ILONG COMPANY LIMITED

Tel: +256(0)755045530

Malakia Road City Mall

Juba-South Sundan

sultankolangdeyo@gmail.com

SWITCHGEAR MAINTENANCE REPORT

PROVISION OF ELECTRICAL MAINTENANCE SERVICE FOR ELECTRICAL MEDIUM VOLTAGE SUBSTATIONS IN MONUSCO FIELD OFFICES IN DEMOCRATIC REPUBLIC OF CONGO (DRC) AND ENTEBBE SUPPORT BASE- UGANDA
(RFP NUMBER: 3100005226)

Submitted to

THE ELECTRICAL SECTION

MONUSCO

MONUSCO

1 Introduction

MONUSCO through the contract # 4700026638 Provision of Electrical Maintenance Service for Medium Voltage Substations in MONUSCO, Field Offices in Entebbe, Uganda. Offered to Ilong Company Limited on 16th October 2024 on issued a Task Order No.1 for Maintenance of Transformers and Switchgear in the Medium Voltage Substations at the Entebbe Service Base. requires transformers to be serviced and maintained to ensure reliable operation of its plant equipment with the least downtime possible.

The current system consists of 11kV/415V switchgears and transformers.

This exercise is a planned annual maintenance activity aimed at ensuring the plant equipment is safe, compliant and operational as required.

MONUSCO contracted Ilong to carry out these services according to agreed standards and specifications.

2 Scope

Supply with all consumables/tools an adequate for selected Medium Voltage and Low Voltage Switchgear in line with the MONUSCO Terms of Reference, International and National Standards and industry best practice.

The agreed scope of work is detailed below:

2.1 Switchgear

- Cleaning of all switchgears from dust ingress
- Adjusting the protection functions and properly grade the relays
- Carry out function tests for the switchgear and ancillaries like VTs, CTs

3 Switchgear Service Details

3.1. SUBSTATION 01

SWITCHGEAR BAY ROUTINE MAINTENANCE REPORT

Substation Name	**S01, MONUSCO**
Bay Number	**02**
Feeder Name	**TX1 Outgoing Panel with a Disconnector & Earth Switch.**
Rated Voltage, kV	**24kV**
Basic Insulation Level (BIL), kV	**75kV**
Insulation Medium	**SF6**
Interrupting Medium of the Circuit Breaker	**Vacuum**
Rated continuous Current, A	**630A**
Rated Short Circuit Current (A), Time (s)	**16kA/3S**
Motor supply voltage	**230VAC**
Control voltage	**230VAC**
Duty cycle	
Mechanical endurance class (CB/ISOLATOR/EARTHSWITCH)	
Serial Number	**1UC1BL0048002**
Name of Manufacturer	**ABB/ELECTOALFA**
Country of Origin	**ITALY**
Date of Manufacture (MM/YYYY)	**2018**
Number of operations	**49**
Maintenance Date (DD/MM/YYYY)	**23/11/2024**

Substation Name	**S01, MONISCO**
Bay Number	**01**
Feeder Name	**Incomer Panel with a Disconnector**
Rated Voltage, kV	**24kV**
Basic Insulation Level (BIL), kV	**75kV**
Insulation Medium	**SF6**
Interrupting Medium of the Circuit Breaker	**Vacuum**
Rated continuous Current, A	**630A**
Rated Short Circuit Current (A), Time (s)	**16kA/3S**
Motor supply voltage	**230VAC**
Control voltage	**230VAC**
Duty cycle	
Mechanical endurance class (CB/ISOLATOR/EARTHSWITCH)	
Serial Number	**1BL00048277**
Name of Manufacturer	**ABB/ELECTOALFA**
Country of Origin	**ITALY**
Date of Manufacture (MM/YYYY)	**2018**
Number of operations	**49**
Maintenance Date (DD/MM/YYYY)	**23/11/2024**

Transformer

Electric Power Transformer

Make: China Electric equipment.

Rated Voltage: 11,000V/400V

Rated Power 1,000KVA.

3.1.1. Insulating and interrupting medium tests and checks

Item Inspected	Remark
Operating pressure for bus bar, Bar	OKAY
Operating pressure for circuit breaker, Bar	OKAY
Low Pressure Alarm, Bar	OKAY
High Pressure Alarm, Bar	OKAY
Gas Density Monitor and Tightness check	OKAY
Ambient Temperature during measurement/check	OKAY

3.1.2. Functional Tests

Description	Selector Switch	Expected Result	Remark
Local operation CB, Open and Close	Local	OK	
Local operation CB, Open and Close	Remote	N/A	
Remote operation, CB Open and Close	Local	N/A	
Remote operation CB, Open and Close	Remote	N/A	
Isolator local operation. Open and Close	Local	OK	
Isolator local operation. Open and Close	Remote	Fail	
E/switch local operation. Open and Close	Local	Use Handle	
E/switch local operation. Open and Close	Remote	N/A	
E/switch remote operation. Open and Close	Local	N/A	
E/switch remote operation. Open and Close	Remote	N/A	
Circuit Breaker manual operation. Open and Close		OK	
Isolator Manual operation. Open and Close		Use Handle	
Earth Switch Manual operation. Open and Close		Use Handle	
Isolator status indication. Open and closed		OK	
Earth switch status indication. Open and closed		OK	
Circuit Breaker status indication Open and Closed		OK	

3.1.3. Circuit Breaker Tests

Contact Resistance of circuit breaker.

Phase	Applied current(A)	Measured Value (μΩ)	Remarks
L1	100	34.15	OK
L2	100	35.63	OK
L3	100	38.20	OK

Insulation resistance of Circuit breaker

Phase	Voltage applied (kV)	Measured Resistance (GΩ)	Remarks
L1	5kV	50.3	OK
L2	5kV	58.4	OK
L3	5kV	48.3	OK

Test Equipment

Record all test equipment used.

Description (Manufacturer/Type)	Tests Done	Serial Number	Calibration Date
OMICRON CPC100	YES	CF305C	03/08/2023
Megger MIT515	YES	102399268	21/11/2023

Maintenance Engineer

Name	**Abbas T**	Signature		Date	**10/12/2024**

Test equipment during clearence at the main entrance.

Tranformer temperature transsducer to Protection relay not configured or wired..

MONUSCO ENG. with ILONG Eng. discussing technicality of the job.

UPS covered with thick dust which destroyed it.

Communication switch covered in thick dust

Telephone receiver covered in dangerously thick dust.

3.1.4. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations SO1	
Feeder Name	Outgoing Transformer 1	
Bay No.	02	
Voltage Level	11 kV	
Date	23/11/2024	
Relay Details		
Relay Make/Type	Schneider Electric/Sepam	
Serial No.		
Rated Current(1A/ 5A)	5A	
Rated Auxiliary Supply Range	24-250 VDC	
1. Visual Inspection		
	Yes/No/NA	
Is the protection relay powered up?	Yes	
Are there any alarms/warnings?	No	
Is the relay LCD display ok (where applicable)?	Yes	
Is there any physical damage to the relay.?	No	
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	No	
Is the relay and other components on the panel well mounted?	Yes	
Are terminations to the relay secure?	Yes	

Is the cabling inside the panel well arranged.?	Yes	
Are all the control panel MCBs in "ON" position?	Yes	
Are there any damaged components inside the panel?	No	
2. Instrumentation		
CT ratio 50/5/5A	Ammeter Reading	
VT ratio: 1000/110	Voltmeter Reading	
	Relay Reading	
3. Relay Configuration and Trip Records		
Relay Date	23/11/2024	
Relay Time	13'24 hours	
Last trip	23/11/2024; 13.15 hours	
(Date and Time)		
4. Protection Settings		
CT - Ratio (Name plate reading)	50/5/5A	
CT - Tap(In as configured in relay)	50/5A	

Settings	**Ip (A)**	**tp**	**I> (A)**
Overcurrent	50A	0.160	1500
Earth fault	5	0.160	630
S E/F			
R E/F			
Ph. Unbalance			

3.1.5. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations SO5
Feeder Name	Incomer Transformer 5
Bay No.	1Q
Voltage Level	415 V
Date	23/11/2024

Relay Details

Relay Make/Type	Schneider Electric/Compact
Serial No.	
Rated Current(1A/ 5A)	1000 A
Rated Auxiliary Supply Range	415 V

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes

Are there any alarms/warnings?	No
Is the relay LCD display ok(where aplicable)?	NA
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

