G+/IMCA in partnership with Energy Institute Walk to work workshop

IMCA®

G+ Global Offshore Wind Health & Safety Organisation

In partnership with

energy institute

G+/IMCA IN PARTNERSHIP WITH ENERGY INSTITUTE
WALK TO WORK WORKSHOP

August 2024

Published by
Energy Institute, London
The Energy Institute is a professional membership body incorporated by Royal Charter 2003
Registered charity number 1097899

The Energy Institute (EI) is the chartered professional membership body for the energy industry, supporting over 23 000 individuals working in or studying energy and 200 energy companies worldwide. The EI provides learning and networking opportunities to support professional development, as well as professional recognition and technical and scientific knowledge resources on energy in all its forms and applications.

The EI's purpose is to develop and disseminate knowledge, skills and good practice towards a safe, secure and sustainable energy system. In fulfilling this mission, the EI addresses the depth and breadth of the energy sector, from fuels and fuels distribution to health and safety, sustainability and the environment. It also informs policy by providing a platform for debate and scientifically-sound information on energy issues.

The EI is licensed by:
– the Engineering Council to award Chartered, Incorporated and Engineering Technician status, and
– the Society for the Environment to award Chartered Environmentalist status.

It also offers its own Chartered Energy Engineer, Chartered Petroleum Engineer, and Chartered Energy Manager titles.

A registered charity, the EI serves society with independence, professionalism and a wealth of expertise in all energy matters.

This publication has been produced as a result of work carried out within the Technical Team of the EI, funded by the EI's Technical Partners. The EI's Technical Work Programme provides industry with cost-effective, value-adding knowledge on key current and future issues affecting those operating in the energy sector, both in the UK and internationally.

For further information, please visit **http://www.energyinst.org**

The EI gratefully acknowledges the financial contributions towards the development of this publication from members of the G+ Global Offshore Wind Health and Safety Organisation:

bp
Corio Generation
EDF Renouvables
Equinor
Iberdrola
Ocean Winds
Ørsted
RWE
Siemens Energy
SSE
Total Energies
Vattenfall
Vestas

However, it should be noted that the above organisations have not all been directly involved in the development of this publication, nor do they necessarily endorse its content.

ISBN 978 1 78725 439 8

Published by the Energy Institute

Hard copy and electronic access to EI and IP publications is available via our website, **https://publishing.energyinst.org**.
Documents can be purchased online as downloadable pdfs or on an annual subscription for single users and companies.
For more information, contact the EI Publications Team.
e: **pubs@energyinst.org**

CONTENTS

1 EXECUTIVE SUMMARY

On 9th April 2024, the G+ (Global Offshore Wind Health and Safety Organisation) and IMCA (International Marine Contractors Association) held a workshop with key industry representatives in response to incidents with 'Walk to Work' (W2W) access systems in offshore wind. The purpose of the workshop was specifically to identify tangible steps the industry should take to deliver an improvement in safety performance of W2W access systems.

The workshop brought together wind farm developers/owners, wind turbine generator suppliers, vessel providers, W2W providers and design agencies. The workshop explored the lifecycle, including procurement of a W2W system, design, oversight and assurance, training, competency and maintenance. This generated several recommendations, many of which are interrelated. These are shown in 1.1.

1.1 RECOMMENDATIONS

The following table summarises the key recommendations and actions that were identified during the workshop.

No.	Recommendation	Owner(s)
1	There should be greater ownership of the end-to-end safety management of W2W applications including the W2W equipment, vessel, interface with the structure, procedures, maintenance, training, emergency response and assurance activities which collectively provide an acceptable safety level. This should ensure that the hierarchy of controls has been effectively deployed and that this can be demonstrated.	Windfarm developers/ owners
2	To support item 1, appropriate guidance should be developed aligned to 5.13.1.	G+ and IMCA W2W working groups
3	The W2W systems currently deployed should be reviewed in line with the principles set out in item 1. Any issues that are identified should be rectified at the earliest reasonable opportunity.	Windfarm developers/ owners and vessel operators
4	During the procurement process, the requirement to auto-retract when people are on the gangway should be challenged, and only permitted when it can be demonstrated that there are adequate controls in place and the residual risks are as low as is reasonably practicable.	Windfarm developers/ owners and vessel operators
5	Options to implement the standardisation of key features of the W2W and transition piece should be reviewed with the objective of minimising issues at this critical interface.	G+ and IMCA W2W working groups

No.	Recommendation	Owner(s)
6	The overarching competency requirements for designers, vessel captains, W2W operators and 'users' should be reviewed, and an industry standard competency framework developed.	G+ and IMCA W2W working groups
7	The overarching training requirements for designers, vessel captains, W2W operators and 'users' should be reviewed and an industry standard training framework developed. This should include emergency operations and simulations.	G+ and IMCA W2W working groups
8	Human factors expertise should be engaged to support the design process.	W2W providers and Vessel Operators
9	Human factors expertise should be engaged to support operational decision making, compliance with procedures and the training framework.	G+ and IMCA W2W working groups
10	A mechanism to share lessons learned by all relevant stakeholders including W2W providers and standard agencies.	G+ and IMCA
11	The large scale application of W2W systems on floating offshore windfarms should be researched to identify potential issues and possible mitigation activities.	G+ and IMCA W2W working groups
12	There should be a campaign to increase awareness of the IMCA standard and explore how a greater range of organisations can have access to them.	IMCA
13	The presence of an appropriate integrity management strategy for the W2W equipment should investigated. If this is not in place, or not adequate then actions should be taken to develop and implement one.	Windfarm developers/ owners and vessel operators
14	A process to manage changes in the W2W software should be implemented if this is not in place.	Windfarm developers/ owners and vessel operators

2 ABBREVIATIONS

Abbreviations	Description
CTV	crew transfer vessels
DP	dynamic positioning
EI	Energy Institute
FMEA	failure modes and effects analysis
FMECA	failure modes, effects and criticality analysis
FSPO	floating production storage and offloading
G+	Global Offshore Wind Health and Safety Organisation
HRA	human reliability analysis
IMCA	International Marine Contractors Association
O&M	operations and maintenance
OEM	original equipment manufacturer
SME	subject matter expert
SOV	service operation vessel
W2W	Walk to Work
WTG	wind turbine generator

3 BACKGROUND AND INTRODUCTION

3.1 BACKGROUND

The W2W workshop was jointly arranged and hosted by G+ and IMCA to review and address safety issues that the offshore wind industry has experienced.

