Base Load Power Hub (BLPH)

OTP - Data Network Systems

Document Number: 123A90-PML-COM-PRO-03051

Document Class: 2

02	31/01/2025	Accepted for Construction (AFC)	F.SIRIGU	A.IVESON	M.BRUNELLI
01	27/12/2024	Accepted for Construction (AFC)	F.SIRIGU	A.IVESON	M.BRUNELLI
00	04/10/2024	Issue for Review (IFR)	F.SIRIGU	A.IVESON	M.BRUNELLI
Rev.	Date	Description	Prepared	Reviewed	Approved

Revision / Change Log

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Rev.	Description
00	Issue for Review (IFR)
01	Accepted for Construction (AFC)
02	Accepted for Construction (AFC)

HOLDS LIST

No.	Description
1	
2	
3	
4	

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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.

1.2 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.

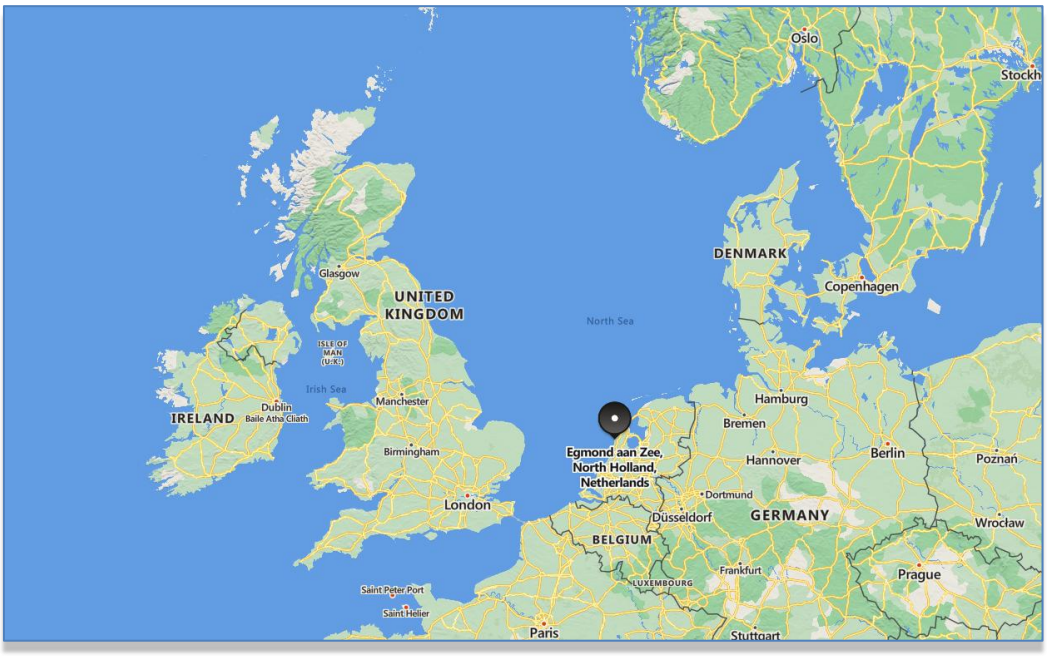


Figure 1 - *HOLLANDSE KUST NOORD WIND PARK Location Map*

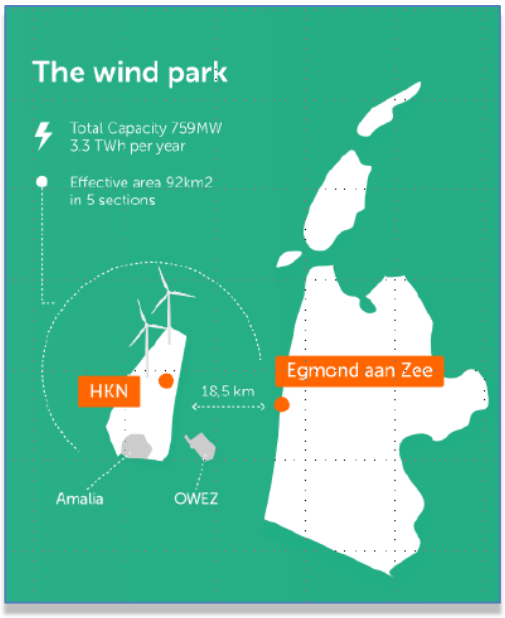


Figure 2 - *Wind Park Details*

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 is located on coordinates E 590719.1, N 5841602.3 and is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.3 Project Concept

All components included in the BLPH will be integrated onshore on a topside 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.

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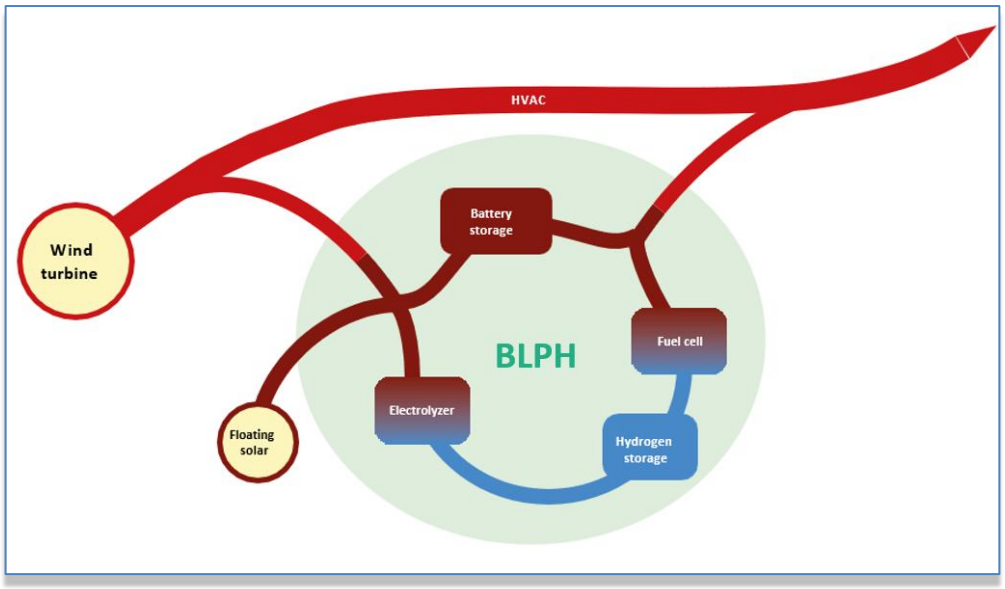


Figure 3 – *BLPH Concept*

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 is 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. DOCUMENT SCOPE

The purpose of this document is to describe the methodology and the planned actions to be implemented for the preparation and execution of Mechanical Completion, Pre-commissioning, Commissioning & Start-Up activities to be performed on the PLANT, including COMPANY PROVIDED ITEMS, at the onshore premises of CONTRACTOR located in Milan (Italy) offices and Piomboni yard - Marina di Ravenna (Italy).

CONTRACTOR, pursuant to CONTRACT and PROJECT requirements, shall implement an exacting methodology, complete with a distinct set of tools and documentation to meet the following key objectives:

Perform the Mechanical Completion, Pre-commissioning and Commissioning on the WORKSITE to the maximum extent possible so as to minimise the commissioning operations on SITE;

- Ensure safety for the people, environment and facilities during the execution of the Commissioning activities at WORKSITE,
- Ensure integrity and operation of the equipment for their lifetime in accordance with PROJECT design and specifications,
- Plan a smooth and flawless execution of the Commissioning activities avoiding unforeseen downtimes and delays.

Achievement of the above objectives shall be obtained by:

- Defining and prioritizing a predetermined sequence of the Mechanical Completion checks, Pre-commissioning and Commissioning tests and tasks,
- Checking, testing systematically and exhaustively all the components of PLANT in compliance with PROJECT approved procedures and CONTRACT terms, managed by a dedicated team of inspectors, technicians and field engineers who will perform the Mechanical Completion, Pre-commissioning, Commissioning and Start-Up tasks and subsequently record the results via discipline specific check, inspection and test sheets (ITR's) & where applicable via discrete Operational Test Procedures (OTP's).
- Ensuring full traceability of the performed checks and tests, through implementation of a dedicated Project Completions Management System (CMS) containing individual references to all tagged items.

3. OTP SUMMARY

3.1 Test Objective

The scope of this document is to describe the testing procedure to be performed local area network (LAN) system. this document provides a step-by-step procedure of all activities required to verify the LAN system to operate as per project requirement.

This document describes both testing procedures to be performed at yard (WORKSITE) and the testing procedures to be performed in offshore (SITE).

The operating test of DATA NETWORKS (B400-SRV-001/B400-NET-001) is performed to ensure that the system is checked and verified for proper operation according to the requirements of the project.

The purpose of this document is to explain the main procedure for data network inspection and testing.

The requirements stated in this document are applicable for the following sub-system(s):

- 86-00: Data Networks

Activities shall be developed as follows:

- Onshore pre-commissioning and commissioning activities at Contractor site (WORKSITE):

PHASE 1: B400-SRV-001/B400-NET-001 located in ITER.

PHASE 2: HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01 located in OER.

- Offshore commissioning (SITE):
  - Connection between ITER and OER through WTG-57 (HNA-5) and between OER and CCR through Company network.

Upon successful completion of the testing requirements stated in this procedure, the system shall be considered ready to be handed over to COMPANY for undertaking the following activities at SITE (offshore).

For further details refer to par. 6 OTP AT OFFSHORE SITE.

The test results shall be recorded in the dedicated test sheets of this procedure.

Any deviation or discrepancy shall be recorded in the commissioning punch list in compliance with the project methodology stated in document 123A90-PML-QHSE-PRO-00117 – Punch List Management Procedure and shall be corrected with appropriate actions.

3.2 System Boundary Limits

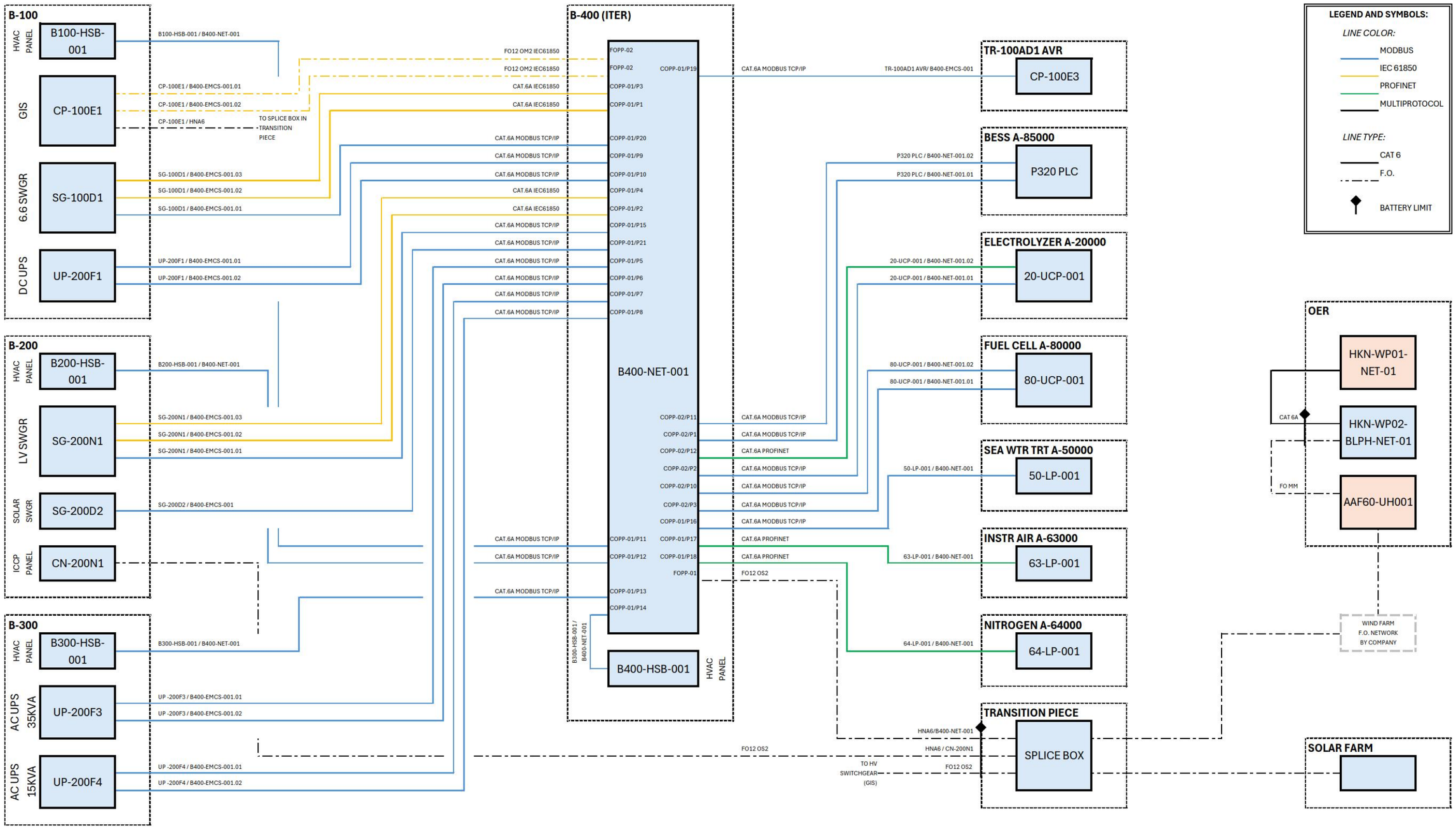


Figure 4 - *Network block diagram with battery limits*

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3.3 Test and System Description

This document is related to the following system:

- 86-00: Data Networks

All equipment must be properly installed in according with vendor document1724000594-IN-DA-0001.

