Base Load Power Hub (BLPH)

OTP – Document Template

Document Number: 123A90-PML-COM-PRO-03056

Document Class: 2

01	01/08/2024	Issue for Acceptance (IFA)	K.CASTELLANI	A.IVESON	M.BRUNELLI
00	15/07/2024	Issue for Review (IFR)	A.IVESON	O.AMADEI	M.BRUNELLI
Rev.	Date	Description	Prepared	Reviewed	Approved

This document undergoes an issuance cycle within EDMS "FusionLive". Its distribution is electronically controlled.
Once printed shall be considered as "NOT CONTROLLED" copy.

Revision / Change Log

Rev.	Description
00	Issue for Review (IFR)
01	Issue for Acceptance (IFA)

HOLDS LIST

No.	Description
1	
2	
3	
4	

Table of Contents

1. INTRODUCTION 4

1.1 Project Overview 4

1.2 Project Location 4

1.3 Project Concept 5

List of Figures

Figure 1 - HOLLANDSE KUST NOORD WIND PARK Location Map 4

Figure 2 - Wind Park Details 5

Figure 3 – BLPH Concept 6

List of Tables

Not applicable

List of Attachments

Attachment 1 – OTP Template – Table of contents

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.

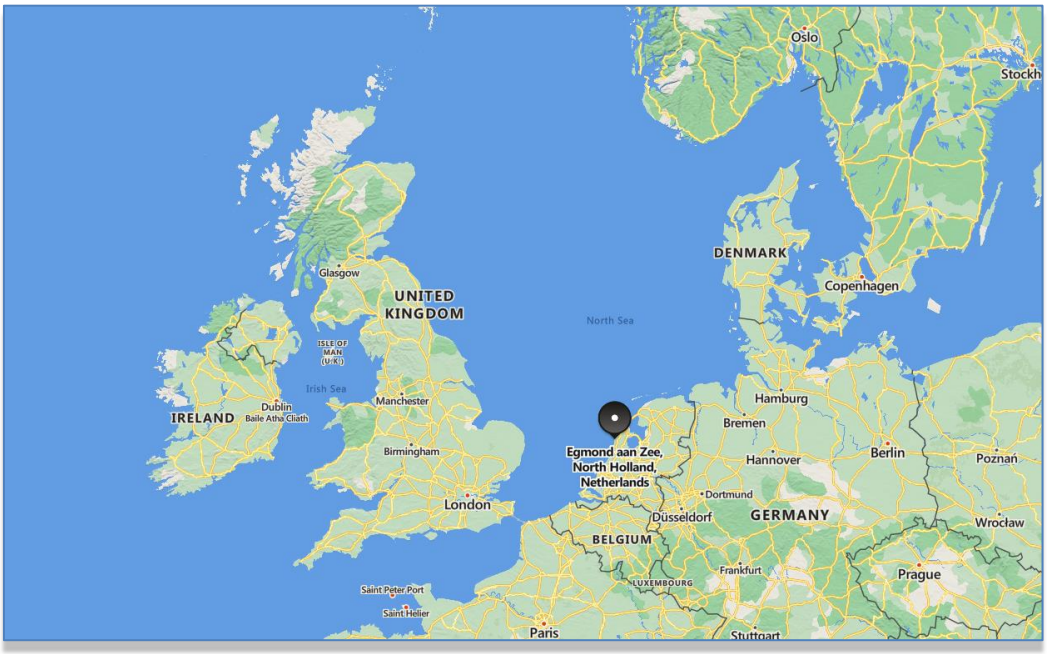


Figure 1 - HOLLANDSE KUST NOORD WIND PARK Location Map

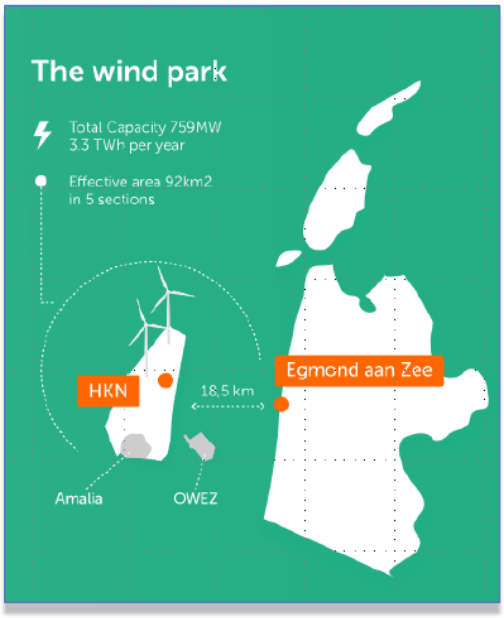


Figure 2 - Wind Park Details

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 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.

