Base Load Power Hub (BLPH)

CLEANING PROCEDURE FOR HYDROGEN LINES

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Attachment 1 – CLEANLINESS REPORT

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.

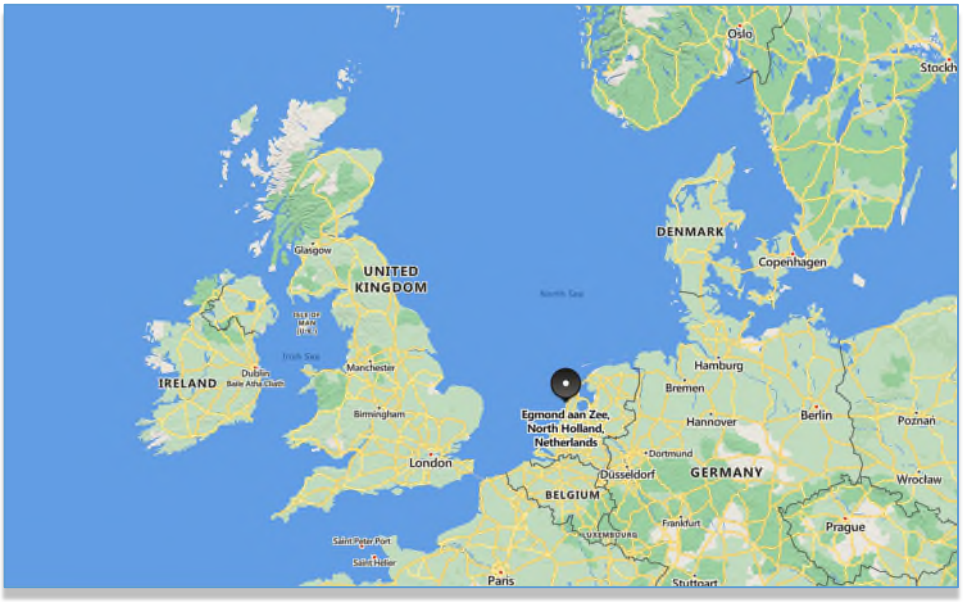


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

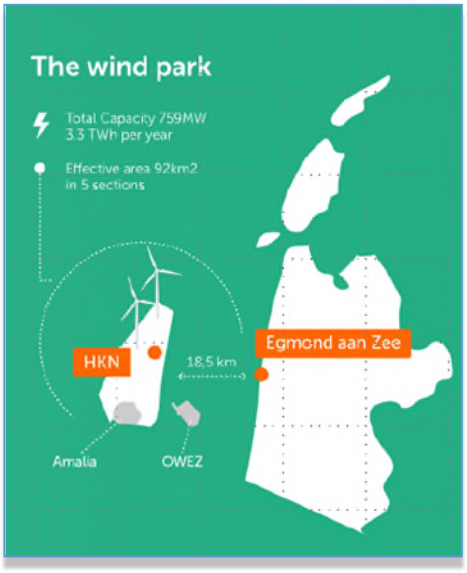


Figure 2 - Wind Park Details

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.

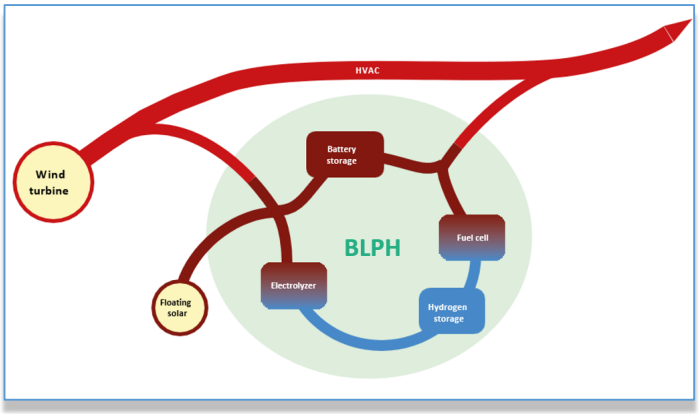


Figure 3 – BLPH Concept

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 PURPOSE

This procedure applies to the activities carried out in Rosetti Marino yard for CROSSWIND BLPH project. It aims to ensure that the piping lines for which process fluid is hydrogen, are properly flushed and cleaned to avoid contamination.

Exclusions

This procedure excludes all other process fluid lines and the hydrogen vent line.

