

# G+ Global Offshore Wind Health & Safety Organisation 6<sup>th</sup> Stakeholder Forum

Date: Wednesday 12 February 2020, Start 09:00, Finish 15:00 (CET)

Venue: NH Hotel, Near to Schiphol Airport, Kruisweg 495. Hoofddorp, 2132 NA, Amsterdam



In partnership with the



## Agenda

- 9:00 Registration, refreshments and networking
- 9:30 **Opening address from the new G+ Chairperson**  
Tove Lunde, Head of Safety, Security and Sustainability for New Energy Solutions, Equinor and Chairperson, G+ Board
- 9:50 **G+ work programme summary – Update from 2019 and plans for 2020**  
Kate Harvey, G+ General Manager  
Beate Hildenbrand, Manager Offshore Wind, Energy Institute
- 10:20 **Insight from IMCA and Workboat Association members**  
Subsea7, Boskalis, IMCA and the Workboat Association
- 10:45 Networking and refreshments
- 11:15 **Implementing G+: view from a Focal Group and member company**  
Hasse Andreasen, Director of Offshore HSE, Ørsted

- 11:40 **Taking offshore wind global**  
Ben Backwell, Chief Executive Officer, Global Wind Energy Council (GWEC)
- 12:00 Lunch
- 13:00 **Panel session – opportunity to question**  
Comprising supply chain representatives, G+ Board and Focal Group members
- 13:30 **Celebrating the successes of the G+ - what has worked well, engagement improvement and suggestions going forward?**  
Roundtable discussions
- 14:00 Networking and refreshments
- 14:15 **Feedback from roundtable discussions – celebrating the successes of the G+**
- 14:45 **Close of Stakeholder Forum**

# G+ GLOBAL OFFSHORE WIND HEALTH & SAFETY ORGANISATION 6<sup>TH</sup> STAKEHOLDER FORUM



13/02/2020

Tove Lunde, Chairperson – G+ Board of Directors

[www.gplusoffshorewind.com](http://www.gplusoffshorewind.com)

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# Safety information for the day

## Means of Escape -

In case of a fire alarm, please follow the fire exit signs (Fire exit 19 or down the stairs to through the lobby) and make your way to the Fire Assembly Point located outside:



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Join at  
**slido.com**  
**#Gplus**

 FULLSCREEN 

## Safety moment

Safety moment source: TPD SSU  
Published: October 2018

### Golden Gate Bridge – moving the HSE standard



**Are we prepared to be judged  
as ‘successful’ by today’s  
standard – or do we choose to  
make a difference and be  
recognised in the future for  
our HSE excellence?**

 **#safetymoment**

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# G+ work programme summary – Update from 2019 and plans for 2020

Kate Harvey, G+ General Manager

Beate Hildenbrand, Manager Offshore Wind

[www.gplusoffshorewind.com](http://www.gplusoffshorewind.com)

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# This is what we do



## The right data

Annual reports. Interactive tools. Available to everyone.



Transparent reporting and knowledge sharing  
are the bedrock of a safe industry

**Health & Safety Incident Reporting**



## The right guidance



Experience, expertise and consensus  
on the safest ways to work

**Good Practice Guidance**




## The right design

**Safe by Design Workshops**

- Machine transfer and access
- Deck chairs
- Hydraulic tensioning & torquing systems

**Wind Turbine Generation:**

- Twelve day
- Access risk signs
- Access to the transition zone
- Bridge from a turbine nacelle to the end of a bin



Design stage advice to reduce incidents  
throughout the lifecycle of an offshore wind farm

**Safe by Design Workshops**



## The right stuff



Incident Data Reporting:	Good Practice Guidance:	Safe by Design Workshops
Because transparent reporting and knowledge sharing are the bedrock of a safe industry	Because experience, expertise and consensus give us the safest ways to work	Because design stage improvements reduce incidents throughout the lifecycle of an offshore wind farm

Everything we do is about making people healthier and safer  
Working together and sharing knowledge  
Because we all own health and safety

**Offshore Wind Health and Safety**



### 3. G+ Good Practice Guidelines

← → ↻ 🔒 gplusoffshorewind.com/work-programme/guidelines


Global Offshore Wind  
Health and Safety Organisation


About the G+ Work programme Membership 🔍


## Good practice guidelines


Home » Work programme » Good practice guidelines


The G+ has published five good practice guidance documents to date. The guidance is intended to be used by all to improve global health and safety standards within offshore wind farms.

 G+/DROPS Reliable securing booklet for offshore wind


 G+ Integrated Offshore Emergency Response (G+ IOER) - Good practice guidelines for offshore renewable energy developments


 The safe management of small service vessels used in the offshore wind industry


 Working at height in the offshore wind industry


 Case study on reducing manual handling and ergonomics related incidents in the offshore wind industry


We are in the process of translating the G+ guidance into multiple languages. Copies of the G+ good practice guidelines are available to download in French, German and Mandarin from the following links.


 The safe management of small service vessels used in the offshore wind industry (German)


 G+/DROPS Reliable securing booklet for offshore wind (German)

 Working at height in the offshore wind industry (German)

 The safe management of small service vessels used in the offshore wind industry (Simplified Mandarin)

 G+/DROPS Reliable securing booklet for offshore wind (Mandarin)

 G+/DROPS Reliable securing booklet for offshore wind (French)

 The safe management of small service vessels used in the offshore wind industry (French)

### 3. G+ Good Practice Guidelines

Published in June 2019



#### G+/DROPS Reliable securing booklet for offshore wind

- An adaptation of selected DROPS *Reliable securing, Best practice recommendations for the securing of structure and equipment at the worksite* content to provide guidance and functional recommendations specifically for the offshore wind industry.
- This edition focuses on operations and maintenance activities in offshore wind. For future editions it is envisioned to also cover other lifecycle stages of offshore wind, as well as to address design risk assessment, adequate training and supervision to determine the risk of dropped objects and the measures suitable to prevent them.



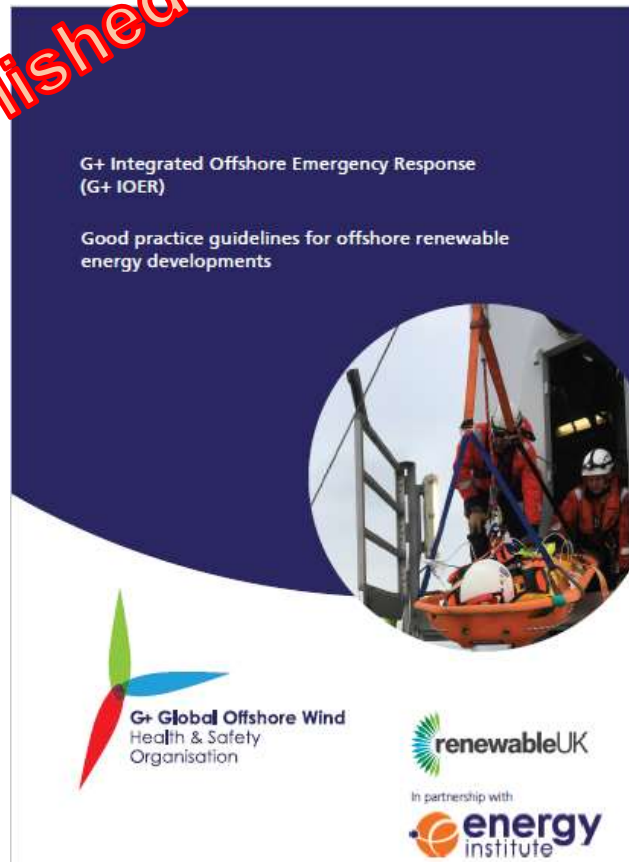
### 3. G+ Good Practice Guidelines

Published in October 2019



#### G+ Integrated Offshore Emergency Response (G+ IOER) Good practice guidelines for offshore renewable energy developments

- International approach for appropriate response that all accountable organisations are encouraged to apply, taking into account the specific risk profile of their projects and their legal and contractual obligations.
- Guidance on exact national expectations can be found within country-specific annexes



### 3. G+ Good Practice Guidelines

Published in June and  
October 2019



- **German and Traditional Mandarin translation of 2<sup>nd</sup> edition of the G+ Good practice guideline -The safe management of small service vessels used in the offshore wind industry**

### 3. G+ Good Practice Guidelines



Published in February 2020



#### **G+ Case study on reducing manual handling and ergonomics related incidents in the offshore wind industry**

- This document provides a case study which is based on analysis of offshore wind industry incidents, assessment of a sample of offshore wind industry activities, a systematic review of regulatory requirements, observation of good practice and stakeholder engagement, including peer review by G+ members.



### 3. Safe by Design Workshops



The G+ has held eight Safe by Design workshops - reports from seven workshops are available to download using the following links:



Marine transfer and access



Escape from a turbine Nacelle in the event of a fire



WTG service lifts



Davit cranes



WTG access and egress



WTG access to the transition piece  
(below airtight deck)



Hydraulic torqueing and tensioning  
systems

### 3. Safe by Design Workshops

Published in October 2019



#### G+ Safe by design Workshop report: Hydraulic torqueing and tensioning systems

- This G+ Safe by Design workshop examined hydraulic torqueing and tensioning on the main flange connections and the associated large fasteners and tooling.
- The workshop was held in London on 5 March 2019 and explored hydraulic torqueing and tensioning system issues with a focus on the Safe by Design (SbD) principles, under the direction of the G+ Focal Group.