The Network and Server Cabinet in ITER data are the following:
GENERAL DATA:

- Supply Voltages from UPS 230V LINE 1; LINE2 and NON-UPS LINE3
- Frequency 50Hz
- Operating Temperature +5°C to 45°C
- Operating Humidity 10 to 93% RH not condensing

Detailed description of the involved sub-system(s) is provided in Project document 123A90-DDL-IN-SP-40018 – Data Network Design Specification.

The system is detailed in the relevant Block Diagram:

123A90-DDL-IN-DD-40019 – Data Network Architecture Drawings.

3.3.1 LAN System Description

For the BLPH Crosswind Project, there will be a Vnet/IP Network interconnecting the equipment's on board of the platform and a PIN (Plant Information Network) used for non-process related open communication. The network equipment in the offshore platform is contained in the cabinet B400-NET-001 which is located inside the ITER (I&T Equipment Room).

The PIN is also connected the WTG-57 tower through a fiber optic link and from there to the onshore infrastructure through another fiber optic link. Onshore there is the OER (Onshore Equipment Room), where the cabinet HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01 is located, which contains all the network equipment. From the OER there's a connection through the Company's Enterprise network to the CCR (Central Control Room), where the supervising workstations are installed.

The control network is based on Yokogawa's robust and highly reliable fully duplexed Vnet/IP real-time network with quick response.

Vnet/IP forms the network backbone connecting Centum VP systems and ProSafe-RS systems and allows data exchange between them in addition to status monitoring on the CI View. Vnet/IP is a fully dual redundant network with Control Bus 1 and 2.

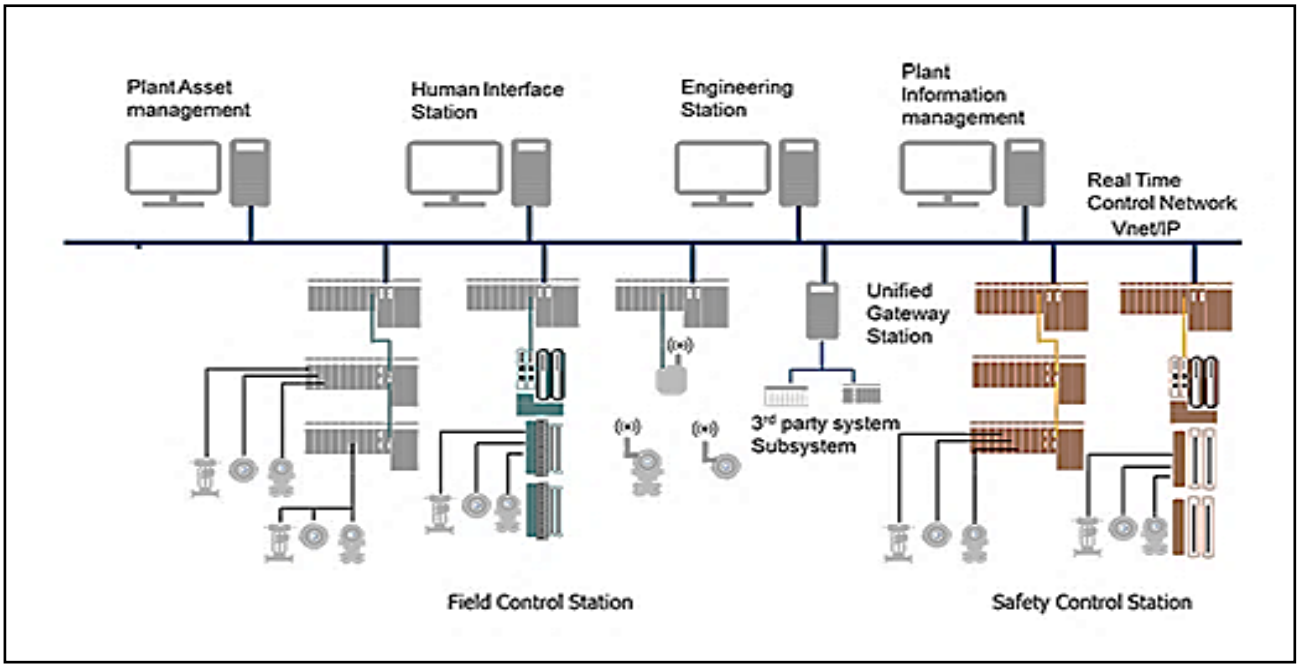


Figure 5 - *Vnet/IP Features*

Vnet/IP also allows communication via Ethernet-based standard protocols within predetermined bandwidth (hereinafter referred to as Open Communications). The Vnet/IP Bus2 can be used for TCP/IP protocol-based communications, such as data access through an ExaOPC interface.

A Vnet/IP network uses network category 6 cables as a minimum.

Vnet/IP Components:

- Vnet/ IP is a control bus conforming to the IEEE 802.3 standard. Line speed is 1 Gbps. A Vnet/IP bus has a dual redundant configuration. On its bus-2, control communications and open-based communications with various Ethernet standard protocols are provided. At the bus-2 side, data access through an ExaOPC interface and TCP/IP protocol-based communications can be carried out. For equipment for network connections, including repeaters, cables, layer 2 switches, and the like, commercially available general-purpose products are used. For the IP address, IPv4 for Class C private space addressing is applied.
- Layer 2 Switch: This is a device to connect equipment within the Vnet/IP domain. The layer 2 switch, unlike a HUB, incorporates bridge functions to send data to the destination terminal equipment only; it can, therefore, reduce traffic within its domain. Commercially available equipment can be used for a layer 2 switch.

Besides the Vnet/IP Networks there is also a single Ethernet based Plant Information Network (PIN). This network is used for non-process related open communication between the several CI Portal/View stations

and EWS's as well as printing functions (if required). The CI Portal/View stations are connected as thin clients with the CI-Servers.

In addition, the PIN is used for communication with the higher-level systems e.g. Cyber Security and connection to the clients Ethernet and/or office network (LAN). The PIN will be connected to the client's office network via DMZ and existing HV-SCADA system (for OPC-UA interface purpose) through Firewalls.

On top of the previously described networks, there is also a Service Network. This network is multiprotocol proprietary by Company and its main purpose is to allow remote access to the platform and CPI/packages for monitoring and maintenance.

The connection to the shore is done through a 24-cores FO cable that enters in a splice box located in the transition piece. The cables connected to the splice box are shown in the following picture:

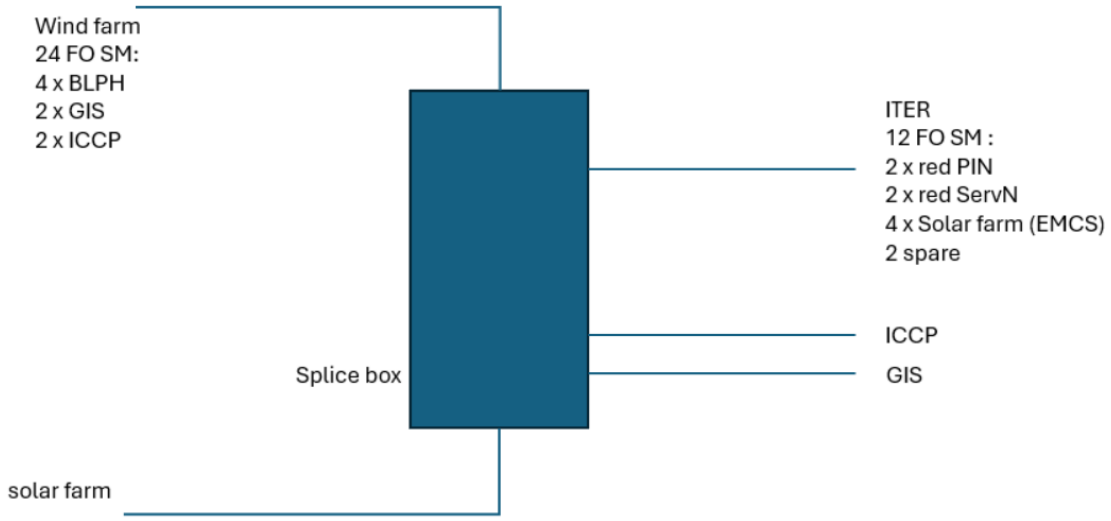


Figure 6 – Splice box and FO cables

The system functions will be formed mainly by the following equipment:

TAG ID	BRAND	MODEL	DESCRIPTION	CABINET
SERVFW-001	Fortinet	FG-80F	Service Firewall 001	HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01
SERVFW-002	Fortinet	FG-80F	Service Firewall 002	HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01
PINSWL2-003	Hirschmann	BRS40	PIN Switch 003	HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01
PINSWL2-004	Hirschmann	BRS40	PIN Switch 004	HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01

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TAG ID	BRAND	MODEL	DESCRIPTION	CABINET
FW-005	Fortinet	FG-100F	OER Firewall 005	HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01
FW-006	Fortinet	FG-100F	OER Firewall 006	HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01
DMZSWL2-001	Hirschmann	BRS40	DMZ switch 001	HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01
DMZSWL2-002	Hirschmann	BRS40	DMZ switch 002	HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01
PINSWL2-005	Hirschmann	BRS40	PIN switch 005	HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01
PINSWL2-006	Hirschmann	BRS40	PIN switch 006	HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01
FOPP-003	Tecnifiber	CE1-24ST(SM)	FO Patch Panel - 24ports (12core) single mode (SM)	HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01
SERVSWL2-002	Hirschmann	BRS40	Service switch 002	B400-NET-001
SERVSWL2-003	Hirschmann	BRS40	Service switch 003	B400-NET-001
PINSWL2-001	Hirschmann	BRS40	PIN switch 001	B400-NET-001
PINSWL2-002	Hirschmann	BRS40	PIN switch 002	B400-NET-001
SNSWL2-003	Hirschmann	GRS105	Safety network switch 003	B400-NET-001
SNSWL2-004	Hirschmann	GRS105	Safety network switch 004	B400-NET-001
CNSWL2-001	Hirschmann	GRS105	Control network switch 001	B400-NET-001
CNSWL2-002	Hirschmann	GRS105	Control network switch 002	B400-NET-001
FW-001	Fortinet	FG-40F	Vnet/IP firewall 001	B400-NET-001
FW-002	Fortinet	FG-40F	Vnet/IP firewall 002	B400-NET-001
FW-003	Fortinet	FG-80F	Comm. Firewall 003	B400-NET-001
FW-004	Fortinet	FG-80F	Comm. Firewall 004	B400-NET-001
COMSWL2-0009	Hirschmann	BRS40	Comm. Switch 009	B400-NET-001
COMSWL2-0010	Hirschmann	BRS40	Comm. Switch 010	B400-NET-001
COMSWL2-0011	Hirschmann	BRS40	Comm. Switch 011	B400-NET-001

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TAG ID	BRAND	MODEL	DESCRIPTION	CABINET
COMSWL2-0012	Hirschmann	BRS40	Comm. Switch 012	B400-NET-001
Modbus SW	Hirschmann	BRS40	Modbus switch	B400-NET-001
Profinet SW	Hirschmann	BRS40	Profinet switch	B400-NET-001
FOPP-001	Tecnifiber	CE1-24ST(SM)	FO Patch Panel - 24ports (12core) single mode (SM)	B400-NET-001
FOPP-002	Tecnifiber	CE1-24ST(MM)	FO Patch Panel - 24ports (12core) multi-mode (MM)	B400-NET-001

Table 1: *List of network equipment*

A dedicated document contains detailed IP addressing plan information (1724000594-IN-RE-000043 – Cyber Security Settings) and each host and system static IP assignments.

