Base Load Power Hub (BLPH)

FAT PROCEDURE – TELECOM EQUIPMENT

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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.

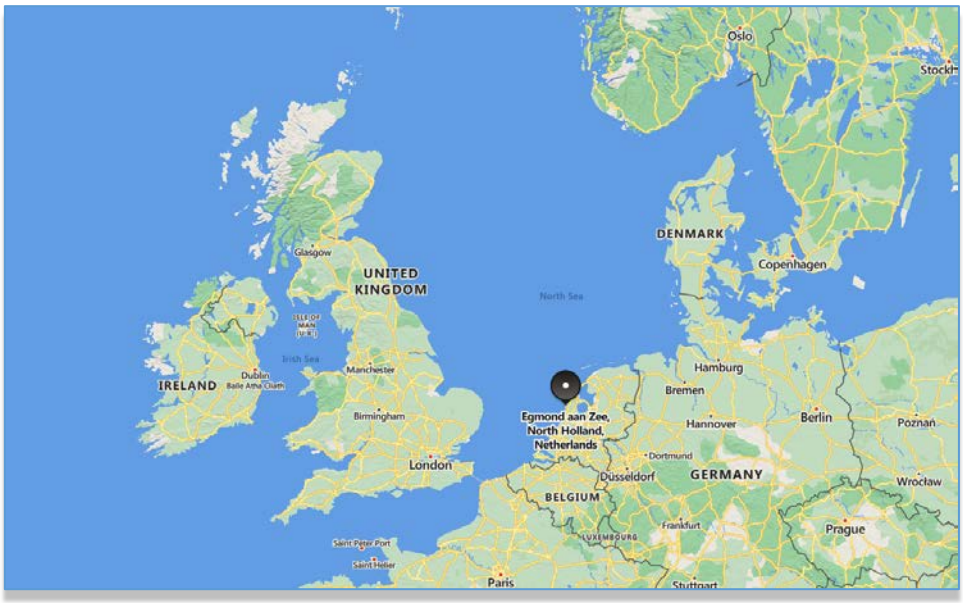


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

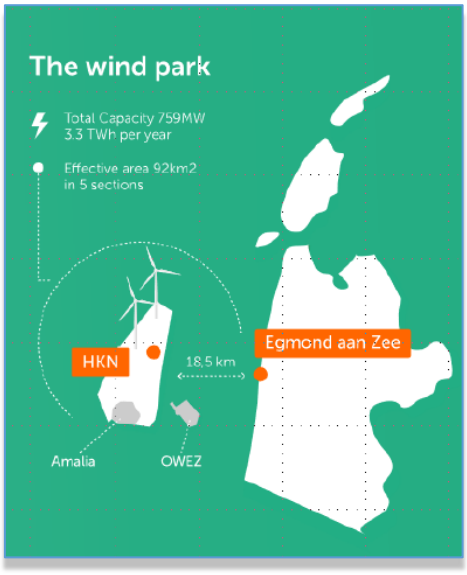


Figure 2 - Wind Park Details

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 by Van 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.

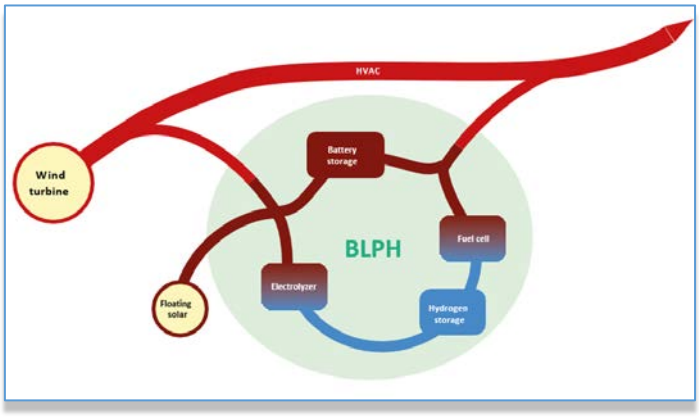


Figure 3 – BLPH Concept

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 DOCUMENT SCOPE

The purpose of this procedure is to define the checks and tests that shall be carried out during Factory Acceptance Test (FAT) of Telecom equipment included in the Fores Engineering scope of supply.
FAT will be performed at Fores workshop, attended by Contractor and/or Company representatives, according to intervention points stated on the last revision of the ITP.

