Base Load Power Hub (BLPH)

Detail Design and Shop Drawing Site Modification Procedure (Red Line Mark-Up)

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Revision / Change Log

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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.

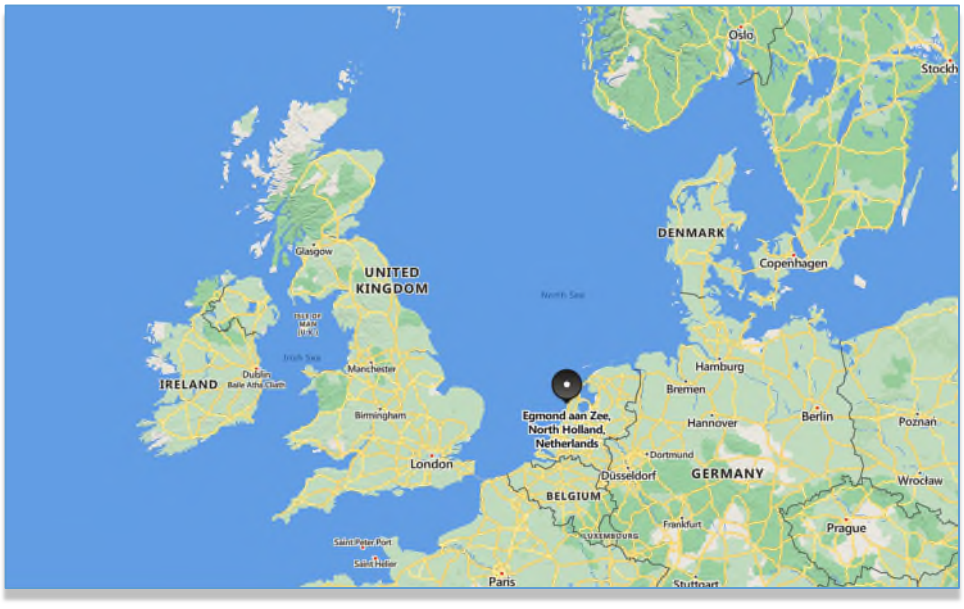


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

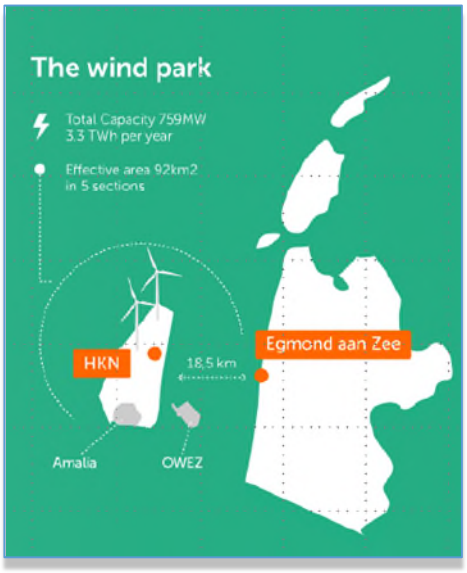


Figure 2 - Wind Park Details

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.

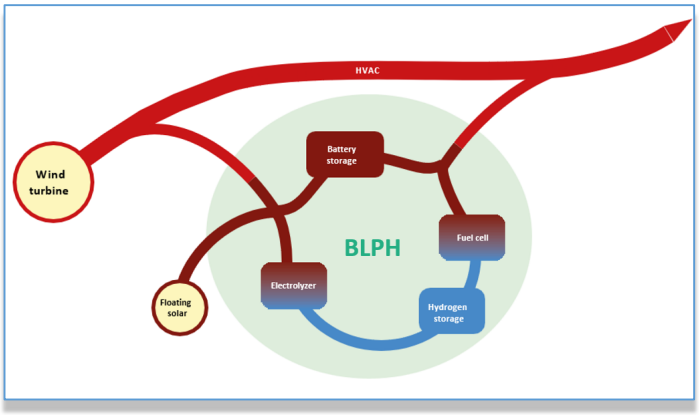


Figure 3 – BLPH Concept

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

The purpose is to establish a process that allows to handle on a fast-track mode all the modifications occurring during Project's Construction Phase, in such a way to be compatible with the multiple activities running in parallel (procurement, construction engineering, construction, …) and the high evolving rate determined by the construction schedule.

The modifications treated in this procedure shall be minor modifications so as that the original final functionality of the modified item cannot be judged as compromised. The modifications considered are typically constructability-related issues, last-minute design adjustments, material substitution driven by availability issues.

In any case, final main purpose is to ensure that there is no adverse impact on conformity of contractual requirements and Project Specifications.

This procedure refers to both modifications to Detail Design documents and Shop Drawings.