# Incident data - Methodology



Member companies submit quarterly data to the Energy Institute, which is quality controlled and analysed.

- Quarterly internal reports reviewed by G+ Focal Group
- Quarterly Deep Dive meetings
- Annual review and update of G+ data template

Anonymised data reports are produced annually for public distribution

- Published through the Energy Institute
- Reports available at <https://www.gplusoffshorewind.com/>

The G+ Focal Group guides the analysis and recommends cross-organisational actions based on data trends.



# G+ 2018 incident data report

Published in June 2019



- The 2018 G+ incident data report continues to provide an overview of the health and safety performance of the G+ members' offshore wind activities, including the holistic industry benchmarking metrics of lost time injury frequency (LTIF) and total recordable injury rate (TRIR), which have experienced a remarkable improvement in 2018.
- In 2018, for the first time, we have collected country-specific information.
- The complete anonymised 2018 incident data is also now available online on the G+ website.

### 3. G+ ongoing and new work programme



Workstream 1	Communication - conference sponsorship and Stakeholder Day. APAC FG
Workstream 2	Transfer GPG
Workstream 3	Physical and medical
Workstream 4	Health and wellbeing
Workstream 5	Safety alerts and sharing information – Toolbox
Workstream 6	Safe by Design
Workstream 7	GPG self-assessment
Workstream 8	Incident data reporting
Workstream 9	HeliOps GPG

### 3. G+ ongoing and new work programme



#### Workstream 3: Physical and medical requirements for Offshore Wind industry workforce

- **Mapping physical requirements** and **developing industry health standards** has been identified as an increasing issue across the offshore wind industry.
  - Currently there is a **variety of medical standards and assessments** used in the international offshore and onshore wind industry. This situation leads to inconsistency, confusion and potential risk for health and safety in the sector.
- ➡
- Evaluation of physical working demands
  - Recommendation for validated medical & physical fitness assessments for offshore windfarm workers that are applicable in G+ member countries.

Adopting the correct physical fitness standards can significantly increase workers' job specific capability, and reduce accidents. These translate into significant industry savings through increased efficiency and safety in the workforce.

### 3. G+ ongoing and new work programme



#### Workstream 4: Health and wellbeing

Aim to identify resources for the industry to use, that would help support the wellbeing of its workforce when planning wellbeing campaigns, looking for solutions to wellbeing issues or applying best practices

- Best practices/strategies already being applied across our industry (potentially a survey of members)
- Access to campaigns already rolled out by Industry associations nationally/ internationally
- Resource map identifying organisations that provide specific services for wellbeing, mental health, and occupational health services
- A wellbeing workshop event for G+ members, focusing on mental health and wellbeing. Open to all relevant stakeholders.
- Agree project plan, including timelines.

**Occupational Stress Risk Assessment** (in collaboration with University of Hull & Health and Safety Executive UK), 13 May 2020 in Hull, UK

### 3. G+ ongoing and new work programme



#### Workstream 5: Safety alerts and sharing information – Toolbox

- Information to be shared: Safety alerts, safety critical tasks (SGRE Act safe), emotionally engaging videos.
- Languages: English, French, German and Traditional Mandarin

The screenshot shows the G+ Toolbox website interface. At the top is a dark header with the "toolbox" logo (a yellow and green icon) and the tagline "PUTTING SAFETY IN YOUR HANDS". To the right of the logo is a search bar with the word "Search" and a magnifying glass icon. Below the header, the main content area displays a safety alert titled "Heavy load dropped onto vessel during lifting operation". The alert is divided into two columns. The left column is titled "What happened?" and contains text describing an incident where a 100 kg load fell from a height of 5 meters onto the bow of a vessel. The right column is titled "Why did it happen?" and explains that the load was either rigged incorrectly or the lifting accessory was not appropriate. It also mentions that no personnel were injured. To the right of the text in the right column is a small image showing a close-up of a lifting hook and a spring gate.

#### Next Steps

- Collate and review G+ safety alerts.
- Starting to upload G+ materials by February
- G+ to decide on specific functionalities i.e. search functions, addition of the G+ logo

# This is what we are going to do

1

## Showcase our work

High level papers that explain the essence of the three main work areas:

- Incident data reporting
- Good practice guidance
- Safe by Design workshops.

Infographics and visual representations of that work.

The idea is to showcase the value of the work on a global scale.



# This is what we are going to do

2

## Showcase our stakeholders

Video interviews with G+ members to:

- Show how the work has evolved.
- Discuss the key issues in health and safety.
- To improve awareness

These have been filmed in the last month and the Media Hub will film more today.

20+ of these interviews will be released starting tomorrow and over the coming weeks.



# So who is we?



3

**You are the champions for health and safety in offshore wind.**

**You have helped create the material that is being released.**

**Now we need to spread that message.**

**To use our networks and influence to help improve health and safety.**

**Let's share the information.**

**Encourage others to engage.**

**Let's make our industry even safer.**



Let's start now

4



**Please switch ON  
all mobile phones**





# **We all own health and safety**

**#weallownhealthandsafety**

# Insight from IMCA and Workboat Association members



IMCA, The Workboat Association, Seaway 7

[www.gplusoffshorewind.com](http://www.gplusoffshorewind.com)

In partnership with the



International Marine Contractors Association

*Improving performance in the marine contracting industry*

# Marine Operations Supporting Renewable Energy

Captain Andy Goldsmith, Technical Adviser – IMCA

Kerrie Forster, Chief Executive Officer - The Workboat Association

Marc van Dorth, Project Engineer – Seaway 7

12 February 2020



## **Who we are**

- We are the trade association representing the vast majority of marine contractors worldwide, with 800 member companies in 60 countries.
- Our history dates from 1972 and the association was renamed in 1995.
- We have a technical and safety focus and have developed a comprehensive library of best practice operating standards for the industry.
- Our mission is to Improve Performance in the Marine Contracting Industry.

# Improving Performance



IMCA has over the past 40 years been fully engaged in reducing the risk of accidents in our industry.

