Base Load Power Hub (BLPH)

SITE ACCEPTANCE TEST PROCEDURE
LV Switchgear
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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.
Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

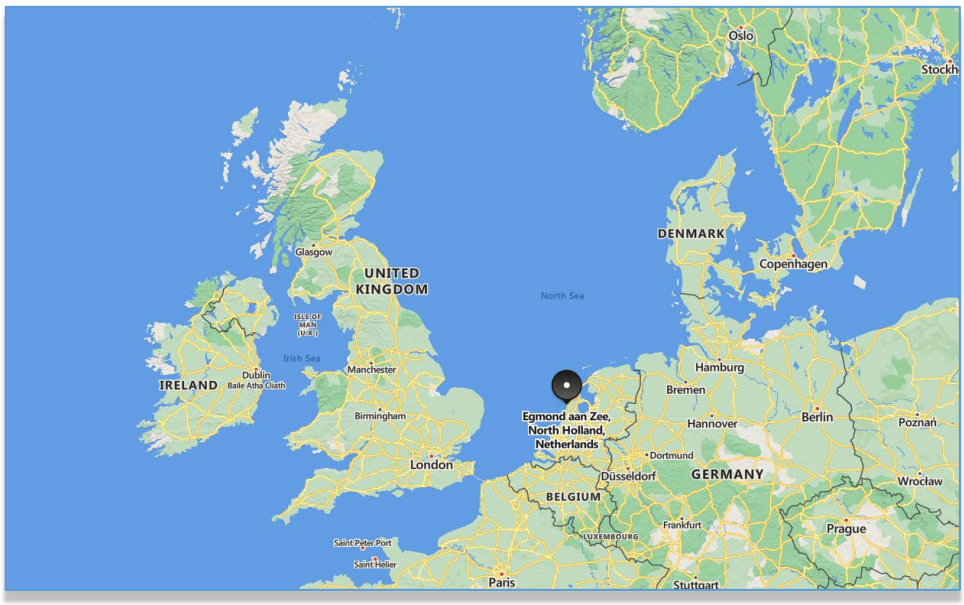


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

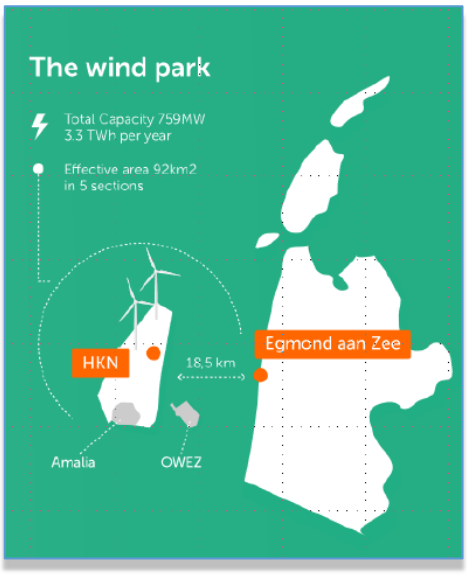


Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed byVan Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

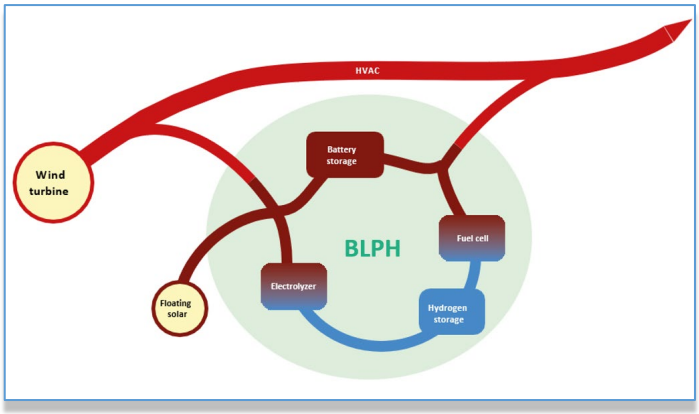


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.
The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

2 SCOPE AND APPLICABILITY

This document provides the commissioning and start-up methods, as well as the testing procedures at site, applicable to L.V. Electrical Switchboards, manufactured by IMESA in compliance to Standard IEC 61439-1 and 61439-2.