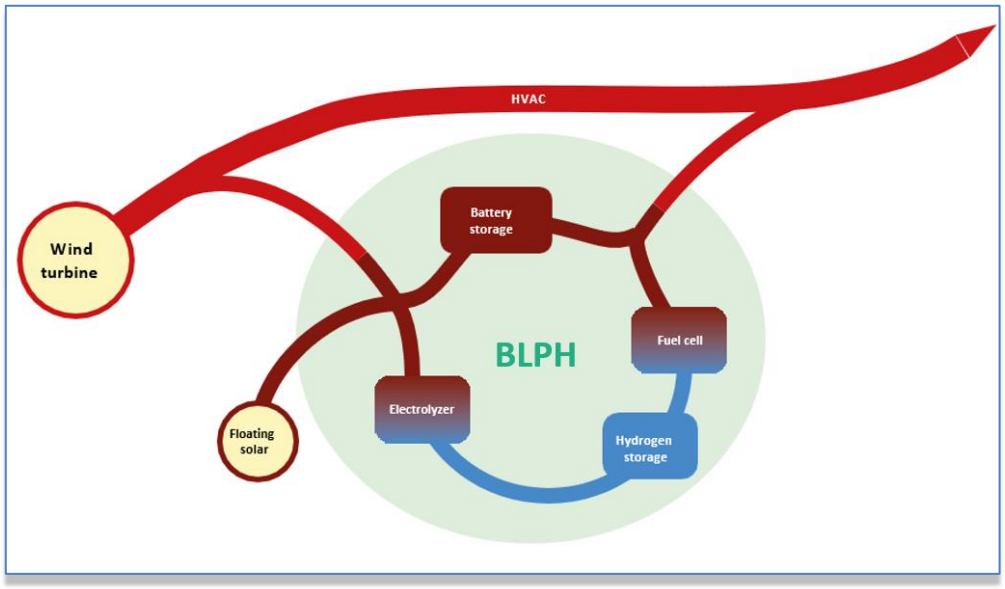


Figure 3 – BLPH Concept

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 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.

OTP – TEMPLATE (TABLE OF CONTENTS)

1 INTRODUCTION .....
1.1 Project Overview .....
1.2 Project Location .....
1.3 Project Concept .....

2 DOCUMENT SCOPE .....

3 OTP SUMMARY.....
3.1 Test Objective .....
3.2 System Boundary Limits .....
3.2 Test and System Description .....
3.3 Safety Devices .....
3.4 HSE Management.....
3.5 Acceptance Criteria.....

4 DOCUMENTS REFERENCES AND ABBREVIATIONS .....
4.1 Reference Documents.....
4.1.1 Company Documents and Standards.....
4.1.2 Project Documents .....
4.1.3 Vendor Documents.....
4.2 Acronyms and Abbreviations .....

5 OTP AT ONSHORE WORKSITE.....
5.1 PLANNING AND MANPOWER .....
5.1.1. Planned tasks with estimated manpower .....
5.1.2. Test duration estimate.....
5.1.3. Vendor Assistance.....
5.1.4. Items Postponed to C&E OTP .....
5.1.5. HOLDS .....

5.2 OTP TEST REQUIREMENTS – ONSHORE WORKSITE.....
5.2.1. Pre-Commissioning Achievement.....
3.2.2. Commissioning Achievement.....
5.2.3. Status of Required Associated Subsystems.....
5.2.4. Special Tools & Test Equipment.....

5.2.5. Consumable List
5.2.6. Commissioning Spare Parts
5.2.7. Temporary Facilities

5.3 OTP DESCRIPTION – ONSHORE WORKSITE
5.3.1 OTP Test Preparation
5.3.2 Electrical Preparation
5.3.3 Mechanical Preparation
5.3.4 Instrument Preparation
5.3.5 Piping Preparation
5.3.6 Additional Discipline Preparation

5.4 OTP TEST STEPS - ONSHORE WORKSITE
5.4.1 Test Preparation
5.4.n Test Steps
5.4.10 OTP Worksite Tests Notes and Remarks
5.4.11 OTP Worksite Tests Certifying Authority Table of Attendances
5.4.12 OTP Worksite Tests Final Signatures and Company Acceptance

5.5 POST TEST CONDITIONS

5.6 REINSTATEMENT AND PRESERVATION TASKS

6 OTP AT OFFSHORE SITE
6.1 PLANNING AND MANPOWER
6.1.1. Offshore site test overview
6.1.2. Planned tasks with estimated manpower
6.1.3. Test duration estimate
6.1.4. Vendor Assistance
6.1.5. Items Postponed to C&E OTP
6.1.6. HOLDS

6.2 OTP TEST REQUIREMENTS – OFFSHORE SITE
6.2.1. Pre-Commissioning Achievement
6.2.2. Commissioning Achievement
6.2.3. Status of Required Associated Subsystems
6.2.4. Special Tools & Test Equipment
6.2.5. Consumable List

6.2.6. Commissioning Spare Parts .....
6.2.7. Temporary Facilities .....

6.3 OTP DESCRIPTION – OFFSHORE SITE .....
6.3.1 OTP Test Preparation .....
6.3.2 Electrical Preparation .....
6.3.3 Mechanical Preparation .....
6.3.4 Instrument Preparation .....
6.3.5 Piping Preparation .....
6.3.6 Additional Discipline Preparation .....

6.4 OTP TEST STEPS - OFFSHORE SITE .....
6.4.1 Test Preparation .....
6.4.n Test Steps .....
6.4.10 OTP Site Tests Notes and Remarks .....
6.4.11 OTP Site Tests Certifying Authority Table of Attendances .....
6.4.12 OTP Site Tests Final Signatures and Company Acceptance .....
6.5 POST TEST CONDITIONS .....

6.6 REINSTATEMENT AND PRESERVATION TASKS .....

7 APPENDICES .....
7.1 Vendor SAT Procedure (where applicable) .....
7.2 Proverlis Summary System Reports .....
7.3 Equipment Related Technical Queries (where applicable) .....
7.4 As Built Documentation (where applicable) .....
7.5 Management of Change – Summary Table of Tasks and Details of Affected Related Documentation (where applicable) .....