Base Load Power Hub (BLPH)

HIRA Report

Commissioning H2

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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.

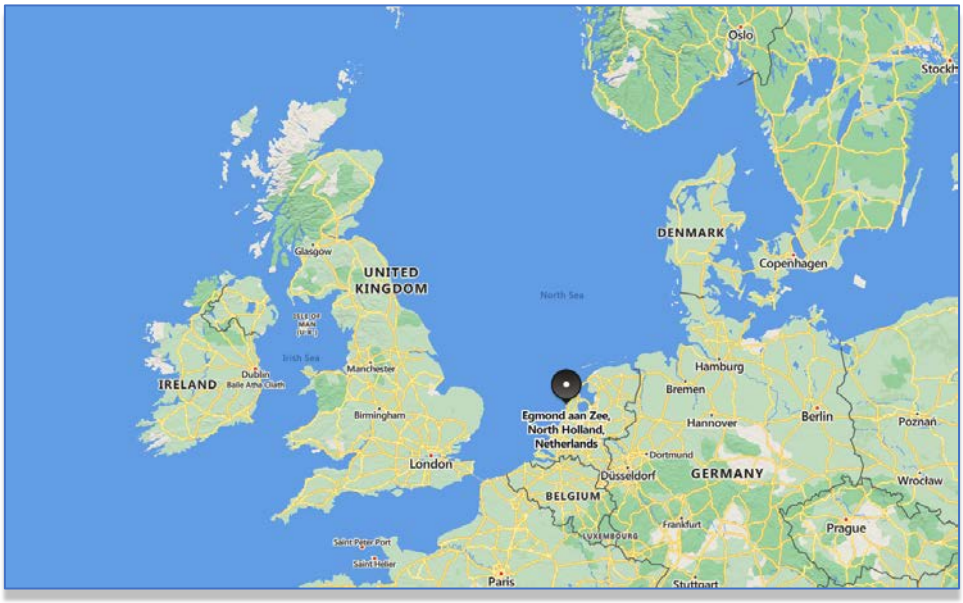


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

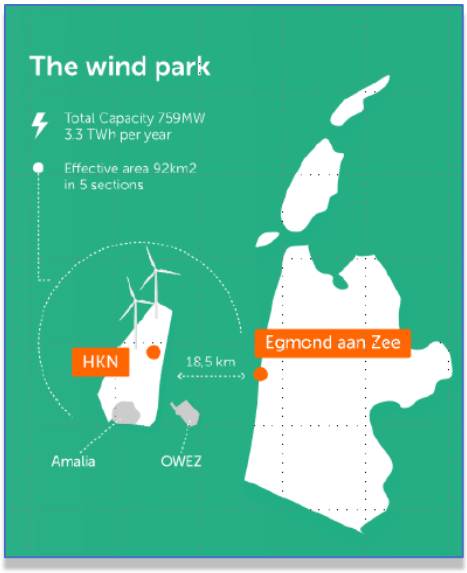


Figure 2 - Wind Park Details

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.

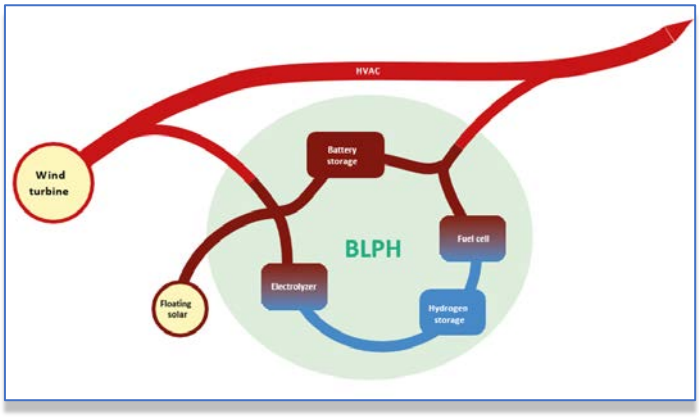


Figure 3 – BLPH Concept

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 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 commissioning Phase prior to introduce H_2 into the system, during electrolyser commissioning and onshore integrated test (OIT), with the following objectives:

- Identify major hazard scenarios, which result from the operation under H_2 commissioning (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.

2.1 REFERENCES

Doc. No.	Description
123A90-PML-QHSE-PL-00001	Contract HSSE Plan - Onshore Phase
123A90-PML-COM-PRO-03007	Commissioning Strategy
123A90-PML-COM-PL-03002	Mechanical completion and Commissioning execution plan
	BLPH Electrolyser Commissioning pre-H2 production - Task Specific Risk Assessment

2.2 DEFINITIONS AND ABBREVIATIONS

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
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
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 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

Definitions	Description
	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
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.