2.1 REFERENCES

Doc. No.	Description
1724000452-QC-ITP-00004	INSPECTION AND TEST PLAN – TELECOM EQUIPMENT
1724000452-TL-DS-00005	EQUIPMENT DATASHEETS – TELECOM EQUIPMENT
1724000452-TL-LIS-00006	EQUIPMENT AND SPECIAL TOOLS LIST – TELECOM EQUIPMENT
1724000452-COM-LIS-00014	SPARE PARTS LIST – TELECOM EQUIPMENT

Table 1 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project

Table 2 - Definitions and Abbreviations

3 FACTORY ACCEPTANCE TEST

3.1 VISUAL AND DIMENSIONAL CHECK

3.1.1 IDCS MATERIAL

Test Name / Test N°	MATERIAL VISUAL AND DIMENSIONAL CHECK	
Test Scope	Perform visual and mechanical check of IDCS material	
ITP Reference	1724000452-QC-ITP-00004 - Step 2.1.1, 2.1.2, 2.1.3, 2.1.4 and 2.1.5	
Reference Documents	1724000452-TL-DS-00005 EQUIPMENT DATASHEETS – TELECOM EQUIPMENT 1724000452-TL-LIS-00006 EQUIPMENT AND SPECIAL TOOLS LIST – TELECOM EQUIPMENT	
Equipment Involved	Items from 1 to 27 in the Equipment List	
Requirements	Measuring tape	
Prerequisites	/	
Notes	/	

Procedure

Step	**Description**	**Acceptance Criteria**
1	Visual dimensional check	Equipment in compliance with related Data sheet
2	Mechanical damage check	No mechanical damage
3	Equipment quality check	Equipment in compliance with related Data sheet
4	Equipment quantity check	Quantity of supplied devices in compliance with Equipment List
5	Equipment tag labels check	Tag Label material and fixing as Reference Documents
6	Certificated check	Compliance with Reference Documents

3.1.2 NAVIGATION AIDS MATERIAL

Test Name / Test N°	MATERIAL VISUAL AND DIMENSIONAL CHECK	
Test Scope	Perform visual and mechanical check of navigation aids material	
ITP Reference	1724000452-QC-ITP-00004 - Step 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7, 2.2.8, 2.2.9, 2.2.10 and 2.2.11	
Reference Documents	1724000452-TL-DS-00005 EQUIPMENT DATASHEETS – TELECOM EQUIPMENT 1724000452-TL-LIS-00006 EQUIPMENT AND SPECIAL TOOLS LIST – TELECOM EQUIPMENT	
Equipment Involved	Items from 28 to 39 in the Equipment List	
Requirements	Measuring tape	
Prerequisites	/	
Notes	/	

Procedure

Step	Description	Acceptance Criteria
1	Visual dimensional check	Equipment in compliance with related Data sheet
2	Mechanical damage check	No mechanical damage
3	Equipment quality check	Equipment in compliance with related Data sheet
4	Equipment quantity check	Quantity of supplied devices in compliance with Equipment List
5	Equipment tag labels check	Tag Label material and fixing as Reference Documents
6	Equipment Ex marking check	Ex label installed and compliant to Ex standard
7	Certificated check	Compliance with Reference Documents

3.1.3 RADIO SYSTEM MATERIAL

Test Name / Test N°	MATERIAL VISUAL AND DIMENSIONAL CHECK	
Test Scope	Perform visual and mechanical check of UHF portable radio	
ITP Reference	1724000452-QC-ITP-00004 - Step 2.3.1, 2.3.2, 2.3.3, 2.3.4 and 2.3.5	
Reference Documents	1724000452-TL-DS-00005 EQUIPMENT DATASHEETS – TELECOM EQUIPMENT 1724000452-TL-LIS-00006 EQUIPMENT AND SPECIAL TOOLS LIST – TELECOM EQUIPMENT	
Equipment Involved	Items from 40 to 45 in the Equipment List	
Requirements	Measuring tape	
Prerequisites	/	
Notes	/	

Procedure

Step	Description	Acceptance Criteria
1	Visual dimensional check	Equipment in compliance with related Data sheet
2	Mechanical damage check	No mechanical damage
3	Equipment quality check	Equipment in compliance with related Data sheet
4	Equipment quantity check	Quantity of supplied devices in compliance with Equipment List
5	Equipment tag labels check	Tag Label material and fixing as Reference Documents
6	Equipment Ex marking check	Ex label installed and compliant to Ex standard
7	Certificated check	Compliance with Reference Documents