With respect to Detail design documents, the procedure defines the flow and control measures, to ensure that, during construction phase, all modifications made to Detail Design documents receive proper review and approval before their implementation.

With respect to Shop drawings, chapter 6, the procedure describes how a limited group of modifications to shop drawings are handled through a form called Design Change Note (DCN).

2.1 REFERENCES

Doc. No.	Description
CONTRACT - SECTION V	Scope Description
K559-2254-PM-PLN-003	Basic Design Engineering Package

2.2 ABBREVIATIONS

Term	Description
DEM	Design and Engineering Manual
DEP	Design and Engineering Practice
MDR	Master Document Register
PEM	Project Engineering Manager
RLMU	Redline Mark-up
ASB	As Built

3 DETAIL DESIGN DOCUMENTS CHANGE IDENTIFICIATION AND REQUEST

3.1 CHANGES GENERATED BY

CONSTRACTOR's Engineering Department

SUB-CONTRACTORS' Engineering or Construction Department

Vendors (through CONTRACTOR or any SUB-CONTRACTOR)

COMPANY (through CONTRACTOR)

3.2 CHANGES PROPOSED BY

Non-compliance to specifications (subject to TQ/DR Technical Queries and Deviations Management Procedure)

Incomplete design/omission

Release of Hold

Change Order

Improvement to Arrangement/Details

Site Interference

Wrong Certified Information/Drawing

Recently received Certified Information/Drawing

Insufficient Detailing/Information

Constructability needs

Safety issues

Human Error

Operability/maintainability

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4 DETAIL DESIGN DOCUMENTS CHANGES APPROVAL PROCESS

4.1 DESIGN CHANGES INITIATED BY CONTRACTOR

CONTRACTOR creates a Red Line Mark Up (RLMU) copy of an existing Detail Design document. For a RLMU sample format, refer to Chapter 8. RLMU copy is duly signed by CONTRACTOR's representative and submitted for approval or information

Any change to the design that is a complete philosophy change, like can be a logic change, cable routing change, wiring, etc, will be agreed and approved between COMPANY and CONTRACTOR

Refer to following Flowchart in chapter 7.

CONTRACTOR submits RLMU in parallel to sub-contractor for implementation under its full responsibility should any applicable comment have impacts.

For further details regarding RLMU preparation refer to Chapter 5. Samples of RLMU drawing are shown in Chapter 9.

4.2 MASTER COPY BOOK

CONTRACTOR shall store the received RLMU copy into the Master Copy Book (hard copies). For onshore and offshore construction activities, the Master Copy Book and RLMU register is managed by CONSTRUCTION.

At the end of the works CONTRACTOR shall collect the Master Copy Book from CONSTRUCTION for RLMUs implementation into Detail Design documents, As-built revision.

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5 RED LINE MARK UP DRAWING

RLMU copies are managed by CONTRACTOR.

RLMU generator shall put a revision No. for RLMU copy. The revision No. be the same of the last applicable revision, followed by alphabetical letter like A, B, C etc...

E.g.: if RLMU is made on a drawing in rev. 01, the drawing shall be marked with changes as revision 01A. If subsequent RLMUs shall occur, the revision index will grow 01B, 01C, etc.

Refer to the sample RLMU drawing in Chapter 8.

CONTRACTOR shall apply the MASTER COPY stamp on RLMU drawing before transmitting to COMPANY with the stamp with the name of who request the modification and the name for Approval of the Project Engineering Manager or Commissioning Manager.

Refer to the sample stamps in Chapter 9.

For Tracking the RLMU, an indication is shown in "FusionLive" document description, in such way that there is direct evidence whenever the document is researched by a potential user.

6 SHOP DRAWINGS DESIGN CHANGES NOTES

CONSTRUCTION shop drawings shall be officially revised to incorporate any change in and accordingly revised drawing shall be issued to all the concerned parties.