The G+ comprises the world's largest offshore wind developers, established to form a group that places health and safety at the forefront of all offshore wind activity and development. The primary aim of the G+ is to create and deliver world class health and safety performance across all its activities in the offshore wind industry. The G+ has partnered with the Energy Institute (EI) to develop materials including good practice guidelines to improve health and safety performance. Through the sharing and analysing of incident data provided by G+ member companies, an evidence-based understanding of the risks encountered during the development, construction and operational phases of a wind farm project has been developed. This information has been used to identify the health and safety risk profile for the offshore wind industry.

The IMCA is a leading trade association representing the vast majority of contractors and the associated supply chain in the offshore marine construction industry worldwide. Its members play a key role in the offshore oil and gas and renewable energy industries.

3.2 INTRODUCTION

Over the last few years, the offshore wind industry has introduced W2W solutions to improve the method of accessing the wind turbine generators (WTGs) and substations. This is partly because they are suitable for incorporation into large service operation vessels (SOV) that are viable for the larger sites, but also because they are considered to be preferable compared to the 'bump and jump'/boat landing approach.

The safety performance has however been below expectations, and lower than the level considered to be acceptable by the industry. G+, its members and IMCA therefore considered it necessary to hold a workshop to review the current practices and identify tangible actions that are required to deliver the necessary improvements.

This report outlines the relevant outcomes of the workshop and summarises the discussions that took place.

There were a number of organisations represented in the workshop that had different practices and capabilities. This report is intended to represent the general industry position, so there may be examples of some organisations operating at a higher level than that presented in this report.

4 METHOD, AGENDA AND ATTENDANCE

4.1 WORKSHOP PREPARATION ACTIVITIES

Prior to the workshop, the incident data was reviewed to identify topics that should be covered. To enable the participants to effectively prepare for the workshop material was shared that included the agenda for the day and the two figures in Appendix A which outlined the key issues that needed to be addressed.

4.2 WORKSHOP AGENDA

The workshop was opened by introductions from:

– Kate Harvey, G+ General Manager;
– Rhys Jones, IMCA Technical Adviser - Marine Renewable Energy, and
– Steve Hillier, Worley Director Asset Management (workshop chair).

This opening included a discussion of the figures contained in the pre-read (Appendix A) with the request for the participants to focus on the following questions:

– How is your organisation satisfying each item?
– Can you evidence/demonstrate this?
– What are the barriers to complying with the requirement?
– How can issues be resolved/barriers removed and what support is needed from the industry?
– What are the practical next steps for the industry to remedy deficiencies?

The workshop participants were reminded of the background to the workshop and that the intended output will be tangible and practical recommendations, in the form of a programme of deliverables, that will address the identified issues.

Following the introduction, the participants were split into four groups and in separate breakout sessions covered all the topics listed below which were considered to provide a suitable structure to explore the various aspects of W2W safety:

Session	Topic
1	Design and Maintenance
2	Procurement
3	Procedures and Competence
4	Emerging Issues

At the end of the breakout sessions, there was a plenary and the outcomes from the day were discussed. The ‘playback’ slides used in the plenary session, which identify the key observations and recommendations, are shown in Appendix B.

These were presented as an immediate record of the discussions and it was recognised that all the notes from the day needed to be reviewed and analysed to ensure all recommendations were identified. This report, therefore, may go beyond the summary in Appendix B in some places.

4.3 WORKSHOP ATTENDEES

The table below lists the organisations that were represented at the workshop.

BP	Parkwind
Acta Marine	RWE Renewables
Ampelmann Operations	Saipem SPA
Corio Generation	Seaway 7
DEME Group	SGRE
DNV	Shell
Equinor	Skyborn Renewables
G+	SMST
Global Wind Organisation	SSE Renewables
Iberdrola/Scottish Power	Van Oord
IJUBOA	Vattenfall
IMCA	Vestas
Jan De Nul	Vestas Northern and Central Europe
North Star Shipping (Aberdeen) Ltd	Wagenborg Offshore Operations
Ocean Winds	Worley
OceanWinds	Z-bridge
Osbit	

5 SUMMARY OF THE WORKSHOP DISCUSSION

This section summarises the discussions during the workshop. There were some themes that occurred in more than one of the four sessions, so this discussion is intentionally not structured in line with the agenda.

Throughout the discussion references are made to the three key types of organisation:

- W2W Providers which represents the organisations that design, manufacturer and supply W2W solutions
- Vessel Providers which represent the organisations that provides the vessel and manages the integration of the W2W solution
- Windfarm Developers or Owners who represent the organisations who have ultimate responsibility for the windfarm

References are also made to 'users' of the system and WTG original equipment manufacturers (OEMs) who are users but also can procure W2W solutions as part of their service offering.

5.1 INDUSTRY GUIDANCE

Two main sources of guidance for W2W solutions were identified. These were:

- IMCA Guidelines for Walk to Work Operations IMCA M254 Rev 0.1 November 2023
- DNV-ST-0358 Offshore Gangways Edition September 2017, Amended July 2022

The IMCA document focuses on operations and maintenance, while DNV-ST-0358 primarily deals with design, but also contains maintenance requirements. Although these are complementary, they have not been written specifically to provide a combined suite of requirements that holistically covers all elements of W2W solutions, their management, and operations. It is therefore recommended that these are reviewed together and gap analysis is carried out to identify areas where further requirements are needed, or the existing ones are inadequate.