The procedure is applicable to the following switchgear tag: SG-200N1, SG-200D2, DP-200N1.

3 APPLICABLE STANDARDS AND DOCUMENTS

The tester will make reference to Standards IEC 61439-1 and IEC 61439-2 and to the engineering documents listed here below.

Ref.	Imesa Doc No.	Description
A1	1723002197-EL-DA-00007	SG-200N1 GENERAL ARRANGEMENTS DWG AND FOUNDATION LOAD CALCULATION INCLUDING COG
A2	1723002197-EL-DA-00008	SG-200D2 GENERAL ARRANGEMENTS DWG AND FOUNDATION LOAD CALCULATION INCLUDING COG
A3	1723002197-EL-DA-00009	DP-200N1 GENERAL ARRANGEMENTS DWG AND FOUNDATION LOAD CALCULATION INCLUDING COG
A4	1723002197-EL-DG-00011	SG-200N1 ELECTRICAL SINGLE LINE DIAGRAM
A5	1723002197-EL-DG-00012	SG-200D2 ELECTRICAL SINGLE LINE DIAGRAM
A6	1723002197-EL-DG-00013	DP-200N1 ELECTRICAL SINGLE LINE DIAGRAM
A7	1723002197-EL-DG-00030	SG-200N1 LV SWG FUNCTIONAL DIAGRAMS - INCOMINGS, INTERCONNECTING AND AUX DISTRIBUTION
A8	1723002197-EL-DG-00031	SG-200N1 LV SWG FUNCTIONAL DIAGRAMS - TYPICAL FEEDERS
A9	1723002197-EL-DG-00032	SG-200D2 FUNCTIONAL DIAGRAM
A10	1723002197-EL-DG-00033	DP-200N1 FUNCTIONAL DIAGRAM
A11	1723002197-EL-DS-00035	SG-200N1 EQUIPMENT DATA SHEETS INCLUDING MSDS and WEIGHT DATA SHEET
A12	1723002197-EL-DS-00036	SG-200D2 EQUIPMENT DATA SHEETS INCLUDING MSDS and WEIGHT DATA SHEET
A13	1723002197-EL-DS-00037	DP-200N1 EQUIPMENT DATA SHEETS INCLUDING MSDS and WEIGHT DATA SHEET
A14	1723002197-EL-CAL 00054 t.b.d.	INSTALLATION OPERATING AND MAINTENACE MANUAL

Hard copy of the a.m. IMESA documents, properly stamped and signed as “AS BUILT”, will be available for the needed testing activities and verifications.

4 SAFETY RECOMMENDATIONS

WARNING



- **All the operations of electric maintenance and installation must be performed by qualified technicians**
- **All the standard electric safety procedures must be respected**
- **Never touch inside the switchboard; only after making sure it is out of voltage and grounded**
- **Always wear personal protective equipment (insulating shoes in rubber, protective glasses, safety helmet, etc...)**
- **Never work alone**
- **Never remove safety screens**
- **Always pay maximum attention when handling components or performing measurements inside the panel**
- **It shall be taken in mind that this test procedure is only for the equipment and is to be used together (not instead of) all safety procedures specified by local Laws, rules, regulations and Standards**

People attending the commissioning and testing activities must wear:

SHOES: Workers, staff of the Customer, the End User or its representatives (inspectors) present during the tests shall wear safety shoes, ever. The staff of the Customer, the End User or its representatives (inspectors) present during the tests must arrive already equipped with their own shoes. The staff of the Customer, the End User or its representatives (inspectors), present during the tests and not wearing safety shoes, may still access the Safe Area, but not the test area. They will therefore only observe the test from Safe Area and conducting the review of the results in test reports.

GLASSES: Workers must wear safety glasses when performing risky for their eyes.

HELMET: Workers must wear protective helmets when performing lifting and handling, or when there is a suspended load. When there are suspended loads or handling and lifting the staff of the Customer, the End User or its representatives (inspectors) present during the tests must remain in the Safe Area.

GLOVES: Workers must wear gloves when performing risky for the hands or vibrations.

