Base Load Power Hub (BLPH)

NITROGEN GENERATION PACKAGE A-64000
HYDROSTATIC TEST PROCEDURE

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Lifting sketch

None

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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.

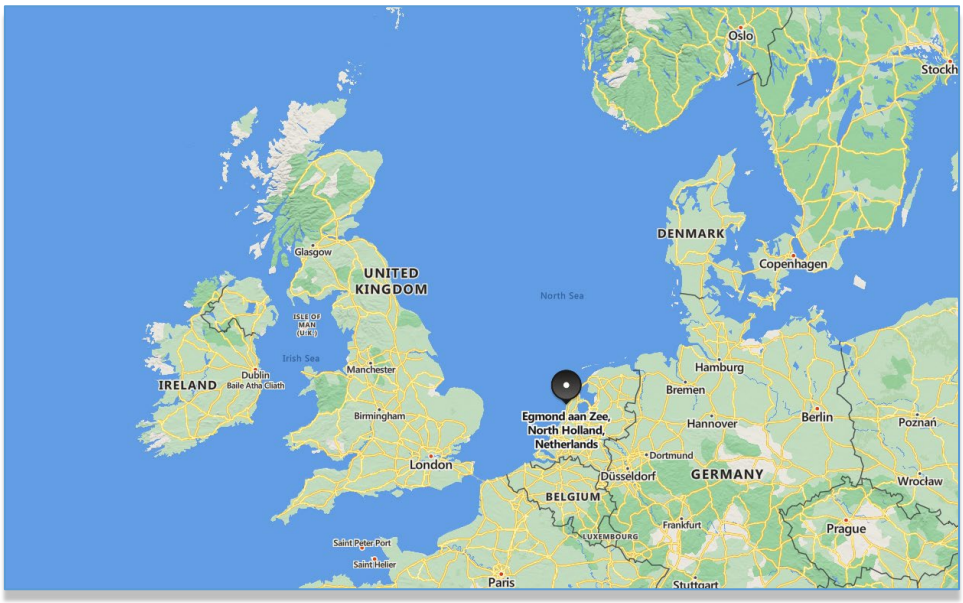


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

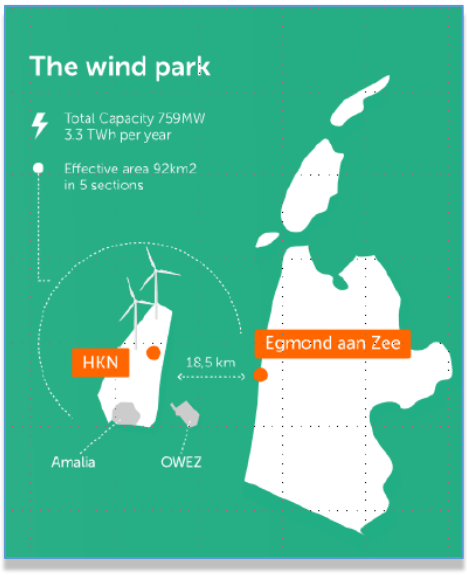


Figure 2 - Wind Park Details

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.

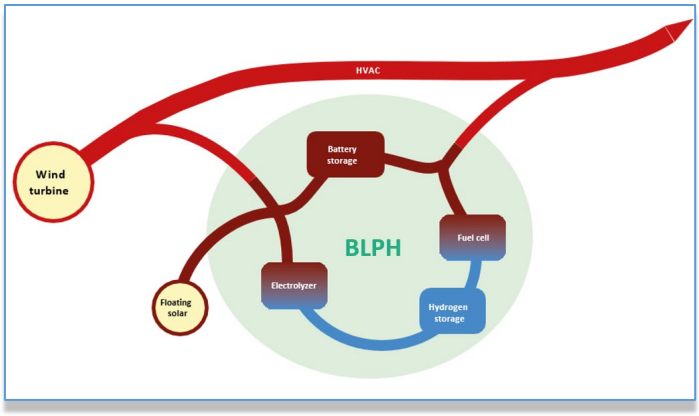


Figure 3 – BLPH Concept

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.

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2 DOCUMENT SCOPE

This document has the scope of giving instructions to the Company's personnel for the performance of Code hydrostatic tests on pressure vessels and piping, before painting

2.1 REFERENCES

Doc. No.	Description
1724000428-PR-PID-00019	PACKAGE P&ID
1724000428-MAC-DA-00005	CERTIFIED PACKAGE GENERAL ARRANGEMENT AND DIMENSIONAL OUTLINE DRAWINGS (INCLUDING : NAMEPLATE, BASEFRAME, FOUNDATION LOADS, NOZZLES LOADS, NOZZLES LIST, BATTERY LIMITS, CoG)

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 HYDROSTATIC TEST PROCEDURE

3.1 SCOPE

This procedure has the scope of giving instructions to the Company's personnel for the performance of Code hydrostatic tests on pressure vessels and piping, before painting.