Definitions	Description
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.
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.

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 1 identifies the nodes used in the analysis.

Node	Node Description
1	General
2	H2 production & OIT

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 work 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.

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- 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: 18/02/2025 - Yard Piomboni & Teams;

Session 2: 26/02/2025 - Yard Piomboni & Teams;

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

The team members who attended the HIRA workshop are presented in Table 3 below. Not all participants were available for both sessions. The attendance lists are shown in Annex 2.

Name	Role/Discipline	Company	Date (1st)	Date (2nd)
Ricci Picciloni Daniele	Project HSSE Mgr.	Rosetti Marino	18/02/2025	26/02/2025
Franchi Davide	HSSE Mgr.	Rosetti Marino	18/02/2025	
Brunelli Massimiliano	Project Manager	Rosetti Marino	18/02/2025	26/02/2025
Giunchi Claudia	PEM	Rosetti Marino	18/02/2025	26/02/2025
Martin Taylor	Commissioning Mgr.	CrossWind	18/02/2025	26/02/2025
Gerry Mc Cann	Commissioning Mgr.	CrossWind	18/02/2025	
Jeroen Van Loon	CM	CrossWind	18/02/2025	26/02/2025
Stephen Bremner	PEM	CrossWind	18/02/2025	26/02/2025
Marta Iacopetti	Project Engineer	CrossWind	18/02/2025	26/02/2025
Adrian Sas	Site HSE Lead	CrossWind	18/02/2025	26/02/2025
Jan Duinhoven	CM	CrossWind	18/02/2025	26/02/2025
Leila Shameki	Electrolyser PEM	Fores	18/02/2025	26/02/2025
Thijs Philippo	CPI Engineer	CrossWind	18/02/2025	26/02/2025
Nicolas Le Brun	HSE Manager	CrossWind		26/02/2025
Dominik Sznajder	Project Manager	CrossWind		26/02/2025
Paul Kyle	Fuel Cell Engineer	KBR		26/02/2025
Luc Paoletti	Electrolyser Engineer	Elogen		26/02/2025

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) are identified between the activities assessed.

A total of 7 recommendations emerged from the HIRA and were addressed and closed during some internal review cycles prior to the document being issued. It remained an open recommendation, presented in Table 4. 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 2	H-04.04	Ambient temperature higher than design	Check with Vendors the exact temperature range limits for the Fuel Cell, electrolyser and BESS.	CW	31-mar-2025