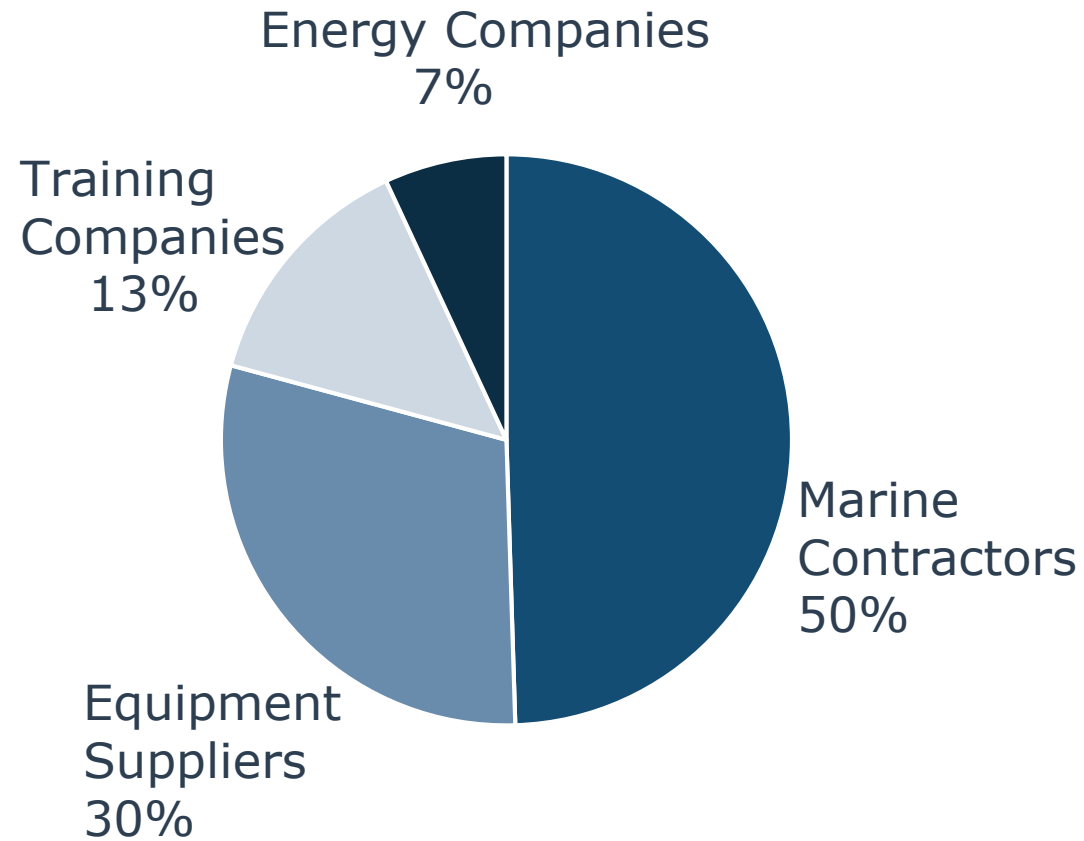
Competence and certification

Equipment standards and compliance requirements

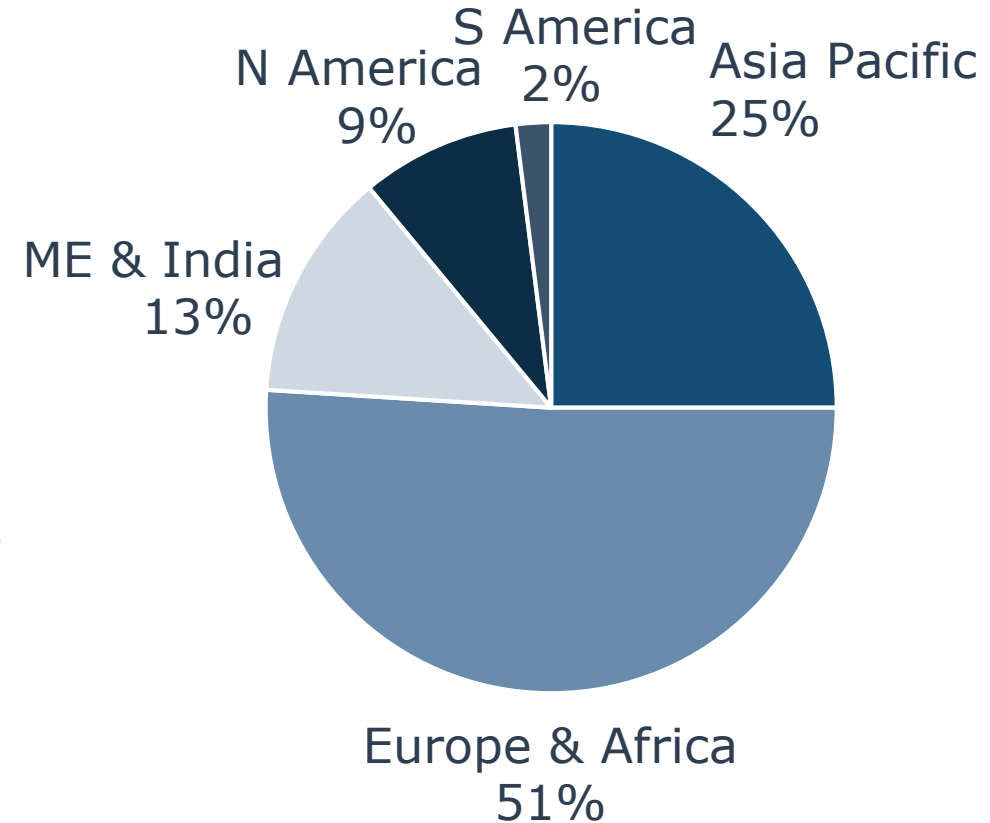
Safe processes and procedures within our documentation

- We operate through a structure of committees, workgroups, and task forces.
- The committees address safety, technical, operational, and contractual matters to improve the performance of the industry.
- 35 committees and workgroups in operation.
- 300 people are engaged in the committee process, mainly generating and maintaining the technical library.

# Membership



**BY MEMBERSHIP  
CATEGORY**



**BY MEMBERSHIP  
LOCATION**

# Operator Members

We have 60 Operator members - Oil & Gas and Offshore Renewable Energy



# Renewable Energy



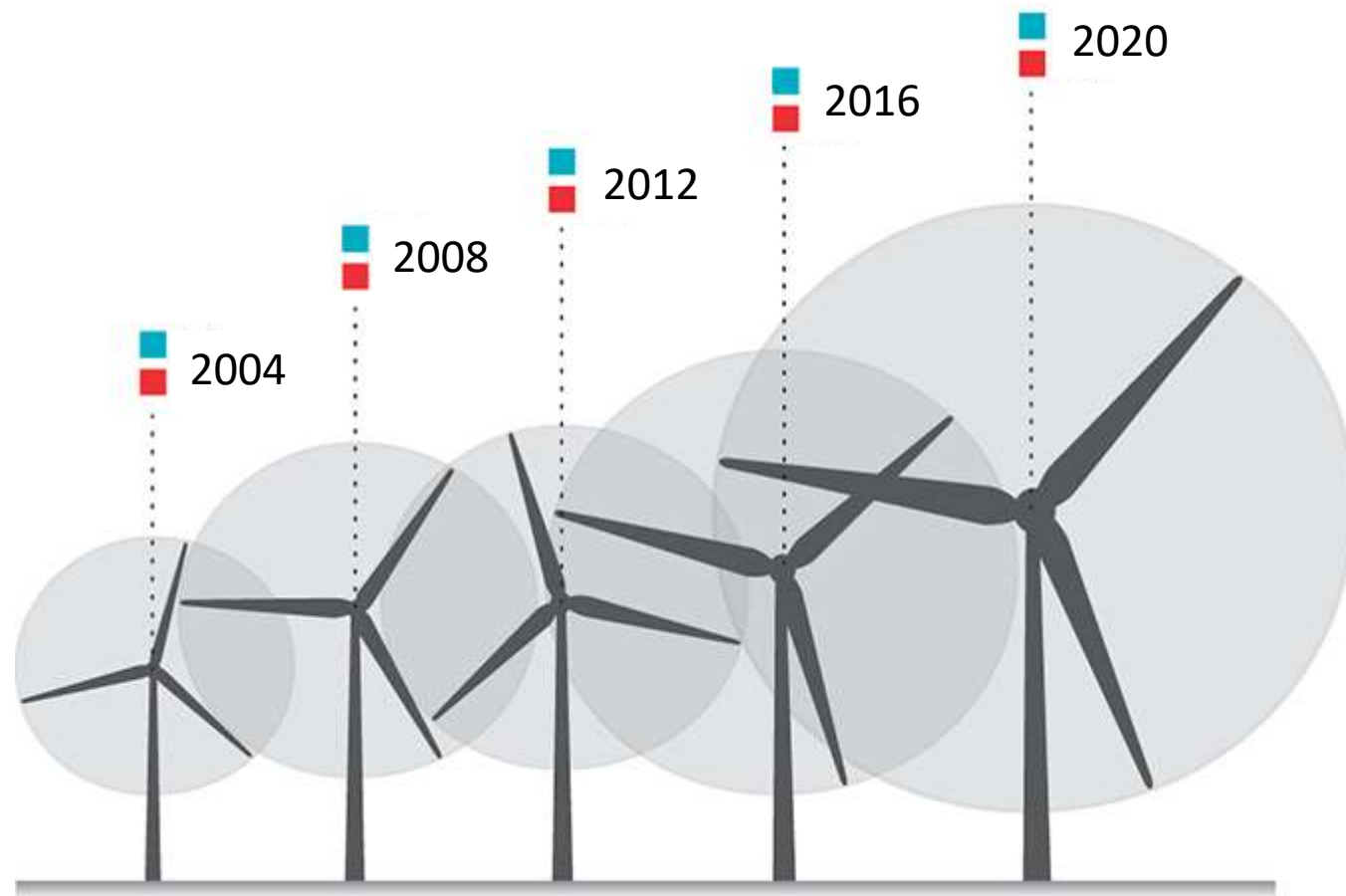



## What is the message?

- IMCA has the knowledge and experience in marine operations
- IMCA has the International recognition and global reach to provide influence
- IMCA supports the harmonisation of guidance and standards across the energy sectors
- IMCA Members are required to follow IMCA Guidance

Kerrie Forster – CEO, The Workboat Association

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A reflection on workstreams that have positively affected the Workboat Sectors involvement in the Offshore Wind Industry since the formation of G+