3.1.4 SPARE PARTS

Test Name / Test N°	MATERIAL VISUAL AND DIMENSIONAL CHECK	
Test Scope	Perform visual and mechanical check of spare parts	
ITP Reference	1724000452-QC-ITP-00004 - Step 2.4.1 and 2.4.2	
Reference Documents	1724000452-TL-DS-00005 EQUIPMENT DATASHEETS – TELECOM EQUIPMENT 1724000452-COM-LIS-00014 SPARE PARTS LIST – TELECOM EQUIPMENT	
Equipment Involved	Items listed in the Spare Part List	
Requirements	/	
Prerequisites	/	
Notes	/	

Procedure

Step	Description	Acceptance Criteria
1	Visual dimensional check	Equipment in compliance with related Data sheet
2	Mechanical damage check	No mechanical damage
3	Equipment quality check	Equipment in compliance with related Data sheet
4	Equipment quantity check	Quantity of supplied devices in compliance with Equipment List
6	Equipment Ex marking check	Ex label installed and compliant to Ex standard

3.2 POWER UP

3.2.1 VHF MARINE RADIO

Test Name / Test N°	RADIO POWER UP	
Test Scope	Verify the correct power up of the VHF Handheld Marine Radios.	
ITP Reference	1724000452-QC-ITP-00004 - Step 2.2.12	
Reference Documents	1724000452-TL-DS-00005 EQUIPMENT DATASHEETS – TELECOM EQUIPMENT 1724000452-TL-LIS-00006 EQUIPMENT AND SPECIAL TOOLS LIST – TELECOM EQUIPMENT	
Equipment Involved	Item 32 and 33 in the Equipment List	
Requirements	/	
Prerequisites	Handheld radio battery shall be charged	
Notes	/	
Procedure		

Step	Description	Acceptance Criteria
1	Switch the radio on turning clockwise the main knob at the top of the radio itself	The radio display will light up showing the used channel and the battery level

3.2.2 DMR UHF RADIO

Test Name / Test N°	RADIO POWER UP	
Test Scope	Verify the correct power up of the DMR UHF Radios.	
ITP Reference	1724000452-QC-ITP-00004 - Step 2.3.6	
Reference Documents	1724000452-TL-DS-00005 EQUIPMENT DATASHEETS – TELECOM EQUIPMENT 1724000452-TL-LIS-00006 EQUIPMENT AND SPECIAL TOOLS LIST – TELECOM EQUIPMENT	
Equipment Involved	Item 40 and 41 in the Equipment List	
Requirements	/	
Prerequisites	Handheld radio battery shall be charged	
Notes	/	

Procedure

Step	Description	Acceptance Criteria
1	Switch the radio on turning clockwise the main knob at the top of the radio itself	The radio display will light up showing the used channel and the battery level

3.3 FUNCTIONAL TEST

3.3.1 VHF MARINE RADIO COMMUNICATION TEST

Test Name / Test N°	RADIO COMMUNICATION TEST	
Test Scope	Verify the correct power up of the equipment and measure the most important radio-electric technical data of the VHF Handheld Marine Radios.	
ITP Reference	1724000452-QC-ITP-00004 – Step 2.2.13	
Reference Documents	1724000452-TL-DS-00005 EQUIPMENT DATASHEETS – TELECOM EQUIPMENT 1724000452-TL-LIS-00006 EQUIPMENT AND SPECIAL TOOLS LIST – TELECOM EQUIPMENT	
Equipment Involved	Item 32 and 33 in the Equipment List	
Requirements	/	
Prerequisites	VHF Radios are supposed to be already switched off	
Notes	/	