There are other standards relevant to specific regions, however these were not discussed in detail during the workshop.

Access to IMCA documents is only possible through membership of the organisation. It was noted that many **W2W Providers** are not members, which limits the level of influence of the IMCA M254. This should be addressed so that any guidance document from IMCA is available and accessible.

Prior to the workshop, the incidents were reviewed against the two standards, and it was found that if the combined requirements were satisfied then the majority of the events that have occurred should have been avoided. This does suggest that there is potentially a lack of appropriate adoption. During the workshop there was a discussion about the level of awareness of the standards, and there were participants who did not know the IMCA guidance existed.

Recommendation:

It is therefore recommended that actions are taken to ensure there is sufficient knowledge of the standards, and their scope, in the offshore wind industry.

5.2 PROCUREMENT

5.2.1 Typical process

Generally, **Windfarm Developers or Owners** have an indirect relationship with the **W2W Provider**.

Initially, **Windfarm Developers or Owners** produce a functional specification for the vessel, and this includes requirements for the W2W solution. This relies on references to industry guidance, standards and, in some cases, also includes their own organisation's specifications.

The **Windfarm Developers or Owners** then approach the vessel market through a competitive tender process. This is followed by the **Vessel Provider** engaging **W2W Providers** with the **Windfarm Developers or Owners** functional requirements and supplements this with any additional requirements of their own. **W2W Providers** therefore can receive enquiries from multiple **Vessel Providers** with different operating ranges (based on the vessel specifications) for the same project.

There are then reviews of the tenders:

1. **W2W Provider** to **Vessel Provider**, and

2. **Vessel Provider** to **Windfarm Developer or Owner**

before a contract is placed.

In this model, there isn't a direct relationship between the **Windfarm Developer or Owner** and **W2W Provider** and limited **Windfarm Developer or Owner** direction of the W2W safety requirements.

Some **Windfarm Developers or Owners** identify 'safety critical systems' and include W2W within that definition. It was not clear, however, that this led to a greater rigor in the procurement process with respect to W2W system safety.

There are situations where the WTG OEM, or other service providers, charter a vessel with a W2W as part of their contract. This further removes the **Windfarm Developer or Owner** from the W2W provider and increases the difficulties implementing sufficient **Windfarm Developer or Owner** oversight regarding W2W system safety.

There were some examples where **W2W Providers** have worked closely with **Vessel Provider** at the vessel design stage. This allows them to develop an integrated dynamic positioning and W2W system, which deliver an improved integrated design.

The procurement process generally takes place after the foundation secondary steel package has 'locked-in' the platform design including key W2W interface features. This prevents the interface being properly managed and optimised for safety. This issue is further compounded as the **W2W Provider** seeks to offer standard products without site specific detailing. This issue could be improved if there was industry standardisation that included certain features of the W2W gangway and the platform.

In some cases, a vessel is procured for a particular windfarm so there may be opportunities to optimise the interface between the platform and gangway through project specific designs. There are, however, also situations where a vessel with a W2W solution will be used for

campaign work or used on a temporary basis at a particular site, and possibly procured by the WTG OEM. In those scenarios there is little opportunity to ensure the interface is optimised for safety, which further reinforces the advantages of a level of standardisation.

Recommendation:

It is recommended that opportunities for industry standardisation of the gangway and the WTG or substation platform are reviewed, and where appropriate implemented.

5.2.2 Windfarm developer or owner specifications

During the workshop, the nature of the **Windfarm Developer or Owner's** specification was discussed along with the role it plays establishing the overarching approach to the design and safety. There was an acknowledgement that the specifications aren't comprehensive, and mainly relied upon industry standards (which were known to not adequately cover all the necessary requirements), and generally, without any supplementary requirements. Overall, the wind farm developer/owner generally delegates the majority of safety decision-making into the supply chain. The reason for this was explored and it was considered to be because:

1. there isn't sufficient knowledge within **Windfarm Developer or Owner** organisations to provide detailed safety requirements, and
2. it was considered to be the responsibility of the **Vessel Provider** and **W2W Provider** to deliver a safe W2W solution.

Recommendation:

It is recommended that industry guidance is developed to enable the **Windfarm Developer or Owner** to adopt a greater role in the safety decision-making. It was suggested that this could be in the form of a standard framework which sets out standard requirements of the **Windfarm Developer or Owner**, which also outlines how **Vessel Providers** should present data and information. This would help ensure that the right requirements are specified, gaps are avoided and there are appropriate mechanisms to review the design and its safety levels. It will also help communication across the industry as parties will become familiar with standard processes and frameworks.

5.3 DESIGN PROCESS

5.3.1 Typical process

As stated in 5.2, **W2W Providers** seek to provide the industry with products rather than develop a project-specific solution.

DNV-ST-0358 is used but this does not cover all the design requirements and there are issues when the rate of technological advancement outpaces the standards, so **W2W Providers** carry out a significant amount of safety decision-making and assessments.

The W2W 'safety philosophy' is determined by **W2W Providers**, generally, with little input from the **Windfarm Developer or Owner**.

Typical design tools are used, such as failure mode and effect analysis/failure modes, effects and criticality analysis (FMEA/FMECA*), and detailed risk assessments are carried out. **W2W Providers** consider risk assessments to be proprietary as they contain intellectual property. This can prevent adequate independent reviews of the risk assessments, and the design in general.

The industry as a whole, therefore places a significant amount of faith and trust in **W2W Providers**. Given the criticality of the product they produce, the level of design oversight could be considered to be insufficient, and not aligned with general good industry practice. This point is not intended to suggest that the W2W designers are not competent but designs that control serious safety consequences should always be subject to rigorous oversight.

Understanding the overall system reliability and behaviour under fault conditions is critical when conducting an assessment of safety of the system, and if it is acceptable.