- eCMID Development
- Boatlanding Standardisation
- Drop Object Mitigation

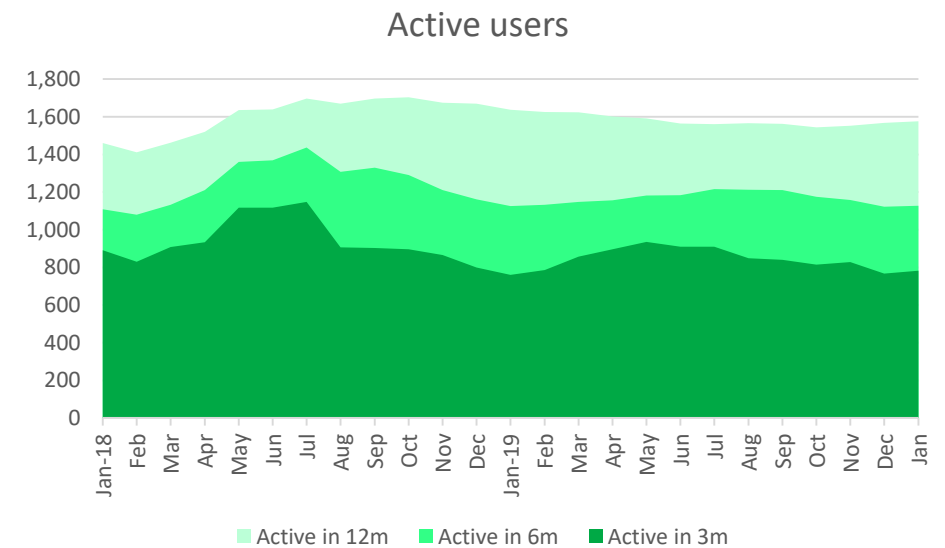
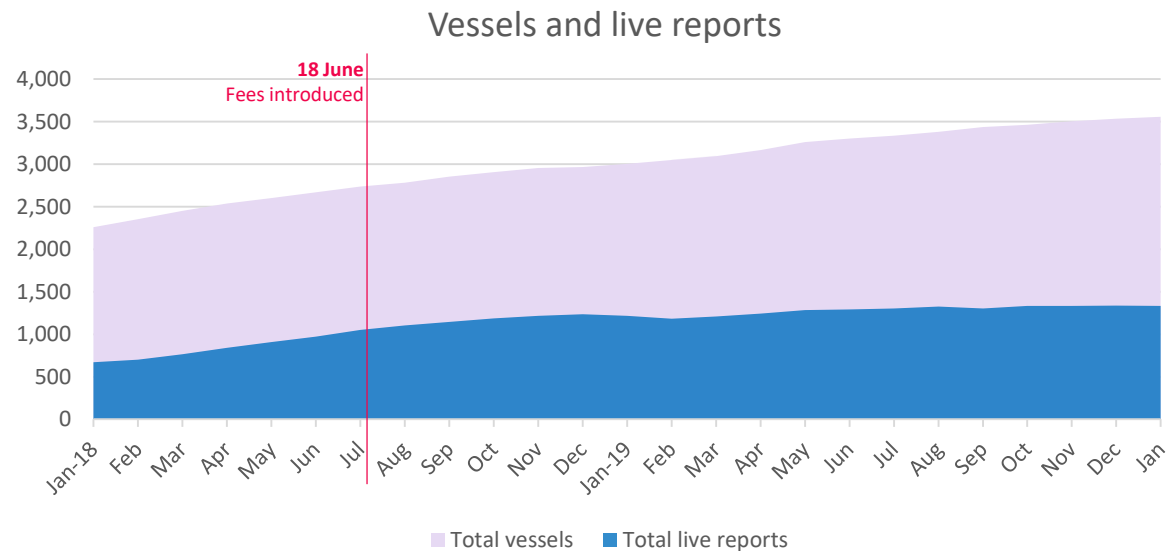
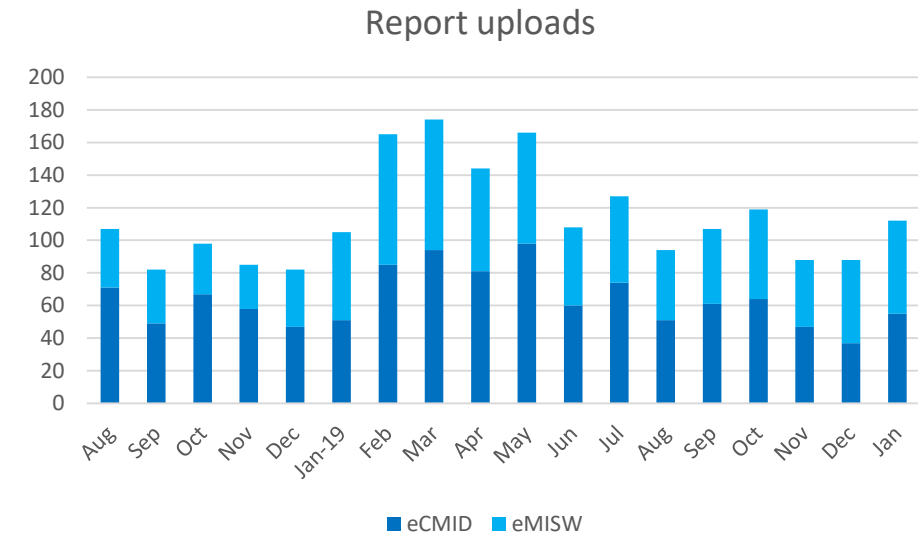




## **Electronic** Common Marine Inspection Document

# eCMID system status

	29 Jan 19	29 Jan 20		
• Live reports:	1216	1333	↑	10%
• Live eCMID reports:	763	727	↓	5%
• Vessels:	3003	3558	↑	19%
• Users (active 6m):	3885	4198	↑	8%



# Inspector accreditation – AVI scheme

## Status of Accredited Vessel Inspector scheme

- Statistics as at 27<sup>th</sup> January 2020:
  - 487** AVIs
  - 141** Non-renewals
  - 8** Suspended (non-attendance of course)
  - 37** Need to attend AVI course
  - 338** Live AVIs
  - 57** Failed assessment
  - 67** Withdrawn prior to assessment
  - 4** With assessors
  - 20** Awaiting information to complete application packs
  - 635** Total applications
- Monthly number of applications (average) 2019: **5.4**



# Progressive Web Application



- Operational testing begins in the next few weeks
- Final completion due for end of 2020



# Objectives and workplan

## **Strategic Objectives:**

1. Keep the eCMID & MISW relevant for the users of today
2. Develop the eCMID & MISW for the users of tomorrow
3. Align with the strategy and objectives of the Marine Division
4. Provide a forum for the exchange of views and expertise on matters pertaining to the eCMID and vessel auditing
5. Actively engage with key industry trade bodies on vessel inspection matters



# GOLDEN RULES



- Do not accept paper copies of a CMID of MISW
- Make sure your Inspector is familiar with the type of vessel they are Inspecting
- Feedback, Feedback, Feedback
- Spread the word





# Standardised Boat Landing Research Report

The information received is analysed and reported in this document which summarises the 'state of the art' and can be used to guide future research and help develop specific guidance.

## 3.3 Abbreviations

CHS	Circular hollow section
CTV	Crew transfer vessel
DNV	Det Norske Veritas
EWEA	European Wind Energy Association
HAT	Highest astronomical tide
HSLC	High speed light craft
IJUBOA	International Jack-up Barge Operators Association
IMCA	International Marine Contractors Association
LAT	Lowest astronomical tide
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MSL	Mean sea level
NWA	National Workboat Association
RHS	Rectangular hollow section
RIB	Rigid inflatable boat
SOV	Service and operation vessel
SUT	Society for Underwater Technology
SWATH	Small waterplane area twin hull
TP	Transition piece
UK HSE	UK Health & Safety Executive
WTG	Wind turbine generator
W2W	Walk to work

## 3.4 Acknowledgements

The following companies and groups are gratefully thanked for their support and information and feedback they have provided:

- Seaway Heavy Lifting and Subsea 7;
- Industry associations and regulatory bodies:
  - International Marine Contractors Association
  - National Workboat Association
  - RenewableUK
  - European Wind Energy Association
  - UK Health & Safety Executive
  - Carbon Trust;
- G9 Offshore Wind Health and Safety Association members, in
  - Centrica Energy
  - Dong Energy
  - E.ON
  - SSE
  - Statoil
  - Statkraft

## 7 Fender Impact Loading

### 7.1 Safety

Crew transfer operations on to WTG foundations are critical activities that need to be completed safely. The operation should be risk assessed and should not be attempted if the CTV is moving around unpredictably in marginal sea states.

The boat landing structure is itself a safety critical piece of equipment. A CTV will be pressing up against the bumper with many tonnes of thrust in addition to hydrodynamic loads. If the bumper fails during a transfer operation the transferring technician is at risk of injury.

There is limited experience of boat landing failure in offshore wind. For example, boat landings were damaged and replaced on the Horns Rev projects. The damage modes included:

- splaying of the fenders due to vessel roll during transfer operations;
- buckling due to impact loads.



Figure 18 – Examples of boat landing damage (LIC Engineering)

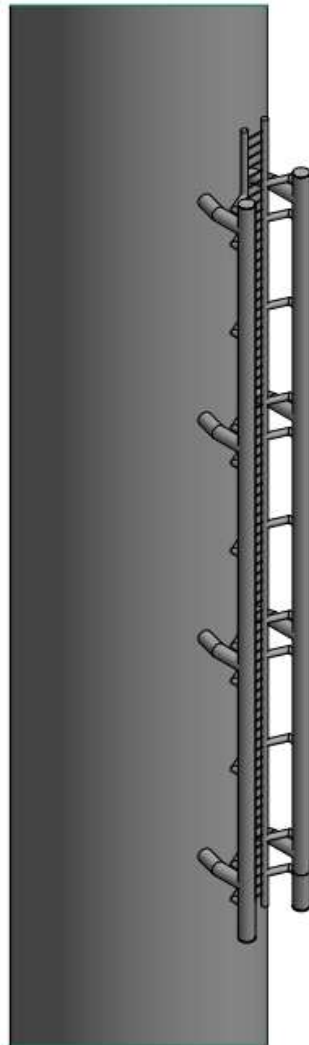


Figure 19 – Curved fender on a ship shaped bow (RG Seasight)

In the UK, the most widely known incident was the failure of the bottom section of the boat landing on a hotel vessel on the Sheringham Shoal project resulting in a crew transfer vessel becoming temporarily trapped under the boat landing.

There have not been widespread failures of the boat landing systems and therefore it can be concluded they have been designed conservatively. However, with high numbers of visits to these foundations it is yet to be seen if there is a longer term issue with fatigue that has yet to materialise.