Complete list of items to be tested is:

Item	Tag. no.	Serial no.	Design Pressure	Test Pressure	Note
PSA tower	C-64001A	S240129	12 barg	17.2 barg	Acc. to 2014/68/EU
PSA tower	C-64001B	S240130	12 barg	17.2 barg	Acc. to 2014/68/EU
After-Filter	S-64001A	S240131	12 barg	17.2 barg	Acc. to 2014/68/EU
After-Filter	S-64001B	S240132	12 barg	17.2 barg	Acc. to 2014/68/EU
N2 receiver	V-64001	S240120	12 barg	17.2 barg	Acc. to 2014/68/EU
Piping	/	/	12 barg	17.2 barg	Acc. to 2014/68/EU

3.2 REFERENCE CODES AND STANDARDS

ASME VIII DIV. 1 Edition 2021

2014/68/EU (PED)

3.3 RESPONSIBILITY

The QCI shall prepare the item for the Hydrostatic test and proceed to the performance of the test with his personnel following the instructions of the Company's QCM who has the responsibility of the enforcement of this procedure, the QC Manual and the Code.

3.4 PREPARATION

3.4.1 The code hydrostatic test follows all manufacture and inspection activities.

3.4.2 The QCM, after having ensured himself that all inspection activities have been satisfactorily completed and reported in the QC plan, authorizes the Shop Manager to prepare the item for the hydrostatic test.

3.4.3 The hydrostatic test shall be done prior to painting.

3.4.4 The Vessel shall be adequately supported before being filled with water, to avoid distortions.

3.4.5 The test medium shall be clean water. The hydrostatic testing of equipment with internal surfaces in austenitic stainless steel material shall be carried out with potable quality water having a maximum chloride content of 30 ppm. For other materials, water with chloride content greater than 250 ppm shall not be used for testing. The temperature of the test water shall be between 5°C to 40°C. The perimeter of the hydrostatic testing should be barricaded, and signs should be set up to inform others that a hydrostatic test is in progress.

3.4.6 All connections shall be blanked off by means of adequate plugs or blind flanges of the rating specified in the drawing, same service gaskets and bolting of the same size and resistance as those specified in the drawing.

3.4.7 The QCM shall provide the required calibrated pressure gauge: the pressure gauge shall be directly connected to the item to be hydrostatic pressure tested, and shall be directly visible by the operator conducting the test. Pressure gauge shall be graduated over a range of about double the intended maximum test pressure but in no case less than 1.5 nor more than 4 times that pressure.

3.4.8 All gauges shall be calibrated against a standard dead-weight tester or a calibrated master gauge. Gauges shall be re-calibrated at any time that there is reason to believe that they are in error.

3.4.9 Calibration records shall be available for review prior to testing.

3.4.10 The Vessel to be tested shall be filled with water and adequately vented from the highest point.

3.4.11 The hydrostatic pressure to be applied shall be that shown on the drawing and shall be read at the highest point of the vessel as positioned for the test, if the pressure gauge is not at this level, the geodetic difference from the top of the vessel and the pressure gauge shall be disallowed from pressure gauge reading. Test pressure shall be determined in accordance with the Division used for construction.

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3.5 EXAMINATION

3.5.1 Start hydrostatic test pump to reach the required test pressure as mentioned into paragraph 3.1 of this document, which should increase pressure 3 steps. Each step should hold the time not less than 5 minutes before increasing pressure to the next step.

3.5.2 The test pressure shall be maintained for a sufficient time to detect leakage. The minimum time the hydrostatic test is maintained is 30 minutes, during the first 15 minutes it is not recommended to make the close up examination, but only a check of the pressure gauge and a distant examination for conspicuous leaks. Close up examination is performed after the first 15 minutes of stabilization. The safety considerations recommend the close up examination may be performed after having decreased the test pressure to the test pressure divided by 1.3 times.

3.5.3 Except for leakage that might occur at temporary test closures for those openings intended for welded connections, leakage is not allowed at the time of the required visual inspection. Leakage from temporary seals shall be directed away so as to avoid masking leaks from other joints. No permanent deformation is allowed.

3.5.4 After testing, the equipment shall be drained and dried to prevent corrosion. Do not leave systems filled with water. During draining a vent valve shall be open at the highest point of the equipment to prevent vacuum.

3.5.5 During testing it is not foreseen a significative ambient temperature change which could bring to a change of test pressure.

3.6 TEST RECORDS

3.6.1 Upon satisfactory completion of the hydrostatic pressure test the QCM shall prepare, date and sign the "Hydrostatic test report" which shall contain at least the following data:

- Equipment identification and test position (horizontal or vertical) if different from the drawing.
- Test pressure, time and close up examination pressure if different.
- Test medium, serial No. range and calibration date of pressure gauge used.
- Date and signature of the QCM.

3.6.2 The hydrostatic test certificate shall be retained in the QC file for the job.

3.7 AUTHORIZED INSPECTOR

For items belonging to 2014/68/EU Category II and above, the Authorized Inspector from Notified Body must witness the hydrostatic test