Table 4 – Recommendations

6 ANNEXES

Annex 1 HIRA register

Annex 2 Attendance sheet

Annex 3 Hazard Guidewords

Annex 1 Risk Register

ITEM NO.	HAZARD	THREAT	CONSEQUENCE	RISK C-Consequence; L-Likelihood; R-Risk			SAFEGUARDS	RESIDUAL RISK C-Consequence; L-Likelihood; R-Risk			RECOMMENDATION	OWNER	DUE DATE	STATUS	COMMENTS
				C	L	R		C	L	R					
H-01.01	Bearing capacity of the soil	Land subsidence at the yard Workshop unsuitable for works	Injuries of personnel Damage of goods & assets	4	b	4b	Yard Load-bearing report. Suitability certificate of building.	3	b	3b					
2. Traffic Management and circulation of personnel															
H-02.01	Moving Vehicles;	Vehicule collisions with people at yard, stacked material other Vehicles;	Injuries of personnel Damage of goods & assets Leakage on soil	4	c	4c	Comply with site safety procedure (PRO-HSE-16); Patterns of movement in and around the workplace (yard layout) identify and fence/segregate temporary storing areas; Flagman for manoeuvring; rear camera for large veichles.	4	b	4b					
H-02.02	Pedestrian	Uneven surface during walking at the yard, workshops, Tripping	Injuries of personnel	3	c	3c	Good housekeeping; Cable management (identify cable ways and keep walking area clear); marked walkways. Yard HSE inductions	3	b	3b					
H-02.03	Fork-lift trucks	Toppling of fork-lift trucks; drop of load	Injuries of personnel Damage of goods & assets	4	c	4c	see H-02.01 Maintenance of routes, route manoeuvre area clear Banksman during loading / unloading Forklylift operated by trained and autorhised drivers, use of seatbelt, mobile phone policy	4	b	4b					
H-02.04	Use Bicycle	Falling with bicycle	Injuries of personnel	3	d	3d	Monitor and control of bicycle movement at yard; reduce number bicycle.	3	b	3b					
H-02.05	Escape from indoor area or decks	Emergency escape routes obstructed or not adequate to the working context	Injuries of personnel	3	b	3b	When Working in an area with > 50pax assessment on a secondary escape (on normal working condition). Assessment of working area to determine when secondary escape is deemed when planning activities during weekly coordination meetings with subcontractors.	3	b	3b					
3. Differences in Height															
H-03.01	work on ladder.	Slips, trips and falls from ladders.	Injuries of personnel Damage of goods & assets	4	c	4c	Compliance with procedure PRO-HSE-18. Minimize use of ladder, keep 3 points of contacts always; Provide access to working area at high by Scaffold, suitable light mobile platform rather than ladder (any derogation for temporary activity only and authorized); Setp-ladder, A-ladder ,hop-up and ladder conform to standard and appropriate to the scope. Type and use of ladder conform to standard EN 131.	4	b	4b					
H-03.02	Personnel at height (lower 1.8m)	Falls from height	Injuries of personnel	3	d	3d	Compliance with site safety procedures (PRO-HSE-18, PRO-HSE-10).- Minimize work at height; Provide a safe working platform with guard-rails, fences, toe-boards, etc.; Employees trained to work at height PPE (safety harness)	3	c	3c					
H-03.03	Personnel at height (above 1.8m) , exlcuding use of man-basket)	Falls from height (working on the decks ...)	Injuries of personnel Damage of goods & assets	4	c	4c	Compliance with site safety procedures (PRO-HSE-18, PRO-HSE-10).- Minimize work at height; Provide a safe working platform with guard-rails, fences, toe-boards, etc.; Employees trained to work at height PPE (safety harness) Rescue Plan defined and tested LSR and line of fire	4	b	4b					
H-03.04	Use on MEWP	hitting structures and toppling of MEWP.	Injuries of personnel Damage of goods & assets	4	c	4c	Only operated by trained and authorised people Do not disembark at height; Yearly 3rd party inspection and manteinance and checking as per vendor instructions; 3rd party trained personnel; secure tools with lanyard; barrier exclusion zones underneath. Checking ground conditions	4	b	4b					