The greatest part of the tests will be carried out in the yard (WORKSITE), except for all the tests described for the offshore scenario. For example, the Fiber Optic network connection will be available only in offshore environment. Integration test with Company Proprietary network is possible only in offshore.

The full list of tests to be performed at WORKSITE is reported in paragraph 5.

The full list of tests to performed at SITE is reported in paragraph 6.

3.4 Safety Devices

- Appropriate Personnel Protective Equipment (PPE) and safety equipment e.g., safety shoes, hand gloves, helmet, earplugs etc. are available and must be used in line with the site requirements.
- Warning safety signs are to be posted with restricted access to essential personnel only.
- Adequate firefighting equipment.

3.5 HSE Management

All necessary safety precautions must be taken to avoid any risk for personnel injury.

- All personnel involved in this operational test shall be competent for the tasks they will be required to undertake
- Place safety / warning signs and segregate the entire area with barrier tapes (safety barriers) of a colour distinguished (blue and white) from those used for construction activities
- Restrict access into area only to authorized personnel
- Conduct "Toolbox Talk" with all personnel prior to starting test work
- Appropriate Personnel Protective Equipment (PPE) and safety equipment e.g. safety shoes, safety glasses, hand gloves, helmet, earplugs etc. are available and must be used in line with the site requirements

- All activities carried out on the project shall be performed in accordance with the "Permit to Work" system Doc. PRO-HSE-23
- Electrical and mechanical isolations are to be assured as per Doc. PRO-HSE-08 and "Commissioning and start-up operation" procedure.
- Observe and enforce all international codes and regulations to safeguard personnel, plant and environment.
- Ensure that the working area is clean, tidy, well illuminated and that access and escape routes are free from obstructions.

Before starting work on any of the activities in this OTP it is the responsibility of the persons performing the work to:

- Familiarize themselves with the plant/equipment to be worked on
- Ensure they are aware of all other work activities that are taking place, or due to take place
- If necessary, re-plan any situation/activity
- Ensure proper communications between parties involved in the execution of the OTP
- Read the relevant Vendor documentation for the equipment covered by this OTP and observe any special requirements and limitations recommended or imposed by Vendor
- Verify that all personnel involved in the implementation of this procedure are familiar with its content as well as the associated safety requirements (Toolbox Talk)

3.6 Acceptance Criteria

Cleaning & Device Integrity check

The aim of this check is to present equipment in a good status.

Phase 1 - Summary

- The B400-SRV-001 will be powered through power supply from AC 35KVA UPS (UP-200F3) 230V line A MCB Q08 and line B MCB Q09, Subsystem SS 84-10, the B400-SRV-001/B400-NET-001 will be powered through power supply from AC 15KVA UPS (UP-200F4) 230V line A MCB Q04 and line B MCB Q05, Subsystem SS 84-20 and Auxiliary Power supply from Distribution Board DP-200N1 230V MCB Q27 and Q28, Subsystem SS 83-20.
- The B400-PCS-001 will be powered through power supply from AC 35KVA UPS (UP-200F3) 230V line A MCB Q04 and line B MCB Q05, Subsystem SS 84-10 and Auxiliary Power supply from Distribution Board DP-200N1 230V MCB Q24, Subsystem SS 83-20.
- The B400-SIS-001 will be powered through power supply from AC 35KVA UPS (UP-200F3) 230V line A MCB Q02 and line B MCB Q03, Subsystem SS 84-10 and Auxiliary Power supply from Distribution Board DP-200N1 230V MCB Q23, Subsystem SS 83-20.
- The B400-FGS-001 will be powered through power supply from AC 15KVA UPS (UP-200F4) 230V line A MCB Q02 and line B MCB Q03, Subsystem SS 84-20 and Auxiliary Power supply from Distribution Board DP-200N1 230V MCB Q26, Subsystem SS 83-20.
- The B400-EMCS-001 will be powered through power supply from AC 35KVA UPS (UP-200F3) 230V line A MCB Q06 and line B MCB Q07, Subsystem SS 84-10 and Auxiliary Power supply from Distribution Board DP-200N1 230V MCB Q25, Subsystem SS 83-20.

Phase 1 will prove correct:

Verify all cabinets are energised with no alarms present.

Phase 2

The System SS 87-50 OER and CCR is set up temporarily in yard.

Phase 2 will validate the following:

Verify the communication between the systems listed in Phase 1 and the Systems SS 87-50 (OER and CCR).

Functional Tests

The aim of this group of tests is to verify that all requested features are correctly working as per customer specification.

4. DOCUMENTS REFERENCES AND ABBREVIATIONS

4.1 Reference Documents

4.1.1 Company Documents and Standards

Document ID	Document Title
[1] K559-2254-CG-PHI-001	Commissioning Philosophy
[2] K559-2254-EL-ELL-002	BLPH Electrical Load List (CCS MODE 2(A) 'HOT STANDBY')
[3] K559-2254-EL-ELL-003	BLPH Electrical Load List (CCS MODE 3(C) 'DISCHARGING')
[4] K559-2254-EL-ELL-004	BLPH Electrical Load List (CCS MODE 4(A) 'COLD STANDBY')
[5] K559-2254-EL-ELL-005	BLPH Electrical Load List (CCS MODE 4A(D) 'EMERGENCY MODE (Island))
[6] K559-2254-EL-ELL-006	BLPH Electrical Load List (CCS MODE 5(D) 'POWER OUT (Blackout))
[7] K559-2254-PR-PHI-001	Main process control philosophy

Table 2: *Company Documents and Standards*

These documents were produced in FEED and made available to RM for info. They have subsequently been superseded by Detailed Design, similar or same deliverables.

4.1.2 Project Documents

Document ID	Document Title
[1] 123A90-PML-PM-LIS-01001	Master Document Register
[2] 123A90-PML-COM-PL-03002	Mechanical Completion & Commissioning Execution Plan
[3] 123A90-PML-COM-LIS-03011	System/Sub-Systems List
[4] 123A90-PML-COM-LIS-03012	System/Sub-System Boundary Limit Diagrams
[5] 123A90-PML-COM-PRO-03007	Commissioning Strategy
[6] 123A90-PML-COM-PRO-03038	Leak Test Procedure
[7] 123A90-PML-COM-SP-03032	Pre-Commissioning Functional Test Sheet Template Collection (ITR-B)
[8] 123A90-PML-COM-SP-03014	Commissioning TDS - Temporary Equipment & Facilities
[9] 123A90-PML-COM-PRO-03019	OTP – Onshore Performance & Integrated Test Procedure
[10] 123A90-PML-COM-LIS-03034	Inhibit-Override Register
[11] 123A90-PML-COM-LIS-03035	PSV Calibration Register
[12] 123A90-PML-COM-PRO-03036	OTP - Black Start Procedure
[13] 123A90-PML-COM-LIS-03024	Commissioning Spare Parts and Consumables List
[14] 123A90-PML-COM-PRO-03022	Initial offshore START-UP procedures
[15] 123A90-PML-COM-RE-03001	Commissioning Final Dossier (ITR-B)
[16] 123A90-PML-QHSE-PRO-00116	Flushing and Cleaning Procedures
[17] 123A90-PML-QHSE-SP-00118	Mechanical Completion Check Sheet Template Collection (ITR-A)
[18] 123A90-PML-QHSE-RE-00115	Mechanical Completion Final Dossier (ITR-A)
[19] 123A90-PML-QHSE-PRO-00117	Punch list Management Procedure
[20] 123A90- 123A90-PML-COM-PRO-03041	OTP - Hydrogen Storage & Venting Systems
[21] 123A90- 123A90-PML-COM-PRO-03042	OTP - Sea Water Intake & Fresh Water Treatment Systems
[22] 123A90- 123A90-PML-COM-PRO-03043	OTP - Instrument Air System
[23] 123A90- 123A90-PML-COM-PRO-03055	OTP - Nitrogen Generation System
[24] 123A90- 123A90-PML-COM-PRO-03045	OTP - HV Switchgear & 66 kV Transformer Systems
[25] 123A90- 123A90-PML-COM-PRO-03046	OTP - 6.6 kV Switchgear & Transformer Systems

Document ID	Document Title
[26] 123A90- 123A90-PML-COM-PRO-03047	OTP - LV Switch Boards & LV Distribution Board Systems
[27] 123A90- 123A90-PML-COM-PRO-03048	OTP - Lighting & Small Power Systems
[28] 123A90- 123A90-PML-COM-PRO-03049	OTP - Electrical Heat Tracing Systems
[29] 123A90- 123A90-PML-COM-PRO-03050	OTP - DC UPS System 10KVA UP-200F1
[30] 123A90- 123A90-PML-COM-PRO-03051	OTP - Data Network Systems
[31] 123A90- 123A90-PML-COM-PRO-03053	OTP - Navaid System
[32] 123A90- 123A90-PML-COM-PRO-03054	OTP - F&G and ESD C&E Logics
[33] 123A90-PML-COM-SP-03057	Worksite WEF (Work Execution Flow Scheme)
[34] 123A90-PML-COM-SP-03058	Site WEF (Work Execution Flow Scheme)
[35] 123A90-PML-QHSE-PL-00001	Project HSE Plan
[36] 123A90-PML-QHSE-PRO-00120	Proverlis Management Procedure
[37] 123A90-PML-COM-PRO-03056	OTP – Document Template
[38] 123A90-PML-COM-PRO-03059	OTP - AC UPS System 35kVA UP-200F3
[39] 123A90-PML-COM-PRO-03060	OTP - AC UPS System 15kVA UP-200F4
[40] 123A90-PML-COM-PRO-03061	OTP – Electrolyser (CPI)
[41] 123A90-PML-COM-PRO-03062	OTP – Fuel Cell (CPI)
[42] 123A90-PML-COM-PRO-03063	OTP – BESS (CPI)

Table 3: *Project Documents*

4.1.3 Vendor Documents

Document ID	Document Title
[1] 1724000594-MD-LIS-00001	SUPPLIER MASTER INDEX REGISTER (SMIR)
[2] 1724000594-QC-ITP-00002	INSPECTION AND TEST PLAN
[3] 1724000594-IN-LIS-00003	Bill of Material
[4] 1724000594-IN-LIS-00007	Systems Cables List
[5] 1724000594-IN-DA-00011	Network and Server Cabinets in ITER ROOM General Arrangement Drawings and Internal Layout
[6] 1724000594-IN-DA-00012	Network and Server Cabinets in OER Room General Arrangement Drawings and Internal Layout

