Base Load Power Hub (BLPH)

HIRA Report

Prefabrication and Mechanical Completion

Document Number: 123A90-PML-QHSE-PRO-00068

Document Class: 2

01	20/11/2023	Issue for Review (IFR)	D. Ricci Picciloni	D. Franchi	M. Brunelli
00	20/10/2023	Issue for Review (IFR)	D. Ricci Picciloni	D. Franchi	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

Table of contents

1 INTRODUCTION 4

1.1 Project Overview 4

1.1.1 Project Location 4

1.1.2 Project Concept 5

2 DOCUMENT PURPOSE 6

2.1 REFERENCES 6

2.2 DEFINITIONS AND ABBREVIATIONS 6

3 HIRA STUDY METHODOLOGY 10

3.1 HIRA workflow 11

3.2 Priority 11

4 HIRA SESSION AND TEAM MEMBERS 12

5 HIRA Outcomes 13

6 ANNEXES 14

Annex 1 Risk Register 15

Annex 2 Attendance sheet 16

Annex 3 Hazard Guidewords 17

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

List of Figures

Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map 4

Figure 2 - Wind Park Details 5

Figure 3 – BLPH Concept 5

Figure 4 – Risk Assessment Matrix ..... Errore. Il segnalibro non è definito.

List of Tables

Table 1 - Node description 11

Table 2 – Risk Assessment Matrix (RAM) 12

Table 3 – HAZID Attendees 13

Table 4 – Recommendations 14

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.

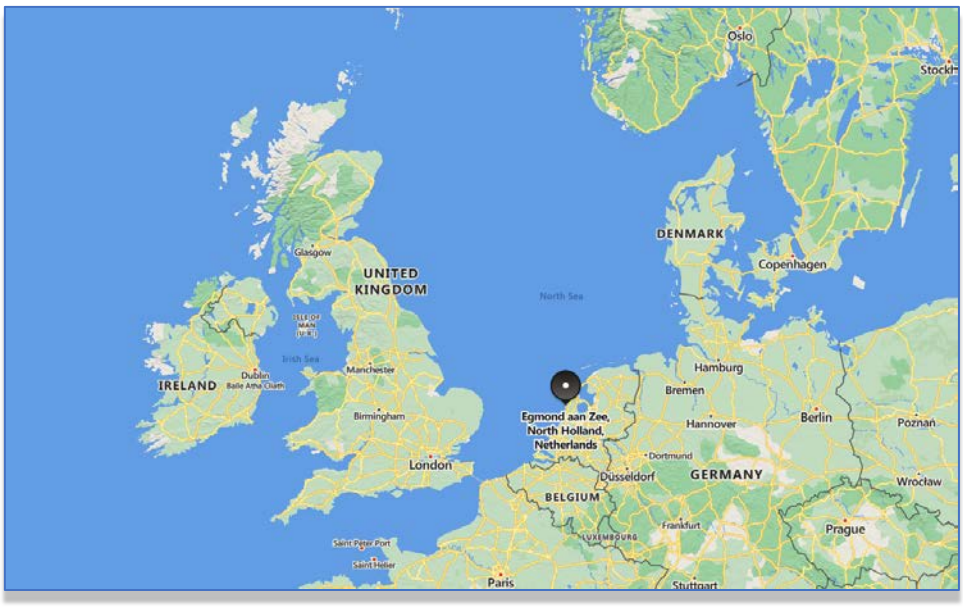


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map



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.

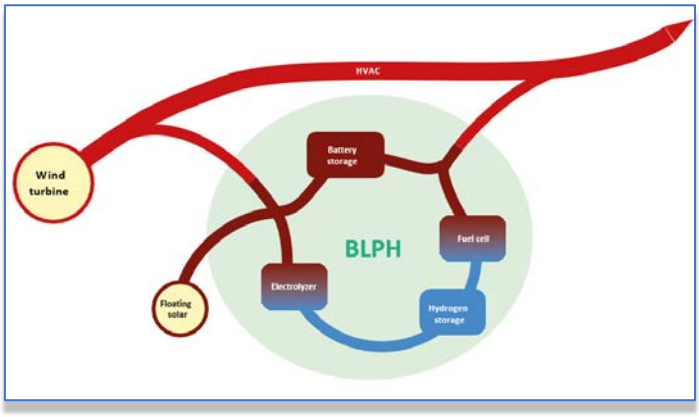


Figure 3 – BLPH Concept

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 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.