ITEM NO.	HAZARD	THREAT	CONSEQUENCE	RISK C-Consequence; L-Likelihood; R-Risk			SAFEGUARDS	RESIDUAL RISK C-Consequence; L-Likelihood; R-Risk			RECOMMENDATION	OWNER	DUE DATE	STATUS	COMMENTS
				C	L	R		C	L	R					
H-03.05	Rope access work	N/A No credible scenario for this project													
H-03.06	Equipment tool object at height	Dropping objects	Injuries of personnel Damage of goods & assets	4	c	4c	Lanyard to secure tools and equipment; Use of net (or sheet) between beams and grating to prevent falling of small object; Exclusion zone at the ground.	4	b	4b					
4. Handling of loads - Manual															
H-04.01	Repetitive handling	Wrong posture. Wear and tear	Injuries of personnel	3	c	3c	Compliance with work instruction (IDL-HSE-19); Trained personnel The hierarchy of risk control will also be followed to ensure the highest mitigation measure is implemented to reduce the manual handling to ALARP .	3	b	3b					
H-04.02	Heavy manual handling	Excessive load handling	Damage of goods Injuries of personnel	3	d	3d	Follow corporate procedure + Risk assessment Minimize manual handling by using mech. aids and specific assessment; Reduce weight (split loads); Ensure individual capabilities are matched to the activity (max weight 25kg);	2	c	2c					
H-04.03	Awkward shapes of load (CoG o sharp edges)	dropping of load or contact with sharp points.	Injuries of personnel	3	d	3d	Compliance with work instruction (IDL-HSE-19); Compliance vendor instruction	3	c	3c					
5. Work Environment															
H-05.01	Workplace lightning	striking of lightning to metal structures	Injuries of personnel Damage of goods & assets	3	b	3b	technical report for lighting hazards Adverse Weather Plans provides procedures and mitigations for environmental conditions . Planning critical works taking into consideration weather forecast Earthing of the strucutre to ground	3	b	3b	Check if any limitation of works are reported in corporate procedure, if not, assess the risk and define instructions.	RM	31-dic	CLOSED	Reported in Yard ERP
H-05.02	strong wind	exposed work jeopardized (i.e. work @height, lifting)	Injuries of personnel Damage of goods & assets	3	c	3c	Suspend works in case of extreme weather Planning critical works taking into consideration weather forecast (fasten light items as sheets, light plates).	3	b	3b					
H-05.03	heavy Rain	exposed work (i.e. work @height, lifting) jeopardized	Injuries of personnel Damage of goods & assets	3	c	3c	Suspend works in case of extreme weather Planning critical works taking into consideration weather forecast	2	c	2c					
H-05.04	Intense Heat	fatigue, dehydration and fainting (falling)	Injuries of personnel	3	c	3c	Comply with IDL-HSE-24	3	b	3b					
H-05.05	Frosty weather	exposed work jeopardized (i.e. work @height, lifting) ; Slipping; Hypothermia.	Injuries of personnel.	3	c	3c	Heated refreshment points; Gravel or sawdust on walkways.	3	b	3b					
6. Chemicals															
H-06.01	Storing of chemicals (lube oil, paint, fuel)	breaking of containment (leakage)	Injuries of personnel; Damage of goods & assets; Damage to Environment.	2	c	2c	storing in dedicate bunded area; ERP and spill kits Fuel for machinery and vehicle- fueling procedure developed	2	c	2c					
H-06.02	Storing of chemicals (lube oil, paint, fuel)	fire	Injuries of personnel; Damage of goods & assets; Damage to Environment.	4	b	4b	Storing in authorized area; Fire fighting equipment (as per fire-plan). ERP	3	b	3b					
H-06.03	Mechanical Handling of chemical	dropping of containers;	Damage of goods & assets; Ground contamination.	2	c	2c	see H-02.01 and H-02-3;	2	c	2c					
H-06.04	Use of Chemicals (exposure)	contamination / intoxication	Injuries of personnel;	3	c	3c	Compliance with SDS and PPE. Eye wash	2	b	2b					
7. Noise															
H-07.01	High level of noise at site	deafness	injuries of personnel	3	c	3c	Dedicate risk assessment; Signage at site. Noisy (>85dB) area identified; PPE (ear protectors).	2	c	2c					
8. Dynamic situations hazards															
H-08.02	Equipment with moving or rotating parts	Contact entanglement of part of the body with moving or rotating part.	Injuries of personnel; Damage of goods & assets.	3	c	3c	tools conform to standard correct use (use for the designed purpose) competent person	3	b	3b					

ITEM NO.	HAZARD	THREAT	CONSEQUENCE	RISK (C-Consequence; L-Likelihood; R-Risk) C	L	R	SAFEGUARDS	RESIDUAL RISK (C-Consequence; L-Likelihood; R-Risk) C	L	R	RECOMMENDATION	OWNER	DUE DATE	STATUS	COMMENTS
H-08.03	Use of knives, other sharp objects/tools	Contact of part of the body with blade or sharp parts.	injuries of personnel	3	c	3c	tools conform to standard correct use (use for the designed purpose) competent person PPE	2	c	2c					
H-08.04	lifting /suspended loads	Lifting equipment or lifting gears or lifting accessories failure waving of load	Injuries of personnel; Damage of goods & assets.	4	c	4c	3rd party inspected checks of gears; lifting plan (non routing liftings); PtW to lifting plan (complex liftings); Barrier lifting area; No works under suspended loads trained and competent personnel. SIMOPS procedure at yards Equipment inspections part of the operation planned maintenance strategy and third party expedited where appropriate and pre-use inspectiobn	3	b	3b					
9. Physical Hazards															
H-9.01	Ultraviolet radiation (i.e. arc welding)	eye exposure	Injuries of personnel;	3	b	3b	Screen the radiation source; PPE.	2	b	2b					
H-9.02	Lasers (surveys)	eye exposure	Injuries of personnel;	3	b	3b	Activities coordination with other parties.	2	b	2b					
10. Ionising Radiation															
H-10.01	Gamma rays, X-ray (NDT controls)	Exposure of personnel to radiation	Injuries of personnel;	2	c	2c	Radiographic report issued by qualified expert (based on work load) with exclusion zone calculation; Training medical fitness and dosimeter (for radiographers); Radiographic test off the normal working time only (normally from 22:00 to 05:00); No storing of sources at site; PtW control; Authorized Subcontractor (no source storing at site); Subcontractor ERP in place.	2	b	2b					
11. Biological hazard															
H-11.01	Small animals droppings	Contamination	Injuries of personnel	2	c	2c	Regular cleaning of indoor areas (workshops, warehouse); Sanitisation of resting points; Rodent control.	1	c	1c					
H-11.02	Food-borne bacteria (e.g. E.coli)	Intestinal infections	Injuries of personnel	2	b	2b	Canteen HCCP program in place; Banned working clothes in the canteen; Prohibition to consume food on working place.	2	b	2b					
H-11.03	Water-borne bacteria (e.g. legionella)	Respiratory system infection	Injuries of personnel	2	c	2c	Regular HVAC Sanitisation.	2	b	2b					
12. Ergonomic Hazards															
H-12.01	Manual materials handling	see H-04.01	see H-04.01				see H-04.01								
H-12.02	Heat stress (high ambient temperatures)	see H-05.04	see H-05.04				see H-05.04								
H-12.03	Cold stress (low ambient temperatures)	see H-05.05	see H-05.05				see H-05.05								
H-12.04	Noise	Exposure to high sound pressure	Injuries of personnel				Risk assessment and medical protocol as per law								
H-12.05	Vibration	HAVs and WBV exposure	Injuries of personnel				Risk assessment and medical protocol as per law								
H-12.06	Lighting	Insufficient lighting; Excessive maintenance times.	Injuries of personnel	2	c	2c	Minimum design requirements of the workplace , including temporary structures Temporary lighting to ensure level as by standards. Workplace periodic HSE inspections	2	b	2b					
13. Security Related Hazards															
H-13.01	Petty and opportunistic crime	stollen of equipment or valuables (both at Yard and at Offices)	no significant consequences	1	b	1b	Fenced area; Access control at the entrance point CCTV.	1	b	1b					