There are situations where W2W solutions are introduced to existing operational sites. These present particular challenges as the platform may not have been designed for the use of W2W solution.

It was noted that physical factors (such as the speed and acceleration of the gangway, especially when transferring from element to another) is not adequately described in the current standards.

During the design process, integration between parties is vital, with **Vessel Providers**, **W2W Providers** and **Windfarm Developers or Owners** all required to work collaboratively. It is recommended that a framework for design is developed that supports this.

Recommendation:

It is recommended that a design framework is developed that allows **Vessel Providers**, **W2W Providers** and **Windfarm Developers or Owners** to work collaboratively, sharing the necessary information, and considering the overall system design including W2W interfaces with the vessel and platform. This should also include the WTG OEM where the W2W solution is part of their scope of services.

5.3.1.1 Auto-retract feature

Prior to the workshop the reported incidents were reviewed, and this included a situation where the auto-retract operation was activated due to a sensor failure and another situation where the system auto-retracted and the cause was not identified.

The control logic is designed to initiate an auto-retract process if it detects that the walkway has reduced contact with the fixed structure, or in the event of a failure of the system.

The auto-retract philosophy, therefore, intentionally places an individual who may be on the gangway in a hazardous situation, and then relies on control measures at the bottom of the 'hierarchy of controls' to manage the risk (audible and visual warning lights and a procedural control).

---

* *Post-Workshop Note: FMEA/FMECA are component-based design tools and sometimes not suitable for complex systems where risk can be an emergent property at interfaces and does not properly consider the role of the human in the system [which is critical given the dependency on procedures] or the external environment. There are other design tools that may be more appropriate for this application such as model-based systems engineering or system-theoretic process analysis.*

Recommendation:

It is recommended that **Windfarm Developers or Owners** take more responsibility reviewing W2W designs to ensure they have acceptable safety levels, control measures are adequate and the 'hierarchy of controls' is appropriately implemented.

It is further recommended that **Windfarm Developers or Owners** particularly focus on the 'design safety philosophy' with respect to the auto-retract feature of the control logic, ensuring that suitable design controls are in place, and the requirement for the gangway to retract while an individual is on it is reviewed.

W2W Providers should provide a disconnect response that does not endanger the gangway user, with sufficient warnings and time.

It is also recommended that the industry captures and shares data regarding the number of occasions the auto-retract feature is initiated, either through normal operation or abnormal fault conditions. This should be used to support risk assessments and review of safety levels.

5.3.2 Variation in W2W designs

There are differences between the W2W designs currently deployed in offshore wind. As discussed in 5.2, functional specifications are used and there is no prescriptive industry guidance. This inevitably results in significant diversity, and even simple features such as the 'traffic light' system that is used to indicate when it is considered safe to transfer differs between W2W solutions. The variation in W2W systems also introduces secondary issues, such as inability to provide standard training.

It may not be desirable, or possible, to fully standardise W2W solutions but establishing industry requirements that deliver commonality of key W2W features would enable the development of standard industry practices, procedures and training. It is recommended that this is considered by the industry.

Recommendation:

Issues relating to the variation in W2W designs supports the basis for the recommendation outlined in 5.2.1.

5.3.3 Variation in transition piece designs

As discussed in 5.3.2 there are significant differences in the W2W designs, but there are also differences in the design of the transition piece landing area and layout. **W2W Providers** consider there to be significant value if there is less variation in the platform layouts and dimensions, and if they are designed around the W2W systems. It is noted that this approach is not possible unless there is some level of standardisation in both this element of the foundation design and W2W designs, which reinforces the recommendations in 5.1 and 5.3.2.

An example of the foundation design increasing risk, is the issues caused by specific types of gates on the platform. In some cases, they are not self-closing and require a manual operation to secure using a pin. This takes time and it is not ideal as it requires a technician to complete this activity while standing at the end of the gangway. The tip of the gangway is possibly the most hazardous location of the W2W solution, and any change in sea state could lead to disconnection while the technician is completing the activity to secure the

gate. It is therefore necessary to avoid time spent at this part of the W2W solution. This is an example where a holistic and integrated approach to the overall system design would consider this scenario and ensure it is dealt with through design.

Recommendation:

Issues relating to the variation in transition piece designs support the basis for the recommendation outlined in 5.2.1.

5.3.4 Moving parts and entrapment

One of the hazards with some of the current designs is the risk of entrapment due to the clearances between the moving parts in the telescopic gangway. Incidents have occurred due to inappropriate clearances which suggests either the design was not completed to standards, the suite of standards is inadequate, or the system behaves differently in operation compared to the design assumption/intent. This is an example of an issue that should be detectable with suitable oversight including an in-use inspection.

Recommendation:

It is recommended that **Windfarm Developers or Owners** should ensure that the risks of moving parts and entrapment are specifically assessed during design reviews and through in-service inspections.

5.3.5 Operational design use and design cases

During operation there are situations that may not be fully considered by the W2W designer. For example, trolleys are used in some applications to improve materials handling issues. A foreseeable scenario, and one that has been reported, is the trolley malfunctioning on the gangway. In this example, the procedure prevented two people from being on the gangway simultaneously, yet it was not possible for one person to drag the trolley. It is not known if the risk assessment had considered this scenario, but the main consideration is the need for an integrated and holistic risk assessment that combines both the system and its use.

The risk assessment should also consider foreseeable abnormal situations and outline appropriate control measures that provide adequate contingencies.

There were also examples where the W2W gangway was used to lift equipment. It is not known if this is captured within the W2W design cases, but it does further support the need for comprehensive risk assessments to support robust change-management activity. As stated in 5.3, **W2W Providers** can consider their equipment-level risk assessment to contain IP and restrict its accessibility. This precludes the important collective holistic assessment, and the ability to ensure that the use of the W2W solution is appropriately managed.