2 DOCUMENT PURPOSE

The Hazard Identification and Risk Assessment (HIRA) Report provides a systematic assessment of potential hazards associated with a particular project, process, or operation. The primary objective is to identify and evaluate potential risks at an early stage, enabling the duty holders to implement appropriate measures to mitigate these risks and ensure a safe system of work and reduction of risks to an acceptable level .

This HIRA study was conducted for the fabrication and construction Phase, up to mechanical completion, of the project with the following objectives:

- Identify major hazard scenarios, which result from the operation under consideration (emphasis on Severity 5 and Red Risk Hazards on the RAM) and threats that relate to potential major hazard accidents.
- Identify the essential controls required to ensure risks are tolerable and ALARP (As Low As Reasonably Practicable).
- Make recommendations/action items that will be implemented in the design. Subsequent completion of these actions to eliminate, reduce and control risks will become a key part of the formal demonstration of ALARP.
- Identify and assign the action owner for each recommendation made.
- Gain a common understanding of the relevant HSE risks.
- Provide input to update the Hazards & Effects Risk Register.

The scope of the HIRA excludes the commissioning works, whose will be assessed in a later stage of the project.

2.1 REFERENCES

Doc. No.	Description
123A90-PML-QHSE-PL-00001	Contract HSSE Plan - Onshore Phase
123A90-PML-CON-PL-04000	Construction Execution Plan

2.2 DEFINITIONS AND ABBREVIATIONS

AED	Automated External Defibrillator
ASC	Yard approved switchboard
ALARP	As Low as Reasonably Practicable
CEI	Comitato Elettrotecnico Italiano
CM	Construction Manager

CPE	Collective protective equipment
CPY	Company
CTR	Contractor
ERT	Emergence Response Team
GOW	Global Wind Organization
HAZID	HAZard IDentification
HIRA	Hazard Identification and Risk Assessment
HSE	Health, Safety and Environment
IOGP	International Oil & Gas Producers
IIF	Incident & Injury Free
ISO	International Standard Organization
JSA	Job Safety Analysis
LTIF	Lost Time Injuries Frequency
MSDS	Material Safety Data Sheet
NDT	Non-destructive testing
PHSEM	Project HSE Manager
PLE / MEWP	Piattaforma di lavoro elevabile / Man Elevating Working Platform
PMT	Project Management Team
PPE	Personal protective equipment
SIMOPS	Simulta neous Operations
SPMT	Self propelled modular transporter
STARRT / TBT	Safety Talk Analysis Reduction Talk / Tool Box Talk
VTS	Head Qarter CTR Site located in Via Trieste, 230 - Ravenna
YPB	Fabrication Yard "Piomboni" located in Via Del Marchesato, 37 - Marina di Ravenna (RA)

For this document, the words and expressions listed below shall have the meaning assigned to them as follows:

Definitions	Description
ACCIDENT	An unplanned, unwanted event which leads to injury, damage or loss, at yard or externally.
ALARP	A risk that has been reduced to a reasonably practicable level that CONTRACTOR is willing to assume with respect to its legal obligation, its HSE policy and its HSE objectives
Applicable Laws	LAWS relating to HSE, including by obtaining any required permits, certifications or authorisations, prior to conducting the relevant part of the WORK
Asset Damages	Accidents that cause damage to an equipment/object in use. Such an accident may require the suspension of operational activities in order to repair or replace the equipment.
COMPANY	CROSSWIND
CONTRACTOR	Rosetti Marino SpA
Control Measures	Precautionary measures which reduce or eliminate risk by taking compensatory, mitigation and corrective actions.
Crisis	An acute situation which falls outside of normal business continuity and emergency response arrangements. It significantly threatens (actually or