CT ratio NA	Ammeter Reading
VT ratio: NA	Voltmeter Reading
	Relay Reading

3. Relay Configuration and Trip Records

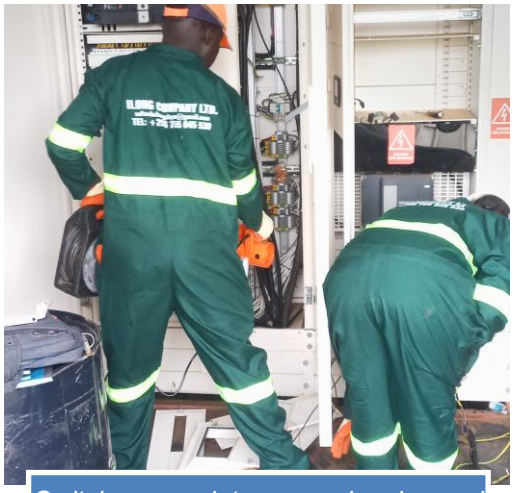
Relay Date	NA
Relay Time	NA
Last trip (Date and Time)	NA

4. Protection Settings

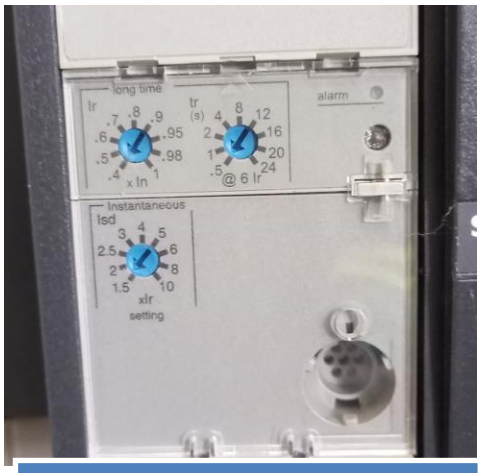
CT - Ratio (Name plate reading)	NA
CT - Tap(In as configured in relay)	NA

Settings	**Ip (A)**	**tp**	**I> (A)**	**t> (s)**
Overcurrent	400 A	0.5 s	1500	0 s
Earth fault	NA	NA	NA	NA
S E/F				
R E/F				
Ph. Unbalance				

General remarks: ……Protection MCCB in good condition.

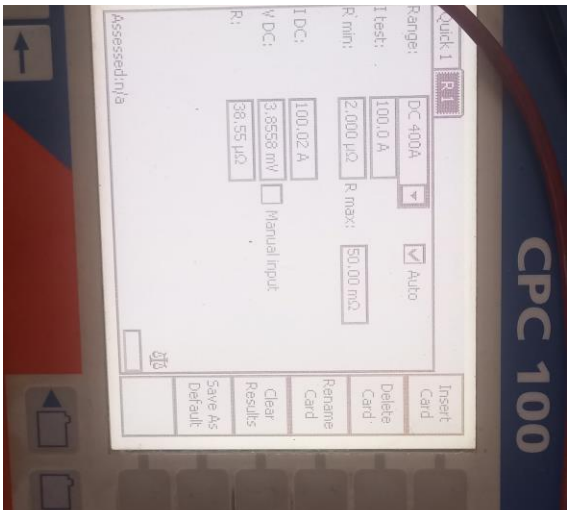


Switchgear maintenance cleaning and terminals checks in progress.



MCCB setting point on MCCB.

Carrying of LV B/B Insulation Resistance Test.



Carrying out of braker Contact Resistance tests

CONCLUSION:

The 415V distribution panels and 11kV RMU panel are all in good operating condition except the amount of dust is so much that it even destroyed the UPS in the Substation 01 room. The dust will also affect the numerical relay with time. It will also cause dry contact in electrical terminations and hence open circuit.

Cleaning was undertaken to ensure that the dust ingress does not affect the electrical operation of the Low Voltage Switchgear.

The Electrical rooms need to be fully concealed and air conditioned to prevent dust ingress.

3.2. SUBSTATION 03

SWITCHGEAR BAY ROUTINE MAINTENANCE REPORT

Substation Name	**S03, MONUSCO**
Bay Number	**03**
Feeder Name	**TX3 Outgoing Panel with a Disconnector & Earth Switch.**
Rated Voltage, kV	**12kV**
Basic Insulation Level (BIL), kV	**75kV**
Insulation Medium	**SF6**
Interrupting Medium of the Circuit Breaker	**Vacuum**
Rated continuous Current, A	**630A**
Rated Short Circuit Current (A), Time (s)	**16kA/3S**
Motor supply voltage	**230VAC**
Control voltage	**230VAC**
Duty cycle	
Mechanical endurance class (CB/ISOLATOR/EARTHSWITCH)	
Serial Number	**IVC1BL00048003**
Name of Manufacturer	**ABB/ELECTOALFA**
Country of Origin	**ITALY**
Date of Manufacture (MM/YYYY)	**2018**
Number of operations	**45**
Maintenance Date (DD/MM/YYYY)	**30/11/2024**

Substation Name	**S03, MONUSCO**
Bay Number	**03**
Feeder Name	**Outgoing Panel with a Disconnector**

Rated Voltage, kV	**24kV**
Basic Insulation Level (BIL), kV	**75kV**
Insulation Medium	**SF6**
Interrupting Medium of the Circuit Breaker	**Vacuum**
Rated continuous Current, A	**630A**
Rated Short Circuit Current (A), Time (s)	**16kA/3S**
Motor supply voltage	**230VAC**
Control voltage	**230VAC**
Duty cycle	
Mechanical endurance class (CB/ISOLATOR/EARTHSWITCH)	
Serial Number	**8128/2018**
Name of Manufacturer	**ABB/ELECTOALFA**
Country of Origin	**ITALY**
Date of Manufacture (MM/YYYY)	**2018**
Number of operations	**42**
Maintenance Date (DD/MM/YYYY)	**30/11/2024**

Transformer

Electric Power Transformer

Vector Group Dyn11

Make: Tanalec.

Rated Voltage: 11,000V/415V

Rated Power 500KVA.

3.2.1. Insulating and interrupting medium tests and checks

	Value	Remark
Operating pressure for bus bar, Bar	NA	
Operating pressure for circuit breaker, Bar	NA	
Low Pressure Alarm, Bar	NA	
High Pressure Alarm, Bar	NA	

Gas Density Monitor and Tightness check	NA
Ambient Temperature during measurement/check	NA

3.2.2. Functional Tests

Description	Selector Switch	Expected Result	Remark
Local operation CB, Open and Close	Local	OK	
Local operation CB, Open and Close	Remote	N/A	
Remote operation, CB Open and Close	Local	N/A	
Remote operation CB, Open and Close	Remote	N/A	
Isolator local operation. Open and Close	Local	OK	
Isolator local operation. Open and Close	Remote	Fail	
E/switch local operation. Open and Close	Local	Use Handle	
E/switch local operation. Open and Close	Remote	N/A	
E/switch remote operation. Open and Close	Local	N/A	
E/switch remote operation. Open and Close	Remote	N/A	
Circuit Breaker manual operation. Open and Close		OK	
Isolator Manual operation. Open and Close		Use Handle	
Earth Switch Manual operation. Open and Close		Use Handle	
Isolator status indication. Open and Closed		OK	
Earth switch status indication. Open and Closed		OK	
Circuit Breaker status indication Open and Closed		OK	

3.2.3. Circuit Breaker Tests

Contact Resistance of circuit breaker(s)

Phase	Applied currents(A)	Measured Value (μΩ)	Remarks
L1	100	46.82	

L2	100	44.10	
L3	100	36.10	

Insulation resistance of Circuit breaker

Phase	Voltage applied (kV)	Measured Resistance (GΩ)	Remarks
L1	5kV	82.3	OK
L2	5kV	66.8	OK
L3	5kV	97.2	OK

2 Test Equipment

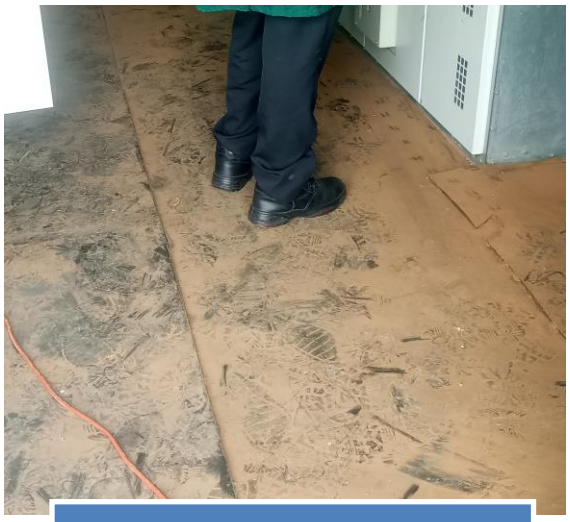
Record all test equipment used.