DRESS: All workers must wear appropriate safety clothing, forever. Helmet, gloves, glasses, safety clothing are not required to staff of the Customer, the end Customer or his representatives (inspectors) present during the tests.

When testing the dielectric properties (applied voltage test), **insulated gloves** and **shoes with retractable toe caps**, as well as suitable **protection clothing covering body and arms**, to be worn.
If the test is suspended even temporarily, the test instrument must be disconnected from the mains.

Before to start any activity, to thoroughly check that the following points are confirmed:
- the lighting system in the area is suitable and in operation
- phone or radio communication system is available, even temporarily for the present activities
- the fire-fighting system is in operation and provided with valid certification (portable fire extinguishers may be also suitable for purpose)
- earthing plant in the area and earthing connections of the subsystems to be energized have been completed and tested

5 GENERAL DESCRIPTION

5.1 LIST OF ABREVIATIONS

S.A.T.	Site Acceptance Test
VT	Voltage Transformer
CT	Current Transformer
NCR	Non-Conformity Report
IED	Intelligent Electronic Device (like programmable relay)
MCB	Miniature Circuit Breaker
CB	Circuit Braker
MCC	Motor Control Center
LV	Low Voltage (Circuit with voltage under 1000Vac or 1500Vdc)
I.O.M.	Installation, Operation and Maintenance manual
a.m.	above mentioned.

5.2 PURPOSE OF SAT

The purpose of the SAT (Site Acceptance Test) is to inspect the switchboard, after installation at site, to ensure that it is ready for energization and start-up and also that its performance requirements will be met.
Prior to performing any Site Acceptance Testing, all Punch list items have to be rectified and closed.

5.3 TESTING TASKS

After completion of the installation phase of the switchboard and in order to prepare it for SAT, pre-commissioning and commissioning are to be first carried out, as further detailed in the next paragraphs.

The overall test activities will be performed by means of the specific test equipment, under the control and responsibility of the test executor, along with some assistants.

The main steps that will be performed are the following:
- Verification of the test procedures and of the related documentation availability.
- Preparation of the test setup
- Execution of the tests according to the Test Procedure and release of the SAT Test Report
- Signing of the SAT Test Report by the test executor and the attending people.

For additional tests not included in its own scope of work, IMESA will provide technical support, as agreed in advance.

List of the tests

Item	Activity	Tool	Support Requested	Type of Test
a.	Mechanical check	Torque Wrench	Mech. Engineer Inspection/Quality Officer	Mandatory
b.	Primary Injection on current transformers	Injection current bench	Electrical Engineer Inspection/Quality Officer	Suggested (to verify that CT is not damaged)
c.	Primary Injection on voltage transformers	Apply low voltage to check the functionality of VT (400V)	Electrical Engineer Inspection/Quality Officer	Suggested (to verify that VT is not damaged)
d.	Testing of protection relays by secondary injection	Secondary injection bench (Omicron)	Electrical Engineer (Relay specialist) Inspection/Quality Officer	Mandatory
e.	Functional test of IEDs, and interlocks.	Secondary injection bench (Omicron)	Electrical Engineer (Relay specialist) Inspection/Quality Officer	Mandatory
f.	Insulating resistance measurement	Megger	Electrical Engineer Inspection/Quality Officer	Mandatory

5.4 TESTING EQUIPMENT

- Megger (e.g. : Chauvin Arnoux ca 6547)
- Tester / Multimeter
- Testing bench for primary injection (e.g. : Omicron CPC 100)
- Relay Testing System (through current / voltage secondary injection – (e.g. : Omicron CMC 353)
- Testing kit for air circuit breakers type Emax ABB (Ekip T&P)
- Torque Wrench (e.g. Dina Beta NM 20÷100)
- Hi-pot test bench (e.g. : Phenix 650-2P)

NOTES:

- it shall be advised in advance availability of the testing equipment at site or whether those are to be provided by the commissioning engineer himself;
- availability of calibration certificates of the above testing equipment, having valid date, must be ensured.

