

**TD-OP-0021**



# **OPERATING PROCEDURE FOR NEW OBUASI SUBSTATION**

**GHANA GRID COMPANY LTD**

## TECHNICAL DIRECTIVES

|  |   |                    |
|--|---|--------------------|
| <b>Title:</b> OPERATING PROCEDURE FOR NEW OBUASI SUBSTATION (NB21)   |   |                    |
| <b>Issued To:</b><br>Director, System Operations<br>Director, NNS<br>Manager, SCC<br>Manager, Dispatch Operations<br>Area Manager, Kumasi<br>Operating Staff, Kumasi Area<br>Maintenance Staff, Kumasi Area<br>Dispatch Staff, SCC | <b>Number:</b> TD-OP-0021   |                    |
|  | <b>Subject Area:</b>  | Operating          |
|  | <b>Issue Date:</b>  | Trial              |
|  | <b>Origin:</b>  | Technical Services |
|  | <b>Key Words:</b> Take Out, Isolate, Prepare, Energize, Restore, Automatic Outage |                    |

CONTENTS

|   |    |
|---|----|
| 1. Purpose.....   | 3  |
| 2. Scope .....  | 3  |
| 3. Procedure.....   | 3  |
| 3.1. To take Q1NB line out of service.....                          | 3  |
| 3.2. To take out, isolate and de-energize Q1NB line for work .....  | 3  |
| 3.3. To restore Q1NB line to service after work.....                | 4  |
| 3.4. To restore Q1NB line to service after automatic outage .....   | 4  |
| 3.5. To take NB2D line out of service.....                          | 5  |
| 3.6. To take out, isolate and de-energize NB2D line for work.....   | 5  |
| 3.7. To restore NB2D line to service after work.....                | 6  |
| 3.8. To restore NB2D line to service after automatic outage .....   | 7  |
| 1.1. To take B3NB line out of service .....                         | 7  |
| 1.2. To take out, isolate and de-energize B3NB line for work .....  | 8  |
| 1.3. To restore B3NB line to service after work .....               | 8  |
| 1.4. To restore B3NB line to service after automatic outage .....   | 9  |
| 3.9. To take K5NB line out of service.....                          | 10 |
| 3.10. To take out, isolate and de-energize K5NB line for work ..... | 10 |
| 3.11. To restore K5NB line to service after work.....               | 10 |
| 3.12. To restore K5NB line to service after automatic outage .....  | 11 |
| 3.13. To isolate 21T1 Transformer for work .....                    | 12 |
| 3.14. To restore 21T1 Bank to service after work .....              | 13 |
| 3.15. To restore 21T1 Bank to service after automatic outage.....   | 13 |
| 3.16. To isolate 21T2 Transformer for work .....                    | 14 |
| 3.17. To restore 21T2 Bank to service after work .....              | 14 |
| 3.18. To restore 21T2 Bank to service after automatic outage.....   | 15 |
| 3.19. To isolate 21T3 Transformer for work .....                    | 16 |
| 3.20. To restore 21T3 Bank to service after work .....              | 16 |
| 3.21. To restore 21T3 Bank to service after automatic outage.....   | 17 |
| 3.22. To isolate 21T1F1 breaker for work.....                       | 17 |
| 3.23. To restore 21T1F1 breaker to service after work.....          | 18 |
| 3.24. To isolate 21T2F2 breaker for work.....                       | 19 |
| 3.25. To restore 21T2F2 breaker to service after work.....          | 19 |
| 4. Explanation.....   | 20 |
| 5. Approval.....  | 21 |

### 1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at NB21 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 NB21 Substation.

### 3. Procedure

#### 3.1. To take Q1NB line out of service

SCC shall carry out (or advise the NB21 Operator to carry out) the following:

- Open 21L1L3 and 21L1A3 breakers

SCC shall carry out (or advise the Q16 Operator to carry out) the following:

- Open 16Q1NB breaker
- Check for no potential on Q1NB line

#### 3.2. To take out, isolate and de-energize Q1NB line for work

- NB21 Operator request for Station Guarantee from Q16

SCC shall carry out (or advise the NB21 Operator to carry out) the following:

- Open 21L1L3 and 21L1A3 breakers

SCC shall carry out (or advise Q16 Operator to carry out) the following:

- Open 16Q1NB breaker
- Check for no potential on Q1NB line

SCC shall advise Q16 Operator to carry out the following:

- Open 16Q1NB-L1 disconnect switch and turn off its 125Vdc supply
- Close 16Q1NB-G ground disconnect switch

SCC shall advise NB21 Operator to carry out the following:

- Open 21L1L3-L1 and 21L1A3-L1 disconnect switches and turn off

125Vdc supply

- Close 21Q1NB-G ground disconnect switch

### **3.3. To restore Q1NB line to service after work**

#### **3.3.1. Prepare Q1NB line for restoration:**

NB21 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 Q1NB line

SCC shall advise Q16 Operator to carry out the following:

- Check opened 16Q1NB breaker
- Open 16Q1NB-G ground disconnect switch
- Turn on 125Vdc supply and close 16Q1NB-L1 disconnect switch

SCC shall advise NB21 Operator to carry out the following:

- Check opened 21L1L3 and 21L1A3 breakers
- Open 21Q1NB-G ground disconnect switch
- Turn on 125Vdc supply and close 21L1L3-L1 and 21L1A3-L1 disconnect switches

#### **3.3.2. Restoration of Q1NB line to service:**

SCC shall:

- Advise the Q16 and NB21 Operators of readiness to restore Q1NB line to service
- Close (or advise the Q16 Operator to close) 16Q1NB breaker
- Close (or advise the NB21 Operator to close) 21L1L3 and 21L1A3 breakers

### **3.4. To restore Q1NB line to service after automatic outage**

If Q1NB line trips auto due to fault:

NB21 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 Q16 Operator to energize) the line **ONCE** by closing 16Q1NB breaker
- Close (or advise the NB21 Operator to close) 21L1L3 and 21L1A3 breakers

NB21 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 NB2D line out of service

SCC shall carry out (or advise the NB21 Operator to carry out) the following:

- Open 21L2L5 and 21A1L2 breakers.

SCC shall carry out (or advise the B12 Operator to carry out) the following:

- Verify opened 11NB2D-S bypass disconnect switch
- Open 11NB2D breaker
- Check for no potential on NB2D line

### 3.6. To take out, isolate and de-energize NB2D line for work

- NB21 Operator shall request for Station Guarantee from B12

SCC shall carry out (or advise the NB21 Operator to carry out) the following:

- Open 21L2L5 and 21A1L2 breakers

SCC shall carry out (or advise the D11 Operator to carry out) the following:

- Check opened 11NB2D-S bypass disconnect switch and turn off its 125Vdc supply

- Open 11NB2D breaker
- Check for no potential on NB2D line

SCC shall advise D11 Operator to carry out the following:

- Open 11NB2D-L2 disconnect switch and turn off its 125Vdc supply
- Close 11NB2D-G ground disconnect switch

SCC shall advise NB21 operator to carry out the following:

- Open 21L2L5-L2 and 21A1L2-L2 disconnect switches and turn off 125Vdc supply
- Close 21NB2D-G ground disconnect switch

### **3.7. To restore NB2D line to service after work**

#### **3.7.1. Prepare NB2D line for restoration:**

NB21 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 NB2D line

SCC shall advise D11 Operator to carry out the following:

- Check opened 11NB2D-S bypass disconnect switch and turn on its 125Vdc supply
- Check opened 11NB2D breaker
- Open 11NB2D-G ground disconnect switch
- Turn on 125Vdc supply and close 11NB2D-L2 disconnect switch

SCC shall advise NB21 Operator to carry out the following:

- Check opened 21L2L5 and 21A1L2 breakers
- Open 21NB2D-G ground disconnect switch
- Turn on 125Vdc supply and close 21L2L5-L2 and 21A1L2-L2 disconnect switches

#### **3.7.2. Restoration of NB2D line to service:**

SCC shall:

- Advise the D11 and NB21 Operators of readiness to restore NB2D line to service
- Close (or advise the D11 Operator to close) 11NB2D breaker
- Close (or advise the NB21 Operator to close) 21L2L5 and 21A1L2 breakers

### 3.8. To restore NB2D line to service after automatic outage

If NB2D line trips auto due to fault:

NB21 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 D11 Operator to energize) the line **ONCE** by closing 11NB2D breaker
- Close (or advise the NB21 Operator to close) 21L2L5 and 21A1L2 breakers

NB21 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 B3NB line out of service

SCC shall carry out (or advise the NB21 Operator to carry out) the following:

- Open 21L1L3 and 21L5L3 breakers

SCC shall carry out (or advise the B12 Operator to carry out) the following:

- Verify opened 12B3NB-S bypass disconnect switch



- Open 12B3NB breaker
- Check for no potential on B3NB line

**3.10. To take out, isolate and de-energize B3NB line for work**

B12 Operator shall request for Station Guarantee from NB21

SCC shall carry out (or advise NB21 operator to carry out) the following:

- Open 21L1L3 and 21L5L3 breakers

SCC shall carry out (or advise the B12 Operator to carry out) the following:

- Checked opened 12B3NB-S bypass disconnect switch and turn off its 125Vdc supply
- Open 12B3NB breaker
- Check for no potential on B3NB line

SCC shall advise NB21 Operator to carry out the following:

- Open 21L1L3-L3 and 21L5L3-L3 disconnect switches and turn off 125Vdc supply
- Close 21B3NB-G ground disconnect switch

SCC shall advise the B12 Operator to carry out the following:

- Open 12B3NB-L3 and turn off 125Vdc supply its supply
- Close 12B3NB-G ground disconnect switch

**3.11. To restore B3NB line to service after work**

**3.11.1. Prepare B3NB line for restoration:**

B3NB 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 B3NB line

SCC shall advise B12 Operator to carry out the following:

- Check opened 12B3NB-S bypass disconnect switch and turn on its 125Vdc supply

## TECHNICAL DIRECTIVES

- Check opened 12B3NB breaker
- Open 12B3NB-G ground disconnect switch
- Turn on 125Vdc supply and close 12B3NB-L3 disconnect switch

SCC shall advise NB21 Operator to carry out the following:

- Check opened 21L1L3 and 21L5L3 breakers
- Open 21B3NB-G ground disconnect switch
- Turn on 125Vdc supply and close 21L1L3-L3 and 21L5L3-L3 disconnect switches

### 3.12. Restoration of B3NB line to service:

SCC shall:

- Advise the B12 and NB21 Operators of readiness to restore B3NB line to service
- Close (or advise the B12 Operator to close) 12B3NB breaker
- Close (or advise the NB21 Operator to close) 21L1L3 and 21L5L3 breakers

### 3.13. To restore B3NB line to service after automatic outage

If B3NB line trips auto due to fault:

B12 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 B12 Operator to energize) the line **ONCE** by closing 12B3NB breaker
- Close (or advise the NB21 Operator to close) 21L1L3 and 21L5L3 breakers

B12 Operator shall:

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

### **3.14. To take K5NB line out of service**

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

- Open 13L5A and 13L5T1 breakers

SCC shall carry out (or advise the NB21 Operator to carry out) the following:

- Open 21L2L5 and 21L5L3 breakers
- Check for no potential on K5NB line

### **3.15. To take out, isolate and de-energize K5NB line for work**

- NB21 Operator request for Station Guarantee from K13

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

- Open 13L5A and 13L5T1 breakers

SCC shall carry out (or advise NB21 Operator to carry out) the following:

- Open 21L2L5 and 21L5L3 breakers
- Check for no potential on K5NB line

SCC shall advise NB21 Operator to carry out the following:

- Open 21L2L5-L5 and 21L5L3-L5 disconnect switches and turn off 125Vdc supply
- Close 21K5NB-G ground disconnect switch

SCC shall advise K13 Operator to carry out the following:

- Open 13L1A-L5 and 13L1T2-L5 disconnect switches and turn off 125Vdc supply
- Close 13K5NB-G ground disconnect switch

### **3.16. To restore K5NB line to service after work**

#### **3.16.1. Prepare K5NB line for restoration:**

NB21 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 K5NB line

SCC shall advise K13 Operator to carry out the following:

- Check opened 13L5A and 13L5T1 breakers
- Open 13K5NB -G ground disconnect switch
- Turn on 125Vdc supply and close 13L5A-L5 and 13L5T1-L5 disconnect switches

SCC shall advise NB21 Operator to carry out the following:

- Check opened 21L2L5 and 21L5L3 breakers
- Open 21K5NB-G ground disconnect switch
- Turn on 125Vdc supply and close 21L2L5-L5 and 21L5L3-L5 disconnect switches

**3.16.2. Restoration of K5NB line to service:**

SCC shall:

- Advise the K13 and NB21 Operators of readiness to restore K5NB line to service
- Close (or advise the K13 Operator to close) 13L5A and 13L5T1 breakers
- Close (or advise the NB21 Operator to close) 21L2L5 and 21L5L3 breakers

**3.17. To restore K5NB line to service after automatic outage**

If K5NB line trips auto due to fault:

K5NB 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 13L5A and 13L5T1 breakers
- Close (or advise the NB21 Operator to close) 21L2L5 and 21L5L3 breakers

K13 Operator shall:

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

### **3.18. To isolate 21T1 Transformer for work**

NB21 Operator shall request Station Guarantee from Customer on 21F1 feeder

SCC shall advise NB21 Operator to carry out the following:

- Inform Customer about readiness to take off 21T1 bank
- Request Customer on 21T1 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 21T1 transformer auxiliaries
- Transfer Station Service from AC1 to AC2, if Station Service is on 21T1 bank

SCC shall carry out (or advise NB21 Operator to carry out) the following:

- Open 21T1F1 breaker
- Open 21A1T1 breaker
- Check for no potential on 21T1 Bank

SCC shall advise NB21 Operator to carry out the following:

- Open 21T1F1-F1 disconnect switch
- Open 21A1T1-A1 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 21T1 auxiliaries and tag
- Open 125Vdc MCB to 21T1 primary and secondary protection and tag with PC13

**3.19. To restore 21T1 Bank to service after work**

**3.19.1. Prepare 21T1 bank for restoration:**

NB21 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 21T1 Bank and temporary grounds removed
- Close 21T1F1-F1 disconnect switch
- Turn on 125Vdc supply and close 21A1T1-A1 disconnect switch
- Close AC control MCB to 21T1 auxiliaries and remove tag
- Close 125Vdc MCB to 21T1 primary and secondary protection and remove PC13 tag
- Advise SCC to restore 21T1 Bank to service

**3.19.2. Restoration of 21T1 bank to service:**

- SCC shall close (or advise NB21 Operator to close) the 21A1T1 breaker
- NB21 Operator shall advise customer of readiness to restore 21F1 feeder to service
- SCC shall close (or advise NB21 Operator to close) the 21T1F1 breaker

**3.20. To restore 21T1 Bank to service after automatic outage**

If 21T1 bank trips auto due to fault:

NB21 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 NB21 Operator to energize) the bank **ONCE** by closing 21A1T1 breaker

NB21 Operator shall advise Customer of readiness to restore 21F1 feeder to

service

- SCC shall close (or advise NB21 Operator to close) 21T1F1 breaker
- Advise customer of readiness to restore 21F1 feeder to service

NB21 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.

### **3.21. To isolate 21T2 Transformer for work**

NB21 Operator shall request Station Guarantee from customer on 21F2 feeder

SCC shall advise NB21 Operator to carry out the following:

- Inform Customer about readiness to take off 21T2 bank
- Request Customer on 21T2 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 21T2 transformer auxiliaries
- Transfer Station Service from AC2 to AC1, if Station Service is on 21T2

SCC shall carry out (or advise NB21 Operator to carry out) the following:

- Open 21A2T2 breaker
- Open 21T2F2 breaker
- Check for no potential on 21T2 Bank

SCC shall advise NB21 Operator to carry out the following:

- Open 21T2F2-F2 disconnect switch
- Open 21A2T2-A2 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 21T2 auxiliaries and tag
- Open 125Vdc MCB to 21T2 primary and secondary protection and tag with PC13

### **3.22. To restore 21T2 Bank to service after work**

**3.22.1. Prepare 21T2 bank for restoration:**

NB21 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 21T2 Bank and temporary grounds removed
- Open 21T2F2-F2 disconnect switch
- Turn on 125Vdc supply and close 21A2T2-A2 disconnect switch
- Close AC control MCB to 21T2 auxiliaries and remove tag
- Close 125Vdc MCB to 21T2 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 21T2 Bank to service

**3.22.2. Restoration of 21T2 bank to service:**

- SCC shall close (or advise NB21 Operator to close) the 21A2T2 breaker
- NB21 Operator shall advise Customer of readiness to restore 21F2 feeder to service
- SCC shall close (or advise NB21 Operator to close) the 21T2F2 breaker

**3.23. To restore 21T2 Bank to service after automatic outage**

If 21T2 bank trips auto due to fault:

NB21 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 NB21 Operator to energize) the bank **ONCE** by closing 21A2T2 breaker

NB21 Operator shall advise Customer of readiness to restore 21F2 feeder to service



SCC shall close (or advise NB21 Operator to close) 21T2F2 breaker

NB21 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.