ISOMETRIC VIEW RECOMMENDED  
BOAT LANDING DESIGN

## RECOMMENDED BOAT LANDING GEOMETRY FOR PUBLIC RELEASE

- THE AIM OF THE OWA PROGRAM IS TO REDUCE THE COST OF OFFSHORE WIND TO BE COMPETITIVE WITH CONVENTIONAL ENERGY GENERATION AS WELL AS TO PROVIDE INSIGHTS REGARDING INDUSTRY STANDARD (AND BEST PRACTICE) HEALTH AND SAFETY REQUIREMENTS.
- THE AIM OF THIS GENERIC BOAT LANDING GEOMETRY IS TO IMPROVE CONSISTENCY ACROSS NEW WIND FARM DEVELOPMENTS. ALL BOAT LANDINGS SHALL AIM TO BE ROBUST AND HAVE SUFFICIENT STRENGTH TO WITHSTAND, WITHOUT PERMANENT DAMAGE, THE EXPECTED OPERATIONAL LOADS THROUGHOUT ITS DESIGN LIFE. CONSISTENCY CAN HELP REDUCE OPERATIONAL COSTS AND MEANS PERSONNEL CAN GAIN FAMILIARITY WITH THE LAYOUT.
- THE BOAT LANDING WILL BE DESIGNED TO REDUCE THE IMPACT ON THE PRIMARY STEEL BY HAVING FATIGUE EFFICIENT CONNECTIONS AND ALSO A FAIL FIRST MECHANISM UNDER ABNORMAL LOADS.
- THE ASSESSMENT COMPLETED FOR THIS PROJECT AND THE CONCLUSIONS MADE ARE FOR A GENERIC BOAT LANDING DESIGN. THE PROJECT WAS COMPLETED ON A NUMBER OF ASSUMPTIONS TO ENABLE DESIGN INPUT PARAMETERS TO BE DEFINED. FOR A SPECIFIC PROJECT THESE ASSUMPTIONS SHOULD BE CHECKED AND VALIDATED AGAINST AVAILABLE DATA TO ENSURE THEY ARE APPROPRIATE. THESE DRAWINGS ARE FOR A GENERIC DESIGN CASE AND NOT INTENDED TO REPLACE A DETAILED BOAT LANDING DESIGN ASSESSMENT AND REVIEW PROCESS.

FURTHER DETAILS OF THE METHODOLOGY AND ASSESSMENT CAN BE FOUND IN 'MARKET REVIEW AND BOAT LANDING DESIGN BRIEF' [1] WHICH CAN BE REQUESTED FROM THE CARBON TRUST. THESE PUBLICLY AVAILABLE DRAWINGS ARE PART OF A COMPREHENSIVE STUDY AND REMAIN THE INTELLECTUAL PROPERTY OF THE OWA.

### KEY ASSESSMENT PARAMETERS

#### IMPACT FORCE

THE OPERATIONAL AND ABNORMAL DESIGN CTV IMPACT FORCES ONTO BOAT LANDING SHOULD BE CALCULATED USING THE METHODOLOGY IN DNVGL-ST-0437 [7]. THE FOLLOWING COMPONENTS ARE RECOMMENDED TO BE ACCOUNTED FOR IN THE CALCULATION OF THE IMPACT FORCE:

- STIFFNESS & ACCEPTABLE DEFORMATION OF CTV FENDER
- EXPECTED MAXIMUM DISPLACEMENT OF CTV IN OPERATION AND ASSOCIATED ADDED MASS FACTOR
- DECELERATION OF CTV DURING VESSEL IMPACT NOTING ERGONOMIC SAFETY LIMITS FOR PERSONNEL
- DEFLECTIONS OF BOTH FOUNDATION (PRIMARY AND SECONDARY STRUCTURE) & CTV FENDER TO BE USED IN ENERGY BALANCE CALCULATION
- CONTRIBUTIONS FROM WAVE AND CURRENT TO VESSEL IMPACT SPEED

AN APPROACH ANGLE FOR IMPACT OF  $\pm 45$  DEGREES FROM THE CENTRELINE OF THE BOAT LANDING WAS REVIEWED AS PART OF THIS PROJECT

WORK ON IMPACT FORCE CALCULATION IS ONGOING AS PART OF OWA ACTIVITIES

#### CRUSHING FORCE

IF CTVs WITH A GRIPPER DOCKING SYSTEM (FOR EXAMPLE, A CLAMPING SYSTEM WITH ASSOCIATED MOTION COMPENSATING SYSTEM POSITIONED AT THE FRONT OF THE CTV WHICH CLAMPS TO A BUMPER BAR) ARE USED ACROSS THE WIND FARM, THE BUMPER BARS WILL NEED TO BE CHECKED FOR LOCAL BUCKLING AND FAILURE DUE TO THE CRUSHING FORCE FROM THE DOCKING CLAMP.

MATERIAL AND LOAD FACTORS SHOULD BE APPLIED ACCORDING TO RELEVANT CODE REQUIREMENTS.

#### BOAT BUMPER IMPACT ELEVATION INPUTS

AT THE HIGHEST TIDAL CONDITIONS DURING WHICH TRANSFERS ARE TO BE UNDERTAKEN, AND ALLOWING FOR VESSEL HEAVE DUE TO SEA STATE, THE VESSEL MUST NOT BE CAPABLE OF RIDING OVER THE TOP OF THE BUMPER BARS, AND ANY REST PLATFORMS ON THE LADDER MUST BE CLEAR OF THE VESSEL [6].

#### UPPER LIMIT ASSUMPTIONS AND VALUES:

- GLOBAL WATER LEVEL RISE =  $\pm 0.3m$
  - WATER DEPTH UNCERTAINTY =  $\pm 0.5m$
  - MAXIMUM VESSEL FREEBOARD =  $\pm 4.0m$
  - WAVE CREST HEIGHT @ Hs OF  $2.5m = 2.5 * 1.86 * 0.6 = \pm 2.8m$
- TOTAL: HAT =  $7.9m$

AT THE LOWEST TIDAL CONDITIONS DURING WHICH TRANSFERS ARE TO BE UNDERTAKEN, AND ALLOWING FOR VESSEL HEAVE DUE TO SEA STATE, THE VESSEL MUST NOT BE AT RISK OF BECOMING TRAPPED BENEATH THE BUMPER BARS [6]

#### LOWER LIMIT ASSUMPTIONS AND VALUES:

- WATER DEPTH UNCERTAINTY =  $-0.5m$
  - MINIMUM VESSEL FREEBOARD =  $\pm 0.5m$
  - WAVE TROUGH HEIGHT @ Hs OF  $2.5m = 2.5 * 1.86 * 0.4 = -1.9m$
- TOTAL: LAT =  $-1.9m$

### G+ GUIDELINES [6]

#### SAFE ZONE

A SAFE ZONE TO PROTECT PERSONNEL FROM POTENTIAL CRUSHING, EXTENDING FROM THE LADDER FACE OF  $500mm$  SHALL BE MAINTAINED AT ALL TIMES.

#### MAXIMUM STEPPING DISTANCE:

THE DISTANCE FROM THE LADDER TO A SAFE AND SUITABLE NON-SLIP WALKING SURFACE ON THE CTV SHALL BE A MAXIMUM OF  $850mm$  FROM THE CENTRELINE OF THE LADDER RUNG TO ALLOW SAFE ACCESS.

A DISTANCE OF  $850mm$  FROM THE FRONT OF THE BUMPER TO THE CENTRELINE OF THE LADDER RUNG IS RECOMMENDED AS THIS FULFILLS THESE REQUIREMENTS. WHERE POSSIBLE  $850mm$  SHOULD BE USED ACROSS DIFFERENT WIND FARM DEVELOPMENTS TO IMPROVE CONSISTENCY AND AID FAMILIARITY IN OPERATIONS.

THE  $850mm$  BUMPER OFFSET IS MOST APPLICABLE IN AREAS OF NEW WIND FARM DEVELOPMENTS. WHERE PROJECTS ARE TO BE LOCATED CLOSE TO EXISTING WIND FARMS, THE LAYOUT OF THE EXISTING WIND FARMS SHOULD BE TAKEN INTO CONSIDERATION. IT IS NOTED THAT IN BOTH UK & EUROPEAN WATERS A BUMPER OFFSET DISTANCE OF  $770mm$  IS COMMONLY USED AS PER RECOMMENDATIONS IN [6].

#### CORROSION ALLOWANCE

DUE TO MATERIAL LOSS THROUGH ABRASION AND IMPACT BY CTVs A CORROSION ALLOWANCE OF BETWEEN  $2-4mm$  IS RECOMMENDED IN [6]. A CORROSION ALLOWANCE OF  $4mm$  IS RECOMMENDED FOR THE BUMPER BAR SURFACES THAT ARE SUBJECT TO ABRASION FROM CTVs AND  $2mm$  FOR OTHER SURFACES. THE REQUIRED CORROSION ALLOWANCE IN EACH PROJECT SHOULD BE REVIEWED ALONGSIDE THE PAINTCOATING SPECIFICATION AND THE CORROSION PROTECTION STRATEGY.

ALL MEMBERS SHALL AIM TO BE SEALED TO PREVENT INTERNAL CORROSION.

A THERMALLY SPRAYED COATING CAN BE APPLIED FOR ADDITIONAL CORROSION PROTECTION; THIS SHOULD BE REVIEWED ON A PROJECT SPECIFIC BASIS.

#### PROJECT DETAILS

AS PART OF THIS PROJECT OTHER AREAS OF THE BOAT LANDING DESIGN WERE REVIEWED. THESE ARE DETAILED IN [1] AND INCLUDE: CONNECTION DETAILS TO PRIMARY STRUCTURE INCLUDING FATIGUE IMPLICATIONS, SYMPATHETIC LOADING EFFECTS, FAIL FIRST DESIGN CRITERIA, AREAS OF DESIGN TO AID OFFSHORE REPLACEMENT OF BOAT LANDING IF DAMAGED, VORTEX INDUCED VIBRATION & SUPPORT ELEVATIONS.