Recommendation:

It is recommended that all foreseeable abnormal scenarios are considered in the risk assessment that outlines appropriate risk control measures that provide adequate contingencies. This should capture the full system including the vessel, platform and decision making.

5.4 OPERATIONAL OPERATING LIMITS

The operating limits for a particular W2W solution, on a particular vessel at a specific site are determined through sea trials. Generally, the limits start low and then are increased based on experience and as the understanding of the system behaviour improves. The process requires careful management as it is naturally subjective in nature. Therefore, the operating limits are not fully defined during the design stage and are produced during deployment.

Ultimately, decisions relating to the limits reside with the vessel captain, but this brings in human factor considerations and ambiguity of acceptable limits.

Although there was a consensus that the ultimate decision whether to transfer or not is with the technician, there are some examples where commercial pressures creates expectations, and project managers who are new to the industry may not be aware of all the constraints and factors that impact the ability to safety transfer.

When reviewing the conditions and deciding whether they are within suitable operating windows, it is necessary to also consider the forecast, the rate the conditions could deteriorate, and the time for the workforce to return to the vessel. This is therefore a complex situation to assess and manage. In changing conditions, there is an inevitable increase in the probability that the W2W solutions will be used for return transfer when the system is closer to its limits, and therefore more likely to detach and auto-retract. There is insufficient industry data to assess how many transfers are carried out in close proximity to the system limits, but it is necessary to understand this to ensure the industry doesn't push the envelope without a full understanding of the implications.

Windfarm Developers or Owners should consider including reporting requirements in the contractual obligations.

Recommendation:

The industry should seek to generate data that shows how often W2W systems are used in situations where they are close to their operating limits, and detachment is possible.

Windfarm Developers or Owners should ensure that there is no pressure to inappropriately extend operating limits, or on individuals to transfer if they are concerned about the conditions.

5.5 ASSURANCE

There are generally activities to review the W2W design. These are typically workshop reviews but these can be compromised and limited as there is significant functionality hidden in proprietary software. **W2W Providers** do use verification organisations but there have still been incidents suggesting, although this will contribute to improved safety, it is not sufficient. Furthermore, there have been incidents that relate to quality so there should be an appropriate quality plan in place.

One of the issues described was the limited knowledge and experience in the **Windfarm Developers or Owners** to complete an effective review. It is therefore necessary to support them with guidance (see 5.13.1).

Recommendation:

It is recommended that **Windfarm Developers or Owners** implement a specific assurance process to ensure they are satisfied that the system has an acceptable safety level.

5.6 OPERATIONAL PROCEDURES

The key individuals who have specific responsibilities in the use of W2W solutions are:

Individual	Summary of responsibilities	Organisation
Vessel captain	Is ultimately responsible for the people on board and the vessel	**Vessel Provider**
Vessel dynamic positioning operator	Has responsibilities for the vessel position	**Vessel Provider**
W2W operator	Is responsible for the operation of the gangway and people during the transfer	**W2W Provider** or **Vessel Provider**
User	Is responsible for following procedures	Service providers, windfarm construction or maintenance teams

There are a number of parties that contribute to a safe transfer, and it is important that a holistic review of roles, responsibilities, accountabilities, competency requirements and training requirements is carried out to ensure the operational procedures are adequate.

In some cases, the **W2W Provider** delivers a full service where they provide the system and personnel to operate and maintain it. There are also situations where the equipment is procured, and the **Vessel Provider** takes responsibility for operation and maintenance. The additional interfaces in this scenario should be considered and dealt with in the procedures.

Different approaches in the industry regarding 'clipping on' were highlighted. Some procedures include the requirement to be 'clipped on' for part of the transfer process to minimise the risk of falling from height. This however creates issues when the gangway retracts so there is an alternative view that is clipping on increases safety risks. There may be application-specific reasons why it is suitable and necessary and not others. An example given was for when there are opposing opinions for the same system. It was acknowledged that the lack of recognised practice, and guidance, around some of these topics leads to different approaches being developed.

There was an example where local 'norms' had evolved, and practices deviated from the documented procedures. An example is the use of a 'thumbs up' signal when an individual had successfully transferred onto the structure. This was observed on several sites and there was no consensus regarding its purpose or what it was specifically communicating. Although this may be considered to be a minor and irrelevant example, it establishes a method of communication that has not been defined and not in line with the procedure. It is important that the written and agreed procedure is reinforced and different routines are not permitted.

The minimum time for dynamic positioning set up and gangway deployment that should elapse prior to personnel being committed to the gangway should be reviewed and ensured to be acceptable.

Recommendation:

It is recommended that **Windfarm Developers or Owners** implement a process to holistically review roles, responsibilities, accountabilities, competency requirements and training requirements.

It is recommended that this industry develops recognised practice and guidance covering topics such as clipping on.

It is also recommended that the industry develops an oversight programme to ensure compliance with procedures is reinforced and informal routines and practices are prevented from developing. This links to the discussion and recommendation in section 5.8.

5.7 COMPETENCY AND TRAINING

5.7.1 Competency

As discussed in 5.3.1, the design of W2W solutions requires consideration of a complex system (including the engineering aspect, the environment and interfaces) and human factors (see 5.8). It is recommended that the level of support needed to adequately support designs, specifically in consideration of human factors and overarching system complexity, is reviewed.

It was recognised that **Windfarm Developers or Owners** have limited exposure to some of the in-depth issues relating to W2W system design, and will therefore need to rely on existing guidance and standards. This was considered to be insufficient to adequately review designs, understand the control logic and assess overall system safety.

The workshop participants had experience of varying competency levels of vessel captains, and it was recognised that there are no industry competency requirements for W2W operators. Furthermore, there are not specific competency requirements for 'users' of the W2W solution.

Overall, there is no overarching competency framework. Given the criticality of the equipment and the complexity, it is considered necessary to develop and implement one.