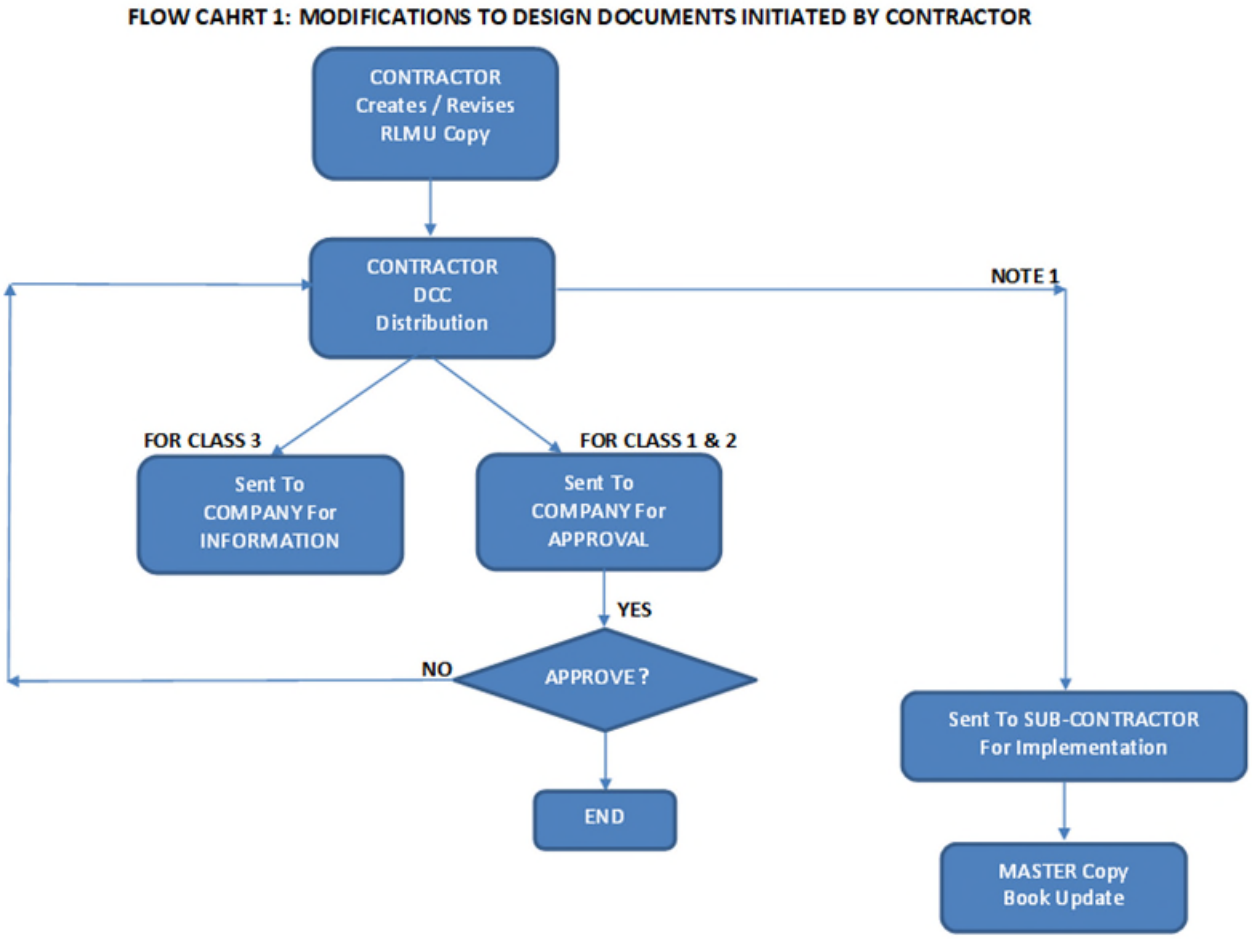
However, for minor changes in shop drawings due to the following reasons:

- joint numbering
- missing dimensions
- Part Nos.,
- Mistaken referred documents

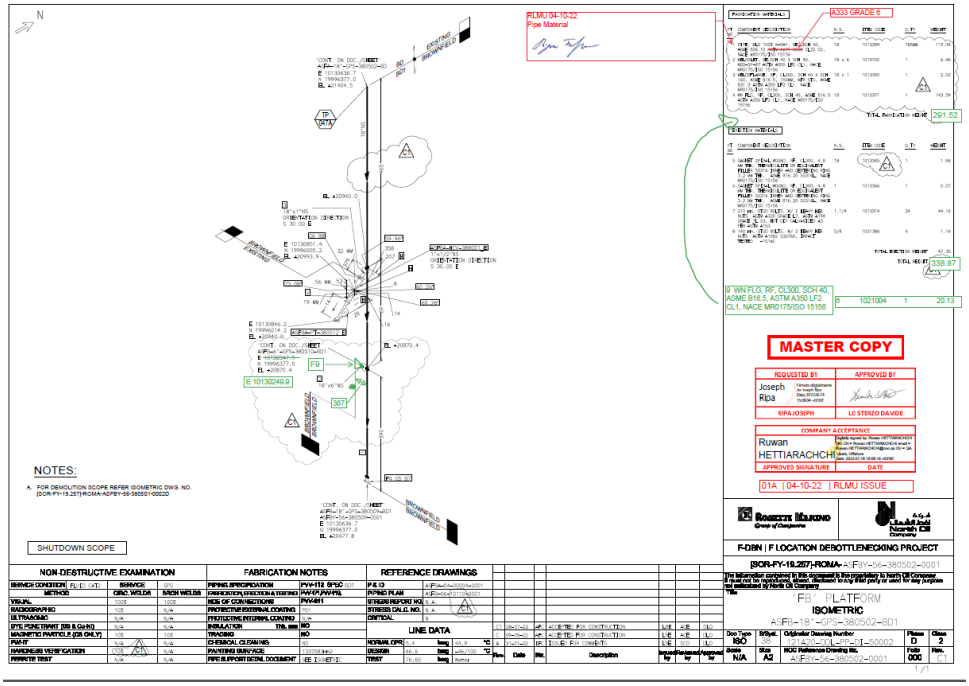
instead of revising the relevant shop drawing, CONSTRUCTION will prepare a RLMU.