Description (Manufacturer/Type)	Tests Done	Serial Number	Calibration Date
OMICRON CPC100	YES	CF305C	03/08/2023
Megger MIT515	YES	102399268	21/11/2023

Maintenance Engineer

Name	**Abbas T**	Signature		Date	**10/12/2024**

Cable trench with old blanket covered in very thick dust.



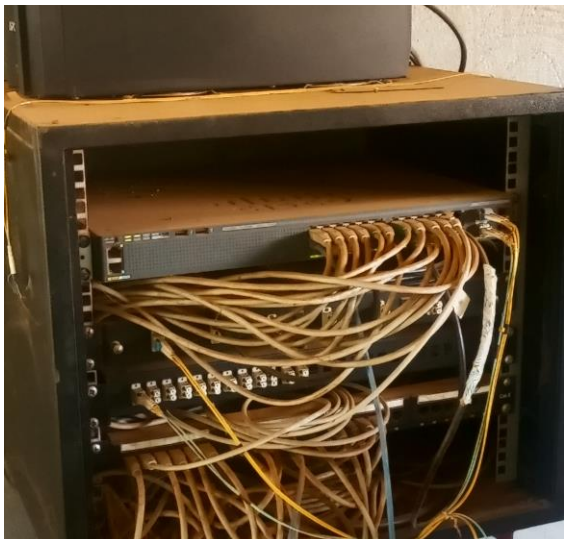
Insulating rubber in too much dust.

UPS in a very sorry dust soaken state.

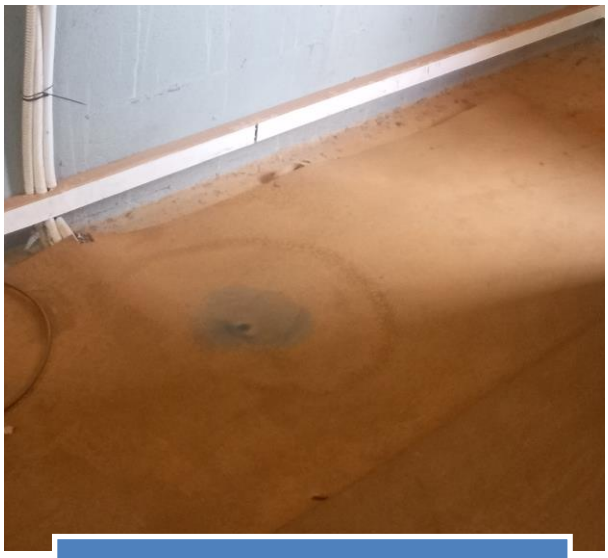
S03 plant house with open chisel wall to the outside with a danger of snakes entrance and habination.

Lack of cement plastered roof with dust falling to the floor as lizards move along the wall.

Non covered ventilations with dust from outside flowing inside..



Communication switch covered in thick dust



Thick choking dust behind the panels..

3.2.4. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations SO3

Feeder Name	Outgoing Transformer 3
Bay No.	02
Voltage Level	11 kV
Date	30/11/2024

Relay Details

Relay Make/Type	Schneider Electric/Sepam
Serial No.	18230097
Rated Current(1A/ 5A)	5A
Rated Auxiliary Supply Range	24-250 VDC

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	Yes
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio 150/5/5A	Ammeter Reading	25 A	
VT ratio: 1000/110	Voltmeter Reading		11 kV
	Relay Reading	25 A	

3. Relay Configuration and Trip Records

Relay Date	30/11/2024
Relay Time	13'45 hours
Last trip (Date and Time)	30/11/2024; 13.35 hours

4. Protection Settings

CT - Ratio (Name plate reading)	150/5/5A
CT - Tap(In as configured in relay)	150/5A

Settings	**Ip (A)**	**tp (s)**	**I> (A)**	**t> (s)**	**I>> (A)**	**t>> (s)**
Overcurrent	50 A	0.160	630	0.110	1200	0.100
Earth fault	7	0.160	70	0.110	630	0.100
S E/F						
R E/F						
Ph. Unbalance						

General remarks : ……Protection Relay in good condition.

3.2.5. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations SO3

Feeder Name	Incomer Transformer 3
Bay No.	1Q
Voltage Level	415 V
Date	30/11/2024

Relay Details

Relay Make/Type	Schneider Electric/Compact
Serial No.	
Rated Current(1A/ 5A)	1000 A
Rated Auxiliary Supply Range	415 V

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	NA
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, ammeters/voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio NA	Ammeter Reading	176 A	
VT ratio: NA	Voltmeter Reading		416 V
	Relay Reading	NA	

3. Relay Configuration and Trip Records

Relay Date	NA
Relay Time	NA
Last trip (Date and Time)	NA

4. Protection Settings

CT - Ratio (Name plate reading)	NA
CT - Tap(In as configured in relay)	NA

Settings	**Ip (A)**	**tp**	**I> (A)**	**t> (s)**	**I>> (A)**	**t>> (s)**
Overcurrent	1000 A	4 s	10,000	0 s	NA	NA
Earth fault	NA	NA	NA	NA	NA	NA
S E/F						
R E/F						
Ph. Unbalance						

General remarks : ……Protection MCCB in good condition.

3.2.6. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations S03
Feeder Name	Incomer From LV Source
Bay No.	2Q
Voltage Level	415 V
Date	30/11/2024

Relay Details

Relay Make/Type	Schneider Electric/Compact
Serial No.	
Rated Current(1A/ 5A)	1000 A
Rated Auxiliary Supply Range	415 V

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	NA
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, ammeters/voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio NA	Ammeter Reading	0 A	
VT ratio: NA	Voltmeter Reading		416 V
	Relay Reading	NA	

3. Relay Configuration and Trip Records

Relay Date	NA
Relay Time	NA
Last trip (Date and Time)	NA

4. Protection Settings

CT - Ratio (Name plate reading)	NA
CT - Tap(In as configured in relay)	NA

Settings	**Ip (A)**	**tp**	**I> (A)**	**t> (s)**	**I>> (A)**	**t>> (s)**
Overcurrent	1000 A	8 s	10,000	0 s	NA	NA
Earth fault	NA	NA	NA	NA	NA	NA
S E/F						
R E/F						
Ph. Unbalance						

General remarks : ……Protection MCCB in good condition.

Checked by:

Name: …Abbas…… Sign: …… Date: ……

Thick Cobwebs and dust inside the panel

Thick cobwebs with small droplets of water seen inside the panel which can be a source of serious arc flash..

Maintenance and terminations checkups ongoing

Cleaned panel with good terminations and heaters working.

3.3. Substation 04

SWITCHGEAR BAY ROUTINE MAINTENANCE REPORT

Substation Name	**S04, MONUSCO**
Bay Number	**04**
Feeder Name	**TX4 Outgoing Panel with a Disconnector & Earth Switch.**
Rated Voltage, kV	**12kV**
Basic Insulation Level (BIL), kV	**75kV**
Insulation Medium	**SF6**
Interrupting Medium of the Circuit Breaker	**Vacuum**
Rated continuous Current, A	**630A**
Rated Short Circuit Current (A), Time (s)	**16kA/3S**
Motor supply voltage	**230VAC**
Control voltage	**230VAC**
Duty cycle	
Mechanical endurance class (CB/ISOLATOR/EARTHSWITCH)	
Serial Number	**IVCIBL00048001**
Name of Manufacturer	**ABB/ELECTOALFA**
Country of Origin	**ITALY**
Date of Manufacture (MM/YYYY)	**2018**
Number of operations	**40**
Maintenance Date (DD/MM/YYYY)	**30/11/2024**

Substation Name	**S04, MONUSCO**
Bay Number	**02**
Feeder Name	**Incomer Panel with a Disconnector**

Rated Voltage, kV	**24kV**
Basic Insulation Level (BIL), kV	**75kV**
Insulation Medium	**SF6**
Interrupting Medium of the Circuit Breaker	**Vacuum**
Rated continuous Current, A	**630A**
Rated Short Circuit Current (A), Time (s)	**16kA/3S**
Motor supply voltage	**230VAC**
Control voltage	**230VAC**
Duty cycle	
Mechanical endurance class (CB/ISOLATOR/EARTHSWITCH)	
Serial Number	**8130/2018**
Name of Manufacturer	**ABB/ELECTOALFA**
Country of Origin	**ITALY**
Date of Manufacture (MM/YYYY)	**2018**
Number of operations	**49**
Maintenance Date (DD/MM/YYYY)	**30/11/2024**

Transformer

Electric Power Transformer

Vector Group Dyn11

Make: Tanalec.

