

**TD-OP-0042**



# **OPERATING PROCEDURE FOR AYANFURI SUBSTATION**

**GHANA GRID COMPANY LTD**

## TECHNICAL DIRECTIVES

Title: OPERATING PROCEDURE FOR AKEMPIM SUBSTATION (AY42)		
<b>Issued</b> Director, System Operations <b>To:</b> Director, SNS Manager, SCC Manager, Dispatch Operations Area Manager, Prestea Operating Staff, Prestea Area Maintenance Staff, Prestea Area Dispatch Staff, SCC	<b>Number:</b> TD-OP-0042	
	<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	

## TECHNICAL DIRECTIVES

### Contents

3.1.	To take BS2AY line out of service.....	3
3.2.	To take out, isolate and de-energize BS2AY line for work .....	3
3.3.	To restore BS2AY line to service after work .....	4
3.4.	Restoration of BS2AY line to service: .....	5
3.5.	To restore BS2AY line to service after automatic outage .....	5
3.6.	To isolate 42T1 Bank for work .....	6
3.7.	To restore 42T1 Bank to service.....	7
3.8.	To restore 42T1 Bank to service after automatic outage .....	7
3.9.	To Isolate 42T1Y1 Breaker for work .....	8
3.10.	To restore 42T1Y1 Breaker to service after work.....	8
3.11.	To Isolate 42Y2F1 Breaker for work .....	9
3.12.	To restore 42Y2F1 Breaker to service after work.....	9
3.13.	To Isolate 42Y2F2 Breaker for work .....	10
3.14.	To restore 42Y2F2 Breaker to service after work.....	10

## TECHNICAL DIRECTIVES

### 1. Purpose

This directive specifies the operations to be carried out to take out of service, isolate or restore equipment at AY42 Substation to service for planned and auto outages.

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### 2. Scope

The directive will be used by Operators at Prestea Operating Area and System Control Center (SCC) for operation of equipment at AY42 Substation.

### 3. Procedure

#### 3.1. To take BS2AY line out of service

SCC shall carry out (or advise the AY42 Operator to carry out) the following:

- Verify opened 42AT1-S by-pass disconnect switch and turn off 125vdc supply
- Open 42T1Y1 breaker
- Open 42AT1 breaker

SCC shall advise the BS30 Operator to carry out the following:

- Open 30L1L2 and 30L2L4 breakers
- Check for no potential on BS2AY line

#### 3.2. To take out, isolate and de-energize BS2AY line for work

AY42 Operator shall request for Station Guarantee from BS30

SCC shall carry out (or advise the AY42 Operator to carry out) the following:

- Verify opened 42AT1-S by-pass disconnect switch and turn off 125vdc supply
- Open 42T1Y1 breaker
- Open 42AT1 breaker

SCC shall carry out (or advise the BS30 Operator to carry out) the following:

## TECHNICAL DIRECTIVES

- Open 30L1L2 and 30L2L4 breakers
- Check for no potential on BS2AY line

SCC shall advise BS30 Operator to carry out the following:

- Open 30L1L2-L2 and 30L2L4-L2 disconnect switches and turn off 125Vdc supply
- Close 30BS2AY-G ground disconnect switch

SCC shall advise AY42 Operator to carry out the following:

- Check opened 42AT1-S by-pass disconnect switch and turn off its 125Vdc supply
- Open 42L2-A disconnect switch and turn off its 125vdc supply
- Close 42BS2AY -G ground disconnect switch

### 3.3. To restore BS2AY line to service after work

#### 3.3.1. Prepare BS2AY line for restoration:

AY42 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 BS2AY line

SCC shall advise BS30 Operator to carry out the following:

- Check opened 30L1L2 and 30L2L4 breakers
- Open 30BS2AY-G ground disconnect switch
- Turn on 125Vdc supply and close 30L1L2-L2 and 30L2L4-L2 disconnect switches

SCC shall advise AY42 Operator to carry out the following:

- Check opened 42AT1-S bypass disconnect switch and turn on its 125Vdc supply
- Check opened 42AT1 breaker
- Open 42BS2AY-G ground disconnect switch