### **3.24. To isolate 21T3 Transformer for work**

NB21 Operator shall request Station Guarantee from customer on 21F3 feeder

SCC shall advise NB21 Operator to carry out the following:

- Inform Customer about readiness to take off 21T3 bank
- Request Customer on 21T3 Bank to take off their load
- Open AC1 Contactor/MCB to take off supply to 21T3 transformer auxiliaries

SCC shall carry out (or advise NB21 Operator to carry out) the following:

- Open 21L1A3 and 21A2A3 breakers
- Open 21T3-F3 disconnect switch
- Open 21T3-A3 disconnect switch and turn off its 125Vdc supply
- Open AC control MCB to 21T3 auxiliaries and tag
- Open 125Vdc MCB to 21T3 primary and secondary protection and tag with PC13
- Check for no potential on 21T3 Bank

### **3.25. To restore 21T3 Bank to service after work**

#### **3.25.1. Prepare 21T3 bank for restoration:**

NB21 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 21T3 Bank and temporary grounds removed
- Open 21T3-F3 disconnect switch

- Turn on 125Vdc supply and close 21T3-A3 disconnect switch
- Close AC control MCB to 21T3 auxiliaries and remove tag
- Close 125Vdc MCB to 21T3 primary and secondary protection and remove PC13 tag
- Advise SCC of readiness to restore 21T3 Bank to service

### **3.25.2. Restoration of 21T3 bank to service:**

- NB21 Operator shall advise Customer of readiness to restore 21F3 feeder to service
- SCC shall close (or advise NB21 Operator to close) the 21L1A3 and 21A2A3 breakers

### **3.26. To restore 21T3 Bank to service after automatic outage**

If 21T2 bank trips auto due to fault:

NB21 Operator shall:

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

NB21 Operator shall advise Customer of readiness to restore 21F3 feeder to service

SCC shall energize (or advise the NB21 Operator to energize) the bank **ONCE** by closing 21L1A3 and 21A2A3 breakers

NB21 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.

### **3.27. To Isolate 21T1F1 breaker for work**

- NB21 Operator shall request Station Guarantee from customer on 21F1 feeder

SCC shall advise NB21 Operator to carry out the following:

- Inform Customer about readiness to take off 21T1 bank
- Request Customer on 21T1 Bank to take off their load
- Transfer station service supply from AC1 to AC2, if Station Service is on 21T1

SCC shall carry out (or advise NB21 Operator to carry out) the following:

- Open 21A1T1 breaker
- Open 21T1F1 breaker

SCC shall advise NB21 Operator to carry out the following:

- Open 21T1-F1 disconnect switch
- Open 21A1T1-A1 disconnect switch and turn off its 125Vdc supply
- Check for no potential on 21T1 Bank

### **3.28. To restore 21T1F1 breaker to service after work**

#### **3.28.1. Prepare 21T1F1 breaker to service for restoration:**

NB21 Operator shall:

- Advise SCC when work on the 21T1F1 breaker to service has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 21T1F1 breaker to service and temporary grounds removed
- Close 21T1F1-F1 disconnect switch
- Turn on 125Vdc supply and close 21A1T1-A1 disconnect switch

#### **3.21.1. Restoration of 21T1F1 breaker to service:**

- SCC shall close (or advise NB21 Operator to close) the 21A1T1 breaker
- NB21 Operator shall advise Customer of readiness to restore 21F1 feeder to service
- SCC shall close (or advise NB21 Operator to close) the 21T1F1 breaker

**3.29. To Isolate 21T2F2 breaker for work**

- NB21 Operator shall request Station Guarantee from customer on 21F2 feeder

SCC shall advise NB21 Operator to carry out the following:

- Inform Customer about readiness to take off 21T2 bank
- Request Customer on 21T2 Bank to take off their load
- Transfer station service supply from AC2 to AC1, if Station Service is on 21T2 bank

SCC shall carry out (or advise NB21 Operator to carry out) the following:

- Open 21A2T2 breaker
- Open 21T2F2 breaker

SCC shall advise NB21 Operator to carry out the following:

- Open 21T2F2-F2 disconnect switch
- Open 21A2T2-A2 disconnect switch and turn off its 125Vdc supply
- Check for no potential on 21T2 Bank

**3.30. To restore 21T2F2 breaker to service after work**

**3.30.1. Prepare 21T2F2 breaker for restoration:**

NB21 Operator shall:

- Advise SCC when work on the 21T2F2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 21T2F2 breaker and temporary grounds removed
- Close 21T2F2-F2 disconnect switch
- Turn on 125Vdc supply and close 21A2T2-A2 disconnect switch

**3.30.2. Restoration of 21T2F2 breaker to service:**

- SCC shall close (or advise NB21 Operator to close) the 21A2T2 breaker
- NB21 Operator shall advise Customer of readiness to restore 21F2 feeder to service

- SCC shall close (or advise NB21 Operator to close) the 21T2F2 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 station has 'A1', 'A2'and 'A3' bus arrangement in Ring Main configuration that provides the normal points of supply to all circuits/equipment such as Q1NB, NB2D, K5NB, B3NB lines, 21T1, 21T2 and 21T3 transformers.

**5. Approval**

.....

**Director, TSD**