Recommendation:

It is recommended that the industry develops and implements a suitable competency framework that includes designers of the W2W solution, designers who integrate the W2W solution into the vessel, individuals undertaking design reviews, vessel captains, dynamic positioning operators, W2W operators and 'users'.

5.7.2 Training

It was noted that there are specific mandatory training courses for crew transfer vessels (CTV) but not W2W solutions. The lack of common training standards, no industry training providers, accreditation, or requirement for repeat training was considered to be a significant industry deficiency.

There is induction training for users, but this does not usually include full training. It was suggested that W2W solutions, and their use, should be incorporated into the basic

safety training with further specific training for each design. Currently, **W2W Providers** set the training requirements, which means there is significant variation and no common requirements.

It was considered necessary to develop a suitable training framework that should include:

– emergency disconnect scenarios;
– use of simulators, and
– sea trials of a particular system.

Another key training consideration was the requirement to train and test the interaction between the vessel captain, dynamic positioning operator and gangway operator.

The training requirements should also include regular refresher videos for the users to constantly reinforce the procedures and how to react in an emergency auto-retract situation.

It is recognised that full system or simulator training is expensive, so an appropriate approach to training should be developed that is fit for purpose and practical.

Recommendation:

It is recommended that the industry develops and implements a training framework that includes:

– Appropriate mandatory courses with requirements for refresher courses.
– Drills that cover the interaction between the vessel captain, dynamic positioning operator and W2W operator and users.
– Regular refresher videos on the vessel.

5.8 HUMAN FACTORS

Issues relating to human factors was a reoccurring theme throughout the workshop. Human factors is a broad area and the section below outlines some of the areas where it should be considered.

As discussed in 5.3.1.1, the current W2W design practice is to utilise an auto-retract feature in several normal, abnormal and fault conditions, and then rely on procedures to manage the risk to an individual that is on the gangway. The decision-making process of the individual is therefore a critical mitigation measure.

Human factors should be considered in detail given the potential safety consequences, the complexity of the system, and the reliance on human decision making as a key safety barrier. It should be an integral part of the design process, with efforts made to quantify the effectiveness of decision making, particularly when under pressure in an emergency situation, and for this to be included in the safety analysis and risk assessment. Specifically, there should be consideration given to the suitability of reliance on decision making in this application. As mentioned in 5.3.1.1, this control measure is the lowest position in the hierarchy of controls. It is noted that there is evidence in the incident reports that individuals have made poor decisions during an emergency auto-retract process.

Another aspect of human factors is how, given an individual's critical role in the overall safety system, the design process ensures the individual is fully considered and the design is centred on supporting their performance. For example, this should include:

- Warning lights and sirens being clearly identifiable and distinct from other systems on the vessel (there are examples where the W2W warning siren is similar to another sound).
- The warning lights are suitably positioned so they are visible along the gangway.
- There is adequate lighting for individuals crossing the gangway, the operator and anyone else involved in the transfer, particularly in consideration of nighttime operations.
- The W2W operator has adequate visibility (either directly or through CCTV) of the transfer.
- Orientation of the control systems.

The training package (see 5.7.2) should also be developed in consideration of human factors.

There are also concerns about complacency and the need to regularly repeat training videos for the purposes of the technicians.

Recommendation:

It is recommended that the human factors discipline is fully integrated into the design process to assess the reliability of human decision making in an emergency auto-retract scenario. human reliability analysis (HRA) provides techniques to understand and help mitigate risks associated with human actions in engineered systems and should be considered.

It is also recommended that human factors is used to:

- Ensure the layout, alarms and warnings, communication processes and procedures are optimised for safety management,
- Support oversight of procedures,
- Support the design of a training framework so that it appropriately deals with human behaviours and complacency.

5.9 INSPECTION AND MAINTENANCE

There are regulatory requirements to inspect vessels, and this does include the W2W solution. These are, however, typically general inspections and the W2W solution is considered to be 'equipment on board' so not subject to a specific detailed independent inspection of the system. It is recommended that a specific W2W inspection is considered.

The life expectancy of W2W system was not generally considered. Corrosion was identified as the main concern but there is no systematic recording of failure rates or inspection results. It was generally unclear who had responsibility for the integrity and through-life management of the W2W solution. This is an example of an issue that may not be adequately addressed without the overarching safety management system discussed in 5.13.

Recommendation:

It is recommended that the industry establishes a specific framework for integrity management and inspections of W2W solutions. This should demonstrably deal with time-dependent degradation mechanisms.

5.10 MANAGEMENT OF SOFTWARE CHANGES AND UPDATES

During the workshop, it was recognised that the **W2W Provider** can implement software changes and updates remotely. There was no oversight or assurance of this process, or in some cases there may be no knowledge that it is taking place.

As discussed in section 5.4, the behaviour of the W2W solution within the vessel system cannot be defined explicitly and users needed to learn and understand it through its use in different conditions. There is clearly the possibility that changes to the control system will fundamentally change the behaviour without the knowledge of operators which increases the safety risks. There is also potential for the software change to contain a serious error, or even in the extreme case be subject to a cyber risk.

Recommendation:

It is recommended that **Windfarm Developers/Owners** review this risk and implement a process to ensure there are proportionate controls in place.

5.11 INDUSTRY LEARNING

There were concerns that the learnings from incidents were not adequately shared amongst the industry, and they were not systematically incorporated into design standards.

Recommendation:

It is recommended that the industry reviews how learning can be improved. This should include sharing information of incidents but also leading indicators such as operations of the auto-retract feature, equipment and system failures and issues with procedures.

5.12 EMERGING ISSUES

The main issue that needs consideration in the context of emerging issues was deemed to be the deployment of W2W solutions on floating wind, specifically concerns about the performance of W2W solutions when the floater is moving. The implications of this are not fully known to understand if it is going to cause issues and increase safety risks.