## TECHNICAL DIRECTIVES

- Turn on 125vdc supply and Close 42L2-A disconnect switch

### 3.4. Restoration of BS2AY line to service:

SCC shall:

- Advise the AY42 and BS30 Operators of readiness to restore BS2AY line to service
- Close (or advise the BS30 Operator to close) 30L1L2 and 30L2L4 breakers
- Close (or advise the AY42 Operator to close) 42AT1 breaker
- AY42 Operator shall advise Customer of readiness to restore 42Y1 and 42Y2 Busses to service
- SCC shall close (or advise AY42 Operator to close) 42T1Y1 breaker
- AY42 Operator shall advise Customer of readiness to restore 42F1 and 42F2 feeders to service
- SCC shall close (or advise AY42 Operator to close) 42Y2F1 and 42Y2F2 breakers
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### 3.5. To restore BS2AY line to service after automatic outage

If BS2AY line trips auto due to fault on the line:

AY42 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:

- Close (or advise the BS30 Operator to close) 30L1L2 and 30L2L4 breakers
- Energize (or advise the AY42 Operator to energize) the line **ONCE** by closing 42AT1 breaker

## TECHNICAL DIRECTIVES

- AY42 Operator shall advise Customer of readiness to restore 42Y1 and 42Y2 Busses to service
- SCC shall close (or advise AY42 Operator to close) 42T1Y1 breaker
- AY42 Operator shall advise Customer of readiness to restore 42F1 and 42F2 feeders to service
- SCC shall close (or advise AY42 Operator to close) 42Y2F1 and 42Y2F2 breakers
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AY42 Operator shall:

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

### 3.6. To isolate 42T1 Bank for work

- AY42 Operator shall request Station Guarantee from customer on 42T1 transformer

SCC shall carry out or advise AY42 operator to carry out the following:

- Inform customers about readiness to take off 42T1 Bank
- Request customers on 42T1 Bank to take off their load
- Transfer Station Service from 42TSS1 to Station Standby Generator
- Open AC1 Contactor/MCB to take off supply to 42T1 transformer auxiliaries

SCC shall carry out (or advise AY42 Operator to carry out) the following:

- Verify opened 42AT1-S by-pass disconnect switch and turn off 125vdc supply
- Open 42AT1 breaker
- Open 42T1Y1 breaker
- Check for no potential on 42T1 Bank
- Open 42T1Y1-Y1 disconnect switch
- Open 42AT1-T1 disconnect switch and turn off its 125vdc supply

## TECHNICAL DIRECTIVES

### 3.7. To restore 42T1 Bank to service

#### 3.7.1. Prepare 42T1 Bank for service after work

- Advise SCC when work on the transformer has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 42T1 Bank and temporary grounds removed
- Check opened 42AT1-S bypass disconnect switch and turn on its 125Vdc supply
- Close 42T1Y1-Y1 disconnect switch
- Turn on 125vdc supply and close 42AT1-T1 disconnect switch
- Advise SCC of readiness to restore 42T1 Bank to service

#### 3.7.2. Restoration of 42T1 Bank to service:

- SCC shall close (or advise AY42 Operator to close) 42AT1 breaker
- Advise customers of readiness to restore feeders on 42T1 to service
- SCC shall close (or advise AY42 Operator to close) 42T1Y1, 42Y2F1 and 42Y2F2 breakers

### 3.8. To restore 42T1 Bank to service after automatic outage

- If 42T1 Bank trips auto due to fault on the equipment

AY42 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 AY42 Operator to energize) the Transformer **ONCE** by closing 42AT1 breaker
- Advise customers of readiness to restore feeders on 42T1 to service
- SCC shall close (or advise AY42 Operator to close) 42Y2F1 and 42Y2F2



## TECHNICAL DIRECTIVES

breakers

AY42 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.