5.5 TEST PHASE AND PASS/FAIL CRITERIA

For each test a set of pass/fail criteria will be defined (it is also possible that each test has a different criteria) in order to establish an acceptance procedure.
Where acceptance and rejection criteria are not established, they shall be defined according to the best practice, making reference to standards or samples.

The main possibilities are the following:

- All the steps are successfully performed (the test passes)
- Some steps fail but the function under test is verified (the test passes after client approval)
- Some steps fail and the function under test is not verified (the test fails)
- Some steps fail but with a specific corrective action the proper function is recovered (the test must be repeated)

If the test fails, a related NCR will be released.

6 PRE-COMMISSIONING ACTIVITIES

Before to start Pre-Commissioning, please, read carefully the I.O.M. document (Installation, Operation and Maintenance manual).
Then proceed with the following checks and actions.

1. Switchboard's cubicles shall be in good and clean status. Make sure that switchboard is clean, free from dust, traces of humidity, installation material debris, cables pieces, tools, provisional connections, etc. , as well as any foreign object.

2. Visually check the interior and exterior of the switchboard for signs of evident damage or shocks. Protective shields, insulating sheaths, etc.. shall be correctly placed and in good order

3. Painting visual check

4. Make sure that the switchboard is correctly installed according to the General Arrangement Drawings and suitably fixed

5. Maintenance clearances shall be according to the General Arrangement Drawings

6. Make sure that any support or protection used to handle the equipment has been removed

7. Make sure that, after completion of the installation, the switchboard overall protection degree is as per General Arrangement Drawings

8. Visual inspection to check that bolted connections of the LV and earthing circuits (at busbars, CBs poles, etc.) are suitably tighten. No disalignment is expected at the marks provided over the bolt, during torque wrench tightening at the factory. In case found, to torque wrench again the connection (see par. 8.1)

9. Cable passages shall be free and unobstructed

10. Couple the auxiliary interpanel connections by the relevant plugs and socket (see schematic diagrams with control voltage distribution loop, panels interconn. wiring and communication network loop)

11. Cabling of control cables from the field in accordance with I/O list / schematics shall be completed

12. Check the incoming / outgoing power cables proper support

13. Make sure that terminals and all the connections have been properly tightened

14. Make sure that all the safety interlock keys (master and copies) have been provided and installed. Where manoeuvres not allowed (forced operations shall be avoided).

15. Remove each L.V. air circuit breaker and MCC drawer from its cubicle, by means of the provided lifting / transport trolley, for a visual check of the breaker status and cleaning; including poles of the fixed part and the terminals on the removable part.
    Make sure that the breaker and the MCC drawer is free from dust and traces of humidity and that there are no signs of evident damage.
    Check that LV withdrawable circuit brakers and MCC drawers can be racked-in and racked out properly

16. Make sure that all fuses are correctly installed
17. All necessary warning and caution signs (voltage level indication, warning for live parts, etc.) shall be installed according to the safety standards and procedures

The results of the a.m. activities shall be recorded on PRE-COMMISSIONING ACTIVITIES REPORT form (see par. 10).

7 COMMISIONIG ACTIVITIES

Carry out the following checks and actions.

1. To be verified that all LV withdrawable circuit breakers and MCC drawers are in open and racked-out position; with charged closing springs (where present).

   N.B.: it is recommended to manually rewind all the circuit breakers closing springs, before to supply the relevant spring motor chargers, with aux. supply voltage, in order to prevent concurrent start-up of many motor gears, which may result in excessive load for the supplying circuit.

   As an alternative, it can be taken care that supply to those motors is provided one by one; by separately closing the relevant MCB, provided within the LV compartment of each feeder unit.
2. Connect all external aux. supplies and check that are at correct voltage value and phase sequence.
3. Check thoroughly the Operating efficiency and the mechanical locks and key safety interlocks.
4. With CBs in test position, close and open the same by local command.
5. Make sure that the phase sequence is in accordance to the electrical diagrams and that all incoming breakers are connected with the same phase sequence.
6. Check monitoring loops (hardwired status / alarm signals / visual status indications).
7. Check protection relays loops, concerning IEDs' integrated logic functions.
8. Put in service (racked-in) position and repeat the test for opening / closing the same from local and remote commands, including control loops from / to the field (commands, status, alarm, etc.)
9. Check CBs tripping, locking-out and alarming functions.