Definitions	Description
	potentially) the safety or well-being of people, the environment, the organisation's reputation and/or its financial position. Ultimately it may put an organisation's license to operate at risk.
Emergency	An Emergency is an unforeseen event/situation that includes one or more of the following: • Has a high probability of escalating to cause immediate danger to life, health, property or environment. • Is immediately threatening to life, health, property, or environment. • Has already caused loss of life, health detriments, property damage or environmental damage
Emergency Response	Actions taken during an emergency to: • Eliminate and/or control and/or manage the harm, loss or impact of the same • Prevent further harm • Promote recovery
Emergency Response Team (ERT)	The team of individuals that responds to an emergency at the asset/location. In most foreseeable cases this shall mean the local site-based emergency response teams at the various locations.
Environmental Accidents	Accidents involving the release of substances from plants and equipment that could be harmful to the environment, including both noise and radiation.
Equipment	Means all equipment, instruments, machinery, plant (floating or otherwise), tools, materials, supplies, scaffolding, temporary works, buildings, and structures (including warehouses, offices, docks, berths, moorings and camps) and all other items supplied, consumed or used by CONTRACTOR or its SUB-CONTRACTORS and vendors in the performance of the WORK.
Hazard	A source of danger with the potential to cause illness, injury or death to personnel or damage to property, facility, or environment
Hazardous Situation	Set of conditions and/or circumstances that lead to an increased exposure to hazards of people, property, or environment. In this type of incident, the unplanned and uncontrolled event is more likely to happen, but has not occurred: If it did, it would fall under the category of "near miss" or any other category for "accident" (according to the severity of consequences).
HSE standards	HSE standards that would be expected in accordance with the practises, methods, specifications generally followed by a competent and experienced contractor in the international oil and gas industry in similar circumstances, as the IOGP Report 577/Feb 2017 "Fabrication site construction safety recommended practices" attached in Exhibit E
Impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products or services

Definitions	Description
Incident	An unplanned, uncontrolled or undesirable event or chain of events that has the potential to result or that has resulted in at least one fatality, injury, illness, environmental damages, financial loss (material loss or production shortfall) and/or affecting company's reputation.
Initial risk	The risk prior to implementation of the risk reduction measures.
Life Saving Rules (IOGP - SHELL)	Rules focus on the activities which, through rigorous data analysis, have been shown to most likely result in fatalities. Each Rule consists of an icon and simple life-saving actions individuals can take to prevent a work-related fatality.
Near Miss	An unplanned, unwanted event that had the potential to lead to injury, damage or loss (but did not, in fact, do so).
On-scene commander	The person, among the staff of the asset holder, in charge at the scene of an incident.
Project	HOLLANDSE KUST NOORD WIND PARK Project
Risk	An unwanted event characterized by its likelihood of occurrence and the extent of consequences arising from the occurrence of this event.
Risk Analysis	Is the process to comprehend the nature of risk and to determine the level of consequence and likelihood.
Security Threats	A Security Threat is a malicious act that aims to corrupt or steal data or disrupt the systems of an organization or the entire organization.
SUBCONTRACTOR	Means any company or person to whom CTR has subcontracted directly or indirectly at any level the performance of any part of service / work.
Qualified Person (PEI):	"Person with the technical capacities to perform electrical works under tension. The eligibility shall be certified and issued in return for a training process exceeded successfully, that include theoretical and practical exercises."
Expert Person (PES):	"Person with education, knowledge and experience relevant, able to analyze the risks and to avoid the dangers that electricity can create". This person have an appropriate training, gained experience and general knowledge of electrical safety. This must also be able to organize independently and safely any type of electrical work and to detect and prevent electrical hazards associated, applying the appropriate measures to eliminate or reduce them. PES has also the ability to deal with unexpected events that can occur during electrical works and the ability to properly inform and educate a PAV to perform a work safely.
Warned Person (PAV):	"Person adequately warned by PES to avoid the hazards that electricity can create." This person have a proper training, acquired knowledge on safety of electricity works and ability to understand instructions from a PES; it must have the ability to organize and execute safe work after receiving instructions from a PES. Also, it must have the ability to face difficulties unexpected, although it might not be able to face them properly in autonomy.

Definitions	Description
Work	All work to be carried out including supply of all material and performance of all services to be provided by CONTRACTOR in accordance with the CONTRACT.

Here below a list of definitions of words often used during an HAZID Session:

Guideword: Key words to be used in association with their associated expanders in order to guide and stimulate creative thinking towards the identification of representative hazards.

Hazard: Anything with the potential to cause harm, including ill health or injury, damage to properties and environment or community impact.

Incident: Any accident and near miss according to their definition

Likelihood: The expectation, possibility or chance of something happening (also referred as frequency).

Loss: The adverse impact of any event on business causing:

- Harm to persons
- Harm to the environment
- Asset damage
- Damage to community

Node: A logic section of the plant/system to be examined in the HAZID (typically consists of a specific project configuration like Option 1, Option 2, etc. or a part of the facilities to be analysed.

Residual risk: The level of risk remaining after implementation of existing controls and recommended preventive and mitigating measures.

Risk: Combination of the likelihood of occurrence of a hazardous event and the severity of consequence that can be caused by the event or exposure(s).