### 3.9. To Isolate 42T1Y1 Breaker for work

- AY42 Operator shall request Station Guarantee from customer on 42T1Y1 Bus

SCC shall advise AY42 Operator to carry out the following:

- Inform customers about readiness to take off 42T1 bank
- Request customers on 42T1 Bank to take off their load

SCC shall carry out (or advise AY42 Operator to carry out) the following:

- Open 42T1Y1 breaker
- Open 42AT1 breaker

SCC shall advise AY42 Operator to carry out the following:

- Verify opened 42AT1-S disconnect switch and turn off its 125vdc supply
- Open 42AT1-T1 disconnect switch and turn off its 125Vdc supply
- Open 42T1Y1-Y1 disconnect switch and turn off its 125Vdc supply
- Check for no potential on 42T1Y1 breaker

### 3.10. To restore 42T1Y1 Breaker to service after work

#### 3.10.1. Prepare 42T1Y1 breaker for restoration:

AY42 Operator shall:

- Advise SCC when work on the 42T1Y1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 42T1Y1 Breaker and temporary grounds removed
- Close 42T1Y1-Y1 disconnect switch and turn on its 125Vdc supply

## **TECHNICAL DIRECTIVES**

- Close 42AT1-T1 disconnect switch and turn on its 125Vdc supply

### **3.10.2. Restoration of 42T1Y1 breaker to service:**

- AY42 Operator shall advise customers of readiness to restore 42T1Y1 breaker to service
- SCC shall close (or advise AY42 Operator to close) 42T1Y1, 42Y2F1 and 42Y2F2 breakers

### **3.11. To Isolate 42Y2F1 Breaker for work**

- AY42 Operator shall request Station Guarantee from customer on 42F1 feeder

SCC shall carry out (or advise AY42 Operator to carry out) the following:

- Open 42Y2F1 breaker

SCC shall advise AY42 Operator to carry out the following:

- Check for no potential on 42F1 feeder
- Open 42Y2F1-Y2 and 42Y2F1-F1 disconnect switches and turn off 125Vdc supply

### **3.12. To restore 42Y2F1 Breaker to service after work**

#### **3.10.3. Prepare 42Y2F1 breaker for restoration:**

AY42 Operator shall:

- Advise SCC when work on the 42Y2F1 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 42F1 feeder and temporary grounds removed
- Close 42Y2F1-Y2 disconnect switch and turn on its 125Vdc supply
- Close 42Y2F1-F1 disconnect switch and turn on its 125Vdc supply

#### **3.10.4. Restoration of 42Y2F1 breaker to service:**

- AY42 Operator shall advise customers of readiness to restore 42Y2F1 breaker to service
- SCC shall close (or advise AY42 Operator to close) the 42Y2F1 breaker

## TECHNICAL DIRECTIVES

### 3.13. To Isolate 42Y2F2 Breaker for work

- AY42 Operator shall request Station Guarantee from customer on 42F2 feeder

SCC shall carry out (or advise AY42 Operator to carry out) the following:

- Open 42Y2F2 breaker

SCC shall advise AY42 Operator to carry out the following:

- Check for no potential on 42F2 feeder
- Open 42Y2F2-Y2 and 42Y2F2-F2 disconnect switches and turn off its 125Vdc supply

### 3.14. To restore 42Y2F2 Breaker to service after work

#### 3.10.5. Prepare 42Y2F2 breaker for restoration:

AY42 Operator shall:

- Advise SCC when work on the 42Y2F2 breaker has been completed and permit(s) surrendered (including all Station Guarantees)
- Check for no potential on 42F2 feeder and temporary grounds removed
- Close 42Y2F2-Y2 and 42Y2F2-F2 disconnect switches and turn on its 125Vdc supply

#### 3.10.6. Restoration of 42Y2F2 breaker to service:

- AY42 Operator shall advise customers of readiness to restore 42Y2F2 breaker to service
- SCC shall close (or advise AY42 Operator to close) the 42Y2F2 breaker

## TECHNICAL DIRECTIVES

### 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**

## TECHNICAL DIRECTIVES

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 BS2AY line and 42T1 transformer.

### 5. **Approval**

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**Director, Technical Services**