Document ID	Document Title
[7] 1724000594-PM-PL-00014	Project Execution Plan (PEP)
[8] 1724000594-IN-DD-00015	System Architecture
[9] 1724000594-IN-DG-00016	Network Connection Diagram
[10] 1724000594-IN-DG-00022	Network and Server Cabinets in ITER Room Wiring Diagrams and Terminal Strips
[11] 1724000594-IN-DG-00023	Network and Server Cabinets in OER Room Wiring Diagrams and Terminal Strips
[12] 1724000594-QC-PRO-00030	HW FACTORY ACCEPTANCE TEST (FAT) PROCEDURE
[13] 1724000594-QC-PRO-00031	SW FACTORY ACCEPTANCE TEST (FAT) PROCEDURE
[14] 1724000594-QC-PRO-00032	Site Acceptance Test (SAT) PROCEDURE
[15] 1724000594-QC-DB-00033	MANUFACTURERS RECORD BOOK (FINAL DOSSIER)
[16] 1724000594-QC-LIS-00034	MANUFACTURERS RECORD BOOK (FINAL DOSSIER) - INDEX
[17] 1724000594-IN-RE-00035	Cyber Security Risk Assessment REPORT
[18] 1724000594-COM-LIS-00039	SPARE PART INDEX REGISTER (COMMISSIONING AND 2-YEARs OPERATION)
[19] 1724000594-IN-RE-00041	CYBERSECURITY WORKSHOP PREPARATION
[20] 1724000594-QC-PRO-00042	THIRD PARTY COMMUNICATION TEST PROCEDURE
[21] 1724000594-IN-RE-000043	Cyber Security Settings

Table 4: *Vendor Documents*

4.2 Acronyms and Abbreviations

Acronyms and Abbreviations	Description
BLPH	Base Load Power Hub
BESS	Battery Energy Storage System
C&E	Cause & Effects
CCR	Centra Control Room
CCS	Central Control System
CPI	Company Provided Item
DNS	Domain Name System
E&I	Electrical & Instrumentation
EMCS	Electrical Monitoring & Control System
ESD	Emergency Shut Down

Acronyms and Abbreviations	Description
F&G	Fire & Gas
FAT	Factory Acceptance Test
FOPP	Fiber Optic Patch Panel
HA	High Availability
HKN	Hollandse Kust Noord
HSE	Health, Safety, & Environment
HSSE	Health, Safety, Security & Environment
HV	High Voltage
HVAC	Heating, Ventilation and Air Conditioning
IP	Internet Protocol
ITR	Inspection & Test Record
LAN	Local Area Network
LOTO	Lock-Out / Tag-Out
LV	Low Voltage
MCB	Miniature Circuit Breaker
OER	Onshore Equipment Room
OTP	Operational Test Procedure (Commissioning)
PCS	Process Control System
RFC	Ready for Commissioning
SAT	Site Acceptance Test
SIMOP	Simultaneous Operations & Maintenance
SIS	Safety Instrumented System
SoF	Statement of Fitness
UPS	Uninterruptible Power Supply
USB	Universal Serial Bus
VooW	Van Oord Offshore Wind
WEF	Work Execution Flow Scheme

Table 5: *Acronyms and Abbreviations*

5. OTP AT REQUIREMENTS - ONSHORE WORKSITE

This chapter refers to the activities to be performed at the Contractor WORKSITE (construction yard).

5.1 Planning and Manpower

5.1.1 Planned tasks with estimated manpower

Estimated manpower is as follows for the entire duration of the Test:

- 1 E&I qualified commissioning engineer from VENDOR.
- 1 E&I supervisor commissioning engineer from CONTRACTOR.
- 1 E&I engineer from CONTRACTOR.
- 1 Representative from COMPANY.

5.1.2 Test duration estimate

The test duration should be as follows:

- 2 Days approx PHASE 1
- 1 Days approx PHASE 2

If necessary, the estimated time can be extended in order to complete all required pre-commissioning and commissioning activities.

5.1.3 Vendor assistance

VENDOR qualified personnel commissioning engineer are required to be on WORKSITE for the duration of Operational Tests.

5.1.4 Items postponed to C&E OTP

Not applicable

5.1.5 Internal System HARDWIRED Signals to be TESTED

Signal tag:	Signal description:
87-XA-061	NET Panel Ventilation Fan Fault …….. [ ]
87-XA-062	NET Panel Power supply & Diodes failure ……..... [ ]
87-XA-063	NET Panel Power supply & Diodes failure ……..... [ ]

Signal tag:	Signal description:
87-XA-064	NET Panel Cumulative Breaker Fault …….. [ ]
87-XA-073	NET Panel High Temperature Alarm ……..… [ ]
87-XA-074	SERVER Panel High Temperature Alarm …….. [ ]
70-XA-051	FGS Panel Ventilation Fan Fault ……..… [ ]
70-XA-052	FGS Panel Power supply & Diodes failure …….... [ ]
70-XA-053	FGS Panel Cumulative Breaker Fault …….... [ ]
70-XA-054	FGS Panel High Temperature Alarm ……..… [ ]
79-XA-051	SIS Panel Ventilation Fan Fault …….... [ ]
79-XA-052	SIS Panel Power supply & Diodes failure …….. [ ]
79-XA-053	SIS Panel Cumulative Breaker Fault …….... [ ]
79-XA-054	SIS Panel High Temperature Alarm …….. [ ]
87-XA-051	PCS Panel Ventilation Fan Fault …….. [ ]
87-XA-052	PCS Panel Power supply & Diodes failure …….... [ ]
87-XA-053	PCS Panel Cumulative Breaker Fault ……..…... [ ]
87-XA-054	PCS Panel High Temperature Alarm …….... [ ]
87-XA-082	OER SRV/NET Panel Power supply & Diodes failure ……..… [ ]
87-XA-083	OER SRV/NET Panel Cumulative Breaker Fault …….... [ ]
87-XA-084	OER SRV/NET Panel High Temperature Alarm ……..…..…..… [ ]
87-XA-091	EMCS Panel Ventilation Fan Fault ……..… [ ]
87-XA-092	EMCS Panel Power supply & Diodes failure ……..… [ ]
87-XA-093	EMCS Panel Cumulative Breaker Fault ……..... [ ]
87-XA-094	EMCS Panel High Temperature Alarm ……..… [ ]

Table 6: *Items HARDWIRING to be Tested*

5.2 OTP TEST REQUIREMENTS – ONSHORE WORKSITE

5.2.1 Pre-Commissioning Achievement

Prior pre-commissioning and commissioning operations starts all the equipment must be installed, mechanically complete, and all cables and patch cords have been tested, pulled and connected to the respective equipment's.

Completion of relevant sub-systems pre-commissioning tasks as applicable and heading to the acceptance of related Ready for Commissioning (RFC) certificates is required in order to proceed with the following commissioning tasks.

5.2.2 Commissioning Achievement

Commissioning achievement will be to bring in an operational status the LAN System.

Before proceeding with the operational testing, completion of the task/check forms for LAN system is required.

5.2.3 Status of Required Associated Subsystems

PHASE 1:

Subsystems required RFC for Commissioning DATA NETWORKS:

- SS 83-20 Distribution Board DP-200N1 230V
- SS 84-10 AC 35KVA UPS (UP-200F3) 230V
- SS 84-20 AC 15KVA UPS (UP-200F4) 230V
- SS 88-00 Earthing System
- SS 86-00 Server/Network Cabinet
- SS 70-00 FGS System Cabinet
- SS 79-00 SIS System Cabinet
- SS 87-00 EMCS System Cabinet
- SS 87-10 PCS System Cabinet

PHASE 2:

- Subsystems required RFC for Commissioning DATA NETWORKS:
- SS 83-20 Distribution Board DP-200N1 230V
- SS 84-10 AC 35KVA UPS (UP-200F3) 230V
- SS 84-20 AC 15KVA UPS (UP-200F4) 230V
- SS 88-00 Earthing System
- SS 86-00 Server/Network Cabinet
- SS 70-00 FGS System Cabinet
- SS 79-00 SIS System Cabinet
- SS 87-00 EMCS System Cabinet
- SS 87-10 PCS System Cabinet
- SS 87-50 OER / CCR System

Safety Instrumented System (SIS) shall be required operative and able to send cut-off signal for shutting down LAN system.

For the testing at SITE, the full network connectivity between BLPH and Wind Farm is supposed to be already established.

5.2.4 Special Tools & Test Equipment

The following instruments and tools will be used for the tests:

- Continuity tester (Multimeter)
- Toolbox
- Network Cable Tester
- Test Laptop
- Portable radios (1 pcs + 1 per Technical Room)

TESTING & MEASUREMENT INSTRUMENT USED			
Type	Serial N.	Calibration certificate	Validity

5.2.5 Consumable List

Not applicable.

5.2.6 Commissioning Spare Parts

Commissioning spare parts shall be as per Vendor doc. 1724000594-COM-LIS-00039 Spare Part Index Register (Commissioning And 2-Years Operation).

5.2.7 Temporary Facilities

- Temporary power supplies for System 87-50 OER/CCR
- Temporary Lan connection between System 87-50 and System 86-00

5.3 OTP DESCRIPTION – ONSHORE WORKSITE

5.3.1 OTP Test Preparation

This phase identifies all the preparatory inspections and activities to be carried out prior to performing the OTP of LAN system.

Installation, earthing/bonding and electrical checks are carried out during Mechanical Completion, no other preliminary tests are necessary.

Step	Description	Result	Verified by	Date
1.	System Ready for Commissioning Certificate (RFC) is issued and approved.			
2.	No Mechanical Completion or Pre-commissioning punch list 'A' items are outstanding against the system to be commissioned.			
3.	Factory Acceptance Test Procedure has been carried out successfully (refer to Doc. 1724000594-QC-PRO-0030).			
4.	All personnel involved in the implementation of this procedure are familiar with its content as well as with associated safety requirements (Toolbox Talk to be conducted before initiation of activities).			
5.	A final walkdown of the system has been completed, to ensure that the system and the area are ready for commissioning.			
6.	Check that areas are free for work and escape routes are clear of any obstructions.			
7.	All safety barriers and warning signs have been installed.			
8.	Ensure that proper communications have been established between parties involved in the implementation of the procedure.			
9.	Verify availability of test equipment and consumables as per section 5.2.4.			
10.	System(s) isolations as per LOTO procedure defined within HSSE Permits to Work and Commissioning procedures duly prepared and approved			
11.	All yard personnel have been duly notified by dedicated LUN (Livening Up Notification) that the system(s) is ready for commissioning.			

5.3.2 Electrical Preparation

The electric power distribution system (Low Voltage distribution) is supposed to be fully commissioned and energized.

Step	Description	Result	Verified by	Date
1.	Check related punch list 'B' items and confirm acceptability for start of commissioning activities.			
2.	Verify that all relevant associated systems / subsystems are completed.			
3.	Verify and confirm the completion of the final connections between the UPS (UP-200F3) line A MCB Q08 and line B MCB Q09 and the Cabinet B400-SRV-001.			
4.	Verify and confirm the completion of the final connections between the UPS (UP-200F4) line A MCB Q04 and line B MCB Q05 and the B400-NET-001/B400-SRV-001.			
5.	Verify and confirm the completion of the final connections between the Distribution Board DP-200N1 line A MCB Q27 and line B MCB Q28 and the Cabinet B400-NET-001/B400-SRV-001.			
6.	Verify and confirm the completion of the final connections between the UPS (UP-200F3) line A MCB Q02 and line B MCB Q03 and the Cabinet B400-SIS-001.			
7.	Verify and confirm the completion of the final connections between the Distribution Board DP-200N1 MCB Q23 and the Cabinet B400-SIS-001.			
8.	Verify and confirm the completion of the final connections between the UPS (UP-200F3) line A MCB Q04 and line B MCB Q05 and the Cabinet B400-PCS-001.			
9.	Verify and confirm the completion of the final connections between the Distribution Board DP-200N1 MCB Q24 and the Cabinet B400-PCS-001.			
10.	Verify and confirm the completion of the final connections between the UPS (UP-200F3) line A MCB Q06 and line B MCB Q07 and the Cabinet B400-EMCS-001.			
11.	Verify and confirm the completion of the final connections between the Distribution Board DP-200N1 MCB Q25 and the Cabinet B400-EMCS-001.			