Risk Ranking: A means of expressing the risk of an activity in terms of a value that represents both its likelihood and severity.

3 HIRA STUDY METHODOLOGY

The main reasons for carrying out HIRA studies are to:

- provide a forum to draw on collective experience at an early stage to ensure inherent safety, health aspects/risks and environmental issues are properly considered in design;
- focus on identifying hazards to people working on the installation, both in terms of accident or long/short term exposure to biological/chemical hazards, and/or to the Assets considering also security aspects and/or to environment or community;
- check whether the precautions and safeguards incorporated in the project development are sufficient to either prevent the hazard to occur or mitigate the severity of any consequence and reduce the risk to ALARP level.

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

The HIRA technique consists of a structured brainstorming of potential hazard scenarios using a comprehensive set of guidewords. Guidewords used in the assessment are shown in Annex 3 Hazard Guidewords. The adequacy and presence of the existing safeguards (either preventive or mitigating) are assessed and finally, the risk associated to the hazardous event is evaluated with the support of the risk matrix shown in Table 4. If the identified control measures are not considered sufficient, recommendations are made, which could reduce the frequency or severity of the hazard identified.

HIRA gives emphasis to the use of the checklist as a prompt for the team to brainstorm. The team knowledge and creativity is used to identify credible causes and hence applicability of the issues. It is important that the checklist is used in a creative manner and not applied too rigidly. It is only in this way that new or unusual hazards will be recognised, or where specific combinations of factors will be identified as causes of concern.

The HIRA has been carried out in accordance with COMPANY procedure and the principles of ISO 17776.

3.1 HIRA workflow

The HIRA was performed by reviewing the precompiled worksheet (Risk Register) based on experience of CTR former industry data.

The leader started the workshop with the first 'Node' to be studied; the intention of that node was discussed and agreed by the team. Table 3 identifies the nodes used in the analysis.

Node	Node Description
1	General
2	fabrication at workshops
3	construction at YPB

Table 1 - Node description

The leader then moved on precompiled Risk Register and within each work phase, the team followed the following procedure.

- The leader nominated the work phase from the risk register and then asked the team to consider the hazards and threads of the wok phase.
- The team assessed the applicability of each guide word. If the guide word was considered applicable, the leader asked the team to identify by brainstorming any potential hazardous events and their effects.
- The brainstorming process was then used to identify all the potential threats or causes of the release of the hazard.
- The team then assessed appropriate controls that would be put in place during project development to prevent or control each threat.
- New recommendations were added where the team considered that risk should or could be reduced further to ALARP.

3.2 Priority

Team members decided the importance or severity of each issue based on the risk assessment matrix.

The Risk Assessment Matrix (RAM), is used to give a simple priority rating on a qualitative basis for each of the risk categories (people, assets, environment and community) to the risks associated with the hazards/issues identified. The worksheet (spreadsheet) is designed such that each issue may be categorised by colour and by grid reference in the RAM.

It is important to recognise that the risk rankings performed was based on a Worst-Case Credible scenario. A worst-case credible scenario is an event that could realistically occur and that has the worst outcome from release of a Hazard, if Controls fail. The approach defines the risk ranking associated with each released hazard, which is useful in ranking the hazards according to their intrinsic potential to cause harm in the actual operating environment. It allows prioritisation of mitigation measures to be determined by the project based on maximising risk reduction.

- High Risk (red). Issues that could affect the viability of the project or have significant HSE or societal impact (e.g. grid D4 or E5).
- Medium Risk (yellow). Issues that will require significant cost or time resources to resolve (e.g. grid B4 or C3).
- Low Risk (dark blue). Issues, which need to be managed for continuous improvement through the effective implementation of the HSSE Management System (e.g. grid A4 or B3).
- Low Risk (light blue). Issues which need to be managed for continuous improvement, although Businesses may set lower priority for further Risk reduction. (e.g. grid B1 or C0).

SEVERITY	CONSEQUENCES				INCREASING LIKELIHOOD				
	People	Assets	Community	Environment	A	B	C	D	E
					Never heard of in the Industry	Heard of in the Industry	Has happened in the Organisation or more than once per year in the Industry	Has happened at the Location or more than once per year in the Organisation	Has happened more than once per year at the Location
0	No injury or health effect	No damage	No effect	No effect					
1	Slight injury or health effect	Slight damage	Slight effect	Slight effect					
2	Minor injury or health effect	Minor damage	Minor effect	Minor effect					
3	Major injury or health effect	Moderate damage	Moderate effect	Moderate effect					
4	PTD or up to 3 fatalities	Major damage	Major effect	Major effect					
5	More than 3 fatalities	Massive damage	Massive effect	Massive effect					

Table 2 – Risk Assessment Matrix (RAM)

4 HIRA SESSION AND TEAM MEMBERS

Dates & locations: Session 1: 24th October 2023, 9:00-18:00 (Ravenna);

The HIRA workshop consisted of a multi-disciplinary team of engineers and other key personnel to enhance the identification of potential hazards. The HIRA was led by CTR HSSE department.