ITEM NO.	HAZARD	THREAT	CONSEQUENCE	RISK (C-Consequence; L-Likelihood; R-Risk) C	L	R	SAFEGUARDS	RESIDUAL RISK (C-Consequence; L-Likelihood; R-Risk) C	L	R	RECOMMENDATION	OWNER	DUE DATE	STATUS	COMMENTS
H-02.00	H2 venting	Source of ignition	H2 fire	4	d	4d	F&G system on Upper Deck 100% operational Flammable gas and vent dispersion study	1	d	1d					
H-02.01	H2 leak	Inability to isolate incoming hydrogen feed in event of leak	Fire and explosion	4	d	4d	Mechanical completion achieved and leak test completed Redundant pressure transmitter in process lines H2 detectors in place and functional Leak testing of the H2 piping Commissioning procedures F&G system 100% operational LO/LC procedure Dedicated black-start procedure with temporary generators	2	d	2d					
H-02.02	N2 loss of containment	Formation of a nitrogen cloud	Oxygen depletion, Anoxia	4	c	4c	Personal O2 monitors to be worn in case of enter electrolyzer Pressure transmitter on N2 line act as warning of possible N2 accumulation	4	a	4a					Any access to electrolyzer and fuel cell must be approved by the package vendors
H-02.03	Malfunctions in purging systems	Accumulation of flammable gases	Fire and explosion if ignited	4	c	4c	Ensure Nitrogen system and Air sistem fully operational before introducing H2 Inhibit and ovverride procedure in place LO/LC procedure Line Walk completed *Already considered in HAZOP*	4	a	4a					
H-02.04	Overpressure	Overpressure feed from the electrolyser or Fuel Cell	Burst of pipes	4	c	4c	The electrolyzer design includes pressure transmitter for safety shutdown and pressure safety valves All piping is designed for pressure service and has been tested Electrolyzer cannot produce pressure exceeding 30 barg per design Ensure overpressure protection Line walk completed	4	a	4a					
H-02.04	*Deleted*														
H-02.05	Fluid under pressure	Projection of hot glycole	Burns Contamination ingestion, inhalation	4	c	4c	Wear PPE (safety glasses) Pipe designed for the pressure and tested HVAC leak tested Spill kit available in place Warning signace	4	a	4a					
H-02.05	Fluid under pressure	Water	Burst of hoses	4	c	4c	Temporary connections shall be pressure rated ITR's for temporary connections	4	a	4a					
H-02.06	Heat	Personnel coming into contact with hot process piping and hot equipment surfaces	Burns	4	c	4c	Insulation PPE Ensure hot surfaces are marked with the appropriate sign Nobody inside the container during operational phase	4	a	4a					
H-02.07	Noise	Equipment running (fans, pumps, motors, etc.)	Inadequate response to alarms Injuries	4	b	4b	Wear ear protectors in process area Warning signages in noisy areas Becons in noisy areas > 100 dB Noise Study available: no areas above 85 dB during normal operation. During ESD can reach 115 dB	4	a	4a					
H-02.08	Fuel cell overheating	Malfunction in cooling system	Loss of the cooling system leading to potential over pressure of the membrane leading to H2 leaks	4	c	4c	Temperature system will shutdown the package	4	a	4a					
H-02.09	*Deleted*														
H-02.10	*Deleted*														
H-02.11	Temporary waste water tank deployment	Different handling respect offshore	Loss of containment	3	c	3c	Temporary tank of the same capacity of the TP waste water tank	3	a	3a	Provide method statement	ROS ENG	07/03/2025	CLOSED	
H-02.12	Software or electronic failures	Control system failure	Loss of platform control Loss of containment	3	d	3d	Any software problem lead to the automatic shut down of the platform	2	c	2c					
3. Utility system															