The results of the a.m. activities shall be recorded on the COMMISSIONING ACTIVITIES REPORT form (see par. 10)

8 SAT TESTING PROCEDURE

8.1 MECHANICAL TESTS

1. Bus-bars tightening check

Torque wrench all the bolted joints of the shipping sections, which have been coupled at site, according to the values indicated here below.
After tightening, each bolt is to be marked by red paint to indicated its relative position against the fixed part (as done for the torque wrench tightening provided at the factory).

The table below shows the torque wrench settings to be used for bolted connections fixing the panels and the bus-bars, too.

Type of screw	Tightening torque (Nm)	Tolerance
M5	5	5%
M6	9	5%
M8	22	5%
M10	45	5%
M12	75	5%
M14	115	5%
M16	185	5%

The results of the a.m. activities shall be recorded on SAT REPORT FOR MECHANICAL TEST form (see par. 10)

8.2 PRIMARY INJECTION ON CURRENT AND VOLTAGE TRANSFORMER

1. Testing CTs ratio

Test the CT for correct ratio with direct current injection to CT primary circuit and reading the measured value from the instruments or protection relays LCD display, provided at the LV compartment front door.

2. Testing VTs ratio

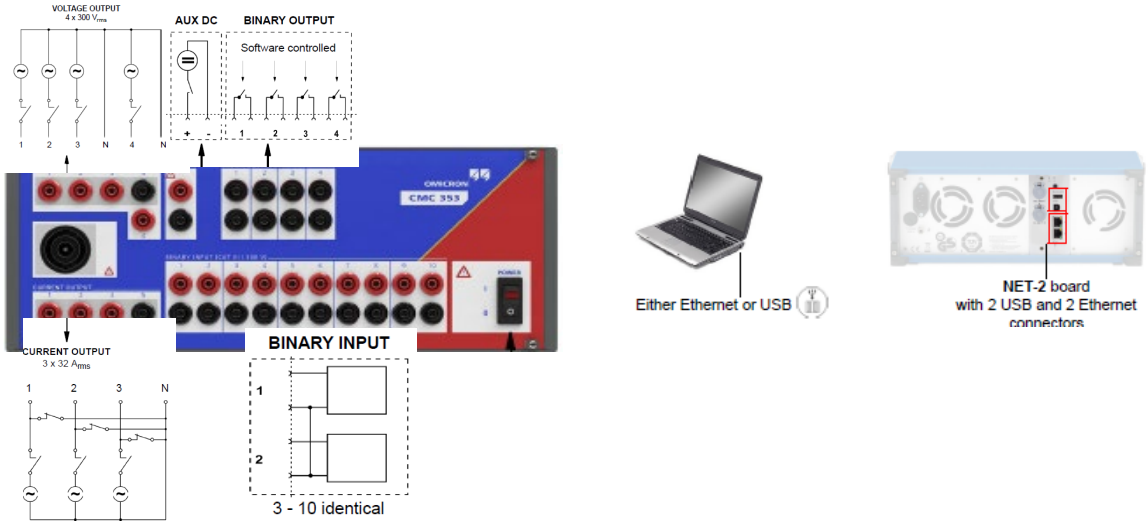
Test the VT for correct ratio with direct voltage injection to VT primary circuit (low voltage 400 V, for testing purpose) and reading the measured value from the instruments or protection relays LCD display, provided at the LV compartment front door.

The results of the a.m. activities shall be recorded on SAT REPORT FOR PRIMARY INJECTION TESTING ON CTs AND VTs form (see par. 10)

8.3 SECONDARY INJECTION TESTS ON PROTECTION RELAYS

Refer to the schematic diagrams, for connections and for checking logic functions.
Refer to the selectivity study for the protection relays' setting parameters.

Omicron secondary injection test kit – connection and interface



Example of testing instruments connection

1. Connection of the test set to the PC (USB Port) for data exchange: output of the data simulation, loading of the binary signal
2. Connection of the analogue outputs of the test set to the transformer inputs of the test object, to inject the simulated currents and voltages.
3. Connection of the binary outputs of the test set to the binary inputs of the test object, to send binary input signals to the test object.
4. Connection of the binary inputs of the test set to the binary outputs of the test object, to receive the binary output signals from the test object.