#### REFERENCES

- [1] MARKET REVIEW AND BOAT LANDING DESIGN BRIEF, REV A2, ATKINS, FEB 2019
- [2] LOADS AND SITE CONDITIONS FOR WIND TURBINES, DNVGL-ST-0437, DNVGL, NOV 2016
- [3] BS EN ISO 14122 PARTS 1-4: SAFETY OF MACHINERY, JUNE 2016
- [4] BS EN 50308 WIND TURBINES - PROTECTIVE MEASURES, DEC 2005
- [5] STANDARDISED BOAT LANDING RESEARCH REPORT, IMCA SEL 041, M 232, SEPT 2016
- [6] WORKING AT HEIGHT IN THE OFFSHORE WIND INDUSTRY, G+ GOOD PRACTICE GUIDELINES, NOV 2014
- [7] LOADS AND SITE CONDITIONS FOR WIND TURBINES, DNVGL-ST-0437, DNVGL, NOV 2016
- [8] SUPPORT STRUCTURES FOR WIND TURBINES, DNVGL-ST-0126, DNVGL, JULY 2018.

#### ACRONYMS

HAT = HIGHEST ASTRONOMICAL TIDE  
LAT = LOWEST ASTRONOMICAL TIDE  
OWA = OFFSHORE WIND ACCELERATOR  
CTV = CREW TRANSFER VESSEL  
WTG = WIND TURBINE GENERATOR

### SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

OTHER THAN THE HAZARDOUS RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NO FURTHER SIGNIFICANT RISKS HAVE BEEN IDENTIFIED

#### NOTES:

- WORK IN ASSOCIATION WITH CARBON TRUST AND OFFSHORE WIND ACCELERATOR PROGRAM (OWA PARTNERS: ENBW, RWE RENEWABLES, INNOVY SE, ORSTED, SCOTTISH POWER, RENEWABLES/BERROLA, SHELL, SSE RENEWABLES, EQUINOR, VATTENFALL WIND POWER).
- LARGER VESSELS ( $>120m$ ) ARE IN OPERATION, FOR EXAMPLE, SATV. THESE ARE CURRENTLY EXCEPTIONS AND SHOULD BE CONSIDERED ON A CASE BY CASE BASIS - SEE [1] FOR DETAILS.



ATKINS	Woodside Grove Addley Road Gorton M16 9BB
Copyright © Atkins Limited (2019)	Tel: +44 (0)1273 736146 Fax: +44 (0)1273 740000

CARBON TRUST	OWA PARTNERS
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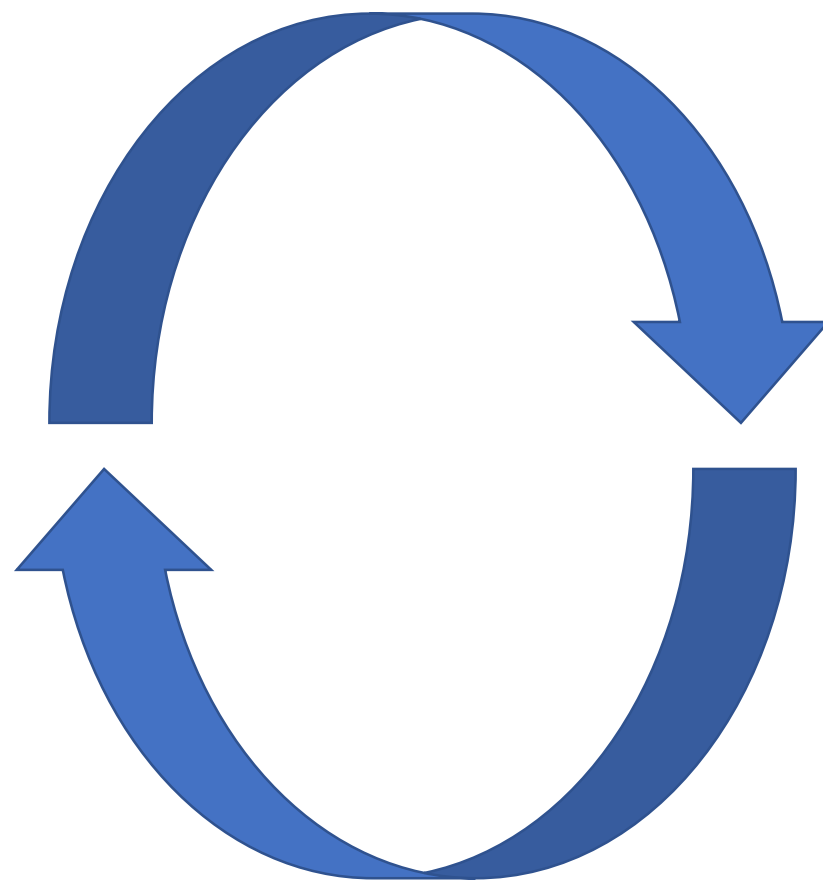
CARBON TRUST	OWA PARTNERS
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**HELP**

Dropped Objects Mitigation







## Marc van Dorth, Seaway 7



- (DP) Incident reporting/ IMCA Annual Statistics
- Marine Renewables - W2W Processes Workgroup
- Marine Renewables - Safety Training Matrix Workgroup

seaway<sup>7</sup>



# IMCA

- Two (2) incident reporting schemes
  - Safety Flashes (continued success)
  - DP Events Reporting


DP EVENT REPORTING


### DP Station Keeping Event Reporting Form

Revised January 2020

IMCA DP station keeping event reporting is secure and confidential. The reports are used to provide anonymous information to the DP industry so as to improve the overall safety of DP operations. See [www.imca-int.com/dp-events](http://www.imca-int.com/dp-events) for more details.

This report should be completed on the following occasions:

- DP incident – a major system failure, environmental or human factor which has resulted in a loss of DP capability
- DP undesired event – a system failure, environmental or human factor which has caused a loss of redundancy and/or compromised DP capability
- DP observation – an event that has not resulted in a loss of redundancy or compromised DP operational capability, but is still deemed worthy of sharing

Please submit your completed form (and supporting documents) to your vessel operating company.

IMCA members and non-member companies should forward reports to IMCA so that information can be anonymously shared with industry by emailing [incidentreports@imca-int.com](mailto:incidentreports@imca-int.com)

**Document details and issue record** This section is treated by IMCA as highly confidential

Vessel	
Location	
Client	
Date of event	
Reported by	
Rank/rating	
Report status (initial/final)	

**1 Operation**

Operation type	
DP event type *	
IMO DP equipment class	
Region	

\* Example events

**DP incident:**

- A thruster fails incorrectly and acts as an undesirable force on the vessel, resulting in the loss of station keeping
- The DP network has failed with errors and all control is lost, the main DP system has lost position keeping capability
- Incorrect setup of an auxiliary system causes transfer of a fault on both redundancy groups
- A blackout leads to loss of position

**DP undesired event:**

- Failure of a DP controller causing a loss in redundancy in the main DP system
- A position reference has a valid signal input with interference and is not rejected
- A partial blackout, vessel holds position but has no redundancy

**DP observation:**

- Failure of a thruster which does not result in a loss of redundancy
- Circuit breakers in a distribution panel are incorrectly labelled
- An incorrect alarm description appears on the DP system causing momentary confusion

IMCA DP Station Keeping Event Reporting Form – Revision January 2020

Page 1 of 3

# IMCA Safety Flash



- Safety alerts are provided by IMCA members and other offshore organisations
- Alerts reissued in Safety Flashes with permission of originator
- More than 20 years of safety alerts with unparalleled use by industry
- Anonymised

A screenshot of the IMCA Safety Flashes website. The header is dark blue with the IMCA logo on the left and a navigation menu on the right. The main content area is white with a large orange lightning bolt icon and the text "SAFETY FLASHES". Below this, there is a search bar and a list of links. The "LATEST ALERTS" section features two entries, each with a lightning bolt icon and a brief description. The "Annual Listings" section shows a grid of years from 2019 to 1997. At the bottom, there is a "Submit a Report" button and a link to the incident reporting hub.

**IMCA**

Search...

[ABOUT IMCA](#) [COMMITTEES](#) [NEWS](#) [EVENTS+MORE](#) [RESOURCES](#) [A-Z](#)

**SAFETY FLASHES**

IMCA safety flashes disseminate important information on incidents and potential hazards and the lessons learnt from them that can help prevent incidents occurring elsewhere in the industry.

Traditionally published as collections (available for download from this site), the alerts are also now available individually online, tagged and searchable.

All members are encouraged to contribute relevant safety-related information – see our guide to the [safety flash submission and approval process](#).

A [summary for 2018 safety flashes](#) has now been published.