ITEM NO.	HAZARD	THREAT	CONSEQUENCE	RISK (C-Consequence; L-Likelihood; R-Risk) C	L	R	SAFEGUARDS	RESIDUAL RISK (C-Consequence; L-Likelihood; R-Risk) C	L	R	RECOMMENDATION	OWNER	DUE DATE	STATUS	COMMENTS
H-03.01	N2 leak in enclosed space	N2 Loss of containment	Anoxia	4	c	4c	O2 personal detector to be worn Keep electrolyzer door's open	4	a	4a					
H-03.02	6,6 kV power supply	Electrocution	Electroshock, death	4	d	4d	Ensure effective grounding on equipments Clearly mark electrical hazards with signs & labels Inform and raise awareness of operators When high voltage is connected, nobody allowed in the vicinity of the transformers Any electrical work must be conducted whit system isolated (LOTO) Temporary power generator area fenced to prevent unauthorized access Appointed SAEP/AEP	4	a	4a					
H-03.03	Stacks retains residual polarization voltage up to three days after stopping	Electrocution	Electroshock, death	4	d	4d	Check residual voltage before working in stacks area Never touch the stacks Only Elogen personnel can work on the stacks Avoid contact between metal objects and stacks or dropping metal objects on the stacks Do not remove the protective cover Restricted access area	4	b	4b					
H-03.04	Cleanless of temporary power supply	Spikes, harmonics	Equipment damage Harm to people as consequence of equipment malfunction	3	b	3b	Temporary power supply fit for purpose	3	a	3a					Make final verification of the quality of the supply before first energization
H-03.05	*Deleted*														
H-03.06	*Deleted*														
H-03.07	Noise	See H-02.07													
H-03.08	SIMOPS	Hot works / source of ignition during H2 production	Fire and explosion Personnel injury Asset damages	5	c	5c	Coordination Barrier management plan Permit to Work Access control Antistatic PPE Atex equipment	5	b	5b					
H-03.09	Remote access control	Unauthorized operations	Loss of containment Safety systems failure	4	c	4c	Remote access management	4	a	4a	Include in remote access management procedure restrictions for OIT	CW/ROS COMM	14/03/2025	CLOSED	123A90-PML-COM-PRO-03064 Remote Access Tracking Register - Guidelines
4. Effect of the surrounding															
H-04.00	H2 release from vent	Ignition of flammable gas cloud from sorrounding projects	Fire and explosion	4	d	4d	Gas vent dispersion study specific for the yard (Ref. Emergency Response procedure Emergency Drill Managememnt of the interfaces /SIMOPS	4	a	4a					
H-04.01	Adverse weather condition	Lightning	Fire and explosion	3	d	3d	Lighting rod installed prior to H2 introduction Lightning protection study Grounding system 100% mechanical completed Lightning storm distance	3	b	3b	Update method statement with this requirement	ROS HSE	14/03/2025	CLOSED	Stop activities during storms is already prescribed by the Yard Emergency Plan.
H-04.02	Veichle circulation	Collision	Loss of containment Gas release Potential source of ignition	3	c	3c	BLPH area fenced off with warning signages Coordination between projects	3	a	3a					
H-04.03	Unauthorized entry	Non-essential people exposed to hazards	Personnel injury Potential source of ignition	3	c	3c	Access control at the fenced area (T-card system, standby persons), checking for unauthorized equipments and proper PPEs	3	a	3a	List and communicate access requirements	ROS/CW HSE	14/03/2025	CLOSED	Barrier Management Plan issued
H-04.04	Ambient temperature higher than design	Lack of process cooling	Electrolyzer overheating	3	d	3d	In case of heat out of temperature range for the cooling system the elctrolyser will stop. Limit the production to less than 100% (to be defined)	3	b	3b	Check with Vendors the exact temperature limits for the Fuel Cell, electrolyser and BESS	CW ENG	14/03/2025	OPEN	
H-04.05	Falling object from other construction sites	Crane failure leading to impact on BLPH during testing	Loss of containment Gas release	4	b	4b	Co-ordinate construction activities with other projects and assess risks for BLPH Crane usage plan to be agreed between projects	4	a	4a	Do not allow any crane operation within the exclusion zone if BLPH is in production	ROS CM/HSE	14/03/2025	CLOSED	Crane management plan already discussed weekly between Construction Managers and Yard Mgr.