The recorded tripping values shall be in conformity with the Selectivity study

The results of the a.m. activities shall be recorded on SAT REPORT FOR PROTECTION FUNCTIONS CHECK form (see par. 10)

8.4 INSULATION RESISTANCE MEASUREMENT

The measurement of the insulation resistance is carried out to check that the installation and re-connection activities at site have been made correctly and that no damage occurred to the equipment, during shipment and installation.
All the VT's, surge arresters, insulation monitoring devices, etc. must be disconnected before the test.

1. Insulation resistance measurement of the main circuits

   It is to be carried out, applying at least 500V d.c. by means of Megger device. The measurement is to be carried out at each phase, while the other two are short-circuited and connected to ground.

   ACCEPTANCE CRITERIA: The test is considered successful if, for each tested circuit, the insulation resistance is above 1MΩ.

The values detected shall be recorded on SAT REPORT FOR INSULATION RESIST MEASUREMENT MAIN CIRCUITS form (see par. 10)

2. Insulation resistance measurement of the auxiliary circuits

   To carry out insulation resistance measurement on auxiliary circuits applying 500V d.c. by means of Megger device. The measurement is to be carried out at each pole, while the other one is connected to ground.

   ACCEPTANCE CRITERIA: The test is considered successful if, for each tested circuit, the insulation resistance is above 1MΩ.

The results of the a.m. dielectric tests shall be recorded on SAT REPORT FOR INSULATION RESIST MEASUREMENT ON AUX CIRCUITS form (see par. 10)

9 PRE-ENERGIZATION REQUIREMENTS

Before to proceed with energization of the LVSB, the following is to be verified.

- Make sure to pull off the short-circuit jumpers fitted on amperometric terminal boards, to avoid running the units with current transformer (-TA) short-circuited at secondary windings.
- Make sure to have re-closed the disconnecting terminals fitted on voltmetric terminal boards, to avoid running the units with voltage transformer (-TV) not connected at secondary windings.
- Make sure that all the miniature CBs for aux. and measuring circuits are closed.
- All system protections, controls, detectors, and monitoring devices shall be reset and ready for operation.
- All protections and control logics shall be reset and ready for operation.
- All recording equipment, where provided, shall be in operation.
- No alarm and/or trip signal shall be active.
- Voltage transformers shall be with fuses suitably placed.
- Circuit breakers shall be in service position (racked-in), open and available.
- Fuses shall be suitably placed.
- Mechanical and electrical interlocks are to be suitably in operation.
- All removable protections against direct contacts with accessible parts (panels, grids, plates, doors, etc.), shall be correctly placed and fixed.
- All the doors shall be closed and fixed panels are to be correctly positioned and bolted.

10 PRE-COMMISSIONING, COMMISSIONING AND SAT REPORT TEMPLATES

The following forms are intended for recording the results of Pre-Commissioning, Commissioning and SAT activities.

Forms provided by the customer may also be employed, on request.

- PRE-COMMISSIONING ACTIVITIES REPORT
- COMMISSIONING ACTIVITIES REPOR
- SAT REPORT FOR MECHANICAL TEST
- SAT REPORT FOR PRIMARY INJECTION TESTING ON CTs AND VT
- SAT REPORT FOR PROTECTION FUNCTIONS CHECK
- SAT REPORT FOR INSULATION RESISTANCE MEASUREMENT ON MAIN CIRCUITS
- SAT REPORT FOR INSULATION RESISTANCE MEASUREMENT ON AUX. CIRCUITs

IMESA ELECTRICAL ENGINEERING

PRE-COMMISSIONING ACTIVITIES REPORT

SWBD:

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend **OK** - **N/A** – not applicable × SEE NOTE

DESCRIPTION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**

NOTES:

TEST PERFORMER	**WITNESS**	**QUALITY OFFICER**	
EXECUTED	**ACCEPTED / VERIFIED**	**ACCEPTED / VERIFIED**	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: **Name:**	**Company:** **Name:**	**Company:** **Name:**	**Company:** **Name:**
Date:	**Date:**	**Date:**	**Date:**