The team members who attended the HIRA workshop are presented in Table 5 below. Not all participants were available full-time a. The attendance list duly signed is shown in Annex 2 Attendance sheet.

Name	Role/Discipline	Company	Date
Kalogera Maria	Innovation Project Mgr.	CW	24.11.2023
Sznajder Dominik	PM	CW	24.11.2023
Van Loon Jeroen	CM	CW	24.11.2023
LeBrun Nicolas.	HSSE Lead	CW	24.11.2023
Suarez Tirso.	Op. Readinees Mgr.	CW	24.11.2023
Borghi Wolmer (Rosetti)	CM	RM	24.11.2023
Brunelli Massimiliano (	PM	RM	24.11.2023
Ricci Picciloni Daniele	Project HSSE Mgr.	RM	24.11.2023
Giunchi Claudia	PE	RM	24.11.2023
Lo Sterzo Davide	PEM	RM	24.11.2023
Franchi Davide	HSSE Mgr.	RM	24.11.2023

Table 3 – HIRA Attendees

5 HIRA Outcomes

This section summarizes the key outputs of the HIRA with detailed worksheets shown in Annex 1 Risk Register. No High Risk (red) identified are identified the activities assessed.

A total of 4 recommendations were recorded during the HIRA. A summary of the recommendations is presented in Table 7. The table lists the actions by action number, the responsible party and hazard reference number referring to the location of the individual Node in the worksheet.

Node	Item	Threat	Recommendations	Responsible party	Due date
Node 1	H-05.01	striking of lightning to metal structures	Check if any limitation of works is reported in corporate procedure, if not, assess the risk and define instructions.	RM	31-dic-2023
Node 1	H-08.04	Lifting equipment or lifting gears or lifting accessories failure waving of load	Define load to consider a complex lifting (50tons) and crosscheck with Company lifting procedure.	RM	31-dic-2023

Node	Item	Threat	Recommendations	Responsible party	Due date
Node 2	H-04.05	Disintegration of disk or getting in contact with rotating disk	Implement the mandatory use of machinery equipped with dead man switch (investigate the possibility to write in the contract).	RM	31-dic-2023
Node 3	H-05.03	collapse of scaffold structure or tempering or unauthorised modification	Reduce time between inspection 7 days. Requirement to be addressed in the contract with subcontractors.	RM	31-dic-2023