12.	Verify and confirm the completion of the final connections between the UPS (UP-200F4) line A MCB Q02 and line B MCB Q03 and the Cabinet B400-FGS-001			
13.	Verify and confirm the completion of the final connections between the Distribution Board DP-200N1 MCB Q26 and the Cabinet B400-FGS-001.			

5.3.3 Mechanical Preparation

Step	Description	Result	Verified by	Date
1.	Confirm availability and normal working operation of HVAC System 77-40 specific to technical room B-400.			

5.3.4 Instrument Preparation

Step	Description	Result	Verified by	Date
1.	Check related punch list 'B' items and confirm acceptability for start of commissioning activities.			
2.	Verify that all relevant associated systems / subsystems are ready.			
3.	Verify that relevant equipment/ components are available and in operation for start of commissioning activities.			
4.	Verify availability of test equipment as per section 5.2.4.			

5.3.5 Piping Preparation

- Not applicable.

5.3.6 Additional Discipline Preparation

- Not applicable.

5.4 OTP TEST STEPS – ONSHORE WORKSITE (PHASE 1 & PHASE 2)

5.4.1 Test Preparation

Need to Verify:

- SS 83-20 Distribution Board DP-200N1 230V
- SS 84-10 AC 35KVA UPS (UP-200F3) 230V
- SS 84-20 AC 15KVA UPS (UP-200F4) 230V
- SS 88-00 Earthing System
- SS 86-00 Server/Network Cabinet
- SS 70-00 FGS System Cabinet
- SS 79-00 SIS System Cabinet
- SS 87-00 EMCS System Cabinet
- SS 87-10 PCS System Cabinet
- SS 87-50 OER / CCR System

All systems and subsystems involved in this procedure must be ready for commissioning and available.

The following table details the full list of tests to be performed at WORKSITE during Phase 1 (ITER)

Test N°	Test Name (Cabinets B400-NET-001/B400-SRV-001)
1.	Network Switch test
2.	Network Switch Backup Test
3.	Firewall Test
4.	Firewall HA Redundancy Test
5.	Firewall Backup Test
6.	LAN Connectivity Test
7.	Cabinet B400-NET-001 Alarm Test (ref. Section 5.1.5)
8.	Cabinet B400-SRV-001 Alarm Test (ref. Section 5.1.5)

The following are the tests to be performed at WORKSITE during Phase 2 (OER):

Test N°	Test Name
1.	Network switch test
2.	Network Switch Backup Test
3.	Firewall Test
4.	FIREWALL HA Redundancy Test

5.	Firewall Backup Test
6.	LAN Connectivity Test
7.	Cabinet OER-NET/SRV-001 Alarm Test (ref. Section 5.1.5)

Each test shown in the table is detailed in the following paragraphs.

5.4.2 Test Steps PHASE 1

The scope of this test is to energize the cabinet with all internal components, even if some equipment is not part of LAN Network system. The cabinet will be fully energized.

Step	Description	Result	Verified by	Date
Energization of Data Networks				
PHASE1: Energization of Subsystems				
Verify related ITR-B for System 86-00, System 70-00, System 79-00, System 87-00, System 87-10 and 87-50 are completed.				
1	Check and confirm that the following MCBs are ready power on from: UPS (UP-200F3) 230V • MCB Q02 and MCB Q03 • MCB Q04 and MCB Q05 • MCB Q06 and MCB Q07 • MCB Q08 and MCB Q09 UPS (UP-200F4) 230V • MCB Q02 and MCB Q03 • MCB Q04 and MCB Q05 Distribution Board DP-200N1 230V • MCB Q23 • MCB Q24 • MCB Q25 • MCB Q26 • MCB Q27 and MCB Q28			
2	Verify System references with the vendor document: SS 86-00 1724000-IN-DG-00022 Sheets 6;7;8;15;16;17. the following protection devices are open: MS1_S; MS2_S; Q1; MS1_N; MS2_N; Q50.			

Step	Description	Result	Verified by	Date
3	Verify System references with the vendor document: SS 70-00 1724000594-IN-DG-00021 sheets 6;8;10 the following protection devices are open: MS1_F; MS2_F; Q1.			
4	Verify System references with the vendor document: SS 79-00 1724000594-IN-DG-00021 sheets 36;37;38 the following protection devices are open: MS1_S; MS2_S; Q50.			
5	Verify System references with the vendor document: SS 87-00 1724000594-IN-DG-0024 Sheets 16;17;18. the following protection devices are open: MS1; MS2; Q1.			
6	Verify System references with the vendor document: SS 87-10 1724000594-IN-DG-0020 sheets 6;8;10. the following protection devices are open: MS1; MS2; Q1.			
7	Close the MCB Q08 and MCB Q09 from UPS (UP-200F3), MCB Q04 and MCB Q05 from UPS (UP-200F4), with reference vendor doc. 1724000-IN-DG-00022 sheets 6;7;15;16, verify that power supply 230V is present on the terminals: TB_PS1_S: 1-2 Voltage _____ V. TB_PS2_S: 1-2 Voltage _____ V. TB_PS1_N: 1-2 Voltage _____ V. TB_PS2_N: 1-2 Voltage _____ V.			

Step	Description	Result	Verified by	Date
8	Close the MCB Q27 and MCB Q28 from Distribution Board DP-200N1and with reference vendor doc. 1724000-IN-DG-00022 sheets 8;17 verify that power supply 230V is present on the terminals: TB_PS3_S: 1-2 Voltage _____ V. TB_PS3_N: 1-2 Voltage _____ V.			
9	Close the MCB Q02 and MCB Q03 from UPS (UP-200F4) and with reference vendor doc. 1724000594-IN-DG-00021 sheets 6;8 verify that power supply 230V is present on the terminals: TB_PS1_F: 1-2 Voltage _____ V. TB_PS2_F: 1-2 Voltage _____ V.			
10	Close the MCB Q26 from Distribution Board DP-200N1and with reference vendor doc. 1724000594-IN-DG-00021 sheet 10 verify that power supply 230V is present on the terminals: TB_PS3_F: 1-2 Voltage _____ V.			

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Step	Description	Result	Verified by	Date
11	Close the MCB Q02 and MCB Q03 from UPS (UP-200F3) and with reference vendor doc. 1724000594-IN-DG-00021 sheets 36;37 verify that power supply 230V is present on the terminals: TB_PS1_S: 1-2 Voltage _____ V. TB_PS2_F: 1-2 Voltage _____ V.			
12	Close the MCB Q23 from Distribution Board DP-200N1and with reference vendor doc. 1724000594-IN-DG-00021 sheet 38 verify that power supply 230V is present on the terminals: TB_PS3_S: 1-2 Voltage _____ V.			
13	Close the MCB Q06 and MCB Q07 from UPS (UP-200F3) and with reference vendor doc. 1724000594-IN-DG-00024 sheet 16;17 verify that power supply 230V is present on the terminals: TB_PS1: 1-2 Voltage _____ V. TB_PS2: 1-2 Voltage _____ V.			

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Step	Description	Result	Verified by	Date
14	Close the MCB Q25 from Distribution Board DP-200N1and with reference vendor doc. 1724000594-IN-DG-00024 sheet 18 verify that power supply 230V is present on the terminals: TB_PS3: 1-2 Voltage _____ V.			
15	Close the MCB Q04 and MCB Q05 from UPS (UP-200F3) and with reference vendor doc. 1724000594-IN-DG-00020 sheets 6;8 verify that power supply 230V is present on the terminals: TB_PS2: 1-2 Voltage _____ V. TB_PS2: 1-2 Voltage _____ V.			
16	Close the MCB Q24 from Distribution Board DP-200N1and with reference vendor doc. 1724000594-IN-DG-00020 sheet 10 verify that power supply 230V is present on the terminals: TB_PS3: 1-2 Voltage _____ V.			
17	Confirmed the steps 7 to 16 let's proceed with energization the System Cabinets: • Systems Cabinet 86-00 • Systems Cabinet 70-00 • Systems Cabinet 79-00 • Systems Cabinet 87-00 • Systems Cabinet 87-10			
18	System cabinet tag: B400-SRV-001			

Step	Description	Result	Verified by	Date
	If the voltages measured at step 7 are in line with the expected values, switch on MCBs, one at a time, according to the sequence proposed below: *Note: For details about electric power scheme and related MCBs refers to wiring diagram doc no. "1724000594-IN-DG-00022".* Energize Q1 (Auxiliary Line – Non-UPS) and Q2/Q3 and verify cabinet service light (H1_S) is switched on with cabinet doors open and service socket (SK1) is powered up. Verify that 230 V (+/- 10%) is present at the service socket and record the value: Service Power sockets 230 V (+/- 10%) Voltage _____ V. Energize MS1_S and Q5 and verify that sockets SK2/KS3 are powered up. Verify that 230 V (+/- 10%) is present at the sockets and record the value at one socket selected randomly: Power sockets 230 V (+/- 10%) Voltage _____ V. Energize MS2_S and Q7 and verify that sockets SK4/KS5 are powered up. Verify that 230 V (+/- 10%) is present at the sockets and record the value at one socket selected randomly: Power sockets 230 V (+/- 10%) Voltage _____ V.			
19	With both UPS-1 and UPS-2 connected, verify that all active equipment is powered up.			

Step	Description	Result	Verified by	Date
	Switch off UPS-1 Line MS1_S. Verify that the equipment is still powered up. …….. [OK] Switch on UPS-1 Line MS1_S. …….. [OK] Switch off UPS-2 Line MS2_S. Verify that the equipment is still powered up. …….. [OK] Switch on UPS-2 Line MS2_S. …….. [OK] **Note:** Under this test with dual PSUs, it is normal that one of the PSUs will not be operational when the connected UPS feed is switched off. The second PSU shall be however operational and supply power to the equipment.			
20	System cabinets tag: B400-NET-001 If the voltages measured at step7 are in line with the expected values, switch on MCBs, one at a time, according to the sequence proposed below: Note: For details about electric power scheme and related MCBs refers to wiring diagram doc no. "1724000594-IN-DG-00022". Energize Q50 (Auxiliary Line – Non-UPS) and Q51/Q52 and verify cabinet service light			

Step	Description	Result	Verified by	Date
	(H1_N) is switched on with cabinet doors open and service socket (SK4) is powered up. Verify that 230 V (+/- 10%) is present at the service socket and record the value: Service Power sockets 230 V (+/- 10%) Voltage _____ V. Energize Q54 and verify that the cabinet fans are activated. Verify the presence of 230 V (+/- 10%) at the fan controller. By adjusting the fan controller knobs, verify that the fan is operating normally. Energize MS1_N (UPS-1 Line) and Q55 and verify that WEIDMULLER PRO EVO 24V Power Supply (G1_N) is switched on (LED is lit). Energize Q56 and verify that sockets SK5/SK6 are powered up. Verify that 230 V (+/- 10%) is present at the sockets and record the value at one socket selected randomly: Power sockets 230 V (+/- 10%) Voltage _____ V. Energize MS2 (UPS-2 Line) and Q58 and verify that WEIDMULLER PRO EVO 24VDC Power Supply (G2) is switched on (LED is lit). Energize Q59 and verify that sockets SK7/SK8 are powered up. Verify that 230 V (+/- 10%) is present at the sockets and record the value at one socket selected randomly: Power sockets 230 V (+/- 10%) Voltage _____ V.			

