18N3J-G ground disconnect switch

3.7. To restore N3J line to service after work

3.7.1. Prepare N3J 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 N3J line

SCC shall advise N14 Operator to carry out the following:

- Check opened 14DL3 and 14L1L3 breakers
- Open 14N3J-G ground disconnect switch
- Turn on 125Vdc supply and close 14DL3-L3 and 14L1L3-L3 disconnect switches

SCC shall advise J18 Operator to carry out the following:

- Check opened 18N3J breaker
- Open 18N3J-G ground disconnect switch
- Turn on 125Vdc supply and close 18N3J-L3 disconnect switch

3.7.2. Restoration of N3J line to service:

SCC shall:

- Advise the J18 and N14 Operators of readiness to restore J2K line to service
- Close (or advise the N14 Operator to close) 14DL3 and 14L1L3 breakers
- Close (or advise the J18 Operator to close) 18N3J breaker

3.8. To restore N3J line to service after automatic outage

If N3J 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 N14 Operator to energize) the line **ONCE** by closing 14DL3 and 14L1L3 breakers
- Close (or advise the J18 Operator to close) 18N3J breaker

J18 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 18T1 Transformer for work

- J18 Operator shall request Station Guarantee from Customers on 18F1, 18F2 and 18F3 Feeders

SCC shall advise J18 Operator to carry out the following:

- Inform Customers about readiness to take off 18T1 bank
- Request Customers on 18T1 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 18T1 transformer auxiliaries

SCC shall carry out (or advise J18 Operator to carry out) the following:

- Open 18F1 breaker
- Open 18F2 breaker
- Open 18F3 breaker
- Open 18T1-A disconnect switch and turn off its 125Vdc supply
- Check for no potential on 18T1 Bank
- Check opened 18F1-S bypass disconnect switch
- Open 18F1-F1 disconnect switch
- Check opened 18F2-S bypass disconnect switch
- Open 18F2-F2 disconnect switch
- Open 18F3-F3 disconnect switch
- Open AC control MCB to 18T1 auxiliaries and tag
- Open 125V DC MCB to 18T1 primary and secondary protection and tag with PC13

3.10. To restore 18T1 Bank to service after work

3.10.1. Prepare 18T1 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 18T1 Bank and temporary grounds removed
- Check opened 18F1, 18F2 and 18F3 breakers
- Check opened 18F1-S disconnect switch (bypass)
- Close 18F1-F1 disconnect switch
- Check opened 18F2-S disconnect switch (bypass)
- Close 18F2-F2 disconnect switch
- Check opened 18F1, 18F2 and 18F3 breakers
- Close 18F3-F3 disconnect switch
- Close AC control MCB to 18T1 auxiliaries and remove tag
- Close 125V DC MCB to 18T1 primary and secondary protection and

remove PC13 tag

- Advise SCC of readiness to restore 18T1 Bank to service

3.10.2. Restoration of 18T1 bank to service:

- SCC shall close (or advise N14 operator to close) 18T1-A disconnect switch

- J18 Operator shall advise Customers of readiness to restore 18T1Bank to service

- SCC shall close (or advise J18 operator to close) the 18F1, 18F2 and 18F3 feeder breakers

3.11. To restore 18T1 Bank to service after automatic outage

If 18T1 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 J18 Operator to energize) the bank ONCE by closing 18J2K or 18N3J breaker

J18 Operator shall advise Customer of readiness to restore 18F1, 18F2 and 18F3 feeders to service

SCC shall close (or advise J18 Operator to close) 18F1Y1, 18F2Y1 and 18F3Y1 breakers

J18 Operator shall:

- Advise the Supervisor/Area Manager and SCC of item above

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

3.12. To isolate 18F1 Breaker for work

- J18 Operator shall request Station Guarantee from Customers on 18F1, 18F2 and 18F3 feeders

SCC shall advise J18 Operator to carry out the following:

- Inform Customers about readiness to take off 18T1 bank

- Check opened 18F1-S bypass disconnect switch and turn off its 125Vdc supply

SCC shall carry out (or advise J18 operator to carry out) the following:

- Open 18F1 breaker
- Open 18F2 breaker
- Open 18F3 breaker

SCC shall advise J18 operator to carry out the following:

- Open 18T1-A disconnect switch and turn off its 125Vdc supply
- Open 18F1-F1 disconnect switch and turn off its 125Vdc supply

3.13. To restore 18F1 Breaker to service after work

3.13.1. Prepare 18F1 breaker for restoration:

J18 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 18T1 Bank and temporary grounds removed
- Check opened 18F1-S bypass disconnect switch and turn on its 125Vdc supply
- Close 18F1-F1 disconnect switch
- Advise SCC of readiness to restore 18F1, 18F2 and 18F3 and breakers to service

3.13.2. Restoration of 18F1 Feeder breaker to service:

- SCC shall advise the J18 Operator to turn on 125Vdc supply and close 18T1-A disconnect switch to energize the 18T1 transformer
- J18 Operator shall advise Customers of readiness to restore 18F1, 18F2 and 18F3 feeders to service
- SCC shall close (or advise J18 Operator to close) 18F1, 18F2 and 18F3 breakers

3.14. To isolate 18F2 Breaker for work

- J18 Operator shall request Station Guarantee from Customers on 18F1, 18F2 and 18F3 feeders

SCC shall advise J18 Operator to carry out the following:

- Inform Customers about readiness to take off 18T1 bank

- Check opened 18F2-S bypass disconnect switch and turn off its 125Vdc supply

SCC shall carry out (or advise J18 Operator to carry out) the following:

- Open 18F1 breaker

- Open 18F2 breaker

- Open 18F3 breaker

SCC shall advise J18 Operator to carry out the following:

- Open 18T1-A disconnect switch and turn off its 125Vdc supply

- Open 18F2-F2 disconnect switch and turn off its 125Vdc supply

3.15. To restore 18F2 Breaker to service after work

3.15.1. Prepare 18F2 breaker for restoration:

J18 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 18T1 Bank and temporary grounds removed

- Check opened 18F2-S bypass disconnect switch and turn on its 125Vdc supply

- Close 18F2-F2 disconnect switch

- Advise SCC of readiness to restore 18F1, 18F2 and 18F3 and breakers to service

3.15.2. Restoration of 18F1 Feeder breaker to service:

- SCC shall advise the J18 Operator to turn on 125Vdc supply and close 18T1-A disconnect switch to energize the 18T1 transformer

- J18 Operator shall advise Customers of readiness to restore 18F1, 18F2 and 18F3 feeders to service

- SCC shall close (or advise J18 Operator to close) 18F1, 18F2 and 18F3 breakers

3.16. To isolate 18F3 Breaker for work

- J18 Operator shall request Station Guarantee from Customers on 18F1,

18F2 and 18F3 feeders

SCC shall advise J18 Operator to carry out the following:

- Inform Customers about readiness to take off 18T1 bank

SCC shall carry out (or advise J18 Operator to carry out) the following:

- Open 18F1 breaker
- Open 18F2 breaker
- Open 18F3 breaker

SCC shall advise J18 Operator to carry out the following:

- Open 18T1-A disconnect switch and turn off its 125Vdc supply
- Open 18F3-F3 disconnect switch

3.17. To restore 18F3 Breaker to service after work

3.17.1. Prepare 18F3 breaker for restoration:

J18 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 18T1 Bank and temporary grounds removed
- Close 18F3-F3 disconnect switch
- Advise SCC of readiness to restore 18F1, 18F2 and 18F3 and breakers to service

3.17.2. Restoration of 18F1 Feeder breaker to service:

- SCC shall advise the J18 Operator to turn on 125Vdc supply and close 18T1-A disconnect switch to energize the 18T1 transformer
- J18 Operator shall advise Customers of readiness to restore 18F1, 18F2 and 18F3 feeders to service
    - SCC shall close (or advise J18 Operator to close) 18F1, 18F2 and 18F3 breakers

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 J2K (Konongo-Kumasi) and N3J (Nkawkaw- Konongo) lines, 18T1 transformer.

5. Approval

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Director, Technical Services