Procedure

Step	Description	Acceptance Criteria
1	Tune the VHF radios on the same simplex channel within the International Marine channel list (e.g. Channel 11 corresponding to frequency 156.550MHz).	Both radios will be operating on the same simplex Marine channel.
2	1) Pressing the Push To Talk switch (PTT) on the first portable radio unit and speaking in close proximity of the handset microphone a voice message will be received by the second radio. 2) Pressing the Push To Talk switch (PTT) on the second portable radio and speaking in close proximity of its integrated microphone, a voice message will be received by the first radio.	1) Second radio receives voice messages from first radio. 2) First radio receives voice messages from second radio Half duplex bidirectional communications can be instated between the radios.
3	Connect the Twin cup headset and the PTT Control Unit (SAVOX C-C440 Ex) to the VHF Handheld marine Radio	When external equipment is connected to the radio, the right side of the display will show a headset.
4	1) Pressing the external Push To Talk switch (PTT) on the first portable radio unit and speaking in close proximity of the handset microphone a voice message will be received by the second radio. 2) Pressing the external Push To Talk switch (PTT) on the second portable radio and speaking in close proximity of its integrated microphone, a voice message will be received by the first radio.	1) Second radio receives voice messages from first radio. 2) First radio receives voice messages from second radio Half duplex bidirectional communications can be instated between the radios.
5	Disconnect the Twin cup headset and the PTT Control Unit (SAVOX C-C440 Ex) to the VHF Handheld marine Radio	When external equipment is disconnected to the radio, the right side of the display will not show a headset.
6	Connect only the Twin cup headset to the VHF Handheld marine Radio	When external equipment is connected to the radio, the right side of the display will show a headset.
7	1) Pressing the Push To Talk switch (PTT) on the first portable radio unit and speaking in close proximity of the handset microphone a voice message will be received by the second radio. 2) Pressing the Push To Talk switch (PTT) on the second portable radio and speaking in close proximity of its integrated microphone, a voice message will be received by the first radio.	1) Second radio receives voice messages from first radio. 2) First radio receives voice messages from second radio Half duplex bidirectional communications can be instated between the radios.

3.3.2 VHF MARINE RADIO RF CHARATERISTIC TEST

Test Name / Test N°	VHF MARINE FIXED RADIO TRANSMITTER RF CHARACTERISTIC TEST	
Test Scope	The scope of this test is to verify the TX RF Power Output in normal and emergency condition, and Tx Frequency	
ITP Reference	1724000452-QC-ITP-00004 – Step 2.2.13	
Reference Documents	1724000452-TL-DS-00005 EQUIPMENT DATASHEETS – TELECOM EQUIPMENT 1724000452-TL-LIS-00006 EQUIPMENT AND SPECIAL TOOLS LIST – TELECOM EQUIPMENT	
Equipment Involved	Item 32 and 33 in the Equipment List	
Requirements	Digital Radio Test Set	
Prerequisites	The Transmitter antenna port of VHF MARINE RADIO must be connected to Radio Test Tool at T/R Port VHF Radios are supposed to be already switched off	
Notes	/	

Procedure

Step	Description	Acceptance Criteria
1	Tune the VHF radios on the same simplex channel within the International Marine channel list (e.g. Channel 11 corresponding to frequency 156.550MHz).	The VHF Radio displays the current working channel (e.g. channel 11)
2	Set the VHF marine Radio to transmit at high power (2 Watt)	The VHF marine radio does not show "Lo" on the display
3	Press PPT to transmit	The TX Power on the digital radio test shall be 32 dBM +/- 1 db. 32dbm = 33dbm (2Watt) – 1 db (loss value of the cable used for the measurement) TX Frequency reading shall be Frequency selected +/- 500Hz
4	Set the VHF marine Radio to transmit at low power (1 Watt)	the VHF marine radio shows "Lo" on the display
5	Press PPT to transmit	The TX Power on the digital radio test shall be 29 dBM +/- 1 db. 29 dbm = 30dbm (1Watt) – 1 db (loss value of the cable used for the measurement) TX Frequency reading shall be Frequency selected +/- 500Hz

3.3.3 VHF MARINE RADIO ADDITIONAL FEATURES TEST

Test Name / Test N°	VHF MARINE RADIO ADDITIONAL FEATURES TEST	
Test Scope	The scope of this test is to verify some additional features of the VHF RADIO	
ITP Reference	1724000452-QC-ITP-00004 – Step 2.2.13	
Reference Documents	1724000452-TL-DS-00005 EQUIPMENT DATASHEETS – TELECOM EQUIPMENT 1724000452-TL-LIS-00006 EQUIPMENT AND SPECIAL TOOLS LIST – TELECOM EQUIPMENT	
Equipment Involved	Item 32 and 33 in the Equipment List	
Requirements		
Prerequisites		
Notes	/	

Procedure

Step	Description	Acceptance Criteria
1	Power up the VHF RADIO and verify that radio operates with channels according to the radio Regulations Channels : 6 12 17 67 73 78A 8 13 19A 68 74 79A 9 14 20A 69 75 LJ 87 10 15 27A 71 76 LJ 88 11 16 28A 72 77	Check that the channels are displayed on the screen
2	Locking the keypad: To lock the keypad, press and hold the Light/Lock button. To unlock the keypad, press and hold the Light/Lock button again.	The display shows a key symbol when the keypad is locked.
3	Using Squelch control To activate Squelch control, press the SQ key. To set the Squelch level, press ↑ (closing) or ↓(opening).	The display shows the Squelch level while it is adjusted, e.g. “SQ 5”.