Table 4 – Recommendations

6 ANNEXES

Annex 1 HIRA register

Annex 2 Attendance sheet

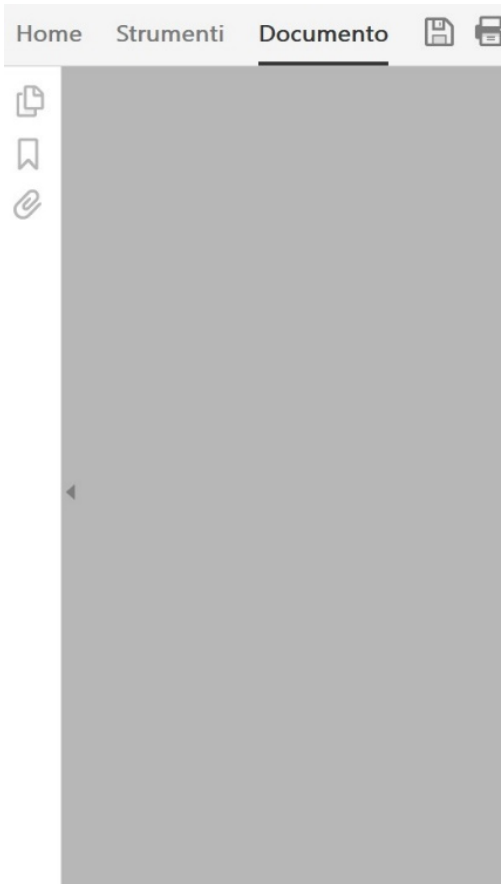
Annex 3 Hazard Guidewords

Annex 1 Risk Register

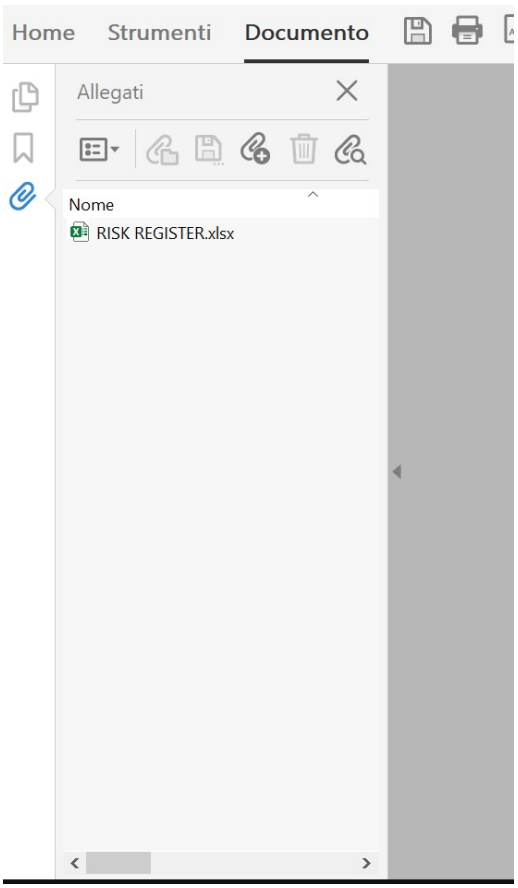
RISK REGISTER.xlsx

Double click on the above icon, or

1) Open the left barof the pdf file



2) Select the attachment



Annex 2 Attendance sheet

CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Contract No. CW-I-WP4-2023-05	ROSETTI MARINO
HIRA (Hazard identification and Risk Assessment) *Prefabrication and Mech Completion* *Attendance sheet*		

Date: 24.10.2023

Time: from 10:00 to 17:00

Venue: Via Trieste Ravenna ITALY

Name	Position	Company	Signature
Maria KALOGERA	Innovations Manager	Cross Wind	(Part-time)
Dominik SZNAJDER	PM	Cross Wind	
Jeroen VAN LOON	CM	Cross Wind	
Nicolas LE BRUN	HSSE	Cross Wind	
Massimiliano BRUNELLI	PM	Rosetti Marino	
Wolmer BORGHI	CM	Rosetti Marino	
Daniele RICCI PICCILONI	Project HSSE Manager	Rosetti Marino	
Davide FRANCHI	Corporate HSSE	Rosetti Marino	
Davide LO STERZO	PEM	Rosetti Marino	

Annex 3 Hazard Guidewords

GUIDING WORDS for hazards identification

Workplaces

Stability and solidity of the structures; Internal and external circulation routes; Emergency routes and exits; Stairs; Microclimate; Natural and artificial lighting; Rest areas and meals; Dressing rooms and closets for clothing; Sanitary assistance services; activities in confined environments or suspected pollution risks; Work at height.

Service facilities

Electrical equipment, electronic equipment; Heating, air conditioning, conditioning and refrigeration systems; Water and sanitary installations; Gas distribution and utilization plants; Lifting systems (lifts, hoists, lifting platforms).

Work equipment

Pressure apparatus and installations; Fixed thermal plants and appliances; Lifting, transport and material handling systems; Air treatment and filtering suction plants; Above-ground fuel tanks at atmospheric pressure; LPG tanks; Portable, electric or petrol-powered tools; Portable welding apparatus; Transportable heat apparatus; Lighting equipment; Transportable generators; Transportable pressure equipment; Construction machinery; Hand tools.

Atmospheric lightening

Physical agents

Noise; Vibration; Electromagnetic fields; Artificial optical radiation.

Ionizing radiations

Alpha, beta, gamma rays.

Hazardous substances

Chemical agents (including dusts); Carcinogens and mutagens; Asbestos.

Biological agents

Viruses, bacteria, cell cultures, microorganisms, endoparasites.

Explosive atmospheres

Presence of explosive atmosphere (due to flammable substances in the state of gases, vapors, mists or dusts).

Fire

Presence of combustible, flammable substances (solid, liquid or gaseous) and ignition conditions (open flames, sparks, hot parts, etc.).

Organizational factors, special conditions

Work-related stress; Night work, overtime, solo work in critical conditions.

Work under voltage and near active parts of plants