Step	Description	Result	Verified by	Date
21	With both UPS-1 and UPS-2 connected, verify that all active equipment is powered up. Switch off UPS-1 Line MS1_N. Verify that the equipment is still powered up. Switch on UPS-1 Line MS1_N. …….. [OK] Switch off UPS-2 Line MS2_N. Verify that the equipment is still powered up. …….. [OK] Switch on UPS-2 Line MS2_N. **Note:** Under this test with dual PSUs, it is normal that one of the PSUs will not be operational when the connected UPS feed is switched off. The second PSU shall be however operational and supply power to the equipment.			
22	System cabinets tag: B400-SIS-001 If the voltages measured at step 9 are in line with the expected values, switch on MCBs, one at a time, according to the sequence proposed below: Note: For details about electric power scheme and related MCBs refers to wiring diagram doc no. "1724000594-IN-DG-00021". Energize Q1 (Auxiliary Line – Non-UPS) and Q2/Q3 and verify cabinet service light (H1_F, H2_Fand H3_F) is switched on with cabinet doors open and service socket (SK1_F) is powered up. Verify that 230 V (+/- 10%) is present at the service socket and record the value: Service Power sockets 230 V (+/- 10%)			

Step	Description	Result	Verified by	Date
	Voltage _____ V. Energize Q5 and verify that the cabinet fans are activated. Verify the presence of 230 V (+/- 10%) at the fan controller. By adjusting the fan controller knobs, verify that the fan is operating normally. Energize MS2_F (UPS-1 Line) and Q6 and verify that WEIDMULLER PRO EVO 24V Power Supply (G1_F) is switched on (LED is lit). Energize Q7/Q8/Q9/Q10/Q11/Q12 and verify that RACK A/B/C/D/E/F are powered up. Energize MS2_F (UPS-2 Line) and Q14 and verify that WEIDMULLER PRO EVO 24VDC Power Supply (G2_F) is switched on (LED is lit). Energize Q15/Q16/Q17/Q18/Q19/Q20 and verify that RACK A/B/C/D/E/F are powered up.			
23	With both UPS-1 and UPS-2 connected, verify that all active equipment is powered up. Switch off UPS-1 Line MS1_F. Verify that the equipment is still powered up. …….. [OK] Switch on UPS-1 Line MS1_F. …….. [OK] Switch off UPS-2 Line MS2_F. Verify that the equipment is still powered up. …….. [OK]			

Step	Description	Result	Verified by	Date
	Switch on UPS-2 Line MS2_F. …….. [OK] **Note:** Under this test with dual PSUs, it is normal that one of the PSUs will not be operational when the connected UPS feed is switched off. The second PSU shall be however operational and supply power to the equipment.			
24	System cabinets tag: B400-FGS-001 If the voltages measured at step11 are in line with the expected values, switch on MCBs, one at a time, according to the sequence proposed below: Note: For details about electric power scheme and related MCBs refers to wiring diagram doc no. "1724000594-IN-DG-00021". Energize Q50 (Auxiliary Line – Non-UPS) and Q51/Q52 and verify cabinet service light (H1_S) is switched on with cabinet doors open and service socket (SK1_S) is powered up. Verify that 230 V (+/- 10%) is present at the service socket and record the value: Service Power sockets 230 V (+/- 10%) Voltage _____ V. Energize Q54 and verify that the cabinet fans are activated. Verify the presence of 230 V (+/- 10%) at the fan controller. By adjusting the fan controller knobs, verify that the fan is operating normally. Energize MS1_S (UPS-1 Line) and Q55 and verify that WEIDMULLER PRO EVO 24V Power Supply (G1_S) is switched on (LED is lit).			

Step	Description	Result	Verified by	Date
	Energize Q56/Q57/Q58 and verify that RACK A/B/C are powered up. Energize MS2_S (UPS-2 Line) and Q60 and verify that WEIDMULLER PRO EVO 24VDC Power Supply (G2_S) is switched on (LED is lit). Energize Q61/Q62/Q63 and verify that and verify that RACK A/B/C are powered up.			
25	With both UPS-1 and UPS-2 connected, verify that all active equipment is powered up. Switch off UPS-1 Line MS1_S. Verify that the equipment is still powered up. …….. [OK] Switch on UPS-1 Line MS1_S. …….. [OK] Switch off UPS-2 Line MS2_S. Verify that the equipment is still powered up. …….. [OK] Switch on UPS-2 Line MS2_S. …….. [OK] **Note:** Under this test with dual PSUs, it is normal that one of the PSUs will not be operational when the connected UPS feed is switched off. The second PSU shall be however operational and supply power to the equipment.			

Step	Description	Result	Verified by	Date
26	System cabinet tag: B400-EMCS-001 If the voltages measured at step13 are in line with the expected values, switch on MCBs, one at a time, according to the sequence proposed below: Note: For details about electric power scheme and related MCBs refers to wiring diagram doc no. "1724000594-IN-DG-00024". Energize Q1 (Auxiliary Line – Non-UPS) and Q2/Q3 and verify cabinet service light (H1) is switched on with cabinet doors open and service socket (SK1) is powered up. Verify that 230 V (+/- 10%) is present at the service socket and record the value: Service Power sockets 230 V (+/- 10%) Voltage _____ V. Energize Q5 and verify that the cabinet fans are activated. Verify the presence of 230 V (+/- 10%) at the fan controller. By adjusting the fan controller knobs, verify that the fan is operating normally. Energize MS1 (UPS-1 Line) and Q6 and verify that WEIDMULLER PRO EVO 24V Power Supply (G1) is switched on (LED is lit). Energize MS2 (UPS-2 Line) and Q8 and verify that WEIDMULLER PRO EVO 24VDC Power Supply (G2) is switched on (LED is lit).			
27	With both UPS-1 and UPS-2 connected, verify that all active equipment is powered up. Switch off UPS-1 Line MS1. Verify that the equipment is still powered up. …….. [OK]			

Step	Description	Result	Verified by	Date
	Switch on UPS-1 Line MS1. …….. [OK] Switch off UPS-2 Line MS2. Verify that the equipment is still powered up. …….. [OK] Switch on UPS-2 Line MS2. …….. [OK] **Note:** Under this test with dual PSUs, it is normal that one of the PSUs will not be operational when the connected UPS feed is switched off. The second PSU shall be however operational and supply power to the equipment.			
28	System cabinet tag: B400-PCS-001 If the voltages measured at step15 are in line with the expected values, switch on MCBs, one at a time, according to the sequence proposed below: Note: For details about electric power scheme and related MCBs refers to wiring diagram doc no. "1724000594-IN-DG-00020". Energize Q1 (Auxiliary Line – Non-UPS) and Q2/Q3/Q4 and verify cabinet service light (H1/H2) is switched on with cabinet doors open and service socket (SK1) is powered up. Verify that 230 V (+/- 10%) is present at the service socket and record the value: Service Power sockets 230 V (+/- 10%)			

Step	Description	Result	Verified by	Date
	Voltage _____ V. Energize Q5 and verify that the cabinet fans are activated. Verify the presence of 230 V (+/- 10%) at the fan controller. By adjusting the fan controller knobs, verify that the fan is operating normally. Energize MS1 (UPS-1 Line) and Q6/Q20 and verify that WEIDMULLER PRO EVO 24V Power Supply (G1/G3) is switched on (LED is lit). Energize Q7/Q8/Q9/Q10 and verify that and verify that RACK A/B/C/D are powered up. Energize MS2 (UPS-2 Line) and Q12/Q21 and verify that WEIDMULLER PRO EVO 24VDC Power Supply (G2/G4) is switched on (LED is lit). Energize Q13/Q14/Q15/Q116 and verify that and verify that RACK A/B/C/D are powered up.			
29	With both UPS-1 and UPS-2 connected, verify that all active equipment is powered up. Switch off UPS-1 Line MS1. Verify that the equipment is still powered up. …….. [OK] Switch on UPS-1 Line MS1. …….. [OK] Switch off UPS-2 Line MS2. Verify that the equipment is still powered up. …….. [OK]			

Step	Description	Result	Verified by	Date
	Switch on UPS-2 Line MS2. …….. [OK] **Note:** Under this test with dual PSUs, it is normal that one of the PSUs will not be operational when the connected UPS feed is switched off. The second PSU shall be however operational and supply power to the equipment.			

5.4.3 WORKSITE PHASE 1 Test no.1 – Network Switch test

Step ID	Actions	Acceptance Criteria	Result
1	Login to the switches with an engineering level account taken from the IP address and password list document.	Login is required to access through the console, and it is successful with the engineer account.	
2	Verify that all the power supplies are correctly shown with no errors, and fans and temperatures are correct.	All the Power supply are "Good" status. The fans in normal operation and the temperature not in alarm.	
3	Verify that the devices are working properly and are correctly seen and connected.	All the network switches are correctly shown.	
4	The network communication is controlled by the system diagnostics and displayed on the engineering station.	The network communication is correctly displayed on the engineering station.	

Tag ID	Brand/Model	Description	Test result
SERVSWL2-002	Hirschmann BRS40	Service switch 002	
SERVSWL2-003	Hirschmann BRS40	Service switch 003	
PINSWL2-001	Hirschmann BRS40	PIN switch 001	

Tag ID	Brand/Model	Description	Test result
PINSWL2-002	Hirschmann BRS40	PIN switch 002	
SNSWL2-003	Hirschmann GRS105	Safety network switch 003	
SNSWL2-004	Hirschmann GRS105	Safety network switch 004	
CNSWL2-001	Hirschmann GRS105	Control network switch 001	
CNSWL2-002	Hirschmann GRS105	Control network switch 002	
COMSWL2-0009	Hirschmann BRS40	Comm. Switch 009	
COMSWL2-0010	Hirschmann BRS40	Comm. Switch 010	
COMSWL2-0011	Hirschmann BRS40	Comm. Switch 011	
COMSWL2-0012	Hirschmann BRS40	Comm. Switch 012	
Modbus SW	Hirschmann BRS40	Modbus switch	
Profinet SW	Hirschmann BRS40	Profinet switch	

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5.4.4 WORKSITE PHASE 1 Test no.2 – Network Switch Backup test

Step ID	Actions	Acceptance Criteria	Result
1	Connect with a temporary laptop with USB cable network switch console port.	Laptop is connected with a terminal software open connected to the matching COM port.	
2	Login to the switch with an engineering level account taken from the IP address and password list document.	Login is required to access through the console, and it is successful with the engineer account.	
3	Configure (or use if already existing) a temporary switch port with the Vnet/IP Network assigned and connect it to the laptop Ethernet port with an assigned static IP, DNS and Gateway. Ping gateway IP from the laptop.	Ping is successful.	
4	Execute the **# copy running-config ftp:** Specify the laptop IP address and give a filename.	File is successfully copied to the laptop TFTP software folder.	
5	Verify that the USB storage cartridge connected to the drive is the FAT labelled. Copy the configuration file from the laptop to the USB drive.	File is copied to the FAT USB disk cartridge. Use the Get-FileHash Powershell command to write the file hash value into a dedicated text file.	

Tag ID	Brand/Model	Description	Test result
SERVSWL2-002	Hirschmann BRS40	Service switch 002	
SERVSWL2-003	Hirschmann BRS40	Service switch 003	
PINSWL2-001	Hirschmann BRS40	PIN switch 001	
PINSWL2-002	Hirschmann BRS40	PIN switch 002	
SNSWL2-003	Hirschmann GRS105	Safety network switch 003	
SNSWL2-004	Hirschmann GRS105	Safety network switch 004	
CNSWL2-001	Hirschmann GRS105	Control network switch 001	
CNSWL2-002	Hirschmann GRS105	Control network switch 002	

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Tag ID	Brand/Model	Description	Test result
COMSWL2-0009	Hirschmann BRS40	Comm. Switch 009	
COMSWL2-0010	Hirschmann BRS40	Comm. Switch 010	
COMSWL2-0011	Hirschmann BRS40	Comm. Switch 011	
COMSWL2-0012	Hirschmann BRS40	Comm. Switch 012	
Modbus SW	Hirschmann BRS40	Modbus switch	
Profinet SW	Hirschmann BRS40	Profinet switch	

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5.4.5 WORKSITE phase 1 test no.3 – Firewall test

Step ID	Actions	Acceptance Criteria	Result
1	Connect with a temporary laptop with USB cable to the network switch console port	Laptop is connected with a terminal software open connected to the matching COM port of the firewall	
2	Login to the Firewall with an engineering level account taken from the IP address and password list document	Login is required to access through the console, and it is successful with the engineer account	
3	Issue the **# get system status** to verify that the firewall pair is correctly set.	Output will contain as a minimum the following: Version: FortiGate-* Serial-Number: FGT*** BIOS version: *** Operation Mode: NAT Current HA mode: A-P Primary	
4	Issue the **# get system ha status** to verify that the firewall pair is correctly set.	Output will contain: **HA Health Status: OK**	
5	Issue the **# execute ha manage 1** to connect to the firewall and repeat steps from 2 to 5. (Firewall number may vary. Check with the get system ha status)	Verify each steps output as shown from 2 to 5.	