3.3.4 SART TEST MODE

Test Name / Test N°	SART TEST MODE	
Test Scope	This test ensures the best battery capacity available for a potential emergency. Although the Tron AIS-SART does not send an alarm via satellite, VHF or other radio communication, usage should be limited to short tests.	
ITP Reference		
Reference Documents	1724000452-TL-DS-00005 EQUIPMENT DATASHEETS – TELECOM EQUIPMENT 1724000452-TL-LIS-00006 EQUIPMENT AND SPECIAL TOOLS LIST – TELECOM EQUIPMENT	
Equipment Involved	Item 28 and 29 in the Equipment List	
Requirements	The test must be conducted outdoors with a clear view to the sky to maximize the GPS location.	
Prerequisites	/	
Notes	/	

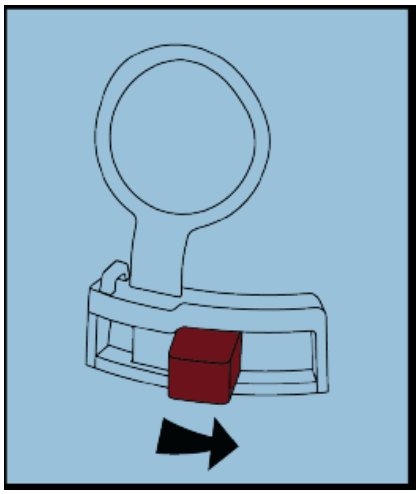
Procedure

Step	Description	Acceptance Criteria
1	Move the switch to the TEST position and hold. 	Tron AIS-SART will now run through a self-test procedure. If a RED LED flashes, it indicates a critical fault. Refer to the error codes for more information
2	Release the switch when both LEDs start flashing. The unit will now search for the GPS position. It will only search for 15 minutes max. 	A successful test is indicated by a 15 sec BEEP and a GREEN LED. 

3.3.5 EPIRB TEST MODE

Test Name / Test N°	EPIRB TEST MODE	
Test Scope	During the normal self-test, the main functionality of the EPIRB is tested. A test signal is transmitted on all frequencies (121.5 MHz, AIS and 406 MHz). These test signals will not be recognized as distress signals. While transmitting the test signals the battery and the transmitted signals are tested.	
ITP Reference		
Reference Documents	1724000452-TL-DS-00005 EQUIPMENT DATASHEETS – TELECOM EQUIPMENT 1724000452-TL-LIS-00006 EQUIPMENT AND SPECIAL TOOLS LIST – TELECOM EQUIPMENT	
Equipment Involved	Item 30 and 31 in the Equipment List	
Requirements		
Prerequisites	/	
Notes	/	

Procedure

Description	**Acceptance Criteria**
To perform the extended self-test, do the following steps within a period of 3 seconds: 1. Move the switch to test position 2. Release to middle position 3. Move the switch to test position and release when the white test indicator lights up. 	The white test indicator LED will light up and the green GNSS indicator LED will start flashing in sequences of 3 fast flashes. This indicates that the EPIRB is searching for a validated position. When a valid position is found the green GNSS indicator LED will remain lit for approximately 1 second and a normal self-test will continue. The top light will flash once at the end of the text if the extended self-test is successful.

Test sequence	Position indicator	RLS indicator	Test indicator	Strobe light
Extended self-test started	-	-	On	-
Waiting for position	Triple flashes	-	-	-
Position achieved	On for 1 second	-	-	-
Self-test started	-	-	On	-
Signals transmitted	-	-	Multiple short off periods	-
RLS enabled *	-	On for 1 second	-	-
Extended self-test successful	-	-	-	One flash
If one of the above tests are unsuccessful, the remaining test sequences will not be performed, and the test indicator will indicate self-test failure.				
Self-test failure			Multiple flashes**	

*For EPIRBs with RLS disabled the RLS indicator will remain off.
**See table in section 3.5.3 for on failure indications.