Rated Voltage: 11,000V/415V

Rated Power 500KVA.

3.3.1. INSULATING AND INTERRUPTING MEDIUM TESTS AND CHECKS

	Value	Remark
Operating pressure for bus bar, Bar		
Operating pressure for circuit breaker, Bar		

Low Pressure Alarm, Bar		
High Pressure Alarm, Bar		
Gas Density Monitor and Tightness check		
Ambient Temperature during measurement/check		

3.3.2. FUNCTIONAL TESTS

Description	**Selector Switch**	**Expected Result**	**Remark**
Local operation CB, Open and Close	Local	OK	
Local operation CB, Open and Close	Remote	N/A	
Remote operation, CB Open and Close	Local	N/A	
Remote operation CB, Open and Close	Remote	N/A	
Isolator local operation. Open and Close	Local	OK	
Isolator local operation. Open and Close	Remote	Fail	
E/switch local operation. Open and Close	Local	Use Handle	
E/switch local operation. Open and Close	Remote	N/A	
E/switch remote operation. Open and Close	Local	N/A	
E/switch remote operation. Open and Close	Remote	N/A	
Circuit Breaker manual operation. Open and Close		OK	
Isolator Manual operation. Open and Close		Use Handle	
Earth Switch Manual operation. Open and Close		Use Handle	
Isolator status indication. Open and Closed		OK	
Earth switch status indication. Open and Closed		OK	
Circuit Breaker status indication Open and Closed		OK	

3.3.3. CIRCUIT BREAKER TESTS

Contact Resistance of circuit breaker(s)

Phase	**Injected Current(A)**	**Measured Value (μΩ)**	**Remarks**

L1	100	34.15	OK
L2	100	35.63	OK
L3	100	38.20	OK

Insulation resistance of Circuit breaker

Phase	Voltage applied (kV)	Measured Resistance (GΩ)	Remarks
L1	5kV	44.8	OK
L2	5kV	36.6	OK
L3	5kV	52.1	OK

TEST EQUIPMENT

Record all test equipment used.

Description (Manufacturer/Type)	Tests Done	Serial Number	Calibration Date
OMICRON CPC100	YES	CF305C	03/08/2023
Megger MIT515	YES	102399268	21/11/2023

Maintenance Engineer

Name	**Abbas T**	Signature		Date	**10/12/2024**

External dusty panel and floor before maintenance

Ant nest built inside the 11kV panel

Heavy Dusty Switchgear panel

Dusty porcelain Insulators and the panel floor

Open through passage from the cable trench to the panel which invites reptiles in the panel because of the warmth

The dusty cable trench that goes up the panel through the cable openings to the panels.

3.3.4. ROUTINE CHECKS FOR OVERCURRENT/EARTH FAULT PROTECTION RELAYS

Substation	United Nations SO4
Feeder Name	Outgoing Transformer 3
Bay No.	02
Voltage Level	11 kV
Date	30/11/2024

Relay Details

Relay Make/Type	Schneider Electric/Sepam
Serial No.	
Rated Current(1A/ 5A)	5A
Rated Auxiliary Supply Range	24-250 VDC

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	No
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	No
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	No; Relay supply MCB off
Are there any damaged components inside the panel?	Yes; One component removed.

2. Instrumentation

	Current(A)	Voltage(V)

CT ratio 50/5/5A	Ammeter Reading	20 A	
VT ratio: 1000/110	Voltmeter Reading		11 kV
	Relay Reading	NA	

3. Relay Configuration and Trip Records

Relay Date	NA
Relay Time	NA
Last trip (Date and Time)	NA

4. Protection Settings

CT - Ratio (Name plate reading)	50/5/5A
CT - Tap(In as configured in relay)	NA

Settings	**Ip (A)**	**tp**	**I> (A)**	**t> (s)**	**I>> (A)**	**t>> (s)**
Overcurrent	NA	NA	NA	NA	NA	NA
Earth fault	NA	NA	NA	NA	NA	NA
S E/F						
R E/F						
Ph. Unbalance						

General remarks: Protection Relay off, one of the MCBs in the panel off and could not be reset. There is a need for the panel drawings so that the necessary diagnosis can be carried out to ascertain the fault, tripping the MCB and to ascertain the status of the protection relay. The role of the missing component in the panel also needs ascertaining from drawings.

Checked by:

Name: …Abbas…… Sign: …… Date: ……

Tripped MCB F851 which we suspected is linked to the Schneider Electric/Sepam *relay*

Schneider Electric/Sepam relay black ouit.

3.3.5. ROUTINE CHECKS FOR OVERCURRENT/EARTH FAULT PROTECTION RELAYS

Substation	United Nations S04
Feeder Name	Incomer From Transformer 4
Bay No.	1Q
Voltage Level	415 V
Date	30/11/2024

Relay Details

Relay Make/Type	Schneider Electric/Compact
Serial No.	
Rated Current(1A/ 5A)	1000 A
Rated Auxiliary Supply Range	415 V

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	NA
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, ammeters/voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio NA	Ammeter Reading	7 A	
VT ratio: NA	Voltmeter Reading		416 V
	Relay Reading	NA	

3. Relay Configuration and Trip Records

Relay Date	NA
Relay Time	NA
Last trip (Date and Time)	NA

4. Protection Settings

CT - Ratio (Name plate reading)	NA
CT - Tap(In as configured in relay)	NA

Settings	**Ip (A)**	**tp**	**I> (A)**	**t> (s)**	**I>> (A)**	**t>> (s)**
Overcurrent	1000 A	0.5 s	1500	0 s	NA	NA
Earth fault	NA	NA	NA	NA	NA	NA
S E/F						
R E/F						
Ph. Unbalance						

General remarks : ……Protection MCCB in good condition.

3.3.6. ROUTINE CHECKS FOR OVERCURRENT/EARTH FAULT PROTECTION RELAYS

Substation	United Nations S04
Feeder Name	Incomer From LV Source
Bay No.	2Q
Voltage Level	415 V
Date	30/11/2024

Relay Details

Relay Make/Type	Schneider Electric/Compact
Serial No.	
Rated Current(1A/ 5A)	1000 A
Rated Auxiliary Supply Range	415 V

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	NA
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, ammeters/voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

CT ratio NA	Ammeter Reading
VT ratio: NA	Voltmeter Reading
	Relay Reading

3. Relay Configuration and Trip Records

Relay Date	NA
Relay Time	NA
Last trip	NA
(Date and Time)	

4. Protection Settings

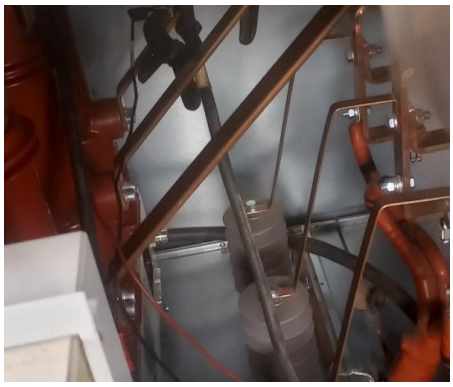
CT - Ratio (Name plate reading)	NA
CT - Tap(In as configured in relay)	NA

Settings	**Ip (A)**	**tp**	**I> (A)**	**t> (s)**

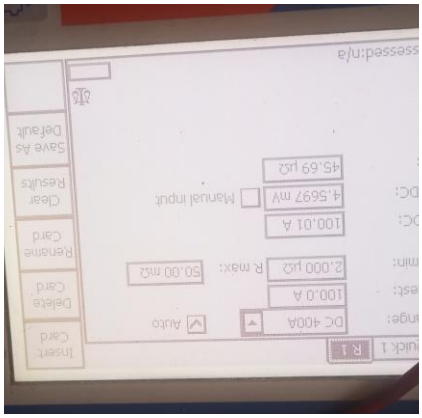
Overcurrent	1000 A	0.5 s	1500	0 s
Earth fault	NA	NA	NA	NA
S E/F				
R E/F				
Ph. Unbalance				

General remarks : ……Protection MCCB in good condition.