IMESA ELECTRICAL ENGINEERING

COMMISSIONING ACTIVITIES REPORT

SWBD:

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend **OK** - **N/A** – not applicable **×** SEE NOTE

DESCRIPTION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**								

NOTES:

TEST PERFORMER	**WITNESS**	**QUALITY OFFICER**	
EXECUTED	**ACCEPTED / VERIFIED**	**ACCEPTED / VERIFIED**	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: **Name:**	**Company:** **Name:**	**Company:** **Name:**	**Company:** **Name:**
Date:	**Date:**	**Date:**	**Date:**

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR MECHANICAL TESTS

SWBD:

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend **OK** - **N/A** – not applicable **×** SEE NOTE

DESCRIPTION	**1**																	

NOTES:

TEST PERFORMER	**WITNESS**	**QUALITY OFFICER**	
EXECUTED	**ACCEPTED / VERIFIED**	**ACCEPTED / VERIFIED**	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: **Name:**	**Company:** **Name:**	**Company:** **Name:**	**Company:** **Name:**
Date:	**Date:**	**Date:**	**Date:**

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR PRIMARY INJECTION TESTING ON CTs AND VTs

SWBD:

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend **OK** - **N/A** – not applicable × SEE NOTE

DESCRIPTION	**1**	**2**															

NOTES:

TEST PERFORMER	**WITNESS**	**QUALITY OFFICER**	
EXECUTED	**ACCEPTED / VERIFIED**	**ACCEPTED / VERIFIED**	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: **Name:**	**Company:** **Name:**	**Company:** **Name:**	**Company:** **Name:**
Date:	**Date:**	**Date:**	**Date:**

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR PROTECTION FUNCTIONS CHECK

SWBD:

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**
PROT. RELAYS' COORD. STUDY DOC. :	**PANEL UNIT:**	**RELAY SERIAL NO. :**

protection unit setting test values					*protection unit operation check values*			
Protection Function	*ANSI Code*	*Setting*		*CT/VT Ratio*	*Phase*	*Test Value*	*Operating Time*	*Result*
		Value	Time [s] or K					

Notes:

TEST PERFORMER	**WITNESS**	**QUALITY OFFICER**	
EXECUTED	**ACCEPTED / VERIFIED**	**ACCEPTED / VERIFIED**	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: **Name:**	**Company:** **Name:**	**Company:** **Name:**	**Company:** **Name:**
Date:	**Date:**	**Date:**	**Date:**

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR INSULATION RESISTANCE MEASUREMENT ON MAIN CIRCUIT

SWBD:

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend **OK** - **N/A** – not applicable × SEE NOTE

DESCRIPTION	**1**												
MAIN CIRCUITS													

MEASURED INSULATION RESISTANCE
L1=
L2=
L3=

NOTES:
Equipment disconnected during Hi-Pot test:

TEST PERFORMER	**WITNESS**	**QUALITY OFFICER**	
EXECUTED	**ACCEPTED / VERIFIED**	**ACCEPTED / VERIFIED**	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: **Name:**	**Company:** **Name:**	**Company:** **Name:**	**Company:** **Name:**
Date:	**Date:**	**Date:**	**Date:**

SAT REPORT FOR INSULATION RESISTANCE MEASUREMENT ON AUX. CIRCUITS

SWBD:

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend **OK** - **N/A** – not applicable × SEE NOTE

DESCRIPTION	**2**												
DIELECTRIC TEST ON AUX. CIRCUITS													

MEASURED INSULATION RESISTANCE
110 V d.c. =
230 V a.c. =
24 V d.c. =

NOTES:
Equipment disconnected during dielectric test:

TEST PERFORMER	**WITNESS**	**QUALITY OFFICER**	
EXECUTED	**ACCEPTED / VERIFIED**	**ACCEPTED / VERIFIED**	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: **Name:**	**Company:** **Name:**	**Company:** **Name:**	**Company:** **Name:**
Date:	**Date:**	**Date:**	**Date:**