3 SCOPE

This procedure is specifically issued and implemented for the Base Load Power Hub (BLPH) project, undertaken for Crosswind.

4 REFERENCES

Doc. No.	Description
CW-I-WP4-2023-05	CONTRACT
CONTRACT SECTION V	SCOPE DESCRIPTION
CONTRACT SECTION IX	QUALITY_MANAGEMENT
123A90-PML-QHSE-QP-00002	PROJECT QUALITY PLAN

Table 1 - Reference Documents

4.1. DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project
PLANT:	Base Load Power Hub (BLPH)
VENDOR OR SUPPLIER	Any organization employed by Rosetti Marino to supply either products or services.
Inspection and Test Plan (ITP)	Document, which identifies the activities to be inspected as well as specifications, methods and acceptance criteria for monitoring and/or testing. It is a synonymous of "Quality Control Plan" (QCP)
FUSIONLIVE	Contractor Electronic Document Management System.

MDR	Master Document Register
DDL	Design Document List
SDL	Supplier Document List
FDL	Fabrication Document List
CPI	Company provided Items

Table 2 - Definitions and Abbreviations

5 RESPONSIBILITIES

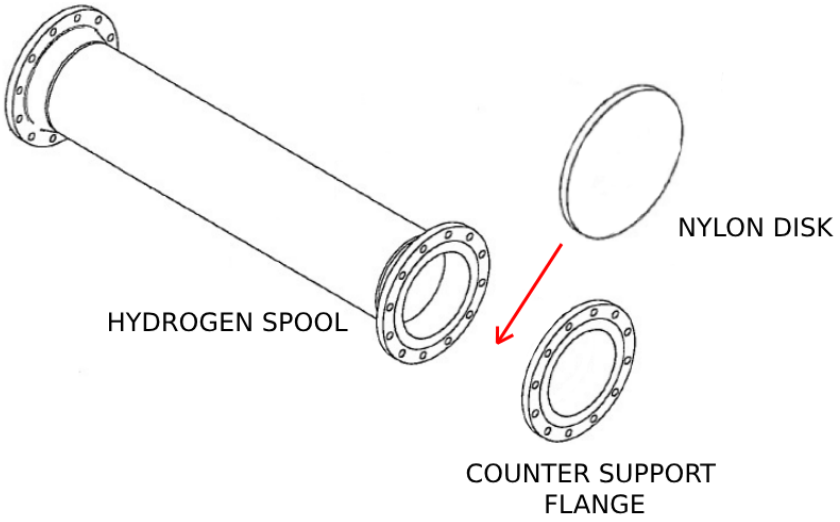
- CONSTRUCTION MANAGER (CM)
  - Ensure that personnel involved have full understanding, competency and sufficient knowledge in management of erection, testing, flushing and final cleaning of piping hydrogen lines.
  - Ensure that the test pack is properly tested, flushed and cleaned with the right equipment and that the proper documentation is correctly updated.
- PIPING ERECTION SUPERVISOR:
  - Direct and supervise all personnel involved in joint welding and testing.
  - Ensure the correct welding and NDE testing is performed prior to the testing of each individual joint.
  - Daily coordination to allow witnessing by inspectors of test packs during reinstatement and cleaning activities.
  - Demonstrate safe working practices, including handling and working with compressed air and fluids under pressure.
- PIPING OPERATORS:
  - Prepares the line for reinstatement after hydrotesting.
  - Prepares the circuit to connect the compressed air system for blowing of the circuit.
  - Assemble all bolted flange connections using correct bolts, gaskets, for all the piping lines
- QC INSPECTOR:
  - Witness 100% of the cleaned lines.
  - Inspect all reinstated and cleaned piping lines to ensure cleanliness and free from defects and damage.
  - Record and signs the reinstatement and cleanliness report (Attachment #01)
  - Ensure the ongoing completion of records for all the lines involved.

6 PERFORMANCE OF OPERATIONS

The already hydrotested piping lines, for which fluid is Hydrogen, will be prepared for a thorough cleaning process using compressed air and resistance disks in plastic nylon. The function of the disks is to act as a resistance barrier that will blow up increasing the pressure and speed of air inside the piping lines. This process will help clean the lines thoroughly, removing all traces of dirt, debris, scale and dust.