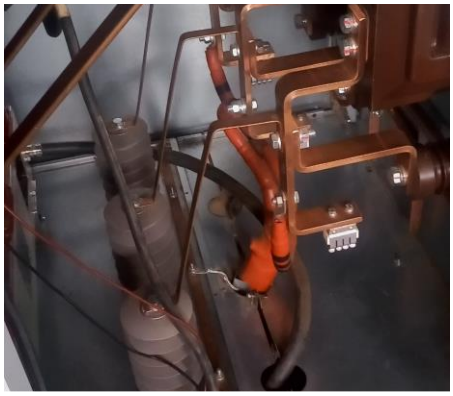
Checking terminations and Vacuum cleaning ongoing.



Carrying out of Breaker contact resistance in progress.



CPC100 display of contact resistance



Cleaned Panel after maintenance.

3.4. SUBSTATION 05

SWITCHGEAR BAY ROUTINE MAINTENANCE REPORT

Substation Name	**S04, MONUSCO**
Bay Number	**04**
Feeder Name	**TX4 Outgoing Panel with a Disconnector & Earth Switch.**
Rated Voltage, kV	**12kV**
Basic Insulation Level (BIL), kV	**75kV**
Insulation Medium	**SF6**
Interrupting Medium of the Circuit Breaker	**Vacuum**
Rated continuous Current, A	**630A**
Rated Short Circuit Current (A), Time (s)	**16kA/3S**
Motor supply voltage	**230VAC**
Control voltage	**230VAC**
Duty cycle	
Mechanical endurance class (CB/ISOLATOR/EARTHSWITCH)	
Serial Number	**IVCIBL00048001**
Name of Manufacturer	**ABB/ELECTOALFA**
Country of Origin	**ITALY**
Date of Manufacture (MM/YYYY)	**2018**
Number of operations	**40**
Maintenance Date (DD/MM/YYYY)	**30/11/2024**

Substation Name	**S04, MONUSCO**
Bay Number	**02**
Feeder Name	**Incomer Panel with a Disconnector**
Rated Voltage, kV	**24kV**
Basic Insulation Level (BIL), kV	**75kV**
Insulation Medium	**SF6**
Interrupting Medium of the Circuit Breaker	**Vacuum**
Rated continuous Current, A	**630A**
Rated Short Circuit Current (A), Time (s)	**16kA/3S**
Motor supply voltage	**230VAC**
Control voltage	**230VAC**
Duty cycle	
Mechanical endurance class (CB/ISOLATOR/EARTHSWITCH)	
Serial Number	**8130/2018**
Name of Manufacturer	**ABB/ELECTOALFA**
Country of Origin	**ITALY**
Date of Manufacture (MM/YYYY)	**2018**
Number of operations	**49**
Maintenance Date (DD/MM/YYYY)	**30/11/2024**

Transformer

Electric Power Transformer

Vector Group Dyn11

Make: Tanalec.

Rated Voltage: 11,000V/415V

Rated Power 500KVA.

3.4.1. Insulating and interrupting medium tests and checks

	Value	Remark
Operating pressure for bus bar, Bar		
Operating pressure for circuit breaker, Bar		
Low Pressure Alarm, Bar		
High Pressure Alarm, Bar		
Gas Density Monitor and Tightness check		
Ambient Temperature during measurement/check		

3.4.2. Functional Tests

Description	**Selector Switch**	**Expected Result**	**Remark**
Local operation CB, Open and Close	Local	OK	
Local operation CB, Open and Close	Remote	N/A	
Remote operation, CB Open and Close	Local	N/A	
Remote operation CB, Open and Close	Remote	N/A	
Isolator local operation. Open and Close	Local	OK	
Isolator local operation. Open and Close	Remote	Fail	
E/switch local operation. Open and Close	Local	Use Handle	
E/switch local operation. Open and Close	Remote	N/A	
E/switch remote operation. Open and Close	Local	N/A	
E/switch remote operation. Open and Close	Remote	N/A	
Circuit Breaker manual operation. Open and Close		OK	
Isolator Manual operation. Open and Close		Use Handle	
Earth Switch Manual operation. Open and Close		Use Handle	
Isolator status indication. Open and Closed		OK	
Earth switch status indication. Open and Closed		OK	
Circuit Breaker status indication Open and Closed		OK	

3.4.3. Circuit Breaker Tests

Contact Resistance of circuit breaker(s)

Phase	Injected Current(A)	Measured Value (mΩ)	Remarks
L1	100	34.15	OK
L2	100	35.63	OK
L3	100	38.20	OK

Insulation resistance of Circuit breaker

Phase	Voltage applied (kV)	Measured Resistance (GΩ)	Remarks
L1	5kV	44.8	OK
L2	5kV	36.6	OK
L3	5kV	52.1	OK

Test Equipment

Record all test equipment used.

Description (Manufacturer/Type)	Tests Done	Serial Number	Calibration Date
OMICRON CPC100	YES	CF305C	03/08/2023
Megger MIT515	YES	102399268	21/11/2023

Maintenance Engineer

Name	**Abbas T**	Signature		Date	**10/12/2024**

3.4.4. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations SO5
Feeder Name	Outgoing Transformer 5
Bay No.	05
Voltage Level	11 kV
Date	24/11/2024

Relay Details

Relay Make/Type	Schneider Electric/Sepam
Serial No.	18230333
Rated Current(1A/ 5A)	5A
Rated Auxiliary Supply Range	24-250 VDC

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	Yes
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio 50/5/5A	Ammeter Reading	50 A	
VT ratio: 11000/110 V	Voltmeter Reading		11 kV
	Relay Reading	50 A	

3. Relay Configuration and Trip Records

Relay Date	24/11/2024
Relay Time	14'24 hours
Last trip (Date and Time)	24/11/2024; 14.10 hours

4. Protection Settings

CT - Ratio (Name plate reading)	50/5/5A
CT - Tap(In as configured in relay)	50/5A

Settings	**Ip (A)**	**tp**	**I> (A)**	**t> (s)**	**I>> (A)**	**t>> (s)**
Overcurrent	25 A	0.160	1200	0.100	NA	NA
Earth fault	7 A	0.160	630	0.100	NA	NA
S E/F						
R E/F						
Ph. Unbalance						

General remarks : ……Protection Relay is in good condition.

3.4.5. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations SO5
Feeder Name	Incomer Transformer 5
Bay No.	1Q
Voltage Level	415 V
Date	24/11/2024

Relay Details

Relay Make/Type	Schneider Electric/Compact
Serial No.	
Rated Current(1A/ 5A)	1000 A
Rated Auxiliary Supply Range	415 V

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	NA
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio NA	Ammeter Reading	540 A	
VT ratio: NA	Voltmeter Reading		417 V
	Relay Reading	NA	

3. Relay Configuration and Trip Records

Relay Date	NA
Relay Time	NA
Last trip (Date and Time)	NA

4. Protection Settings

CT - Ratio (Name plate reading)	NA
CT - Tap(In as configured in relay)	NA

Settings	Ip (A)	tp	I> (A)	t> (s)	I>> (A)	t>> (s)
Overcurrent	400 A	0.5 s	1500	0 s	NA	NA
Earth fault	NA	NA	NA	NA	NA	NA
S E/F						
R E/F						
Ph. Unbalance						

General remarks : ……Protection MCCB in good condition.

3.4.6. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	SO5
Feeder Name	INCOMER FROM LV
Bay No.	2Q
Voltage Level	415V
Date	24/11/2024

Relay Details

Relay Make/Type	Schneider Electric/Compact
Serial No.	NA
Rated Current(1A/ 5A)	1000A
Rated Auxiliary Supply Range	240VAC

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	YES
Are there any alarms/warnings?	NA
Is the relay LCD display ok(where applicable)?	NA
Is there any physical damage to the relay.?	NO
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	NO
Is the relay and other components on the panel well mounted?	YES
Are terminations to the relay secure?	YES
Is the cabling inside the panel well arranged.?	YES
Are all the control panel MCBs in "ON" position?	YES
Are there any damaged components inside the panel?	NO

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio	Ammeter Reading	NA	
VT ratio	Voltmeter Reading		NA
	Relay Reading	NA	

3. Relay Configuration and Trip Records

Relay Date	NA
Relay Time	NA
Last trip (Date and Time)	NA

4. Protection Settings

CT - Ratio (Name plate reading)	NA
CT - Tap(In as configured in relay)	NA

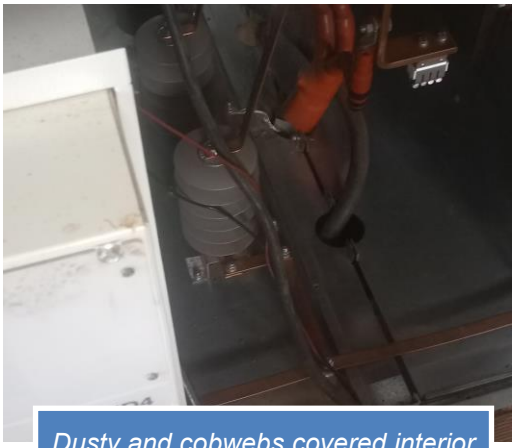
Settings	**Ip (A)**	**tp**	**I> (A)**	**t> (s)**	**I>> (A)**	**t>> (s)**
Overcurrent	252A	0.5S	1500A	0S		
Earth fault						
S E/F						
R E/F						
Ph. Unbalance						

General remarks : The panel and the relay are in all good conditions.