Annex 2 Attendance sheet

ROSETTI MARINO

CROSSWIND

Progetto / *Project*	Base Load Power Hub – 123A90		
Data / *Date*	18/02/2025	Ora / *Time*	14:00 – 16:00
Luogo / *Venue*	YPB Box F 0 Meeting Room - Teams		
Oggetto / *Subject*	HAZID Commissioning H2		

Partecipanti / *Attendance sheet*

Nome / *Name*	Ruolo / *Position*	Società / *Company*	Firma / *Signature*
1. GERRY MCCANN	COMM ENG	CROSSWIND	
2. Leila Shamekhi	Electrolyser PEM/PTC	Fores	
3. CLAUDIA GUNCHI	RM PEM	ROSETTI	
4. DAVIDE FRANCHI	RM HSE M	ROSETTI	
5. Jeroen van Loon	CW CM	Crosswind	
6. Jan Duinhoven	CW CM	Crosswind	
7. Marta Iacopetti	CW BLPM PE	Crosswind	
8. DANIELE RICCI RICCILONI	RM PHSEM	ROSETTI	
9.			
10.			
11.			
12.			
13.			
14.			
15.			

1. Riepilogo

Titolo riunione	HAZID H2 Workshop - placeholder
Persone che hanno partecipato	7
Ora di inizio	2/18/25, 1:59:37 PM
Ora di fine	2/18/25, 4:56:57 PM
Durata della riunione	2h 57m 20s
Tempo medio di partecipazione	2h 33m 30s

2. Partecipanti

Nome	Primo acce	Ultima usci	Durata riun	Posta elettr	ID partecip
Ricci Picciloni Daniele (Rosetti)	2/18/25, 1:	2/18/25, 4:	2h 52m 35s	Daniele.Ric	Daniele.Ric
Stephen Bremner (Esterno)	2/18/25, 2:	2/18/25, 4:	2h 5m 57s	stephen.br	stephen.br
Martin Taylor (Esterno)	2/18/25, 2:	2/18/25, 4:	2h 4m 11s	martin.tayl	martin.tayl
Brunelli Massimiliano (Rosetti)	2/18/25, 2:	2/18/25, 4:	2h 53m 14s	Massimilia	Massimilia
Marta Iacopetti (Esterno)	2/18/25, 2:	2/18/25, 4:	2h 44m 45s	marta.iacoj	marta.iacoj
Adrian Sas (Esterno)	2/18/25, 2:	2/18/25, 4:	2h 44m 52s	adrian.sas@	adrian.sas@
Philippo, Thijs P GSNL-PTX/G/H/GP (Esterno)				T.Philippo@	T.Philippo@

3. Attività di riunione

Nome	Ora di parte	Ora di uscit	Durata	Posta elettr	Ruolo
Ricci Picciloni Daniele (Rosetti)	2/18/25, 1:	2/18/25, 4:	2h 52m 35s	Daniele.Ric	Organizzato
Stephen Bremner (Esterno)	2/18/25, 2:	2/18/25, 2:	2m 14s	stephen.br	Relatore
Stephen Bremner (Esterno)	2/18/25, 2:	2/18/25, 4:	2h 3m 43s	stephen.br	Relatore
Martin Taylor (Esterno)	2/18/25, 2:	2/18/25, 3:	1h 31m 51s	martin.tayl	Relatore
Martin Taylor (Esterno)	2/18/25, 3:	2/18/25, 4:	32m 20s	martin.tayl	Relatore
Brunelli Massimiliano (Rosetti)	2/18/25, 2:	2/18/25, 4:	2h 53m 14s	Massimilia	Relatore
Marta Iacopetti (Esterno)	2/18/25, 2:	2/18/25, 2:	4m 16s	marta.iacoj	Relatore
Marta Iacopetti (Esterno)	2/18/25, 2:	2/18/25, 4:	2h 40m 29s	marta.iacoj	Relatore
Adrian Sas (Esterno)	2/18/25, 2:	2/18/25, 4:	2h 44m 52s	adrian.sas@	Relatore