Recommendation:

It is recommended that the behaviour of W2W solutions when used with floating structures is reviewed and a de-risking programme established.

5.13 W2W SAFETY MANAGEMENT FRAMEWORK

W2W solutions are not simple and operate within a broader complex system that includes the vessel, the sea state, human factors, and the permanent asset. Furthermore, the control measures include design, procedures, and training, so an acceptable standard of safety levels is delivered through an appropriate combination and interaction of these factors. The consequences of a failure is also severe with serious safety implications.

The complexity, coupled with the seriousness of a failure, demands an overarching W2W Safety Management Framework. The only party who is in a position to deliver this is the **Windfarm Developer or Owner**. The feedback in the workshop was that this was not generally in place and as stated in 5.3.1 the majority of safety decisions are delegated to other parties.

It is recommended that **Windfarm Developers or Owners** increase their ownership of an overarching safety management framework and take a more active role in design decision making, management of system interfaces and oversight. The W2W Safety Management Framework should demonstrate that the overall system, including the W2W equipment, vessel, interface with the structure, procedures, maintenance, training, emergency response and assurance activities collectively provide an acceptable safety level. It should also cover human factors and outlines the life-cycle integrity plan.

This should be regularly reviewed and particularly following any relevant incident in the industry.

The oil and gas sector undertake gap analyses for FMECAs, and have specific tools for this purpose, and this may be an appropriate methodology to adopt when assessing gangways.

Recommendation:

It is recommended that **Windfarm Developers or Owners** implement an overarching safety management framework that covers the overall system and is used to demonstrate an acceptable level of safety. This should cover and integrate the themes discussed though the previous sections as appropriate.

5.13.1 W2W Safety management framework guidance

It was acknowledged in the workshop that **Windfarm Developers or Owners,** or WTG OEMs who may also be procuring W2W solutions, are not experts so guidance would be necessary to support the development of a W2W safety management framework.

Recommendation:

The industry should support **Windfarm Developers or Owners** implement overarching safety management frameworks and fulfil the requirements set out in the previous sections of this document by developing appropriate practical guidance. This should also provide guidance on how to carry out a holistic assessment of safety levels of W2W solutions, including the questions:

- Is the control logic in the event of a failure of part of the system understood and acceptable?
- Is there sufficient redundancy in the control system to avoid the system going into auto-retract mode due to sensor failures?
- Why it is necessary for the system to auto-retract while an individual is still on the gangway?
- Is the system reliability level adequate and acceptable?
- Has sufficient design assurance been carried out?
- Does the design include moving parts that could allow someone to being trapped?

6 RECOMMENDATIONS

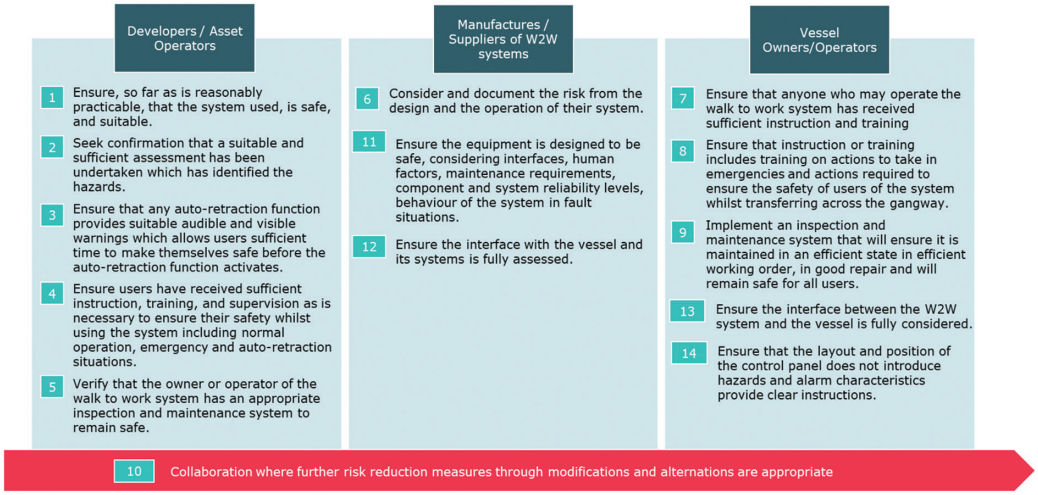
The following table provides the key recommendations from the workshop.

No.	Recommendation	Owner(s)
1	There should be greater ownership of the end-to-end safety management of W2W applications, including the W2W equipment, vessel, interface with the structure, procedures, maintenance, training, emergency response and assurance activities which collectively provide an acceptable safety level. This should ensure that the hierarchy of controls has been effectively deployed and that this can be demonstrated.	Windfarm Developers or Owners
2	To support item 1, appropriate guidance should be developed aligned with 5.13.1.	G+ and IMCA W2W working groups
3	The W2W systems currently deployed should be reviewed in line with the principles set out in item 1. Any issues that are identified should be rectified at the earliest reasonable opportunity.	Windfarm Developers or Owners and Vessel Operators
4	During the procurement process, the requirement to auto-retract when people are on the gangway should be challenged, and only permitted when it can be demonstrated that there are adequate controls in place and the residual risk is as low as is reasonably practicable.	Windfarm Developers or Owners and Vessel Operators
5	Options to implement the standardisation of key features of the W2W and transition piece should be reviewed with the objective of minimising issues at this critical interface.	G+ and IMCA W2W working groups
6	The overarching competency requirements for designers, vessel captains, W2W operators and 'users' should be reviewed and an industry standard competency framework developed.	G+ and IMCA W2W working groups
7	The overarching training requirements for designers, vessel captains, W2W operators and 'users' should be reviewed and an industry standard training framework developed. This should include emergency operations and simulations.	G+ and IMCA W2W working groups
8	Human factors expertise should be engaged to support the design process.	W2W providers and Vessel Operators
9	Human factors expertise should be engaged to support operational decision making, compliance with procedures and the training framework.	G+ and IMCA W2W working groups
10	A mechanism to share lessons learned by all relevant stakeholders including W2W providers and standard agencies.	G+ and IMCA