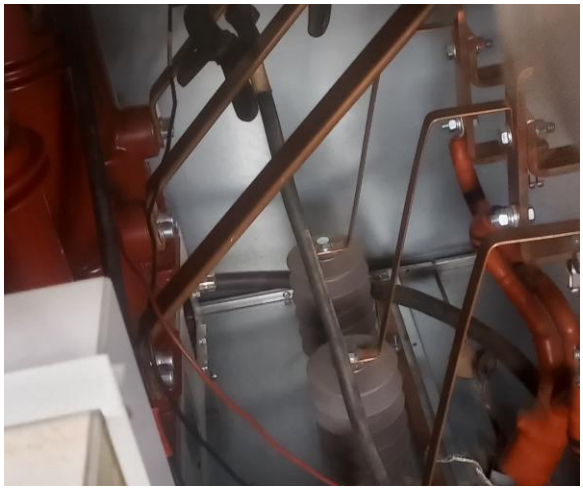
Scheneider relay covered in cobwebs.

Dusty Switchgear interior parts

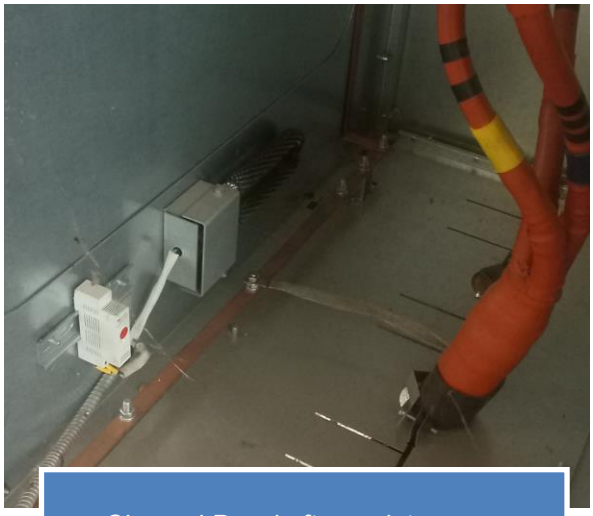
Interior panel covered with in cobwebs.



Dusty and cobwebs covered interior part of the 11kV panel



CPC100 display of contact resistance after panel maintenance.



Cleaned Panel after maintenance.

Internal control wiring and relay after maintenance

All MCB in good condition and terminations.

3.5. POWERHOUSE SWITCHGEARS

3.5.1. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations Main
Feeder Name	Incoming Feeder ATS
Bay No.	02
Voltage Level	11 kV
Date	01/12/2024

Relay Details

Relay Make/Type	Schneider Electric/Eeasergy
Serial No.	8280/08
Rated Current (1A/ 5A)	5A
Rated Auxiliary Supply Range	24-250 VDC

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	Yes
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio 150/5/5A	Ammeter Reading	35 A	
VT ratio: 11000/110 V	Voltmeter Reading		11 kV
	Relay Reading	35 A	

3. Relay Configuration and Trip Records

Relay Date	01/12/2024

Relay Time	13’40 hours
Last trip (Date and Time)	NA

4. Protection Settings

CT - Ratio (Name plate reading)	150/5/5A
CT - Tap(In as configured in relay)	150/5A
VT Ratio:	1000/110

Settings	Vp2 (%)	tVp2	Vp2> (%)	t> (s)	I>> (A)	t>> (s)
Un-balance Voltage	10	0.100	90	2	NA	NA
Earth fault	NA	NA	NA	NA	NA	NA
S E/F						
R E/F						
Ph. Unbalance						

General remarks : ……Protection Relay in good condition.

3.5.2. Circuit Breaker Tests

Contact Resistance of circuit breaker(s)

Phase	Injected Current(A)	Measured Value (mΩ)	Remarks
L1	100	32.13	OK
L2	100	35.05	OK
L3	100	34.69	OK

Insulation resistance of Circuit breaker

Phase	Voltage applied (kV)	Measured Resistance (GΩ)	Remarks
L1	5kV	28.6	OK
L2	5kV	32.4	OK
L3	5kV	41.6	OK

3.5.3. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations Main
Feeder Name	Outgoing Feeder SO5
Bay No.	01
Voltage Level	11 kV
Date	01/12/2024

Relay Details

Relay Make/Type	Schneider Electric/Sepam
Serial No.	18230207
Rated Current(1A/ 5A)	5A
Rated Auxiliary Supply Range	24-250 VDC

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	Yes
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio 50/5/5A	Ammeter Reading	15 A	
VT ratio: 1000/110	Voltmeter Reading		11 kV
	Relay Reading	15 A	

3. Relay Configuration and Trip Records

Relay Date	01/12/2024
Relay Time	13'24 hours
Last trip	01/12/2024; 13.10 hours

(Date and Time)	

4. Protection Settings

CT - Ratio (Name plate reading)	50/5/5A
CT - Tap(In as configured in relay)	50/5A

Settings	Ip (A)	tp	I> (A)	t> (s)	I>> (A)	t>> (s)
Overcurrent	25 A	0.200	700	0.140	1200	0.100
Earth fault	10	0.200	50	0.140	630	0.100
S E/F						
R E/F						
Ph. Unbalance						

General remarks : ……Protection Relay in good condition.

3.5.4. Circuit Breaker Tests

Contact Resistance of circuit breaker(s)

Phase	Injected Current(A)	Measured Value (mΩ)	Remarks
L1	100	58.46	OK
L2	100	28.75	OK
L3	100	25.38	OK

Insulation resistance of Circuit breaker

Phase	Voltage applied (kV)	Measured Resistance (GΩ)	Remarks
L1	5kV	51.2	OK
L2	5kV	38.6	OK
L3	5kV	46.8	OK

3.5.5. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations Main
Feeder Name	Outgoing Feeder S04
Bay No.	02
Voltage Level	11 kV
Date	01/12/2024

Relay Details

Relay Make/Type	Schneider Electric/Sepam
Serial No.	18230224
Rated Current(1A/ 5A)	5A
Rated Auxiliary Supply Range	24-250 VDC

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	Yes
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio 50/5/5A	Ammeter Reading	10.10 A	
VT ratio: 1000/110	Voltmeter Reading		11 kV
	Relay Reading	9.96 A	

3. Relay Configuration and Trip Records

Relay Date	01/12/2024
Relay Time	13’25 hours
Last trip (Date and Time)	01/12/2024; 13.15 hours

4. Protection Settings

CT - Ratio (Name plate reading)	5/5/5A
CT - Tap(In as configured in relay)	50/5A

Settings	**Ip (A)**	**tp**	**I> (A)**	**t> (s)**	**I>> (A)**	**t>> (s)**
Overcurrent	50 A	0.200	700	0.140	1200	0.100
Earth fault	10	0.200	50	0.140	630	0.100
S E/F						
R E/F						
Ph. Unbalance						

General remarks : ……Protection Relay in Good condition.