---

**LATEST ALERTS**

**Near miss – two dropped objects (MSF)**  
What happened? The Marine Safety Forum (MSF) has published Safety Alert 19-08 relating to two dropped object incidents on the same vessel. Both events had the potential to cause major or fatal injuries to vessel deck or installation crew involved in lifting operations. In the first incident, on a vessel engaged in offshore backloading operations. [Continue reading](#)  
25 July 2019

**Mattress beam landed very close to divers**  
What happened? During subsea lifting operations with divers in the water, a large mattress lifting beam was lowered inappropriately close to the divers. The two saturation divers were deployed on the seabed at 156 msw, assisting with concrete mattress recovery using a mattress lifting beam attached to the vessel main crane. The beam weighed 695kg. [Continue reading](#)  
29 July 2019

Search safety flashes

**Annual Listings**

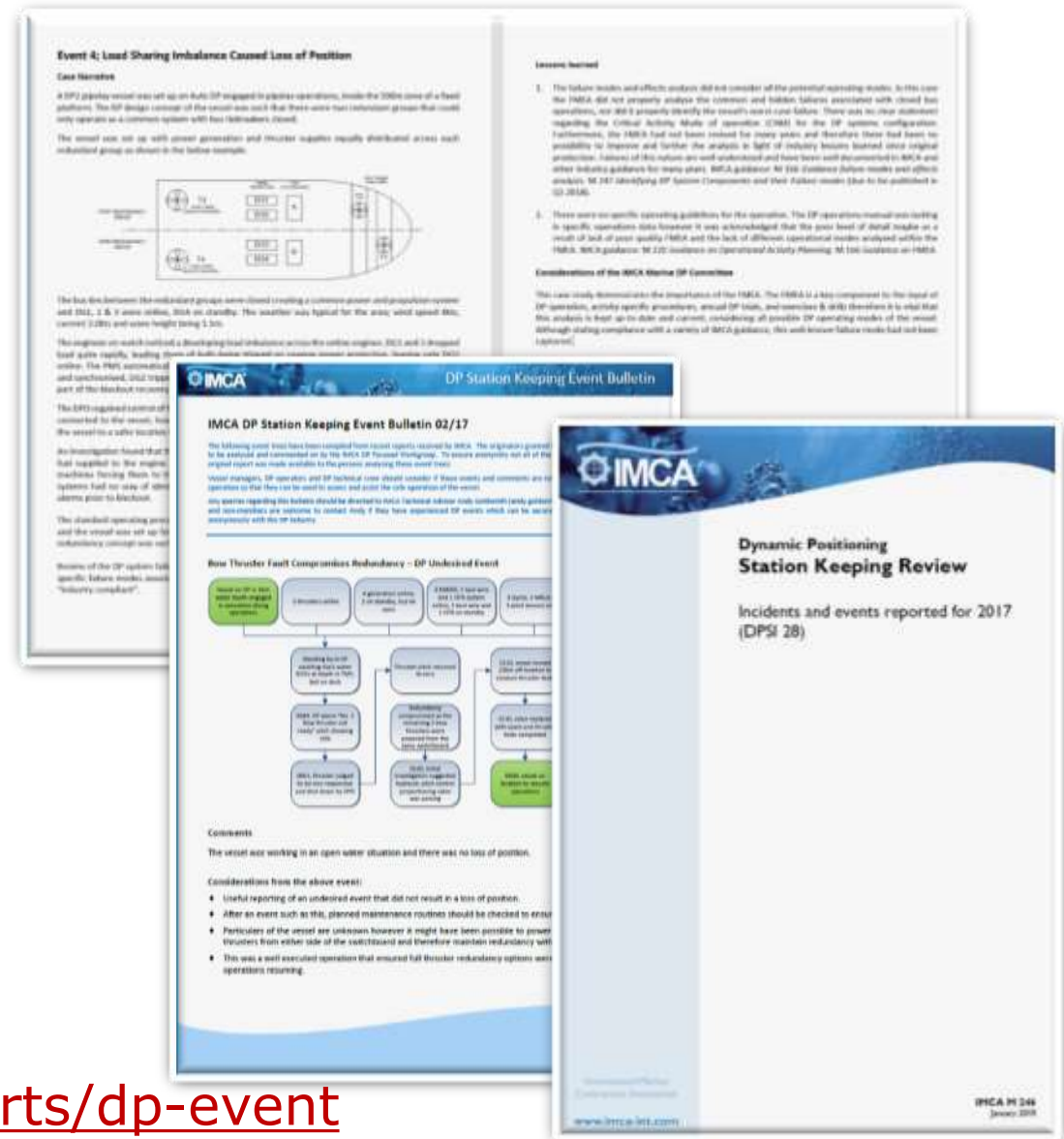
• 2019	• 2011	• 2003
• 2018	• 2010	• 2002
• 2017	• 2009	• 2001
• 2016	• 2008	• 2000
• 2015	• 2007	• 1999
• 2014	• 2006	• 1998
• 2013	• 2005	• 1997
• 2012	• 2004	

**Submit a Report**

Please visit our [incident reporting hub](#) for process details, forms and submission guidance.

# DP Event Reporting Scheme - Output

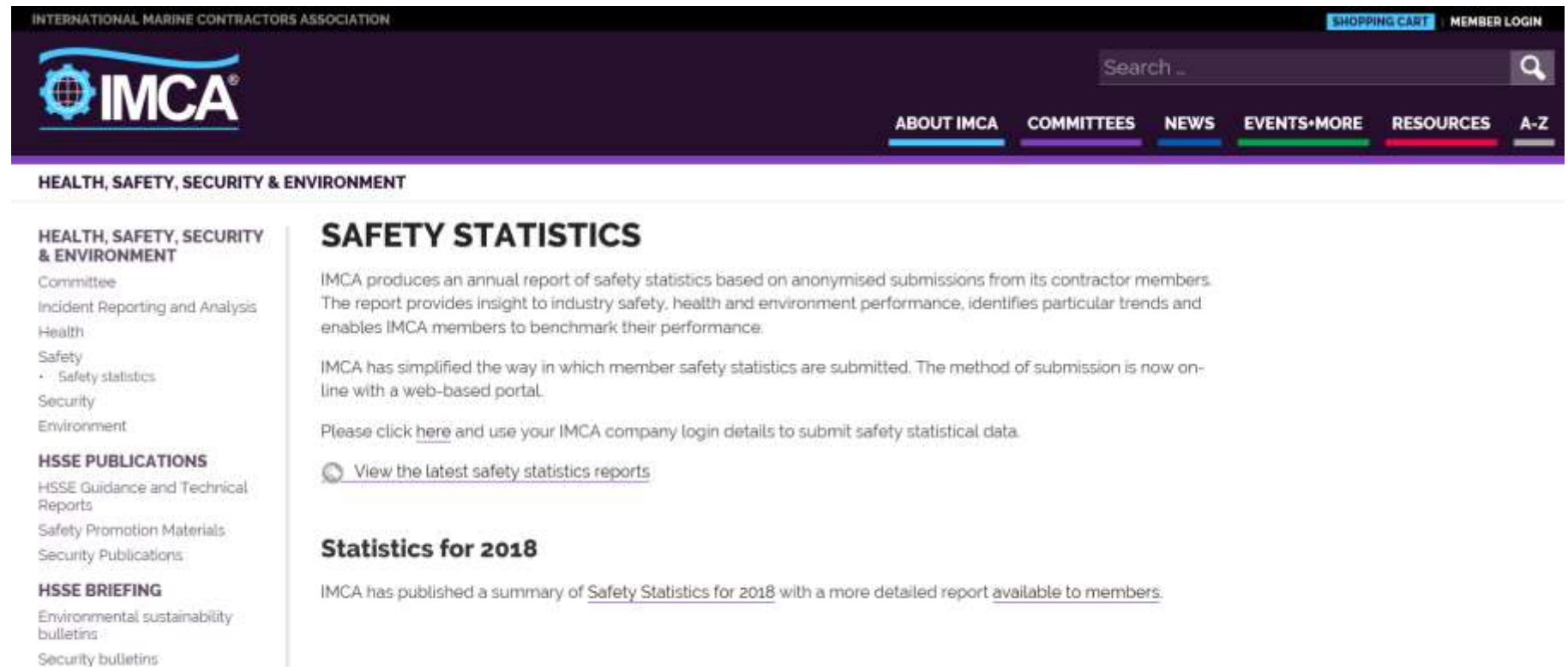
- Widely used across all geographical areas
- The industry standard for reporting DP events for over 20yrs
- Event flow diagrams and case studies focusing on current & relevant reported station keeping events
- In the public domain for benefit to industry
- Allows DP vessels to easily compare events with their onboard situation



[www.imca-int.com/alerts/dp-event](http://www.imca-int.com/alerts/dp-event)



# Annual Report on Member Safety Statistics. Simplified and efficient system.



INTERNATIONAL MARINE CONTRACTORS ASSOCIATION

SHOPPING CART MEMBER LOGIN

Search

ABOUT IMCA COMMITTEES NEWS EVENTS•MORE RESOURCES A-Z

HEALTH, SAFETY, SECURITY & ENVIRONMENT

**HEALTH, SAFETY, SECURITY & ENVIRONMENT**

- Committee
- Incident Reporting and Analysis
- Health
- Safety
  - Safety statistics
- Security
- Environment

**HSSE PUBLICATIONS**

- HSSE Guidance and Technical Reports
- Safety Promotion Materials
- Security Publications

**HSSE BRIEFING**

- Environmental sustainability bulletins
- Security bulletins

**SAFETY STATISTICS**

IMCA produces an annual report of safety statistics based on anonymised submissions from its contractor members. The report provides insight to industry safety, health and environment performance, identifies particular trends and enables IMCA members to benchmark their performance.

IMCA has simplified the way in which member safety statistics are submitted. The method of submission is now on-line with a web-based portal.

Please click [here](#) and use your IMCA company login details to submit safety statistical data.

[View the latest safety statistics reports](#)

**Statistics for 2018**

IMCA has published a summary of [Safety Statistics for 2018](#) with a more detailed report [available to members](#).