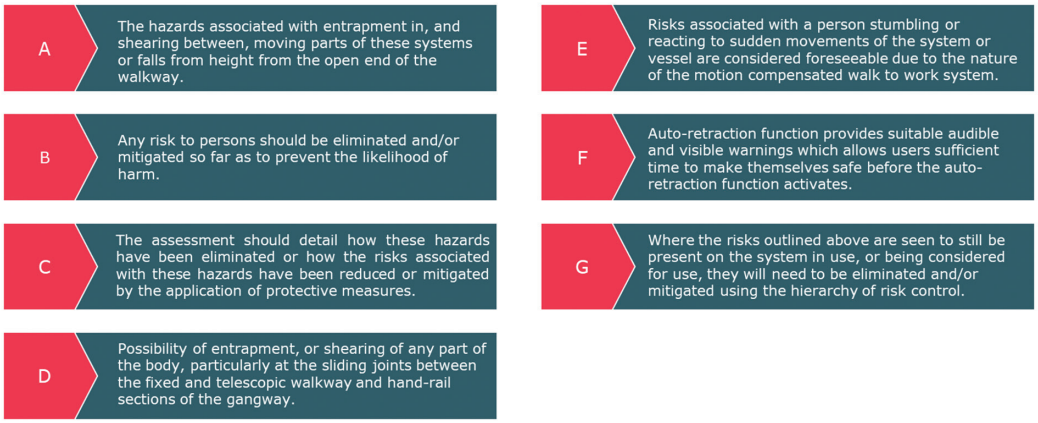
No.	Recommendation	Owner(s)
11	The large scale application of W2W systems on floating offshore windfarms should be researched to identify potential issues and possible mitigation activities.	G+ and IMCA W2W working groups
12	There should be a campaign to increase awareness of the IMCA standard and explore how a greater range of organisations can have access to them.	IMCA
13	The presence of an appropriate integrity management strategy for the W2W equipment should be investigated. If this is not in place, or not adequate, then actions should be taken to develop and implement one.	Windfarm Developers or Owners and Vessel Operators
14	A process to manage changes in the W2W software should be implemented if this is not in place.	Windfarm Developers Owners and Vessel Operators

APPENDIX A
WORKSHOP PRE-READ

A.1 SPECIFIC REQUIREMENTS FOR SAFE USE OF W2W SYSTEMS



A.2 RISK ASSESSMENT CONSIDERATIONS



APPENDIX B
CLOSING SUMMARY

General Summary

1. There is a need for an overarching safety management approach that integrates the various elements (design, process, training, etc.).
2. There is very little standardisation in the industry.
3. Significant variation in the dynamic positioning (DP), vessels, W2W.
4. There needs to be an increase focus on the discipline of human factors (a key control measure is discipline).
5. There are insufficient guidelines and standards (increased awareness is required).
6. The IMCA guidance wasn't fully understood and known about in some cases.
7. IMCA needs broader membership and wider industry coverage. Developers can stipulate memberships as a procurement requirement. Membership benefits need to be clear and communicated.

Design Summary

1. Standardisation of alarms, signs, markings etc is important for consistent user experience. Remove unnecessary differences – e.g. common alerts, etc.
2. Interfaces are key and the W2W system generally is procured after design decisions have been locked in.
3. The 'safety philosophy' is determined by the W2W designer and it is not part of design standard.
4. Integration between parties is vital – vessel operators, W2W OEMs developers and operators.
5. Some W2W OEMs have worked closely with vessel operators from the design stage and are able to develop an integrated DP / W2W system which an improved ability to design a suitable system for the project environment.
6. Some developers have defined W2W as a safety critical system which requires additional focus.
7. QA and control very important – certification alone isn't enough. Experience and incidents have shown that quality control must be in place and regularly reviewed.
8. There are issues relating to the management of changes to software and parameters.
9. Sharing of information is essential.

Procurement Summary

1. Functional specifications are used which pushes decisions in the supply chain.
2. There are opportunities to improve the level of oversight and assurance.
3. The level of assurance is variable.
4. There may be benefit in some industry guidance to help clients specify equipment and ensure compliance.
5. Standard approach from clients and how W2W providers present data (framework) help avoid gaps, communication…

Design Summary

1. Standardisation of alarms, signs, markings etc is important for consistent user experience. Remove unnecessary differences – e.g. common alerts, etc.
2. Interfaces are key and the W2W system generally is procured after design decisions have been locked in.
3. The 'safety philosophy' is determined by the W2W designer and it is not part of design standard.
4. Integration between parties is vital – vessel operators, W2W OEMs developers and operators.
5. Some W2W OEMs have worked closely with vessel operators from the design stage and are able to develop an integrated DP / W2W system which an improved ability to design a suitable system for the project environment.
6. Some developers have defined W2W as a safety critical system which requires additional focus.
7. QA and control very important – certification alone isn't enough. Experience and incidents have shown that quality control must be in place and regularly reviewed.
8. There are issues relating to the management of changes to software and parameters.
9. Sharing of information is essential.

Emerging Issues Summary

1. Floating – needs to be proactively managed. Good experience from operations and maintenance (O&M) with floating production storage and offloading (FPSOs).
2. W2W systems – ongoing subject matter expert (SME) support needed.
3. Mechanical degradation – monitoring.
4. Lessons learned and feedback from the industry – continue collaboration and reporting (possible reporting).
5. Operational limits and pressure to transfer.

Energy Institute
61 New Cavendish Street
London W1G 7AR, UK

t: +44 (0) 20 7467 7100
e: pubs@energyinst.org
www.energyinst.org

ISBN 978 1 78725 439 8
Registered Charity Number: 1097899