3.5.6. Circuit Breaker Tests

Contact Resistance of circuit breaker(s)

Phase	Injected Current(A)	Measured Value (mΩ)	Remarks
L1	100	33.85	OK
L2	100	30.71	OK
L3	100	13.33	OK

Insulation resistance of Circuit breaker

Phase	Voltage applied (kV)	Measured Resistance (GΩ)	Remarks
L1	5kV	61.3	OK
L2	5kV	45.8	OK
L3	5kV	41.5	OK

3.5.7. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations Main
Feeder Name	Incoming Feeder Generator/TX
Bay No.	03
Voltage Level	11 kV
Date	01/12/2024

Relay Details

Relay Make/Type	Schneider Electric/Sepam
Serial No.	18230045
Rated Current(1A/ 5A)	5A

Rated Auxiliary Supply Range	24-250 VDC

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	Yes
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio 50/5/5A	Ammeter Reading	39.82 A	
VT ratio: 1000/110	Voltmeter Reading		11 kV
	Relay Reading	39.5 A	

3. Relay Configuration and Trip Records

Relay Date	01/12/2024
Relay Time	13’25 hours
Last trip (Date and Time)	01/12/2024; 13.15 hours

4. Protection Settings

CT - Ratio (Name plate reading)	150/5/5A
CT - Tap(In as configured in relay)	150/5A

Settings	**Ip (A)**	**tp**	**I> (A)**	**t> (s)**	**I>> (A)**	**t>> (s)**
Overcurrent	150 A	0.250	700	0.250	1200	0.100
Earth fault	30	0.250	150	0.250	630	0.100
S E/F						
R E/F						
Ph. Unbalance						

General remarks : ……Protection Relay in good condition.

3.5.8. Circuit Breaker Tests

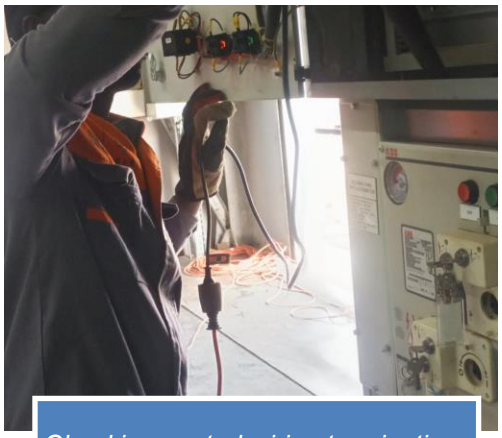
Contact Resistance of circuit breaker(s)

Phase	Injected Current(A)	Measured Value (mΩ)	Remarks
L1	100	26.31	OK
L2	100	29.29	OK
L3	100	23.08	OK

Insulation resistance of Circuit breaker

Phase	Voltage applied (kV)	Measured Resistance (GΩ)	Remarks
L1	5kV	35.8	OK
L2	5kV	29.6	OK
L3	5kV	32.4	OK

Getting Relay data

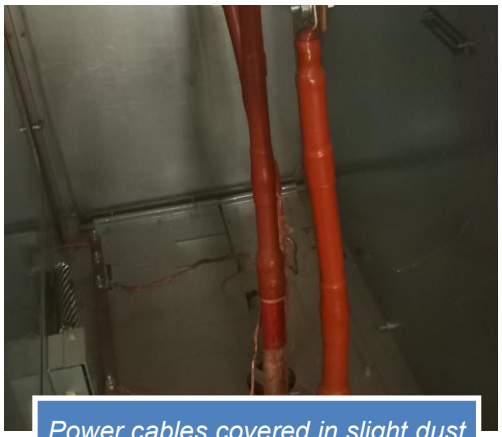


Checking control wiring terminations

Vacuum cleaning of control panel.

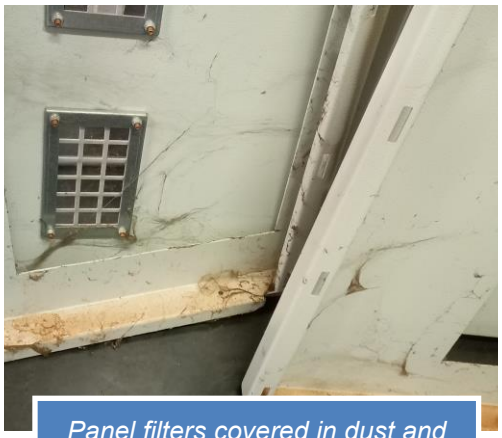
Cobwebs on control doors

Cobwebs covering current transformer compartments



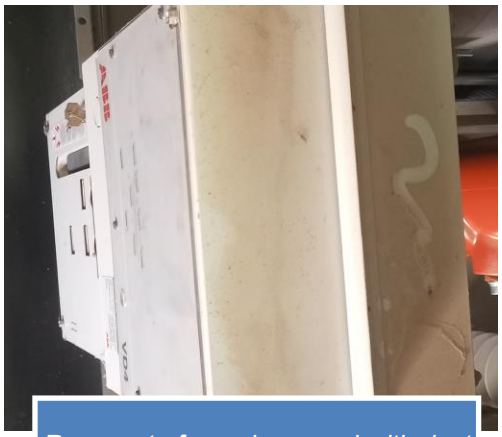
Power cables covered in slight dust and cobwebs.

Overcurrent test being prepared.



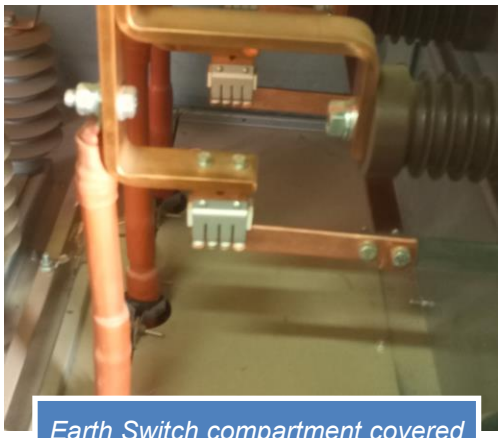
Panel filters covered in dust and cobwebs.

Open halls from cable trench to 11kV panel power cable compartment.

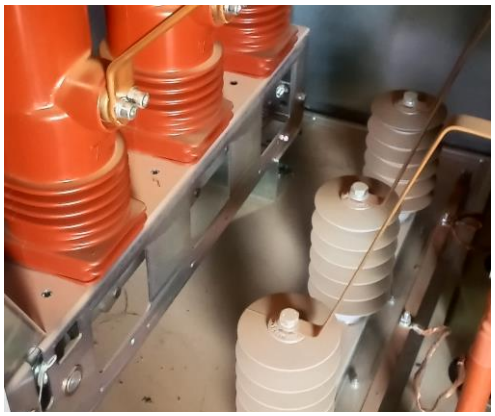


Rear part of panel covered with dust

Surge arrester compartment covered in dust and cobwebs.



Earth Switch compartment covered in dust and cobwebs,



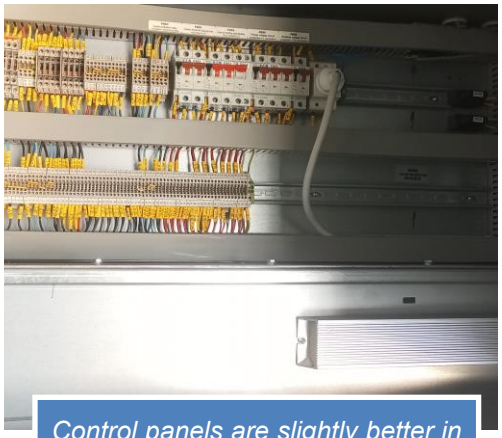
Breaker Porcelain limbs covered in dust and cobwebs.

Current transformer bars covered in dust.

Panel Earth bars covered in duist and cobwebs.

Heavy Cobwebs and dust in breaker compartments.

Interior panel fully covered with in cobwebs and dust.

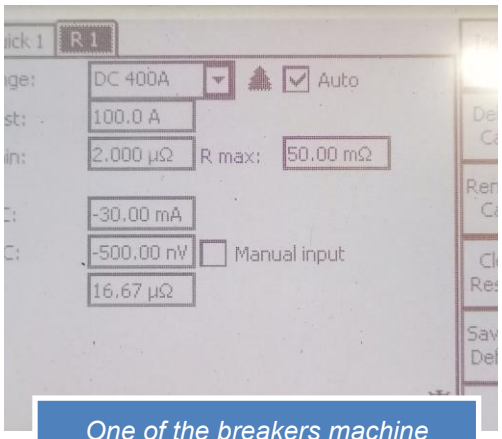


Control panels are slightly better in terms of dust and cobwebs.

Interior panel after maintenance

CT compartments after maintenance.

Carrying contact resistance and primary injection tests.