Tag ID	Brand/Model	Description	Test result
FW-001	Fortinet FG-40F	Vnet/IP firewall 001	
FW-002	Fortinet FG-40F	Vnet/IP firewall 002	
FW-003	Fortinet FG-80F	Comm. Firewall 003	
FW-004	Fortinet FG-80F	Comm. Firewall 004	

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Test Notes and Remarks:

5.4.6 WORKSITE phase 1 test no.4 – Firewall HA Redundancy test

Step ID	Actions	Acceptance Criteria	Result
1	Configure (or use if already existing) a temporary switch port with the Vnet/IP Network assigned and connect it to the laptop Ethernet port with an assigned static IP, DNS and Gateway. Ping the firewall management IP from the laptop.	Ping is successful.	
2	From the laptop open a browser session to the firewall admin page and login the firewall with an engineering level account taken from the IP address and account list document.	Login is successful.	
3	Verify which unit is the master of the HA cluster and power off the device. Verify that after few seconds it is still possible to access the login page of the Firewall, and the HA status shows only the secondary unit as active and listed in the HA status dashboard.	Login is still successful. System is still operational with the secondary Fortigate unit.	
4	Reboot again the switched off unit and verify that the system is still operational and both units become operational again from the HA status dashboard.	Both units get back listed in the system HA status dashboard.	
5	Repeat steps 3 and 4 with the other unit.	Login is still successful. System is still operational with the primary unit. Both units get back listed in the system HA status dashboard.	

Tag ID	Brand/Model	Description	Test result
FW-001	Fortinet FG-40F	Vnet/IP firewall 001	
FW-002	Fortinet FG-40F	Vnet/IP firewall 002	
FW-003	Fortinet FG-80F	Comm. Firewall 003	
FW-004	Fortinet FG-80F	Comm. Firewall 004	

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Test Notes and Remarks:

5.4.7 WORKSITE phase 1 test no.5 – Firewall Backup test

Step ID	Actions	Acceptance Criteria	Result
1	Configure (or use if already existing) a temporary switch port with the Vnet/IP Network assigned and connect it to the laptop Ethernet port with an assigned static IP, DNS and Gateway. Ping the firewall management IP from the laptop.	Ping is successful.	
2	From the laptop open a browser session to the firewall admin page and login the firewall with an engineering level account taken from the IP address and account list document.	Login is successful.	
3	Click on the top right account name box and select Backup > Configuration. Choose Local PC and set and encryption password as noted in the IP address and password document. Save the configuration file to a temporary folder in the local PC	File is successfully saved in the destination folder.	
4	Verify that the USB storage cartridge connected to the drive is the FAT labelled. Copy the configuration file from the laptop to the USB drive.	File is copied to the SAT USB disk cartridge. Use the Get-FileHash Powershell command to write the file hash value into a dedicated text file.	

Tag ID	Brand/Model	Description	Test result
FW-001	Fortinet FG-40F	Vnet/IP firewall 001	
FW-002	Fortinet FG-40F	Vnet/IP firewall 002	
FW-003	Fortinet FG-80F	Comm. Firewall 003	
FW-004	Fortinet FG-80F	Comm. Firewall 004	

Test Notes and Remarks:

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5.4.8 WORKSITE phase 1 test no.6 – LAN Connectivity Test

Step ID	Actions	Acceptance Criteria	Result
1	(If applicable) Verify each Data Socket (RJ45) in every room can provide network connectivity to the network device connected on it. Note: if the Data Socket does not have any IP device connected, just connect a temporary Laptop to test the socket (ping test).	The IP device connected to the RJ45 Data Socket have network connectivity.	

Equipment	Tag	IP Address	Result

Test Notes and Remarks:

5.4.9 Test Steps PHASE 2

The scope of this test is to energize the cabinet with all internal components, even if some equipment is not part of LAN Network system. The cabinet will be fully energized.

The entire test should only be performed the first time when the cabinet is energized. If the cabinet has already been powered up while performing OTP procedures for other Telecom System, there is no need to repeat this test again. In this case, the successful energization of the cabinet shall be reflected in the official documentation; write down in the "Test Notes and Remarks" section the code and name of OTP procedure where the energization of the cabinet has been successfully performed.

Step	Description	Result	Verified by	Date
Power on Cabinet OER-NET/SRV-001with temporary power supply and temporary communication.				
PHASE 2:				
Onshore Equipment Room and Central Control Room - System 87-50				
1.	Check and confirm all panels are involved as per section 5.4.1 are available.			
2.	Verify the temporary communication from Data Networks to Cabinet OER-NET/SRV-001 is available.			
3.	Close the MCBs from temporary power supply and with reference vendor doc. 1724000594-IN-DG-00023 sheets 6/7/8 verify that power supply 230V is present on the terminals: TB_PS1: 1-2 Voltage _____ V. TB_PS2: 1-2 Voltage _____ V. TB_PS3: 1-2 Voltage _____ V.			

Step	Description	Result	Verified by	Date
4.	System cabinets tag: OER-NET/SRV-001 If the voltage measured at step 3 are in line with the expected values, switch on MCBs, one at a time, according to the sequence proposed below: *Note: For details about electric power scheme and related MCBs refers to wiring diagram doc no. "1724000594-IN-DG-00023".* Energize Q1 (Auxiliary Line – Non-UPS) and Q2/Q3 and verify cabinet service lights (H1/H2) are switched on with cabinet doors open and service socket (SK1) is powered up. Verify that 230 V (+/- 10%) is present at the service socket and record the value: Service Power sockets 230 V (+/- 10%) Voltage _____ V. Energize MS1 (UPS-1 Line) and Q5 and verify that WEIDMULLER PRO EVO 24VDC Power Supply (G1) is switched on (LED is lit). Energize Q6 and verify that sockets SK2/SK3 are powered up. Verify that 230 V (+/- 10%) is present at the sockets and record the value at one socket selected randomly: Power sockets 230 V (+/- 10%) Voltage _____ V. Energize MS2 (UPS-2 Line) and Q8 and verify that WEIDMULLER PRO EVO 24VDC Power Supply (G2) is switched on (LED is lit). Energize Q9 and verify that sockets SK4/SK5 are powered up.			

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Step	Description	Result	Verified by	Date
	Verify that 230 V (+/- 10%) is present at the sockets and record the value at one socket selected randomly: Power sockets 230 V (+/- 10%) Voltage _____ V.			
5.	Verify that all active equipment is powered up. the power supply redundancy test is done with the MCBs inside the panel. Switch off MCB MS1. Verify that all the equipment is still powered up. …….. [OK] Switch on MCB MS1 …….. [OK] Switch off MCB MS2. Verify that all the equipment is still powered up. …….. [OK] Switch on MCB MS2. …….. [OK] **Note:** In this test with two power supplies, it is normal for one of the power supplies to be inoperative when the connected power is turned off. The second power supply,			

Step	Description	Result	Verified by	Date
	however operational, must be to supply power to the equipment.			

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5.4.10 WORKSITE PHASE 2 Test no.1 – Network Switch test

Step ID	Actions	Acceptance Criteria	Result
1	Login to the switches with an engineering level account taken from the IP address and password list document.	Login is required to access through the console, and it is successful with the engineer account.	
2	Verify that all the power supplies are correctly shown with no errors, and fans and temperatures are correct.	All the Power supply are "Good" status. The fans in normal operation and the temperature not in alarm.	
3	Verify that the devices are working properly and are correctly seen and connected.	All the network switches are correctly shown.	

Tag ID	Brand/Model	Description	Test result
PINSWL2-003	Hirschmann BRS40	PIN Switch 003	
PINSWL2-004	Hirschmann BRS40	PIN Switch 004	
DMZSWL2-001	Hirschmann BRS40	DMZ switch 001	
DMZSWL2-002	Hirschmann BRS40	DMZ switch 002	
PINSWL2-005	Hirschmann BRS40	PIN switch 005	
PINSWL2-006	Hirschmann BRS40	PIN switch 006	

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Test Notes and Remarks:

5.4.11 WORKSITE PHASE 2 Test no.2 – Network Switch Backup test

Step ID	Actions	Acceptance Criteria	Result
1	Connect with a temporary laptop with USB cable network switch console port.	Laptop is connected with a terminal software open connected to the matching COM port.	
2	Login to the switch with an engineering level account taken from the IP address and password list document...	Login is required to access through the console, and it is successful with the engineer account.	
3	Configure (or use if already existing) a temporary switch port with the Vnet/IP Network assigned and connect it to the laptop Ethernet port with an assigned static IP, DNS and Gateway. Ping gateway IP from the laptop.	Ping is successful.	
4	Execute the **# copy running-config ftp:** Specify the laptop IP address and give a filename.	File is successfully copied to the laptop TFTP software folder.	
5	Verify that the USB storage cartridge connected to the drive is the FAT labelled. Copy the configuration file from the laptop to the USB drive.	File is copied to the FAT USB disk cartridge. Use the Get-FileHash Powershell command to write the file hash value into a dedicated text file.	

Tag ID	Brand/Model	Description	Test result
PINSWL2-003	Hirschmann BRS40	PIN Switch 003	
PINSWL2-004	Hirschmann BRS40	PIN Switch 004	
DMZSWL2-001	Hirschmann BRS40	DMZ switch 001	
DMZSWL2-002	Hirschmann BRS40	DMZ switch 002	
PINSWL2-005	Hirschmann BRS40	PIN switch 005	
PINSWL2-006	Hirschmann BRS40	PIN switch 006	

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Test Notes and Remarks:

5.4.12 WORKSITE PHASE 2 Test no.3 – Firewall test

Step ID	Actions	Acceptance Criteria	Result
1	Connect with a temporary laptop with USB cable to the network switch console port	Laptop is connected with a terminal software open connected to the matching COM port of the firewall	
2	Login to the Firewall with an engineering level account taken from the IP address and password list document	Login is required to access through the console, and it is successful with the engineer account	
3	Issue the **# get system status** to verify that the firewall pair is correctly set.	Output will contain as a minimum the following: Version: FortiGate-* Serial-Number: FGT*** BIOS version: *** Operation Mode: NAT Current HA mode: A-P Primary	
4	Issue the **# get system ha status** to verify that the firewall pair is correctly set.	Output will contain: **HA Health Status: OK**	
5	Issue the **# execute ha manage 1** to connect to the firewall and repeat steps from 2 to 5. (Firewall number may vary. Check with the get system ha status)	Verify each steps output as shown from 2 to 5.	

Tag ID	Brand/Model	Description	Test result
SERVFW-001	Fortinet FG-80F	Service Firewall 001	
SERVFW-002	Fortinet FG-80F	Service Firewall 002	
FW-005	Fortinet FG-100F	OER Firewall 005	
FW-006	Fortinet FG-100F	OER Firewall 006	

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Test Notes and Remarks:

5.4.13 WORKSITE PHASE 2 Test no.4 – Firewall HA Redundancy test

Step ID	Actions	Acceptance Criteria	Result
1	Configure (or use if already existing) a temporary switch port with the Vnet/IP Network assigned and connect it to the laptop Ethernet port with an assigned static IP, DNS and Gateway. Ping the firewall management IP from the laptop.	Ping is successful.	
2	From the laptop open a browser session to the firewall admin page and login the firewall with an engineering level account taken from the IP address and account list document.	Login is successful.	
3	Verify which unit is the master of the HA cluster and power off the device. Verify that after few seconds it is still possible to access the login page of the Firewall and the HA status shows only the secondary unit as active and listed in the HA status dashboard.	Login is still successful. System is still operational with the secondary Fortigate unit.	
4	Reboot again the switched off unit and verify that the system is still operational and both units become operational again from the HA status dashboard.	Both units get back listed in the system HA status dashboard.	
5	Repeat steps 3 and 4 with the other unit.	Login is still successful. System is still operational with the primary unit. Both units get back listed in the system HA status dashboard.	