1. Riepilogo

Titolo riunione	HAZID H2 Workshop - Conclusion
Persone che hanno partecipato	11
Ora di inizio	2/26/25, 1:59:39 PM
Ora di fine	2/26/25, 3:58:29 PM
Durata della riunione	1h 58m 49s
Tempo medio di partecipazione	1h 21m 18s

2. Partecipanti

Nome	Primo acce	Ultima usci	Durata riun	Posta elettr	ID partecip
Ricci Picciloni Daniele (Rosetti)	2/26/25, 2:	2/26/25, 3:	1h 43m 32s	Daniele.Ric	Daniele.Ric
Shamekhi Leila (EFE)	2/26/25, 2:	2/26/25, 3:	1h 43m 9s	Leila.Sham	leila.shame
Martin Taylor (Esterno)	2/26/25, 2:	2/26/25, 3:	1h 40m 52s	martin.tayl	martin.tayl
Luc Paoletti	2/26/25, 2:	2/26/25, 2:	7m 28s	luc.paoletti	luc.paoletti
Stephen Bremner (Esterno)	2/26/25, 2:	2/26/25, 3:	1h 27m 42s	stephen.br	stephen.br
Nicolas Le Brun (Esterno)	2/26/25, 2:	2/26/25, 3:	1h 41m 1s	nicolas.leb	nicolas.leb
Dominik Sznajder (Esterno)	2/26/25, 2:	2/26/25, 2:	34m 28s	dominik.szı	dominik.szı
Adrian Sas (Esterno)	2/26/25, 2:	2/26/25, 3:	1h 40m 30s	adrian.sas@	adrian.sas@
Paul Kyle (Esterno)	2/26/25, 2:	2/26/25, 3:	1h 11m 35s	Paul.Kyle@	Paul.Kyle@
Marta Iacopetti (Esterno)	2/26/25, 2:	2/26/25, 3:	1h 39m 37s	marta.iacoı	marta.iacoı
Brunelli Massimiliano (Rosetti)	2/26/25, 2:	2/26/25, 3:	1h 24m 24s	Massimiliar	Massimiliar

3. Attività di riunione

Nome	Ora di parte	Ora di uscit	Durata	Posta elettr	Ruolo
Ricci Picciloni Daniele (Rosetti)	2/26/25, 2:	2/26/25, 3:	1h 43m 32s	Daniele.Ric	Organizzato
Shamekhi Leila (EFE)	2/26/25, 2:	2/26/25, 3:	1h 43m 9s	Leila.Sham	Relatore
Martin Taylor (Esterno)	2/26/25, 2:	2/26/25, 2:	5m 26s	martin.tayl	Relatore
Martin Taylor (Esterno)	2/26/25, 2:	2/26/25, 3:	1h 35m 26s	martin.tayl	Relatore
Luc Paoletti	2/26/25, 2:	2/26/25, 2:	7m 28s	luc.paoletti	Relatore
Stephen Bremner (Esterno)	2/26/25, 2:	2/26/25, 2:	30m 10s	stephen.br	Relatore
Stephen Bremner (Esterno)	2/26/25, 3:	2/26/25, 3:	57m 32s	stephen.br	Relatore
Nicolas Le Brun (Esterno)	2/26/25, 2:	2/26/25, 3:	1h 41m 1s	nicolas.leb	Relatore
Dominik Sznajder (Esterno)	2/26/25, 2:	2/26/25, 2:	19m 54s	dominik.szı	Relatore
Dominik Sznajder (Esterno)	2/26/25, 2:	2/26/25, 2:	14m 34s	dominik.szı	Relatore
Adrian Sas (Esterno)	2/26/25, 2:	2/26/25, 3:	1h 40m 30s	adrian.sas@	Relatore
Paul Kyle (Esterno)	2/26/25, 2:	2/26/25, 3:	1h 11m 35s	Paul.Kyle@	Relatore
Marta Iacopetti (Esterno)	2/26/25, 2:	2/26/25, 3:	1h 39m 37s	marta.iacoı	Relatore
Brunelli Massimiliano (Rosetti)	2/26/25, 2:	2/26/25, 3:	1h 24m 24s	Massimiliar	Relatore

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