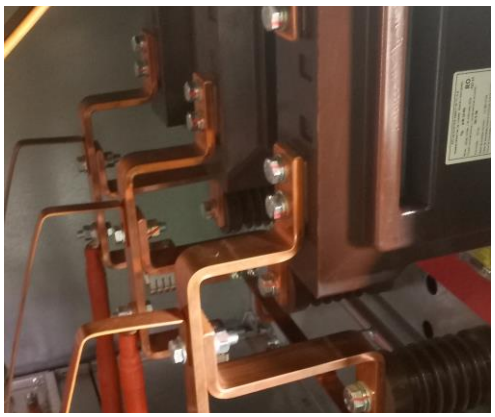
One of the breakers machine generated contact resistance tests.

Testing of contact resistance of breaker using CPC100

11kV Breaker and Surge arrester compartment after maintenance,

11KV compartment after maintenance

11kV breaker compartment after maintenance.



CT after maintenance.

More 11kV panels after maintenance.

Cleaned 11kV cable compartment after maintenance.

11kV Switchgears after maintenance.

Trip Tests:

All tripping tests for all the 11kV panels were successful

3.6. LV POWER SUPPLY BOARDS

3.6.1. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations Main
Feeder Name	Outgoing Sally Portal
Bay No.	2Q
Voltage Level	415 V
Date	01/12/2024

Relay Details

Relay Make/Type	Schneider Electric/Compact
Serial No.	
Rated Current(1A/ 5A)	630 A
Rated Auxiliary Supply Range	415 V

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	NA
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio NA	Ammeter Reading	NA	
VT ratio: NA	Voltmeter Reading		NA
	Relay Reading	NA	

3. Relay Configuration and Trip Records

Relay Date	NA

Relay Time	NA
Last trip (Date and Time)	NA

4. Protection Settings

CT - Ratio (Name plate reading)	NA
CT - Tap(In as configured in relay)	NA

Settings	**Ip (A)**	**tp**	**I> (A)**	**t> (s)**	**I>> (A)**	**t>> (s)**
Overcurrent	250 A	0.9 s	NA	NA	NA	NA
Earth fault	NA	NA	NA	NA	NA	NA
S E/F						
R E/F						
Ph. Unbalance						

General remarks : ……Protection MCCB in good condition.

3.6.2. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations Main
Feeder Name	Outgoing RTCC 1
Bay No.	2Q
Voltage Level	415 V
Date	01/12/2024

Relay Details

Relay Make/Type	Schneider Electric/Compact
Serial No.	
Rated Current(1A/ 5A)	630 A
Rated Auxiliary Supply Range	415 V

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	NA
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes

Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio NA	Ammeter Reading	NA	
VT ratio: NA	Voltmeter Reading		NA
	Relay Reading	NA	

3. Relay Configuration and Trip Records

Relay Date	NA
Relay Time	NA
Last trip (Date and Time)	NA

4. Protection Settings

CT - Ratio (Name plate reading)	NA
CT - Tap(In as configured in relay)	NA

Settings	**Ip (A)**	**tp**	**I> (A)**	**t> (s)**	**I>> (A)**	**t>> (s)**
Overcurrent	250 A	0.9 s	NA	NA	NA	NA
Earth fault	NA	NA	NA	NA	NA	NA
S E/F						
R E/F						
Ph. Unbalance						

General remarks : ……Protection MCCB in good condition.

3.6.3. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations Main
Feeder Name	Incomer Transformer Main
Bay No.	1Q
Voltage Level	415 V
Date	01/12/2024

Relay Details

Relay Make/Type	Schneider Electric/Compact
Serial No.	
Rated Current(1A/ 5A)	1000 A
Rated Auxiliary Supply Range	415 V

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	NA
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio NA	Ammeter Reading	NA	
VT ratio: NA	Voltmeter Reading		NA
	Relay Reading	NA	

3. Relay Configuration and Trip Records

Relay Date	NA
Relay Time	NA
Last trip (Date and Time)	NA

4. Protection Settings

CT - Ratio (Name plate reading)	NA
CT - Tap(In as configured in relay)	NA

Settings	**Ip (A)**	**tp**	**I> (A)**	**t> (s)**	**I>> (A)**	**t>> (s)**
Overcurrent	600 A	0.9 s	1500	0 s	NA	NA
Earth fault	NA	NA	NA	NA	NA	NA
S E/F						
R E/F						
Ph. Unbalance						

General remarks : ……Protection MCCB in good condition.

3.6.4. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations Main
Feeder Name	Outgoing Q16
Bay No.	5Q
Voltage Level	415 V
Date	01/12/2024

Relay Details

Relay Make/Type	Schneider Electric/Compact
Serial No.	
Rated Current(1A/ 5A)	1000 A
Rated Auxiliary Supply Range	415 V

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No
Is the relay LCD display ok(where applicable)?	NA
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio NA	Ammeter Reading	NA	

VT ratio: NA	Voltmeter Reading		NA
	Relay Reading	NA	

3. Relay Configuration and Trip Records

Relay Date	NA
Relay Time	NA
Last trip (Date and Time)	NA

4. Protection Settings

CT - Ratio (Name plate reading)	NA
CT - Tap(In as configured in relay)	NA

Settings	**Ip (A)**	**tp**	**I> (A)**	**t> (s)**	**I>> (A)**	**t>> (s)**
Overcurrent	320 A	0.5 s	1500	0	NA	NA
Earth fault	NA	NA	NA	NA	NA	NA
S E/F						
R E/F						
Ph. Unbalance						

General remarks : ……Protection MCCB in good condition.

3.6.5. Routine Checks for Overcurrent/Earth Fault Protection Relays

Substation	United Nations Main
Feeder Name	Outgoing Q15
Bay No.	4Q
Voltage Level	415 V
Date	01/12/2024

Relay Details

Relay Make/Type	Schneider Electric/Compact
Serial No.	
Rated Current(1A/ 5A)	1000 A
Rated Auxiliary Supply Range	415 V

1. Visual Inspection

	Yes/No/NA
Is the protection relay powered up?	Yes
Are there any alarms/warnings?	No

Is the relay LCD display ok(where applicable)?	NA
Is there any physical damage to the relay.?	No
Is there any physical damage to the front panel devices (e.g., switches, Ammeters/Voltmeters)?	No
Is the relay and other components on the panel well mounted?	Yes
Are terminations to the relay secure?	Yes
Is the cabling inside the panel well arranged.?	Yes
Are all the control panel MCBs in "ON" position?	Yes
Are there any damaged components inside the panel?	No

2. Instrumentation

		Current(A)	Voltage(V)
CT ratio NA	Ammeter Reading	NA	
VT ratio: NA	Voltmeter Reading		NA
	Relay Reading	NA	

3. Relay Configuration and Trip Records

Relay Date	NA
Relay Time	NA
Last trip (Date and Time)	NA

4. Protection Settings

CT - Ratio (Name plate reading)	NA
CT - Tap(In as configured in relay)	NA

Settings	**Ip (A)**	**tp**	**I> (A)**	**t> (s)**	**I>> (A)**	**t>> (s)**
Overcurrent	160 A	0.5 s	1250	0	NA	NA
Earth fault	NA	NA	NA	NA	NA	NA
S E/F						
R E/F						
Ph. Unbalance						

General remarks : ……Protection MCCB in good condition.

4. CONCLUSION

1) There is a lot of dust in the Switchgear rooms. The Ingress protection of most switchgear is IP 3X and there is a lot of dust creeping in to the inner parts of the switchgear panels. This dust has an adverse effect on the switchgear functionality of electronic equipment like relays and switching equipment like dry contacts. The dust needs to be eliminated by fully concealing the switchgear rooms and using air conditioners for cooling.
2) The open sections of the switchgear rooms attract moisture and cobwebs. These can cause arc flash within the breaker compartments and the transformers. Periodic fumigation is required.
3) The lack of proper cement plastered walls and floors increase the amount of dust in the substation rooms. The rooms need to be floored with Epoxy floor finish to ensure cleaner floors.
4) The openings from the cable trench to the 11kV panels will lead to reptiles entering the panels because of warmth and hence cause short circuit and arc blast. So, all opening will have to be filled with polyurethane form.
5) Moist of the UPS in the substations have given way because of high dust and heat. These need to be replaced.
6) There cooling system in the substation are not working.
7) Mixing oil transformers with tendency of oil leakages will affect the electrical panels.
8) The Plant Houses should not be used as storage of waste products as it may attract other animals like reptiles and ants.
9) All the drawings of the various electrical equipment should be available as in substation 04 the tripping of the MCB that we suspect supplies the protection relay.