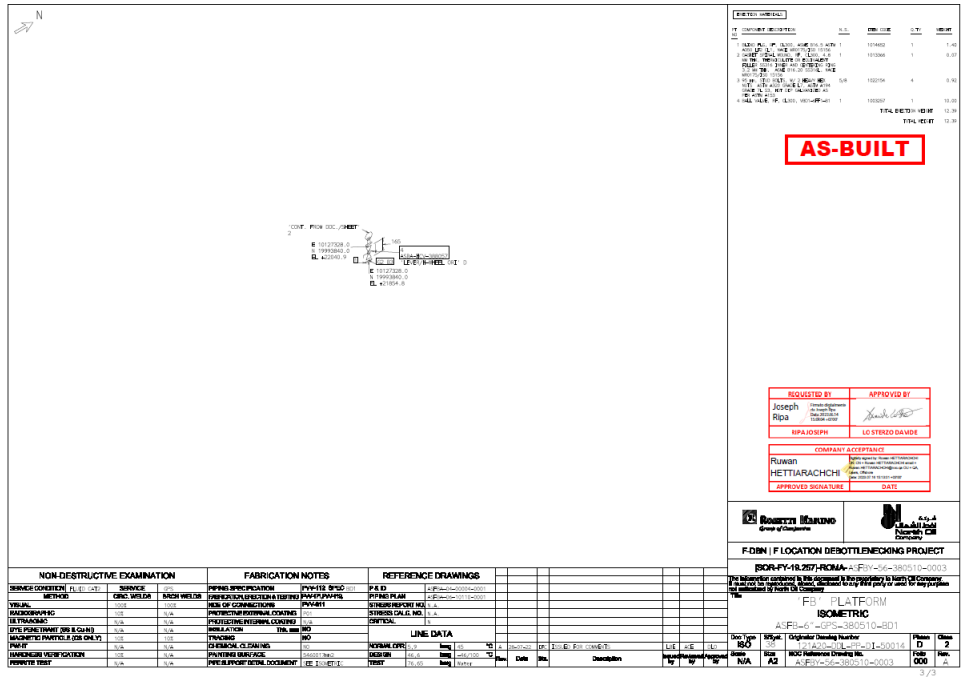
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7 FLOWCHART


FLOW CAHRT 1: MODIFICATIONS TO DESIGN DOCUMENTS INITIATED BY CONTRACTOR
CONTRACTOR Creates / Revises RLMU Copy
CONTRACTOR DCC Distribution
NOTE 1
FOR CLASS 3
Sent To COMPANY For INFORMATION
FOR CLASS 1 & 2
Sent To COMPANY For APPROVAL
YES
NO
APPROVE ?
END
Sent To SUB-CONTRACTOR For Implementation
MASTER Copy Book Update

8 RLMU / AS BUILT DRAWING SAMPLE





9 STAMPS SAMPLE

REQUESTED BY	APPROVED BY
Name	LO STERZO DAVIDE

COMPANY ACCEPTANCE	
APPROVED SIGNATURE	DATE

MASTER COPY

AS BUILT

10 AS BUILT PREPARATION

All documents that, as per MDR, shall be moved to ASB stage, will be stamped with above stamps shown in chapter 9 depending on if they have a markup (Master Copy stamp) or not (As Built stamp).

Document must be signed by CONTRACTOR and COMPANY before as built preparation so that there will be control everything has been constructed as per Engineering design approved by COMPANY.

Once all documents are signed and stored in a proper folder, CONTRATCOR will start PRE-ASB preparation and will submit to COMPANY, trough Aconex, the PRE-ASB document, attaching inside the document, the PDF format signed copy (see chapter 8) for COMPANY verification to proceed with As Built preparation.

PRE-ASB copy will be verified by COMPANY only against markup/as built copy previously signed to verify that all mark ups, previously agreed and signed, are implemented or not.

COMPANY shall approve pre-asb documents in Aconex within 2 months from submission. If approval will not arrive in two months, documentation will be considered approved and moved in ASB stage.

CONTRACTOR will not implement any further comment that are not previously represented on signed documents.

Once PRE-ASB copy will be approved, CONTRACTOR will issue As Built copy for information only, not subject to COMPANY approval or comments.