Tag ID	Brand/Model	Description	Test result
SERVFW-001	Fortinet FG-80F	Service Firewall 001	
SERVFW-002	Fortinet FG-80F	Service Firewall 002	

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Tag ID	Brand/Model	Description	Test result
FW-005	Fortinet FG-100F	OER Firewall 005	
FW-006	Fortinet FG-100F	OER Firewall 006	

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Test Notes and Remarks:

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5.4.14 WORKSITE PHASE 2 Test no.5 – Firewall Backup test

Step ID	Actions	Acceptance Criteria	Result
1	Configure (or use if already existing) a temporary switch port with the Vnet/IP Network assigned and connect it to the laptop Ethernet port with an assigned static IP, DNS and Gateway. Ping the firewall management IP from the laptop.	Ping is successful.	
2	From the laptop open a browser session to the firewall admin page and login the firewall with an engineering level account taken from the IP address and account list document.	Login is successful.	
3	Click on the top right account name box and select Backup > Configuration. Choose Local PC and set and encryption password as noted in the IP address and password document. Save the configuration file to a temporary folder in the loca PC	File is successfully saved in the destination folder.	
4	Verify that the USB storage cartridge connected to the drive is the FAT labelled. Copy the configuration file from the laptop to the USB drive.	File is copied to the SAT USB disk cartridge. Use the Get-FileHash Powershell command to write the file hash value into a dedicated text file.	

Tag ID	Brand/Model	Description	Test result
SERVFW-001	Fortinet FG-80F	Service Firewall 001	
SERVFW-002	Fortinet FG-80F	Service Firewall 002	
FW-005	Fortinet FG-100F	OER Firewall 005	
FW-006	Fortinet FG-100F	OER Firewall 006	

Test Notes and Remarks:

5.4.15 WORKSITE PHASE 2 Test no.6 – LAN Connectivity Test

Step ID	Actions	Acceptance Criteria	Result
1	(If applicable) Verify each Data Socket (RJ45) in every room can provide network connectivity to the network device connected on it. Note: if the Data Socket does not have any IP device connected, just connect a temporary Laptop to test the socket (ping test).	The IP device connected to the RJ45 Data Socket have network connectivity.	

Equipment	Tag	IP Address	Result

Test Notes and Remarks:

5.4.16 OTP Worksite Tests – Notes and Remarks

Item N°	Note / Remark
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5.4.17 OTP Worksite Tests – Tests Certifying Authority Table of Attendances

Name and Surname	Certifying Authority	Position	Signature

5.4.18 OTP Worksite Tests – Final Signatures and Company Acceptance

Name and Surname	Certifying Authority	Position	Signature

5.5 POST TEST CONDITION

5.5.1 Post OTP Summary

The successful completion of functional tests shall prove and verify the correct functionality of the systems/ sub-system as per Project requirements and specification and acceptable for handover from onshore to offshore activities.

5.5.2 Data Recording

A data recorded during OTP shall be collected and attached to this procedure (see section 7). This also includes the mark-ups of supporting documents/drawings used for tests.

5.5.3 Final Sub-system status

Systems/subsystem final status will be discussed and agreed during kick off meeting that shall be held as post-test meeting with all involved parties. There shall be defined final status that it is required for the system/subsystem(s) and plan of preparation and preservation for the platform sail away.

5.6 REINSTATEMENT AND PRESERVATION TASKS

- Not applicable.

6. OTP AT OFFSHORE SITE

6.1 PLANNING AND MANPOWER

6.1.1 Offshore Site overview

It is expected that all precommissioning tests, systems energization and commissioning steps have been successfully performed during the Onshore WORKSITE Phases.

Consequently, during the offshore SITE phase, the respective systems will be inspected prior to re-energization. No additional test steps will be required on these items of equipment, correct operation and functioning will be verified.

6.1.2 Planned tasks with estimated manpower

Estimated manpower is as follows for the entire duration of the Test:

- 1 E&I supervisor commissioning engineer from CONTRACTOR.
- 1 E&I engineer from COMPANY.
- 1 Certifying Authority Representative.

6.1.3 Test duration estimate

The test duration is estimated to be

- approx. 0.5 day.

If necessary, the estimated time can be extended to complete all required pre-commissioning and commissioning activities.

6.1.4 Vendor assistance

- Not applicable.

6.1.5 Items postponed to C&E OTP

- Not applicable.

6.2 OTP TEST REQUIREMENT – OFFSHORE SITE

6.2.1 Pre-Commissioning Achievement

- Not applicable.

6.2.2 Commissioning Achievement

Commissioning achievement will be to test the network connections through fiber optic link of the ITER (located in the platform) to the OER (onshore) through connections located in WTG-57 (HNA-5) and of the OER to the CCR through Company's proprietary network.

By doing this, the LAN System shall be fully working and operative.

Before proceeding with the operational testing, completion of the task/check forms for LAN system is required.

6.2.3 Status of Required Associated Subsystems

The systems involved has been already energized and commissioned in WORKSITE Phase

6.2.4 Special Tools & Test Equipment

The following instruments and tools will be used for the tests:

- Continuity tester (Multimeter)
- Toolbox
- Network Cable Tester
- Test Laptop
- Portable radios (1 pcs + 1 per Technical Room)

Type	Manuf./Model	Serial Number	Software	Calibration

6.2.5 Consumable List

Not applicable.

6.2.6 Commissioning Spare Parts

Commissioning spare parts shall be as per Vendor doc. 1724000594-COM-LIS-00039 Spare Part Index Register (Commissioning And 2-Years Operation).

6.2.7 Temporary Facilities

Not applicable.

6.3 OTP DESCRIPTION – OFFSHORE SITE

6.3.1 OTP Test Preparation

This phase identifies all the preparatory inspections and activities to be carried out prior to performing the OTP of LAN system.

Submarine fiber optic cable connecting BLPH offshore platform to WTG-57 has been successfully tested. Interconnection between HNA-5 and onshore CCR is established and working smoothly. All test results have been recorded.

Installation, earthing/bonding and electrical checks are carried out during Mechanical Completion, no other preliminary tests are necessary.

Step	Description	Result	Verified by	Date
1	System Ready for Operation (RFO), Certificate is issued and approved.			
2	No blocking punch list items are outstanding against the system to be commissioned.			
3	Verify and confirm that all steps performed at WORKSITE of this procedure are completed without any pending issues that would prevent from proceeding with the offshore SITE procedure,			
4	All personnel involved in the implementation of this procedure are familiar with this procedure as well as with associated safety requirements (Toolbox Talk to be conducted before initiation of activities).			
5	Verify that F.O. terminations, splicing, connections and all the activities related to the network connections between the parties are duly performed and successfully tested. The results of such tests shall be recorded.			
6	Check that areas are free for work and escape routes are clear of any obstructions.			
7	Ensure that proper communications have been established between parties involved in the implementation of the procedure.			
8	Verify availability of test equipment as per par. 6.2.4			

Step	Description	Result	Verified by	Date
9	All personnel have been duly notified during dedicated daily SIMOPS meetings that the system(s) is ready for commissioning.			

6.3.2 Electrical Preparation

Step	Description	Result	Verified by	Date
1	The connection to the onshore existing electric power distribution system (Low Voltage distribution) by Company is supposed to be fully commissioned and operative.			

6.3.3 Mechanical Preparation

- Not applicable.

6.3.4 Instrument Preparation

The following steps shall be verified:

Step	Description	Result	Verified by	Date
1	No blocking punch list items are outstanding against the system to be commissioned.			
2	Verify that all relevant associated control and protection systems / subsystems are ready.			
3	Verify as relevant Inhibit and Override list has been prepared and validated (as per JSA).			

6.3.5 Piping Preparation

Not applicable.

6.3.6 Additional Discipline Preparation

Not applicable.

6.4 OTP TEST STEPS – OFFSHORE SITE

6.4.1 Test Preparation

Need to Verify:

- SS 83-20 Distribution Board DP-200N1 230V
- SS 84-10 AC 35KVA UPS (UP-200F3) 230V
- SS 84-20 AC 15KVA UPS (UP-200F4) 230V
- SS 88-00 Earthing System
- SS 86-00 Server/Network Cabinet
- SS 70-00 FGS System Cabinet
- SS 79-00 SIS System Cabinet
- SS 87-00 EMCS System Cabinet
- SS 87-10 PCS System Cabinet
- SS 87-50 OER / CCR System
- SS 86-20 Fiber Optic Links

All systems and subsystems involved in this procedure must be ready and available.
The F.O. connections shall be successfully commissioned and ready for communication.

6.4.2 Test Steps

Step ID	Actions	Acceptance Criteria	Result
1	Check and confirm that the UPS (UP-200F3)230 V, UPS (UP-200F4) 230V and Distribution Board DP-200N1 230V are ready for power on.		
2	Check and confirm that the: • SS 86-00 Server/Network Cabinet • SS 70-00 FGS System Cabinet • SS 79-00 SIS System Cabinet • SS 87-00 EMCS System Cabinet • SS 87-10 PCS System Cabinet • SS 87-50 OER / CCR System are ready for power on.		
3	Confirmed the above we can proceed with energization.		
4	Login to the switches in B400-NET-001 with an engineering level account taken from the IP address and password list document.	Login is required to access through the console, and it is successful with the engineer account.	

Step ID	Actions	Acceptance Criteria	Result
5	Verify that the devices are working properly and are correctly seen and connected.	All the network switches are correctly shown.	
6	With reference to the information contained in the IP address and password list document, ping IP devices in HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01 from the laptop.	Ping is successful.	
7	Repeat steps above the other way round, i.e. connect to the switches in HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01 and ping devices in B400-NET-001	Ping is successful.	
8	From CCR, login to any of the EWS and ping devices in both B400-NET-001 and HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01	Ping is successful.	

Tag ID	Brand/Model	Description	Test result
FOPP-001	Tecnifiber CE1-24ST(SM)	FO Patch Panel - 24ports (12core) single mode (SM) (B400-NET-001)	
FOPP-002	Tecnifiber CE1-24ST(MM)	FO Patch Panel - 24ports (12core) multi-mode (MM) (B400-NET-001)	
FOPP-003	Tecnifiber CE1-24ST(SM)	FO Patch Panel - 24ports (12core) single mode (SM) (HKN-WPO1-BLPH-NET-01 / HKN-WPO1-BLPH-SRV-01)	

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6.4.3 OTP Site Tests Notes and Remarks

Item N°	Note / Remark
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6.4.4 OTP Site Tests – Certifying Authority Table of Attendance

Name and Surname	Certifying Authority	Position	Signature

6.4.5 OTP Site Tests – Final Signatures and Company Acceptance

Name and Surname	Certifying Authority	Position	Signature

6.5 POST TEST CONDITIONS

6.5.1 Post OTP Summary

The successful completion of functional tests shall prove and verify the correct functionality of the systems/ sub-system as per Project requirements and specification and acceptable for handover to COMPANY.

6.5.2 Data Recording

A data recorded during OTP shall be collected and attached to this procedure (see section 7). This also includes the mark-ups of supporting documents/drawings used for tests.

6.5.3 Final Sub-system status

Systems/subsystem final status will be discussed and agreed during kick off meeting that shall be held as post-test meeting with all involved parties.

6.6 REINSTATEMENT AND PRESERVATION TASKS

- Not applicable.

7. APPENDICES

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7.1 Vendor SAT Procedure

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7.2 Proverlis Summary System Reports

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7.3 Equipment Related Technical Queries

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7.4 As Built Documentation

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7.5 Management of Change – Summary Table of Tasks and Details of Affected Related Documentation

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