6.1. INSTALLATION OF NYLON DISK

As the hydrogen spools are done with the hydrotesting activities, they will be prepared for the internal cleaning. This will be done by first installing a nylon disk between the last flange and a counter support flange used to keep the nylon disk in between. The layout will be as follows:



Installation of the nylon rupture disk layout

6.2. BOLTING-UP OF THE CONNECTION

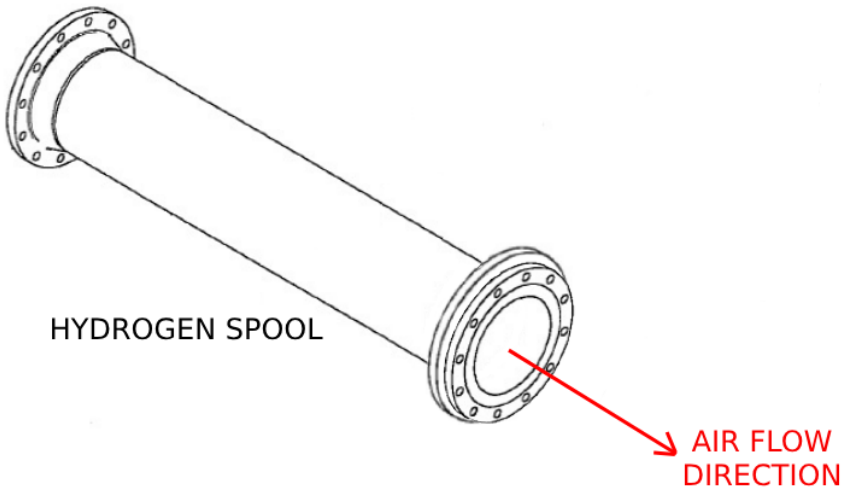
As the nylon disk is installed between the spool flange and the counter support flange, related gaskets and bolt will be installed prior to start pressuring the system.

6.3. PRESSURIZING THE SYSTEM – BLOW OUT

As the pipe spool is ready with the nylon disk installed and properly tightened, the system is ready to be put under pressure. From the inlet point, compressed, dry, and clean air will be pumped inside the spool and a pressure increase should be observed.

The air pressure will start acting against the nylon disk. As the pressure increases, the nylon disk will start deforming and will eventually break, letting go all the internal pressure with a high velocity blow out. This

blow out is the process that will clean all the traces of dirt, debris, scale and dust. The system will work as follows:



Blow out air flow direction

6.4. CLEANING ACCEPTANCE

The pressurization of the system and consequent blow out will take out most of the dirt, debris, scale and dust. However, if a considerable amount of particles can still be observed the same can be repeated as needed.

Once the piping spool shows no clear sign of dirt particles, the same can be considered acceptable and the test pack can be considered closed.

7 SAFETY – PPE/WORK AREA

Relevant recommendation stated in the Project HSE plant and Company safety standard shall be complied with. Hereafter are listed precaution concerning specific aspects.

Correct PPE will be worn at all times. Eye protection must be worn whilst on the worksite & must be worn during all testing and cleaning operations.

When working at heights or where danger exists from falling objects, equipment should always be secured wherever reasonably practicable.

When working at height, areas below must be cordoned off where risk of falling objects is present.

The working area in which the cleanliness operations will occur will be barricaded and no access will be given to unauthorized persons.

Moreover, to avoid any possible interference with other teams working in the area, the cleanliness activities will be conducted during lunch time or when the shift is over.

Attachment #1: CLEANLINESS REPORT

ROSETTI MARINO CROSSWIND

ITEM	Tag	:			Dwg		
	S/Sys	:			Module		
TASK	code		Location		User		
FORM	Process MC	Activity PIP	Discipline Piping	Form TMX03		Cleaning	

CLEANING MEDIUM

Air		Water		Steam		Oil		Other		Mechanical	

Component

Chemical treatment | Filtration | Screen size

EQUIPMENTS

Equipment **removed** | Agreed list of removed fragile devices to be attached to this Test Sheet

Excepted removed equipments, pipework installation is conform to the specifications & PID's

Equipment **added** | Exhaustive list to be attached (temporary filters, spools...etc)

TEST RESULTS

Test date		Start time		End time	
Flow rate		Duration		Medium T°	

Operation Description

Safety Precautions

Result and comments

Page 1/1	Performed by	☐ WITNESS ☐ REVIEW	☐ WITNESS ☐ REVIEW
Company			
Name			
Date			
Signature			