# Matrix of Basic Safety Training Requirements for Offshore Energy Sector

- Chairman - Marc van Dorth
- Seaway 7

Offshore vessel safety training matrix

<b>Principles:</b> The matrix shows the basic safety training requirements dependent on where the crew member is located. Locally applicable legislation may impose requirements in excess of the above, in this matrix. The working pattern and environment of personnel living and working on a vessel or on a continuous basis, affect the training requirements compared to personnel visiting a structure on a daily basis. It is stressed that the basic safety training is only one element of competence requirement which is addressed by competency assessment schemes. The required competencies should be assessed by considering both the individual and group skill requirements.					
	Marine Personnel	Access to vessel only (Construction, Service or Crew Transfer)	Personnel other than Marine Personnel Access to offshore platform with continuous gangway connection to vessel (Transition Piece, Jacket or Offshore platform)	Access to offshore platform and left isolated (No gangway connection) (Transition Piece, Jacket or Offshore platform)	Full access to offshore platforms including Nacelle and Energized Areas
<b>Required competencies</b>					
<b>Company and Client induction</b>	As	As	As	As	As
<b>Vessel specific safety induction</b>	As	As	As	As	As
<b>Medical fitness</b>	As per STCW requirements or equivalent domestic certification for vessels under 500g	OSUK Health Certificate or RUK Medical Fitness to work	OSUK Health Certificate or RUK Medical Fitness to work	OSUK Health Certificate or RUK Medical Fitness to work	OSUK Health Certificate or RUK Medical Fitness to work
<b>Basic sea survival skills</b>	As per STCW requirements or equivalent domestic certification for vessels under 500g	OPITO Basic Offshore Safety Induction and Emergency Training or Further Offshore Emergency Training or GUV Basic Safety Training Standard - Sea survival	OPITO Basic Offshore Safety Induction and Emergency Training or Further Offshore Emergency Training or GUV Basic Safety Training Standard - Sea survival	OPITO Basic Offshore Safety Induction and Emergency Training or Further Offshore Emergency Training or GUV Basic Safety Training Standard - Sea survival	GUV Basic Safety Training Standard - Sea survival
<b>Fire awareness / basic fire fighting skills</b>	As per STCW requirements or equivalent domestic certification for vessels under 500g	OPITO Basic Offshore Safety Induction and Emergency Training or Further Offshore Emergency Training Standard - Fire awareness	OPITO Basic Offshore Safety Induction and Emergency Training or Further Offshore Emergency Training Standard - Fire awareness	OPITO Basic Offshore Safety Induction and Emergency Training or Further Offshore Emergency Training Standard - Fire awareness	GUV Basic Safety Training Standard - Fire awareness
<b>Basic first aid skills</b>	As per STCW requirements or equivalent domestic certification for vessels under 500g	OPITO Basic Offshore Safety Induction and Emergency Training or Further Offshore Emergency Training Standard - First Aid	OPITO Basic Offshore Safety Induction and Emergency Training or Further Offshore Emergency Training Standard - First Aid	OPITO Basic Offshore Safety Induction and Emergency Training or Further Offshore Emergency Training Standard - First Aid	GUV Basic Safety Training Standard - First aid
<b>Vessel to vessel boatlanding transfer skills</b>	As per STCW requirements or equivalent domestic certification for vessels under 500g; and training appropriate to the work being conducted to demonstrate safe transfer from vessel to vessel and recorded as part of a training record	N/A	N/A	N/A	N/A
<b>Manual handling skills</b>	As per STCW requirements or equivalent domestic certification for vessels under 500g; and training appropriate to the work being conducted and recorded as part of a training record	Training appropriate to the work being conducted and recorded as part of a training record	Training appropriate to the work being conducted and recorded as part of a training record or GUV Manual handling element	Training appropriate to the work being conducted and recorded as part of a training record or GUV Manual handling element	GUV Manual handling element
<b>Working at height and rescue skills</b>	As per STCW requirements or equivalent domestic certification for vessels under 500g; and training appropriate to the work being conducted and recorded as part of a training record	Training appropriate to the work being conducted and recorded as part of a training record	Training appropriate to the work being conducted and recorded as part of a training record or GUV Working at height element	Training appropriate to the work being conducted and recorded as part of a training record or GUV Working at height element	GUV Working at height element
<b>Slings / signaller skills (For selected person)</b>	As per STCW requirements or equivalent domestic certification for vessels under 500g	Training appropriate to the work being conducted and recorded as part of a training record	Training appropriate to the work being conducted and recorded as part of a training record	Training appropriate to the work being conducted and recorded as part of a training record	GUV slings/signaller course - Specific to wind technicians

# Marine Renewables - Safety Training Matrix Workgroup

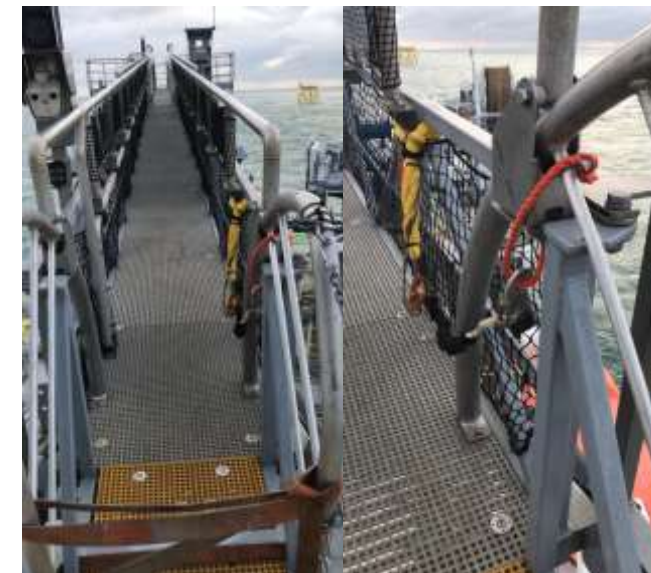


- Crew members have Statutory safety training to internationally accepted levels recognized in the Offshore Energy Industry for many years
- Some Clients are requiring blanket training to GWO standards which were primarily designed in favor for wind turbine technicians with a different competency level or offshore (vessel) rota
- The intention is to achieve more synergy and produce a Matrix of Compliance for Basic Safety Training accepted by IMCA and G+ members
- IMCA member companies can use their competence assurance scheme to discuss more detailed requirements with their clients
- The ambition is to have the matrix accepted and used as part of the project award contract covering training requirements
- It is anticipated a final version of the matrix will be available by the end of the month (February 2020)



## Standardising W2W Processes

- Relative new innovation
- Multiple W2W suppliers available



# Marine Renewables - W2W Processes

## Workgroup

- The current trend of larger wind farms being built (further) offshore, has increased the demand for motion compensated gangways. They should be suitable for operation in acceptable sea states
- Concern regarding the non-standardised approach gangway manufacturers have taken towards operational procedures and alarms
- Manufacturers have been requested to provide their standard emergency procedures for persons using their gangway and the meaning of their traffic light signals
- These would be used to produce a recommendation for standardisation
  - Acceptance of this would complete the objective of the IMCA workgroup
- Currently engaging with an Oil & Gas Steering Group having similar but more far reaching ambitions of standardisation
  - Consideration would be made on how IMCA could assist with implementation

Improving performance in the  
marine contracting industry

# A testimonial from a committed industry member

G+ 6<sup>th</sup> Stakeholder Day  
Amsterdam, 12<sup>th</sup> February 2020



Hasse Andreasen  
HSE Director  
Ørsted Offshore

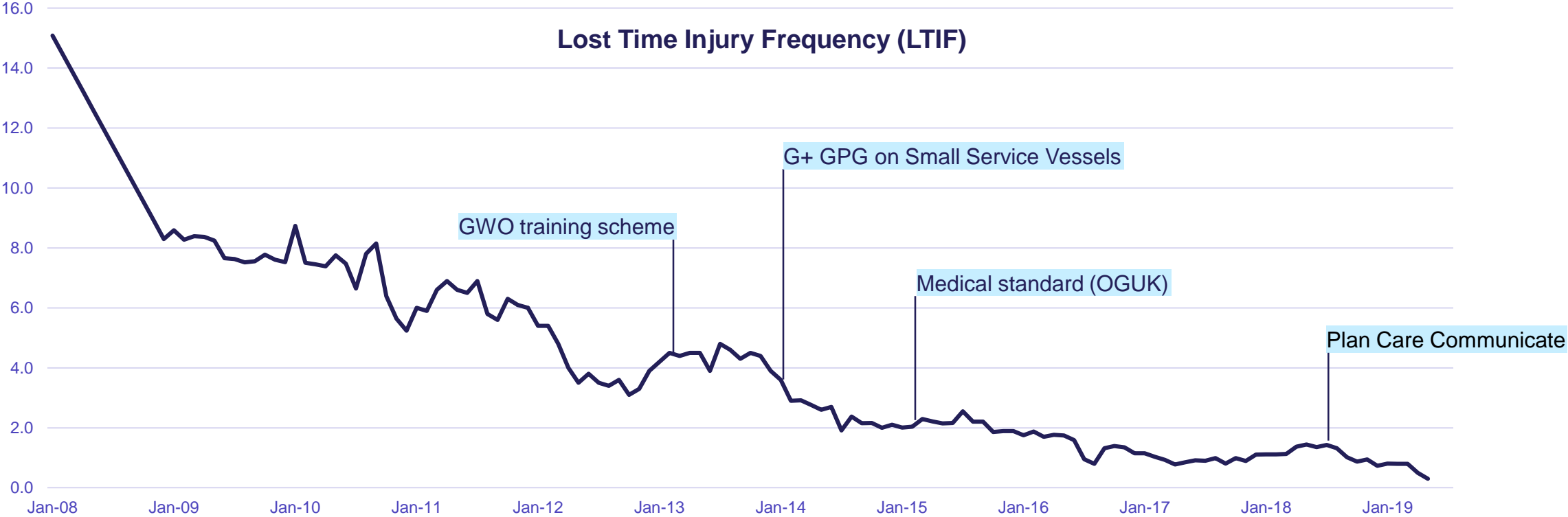
Ørsted

# The big WHY...

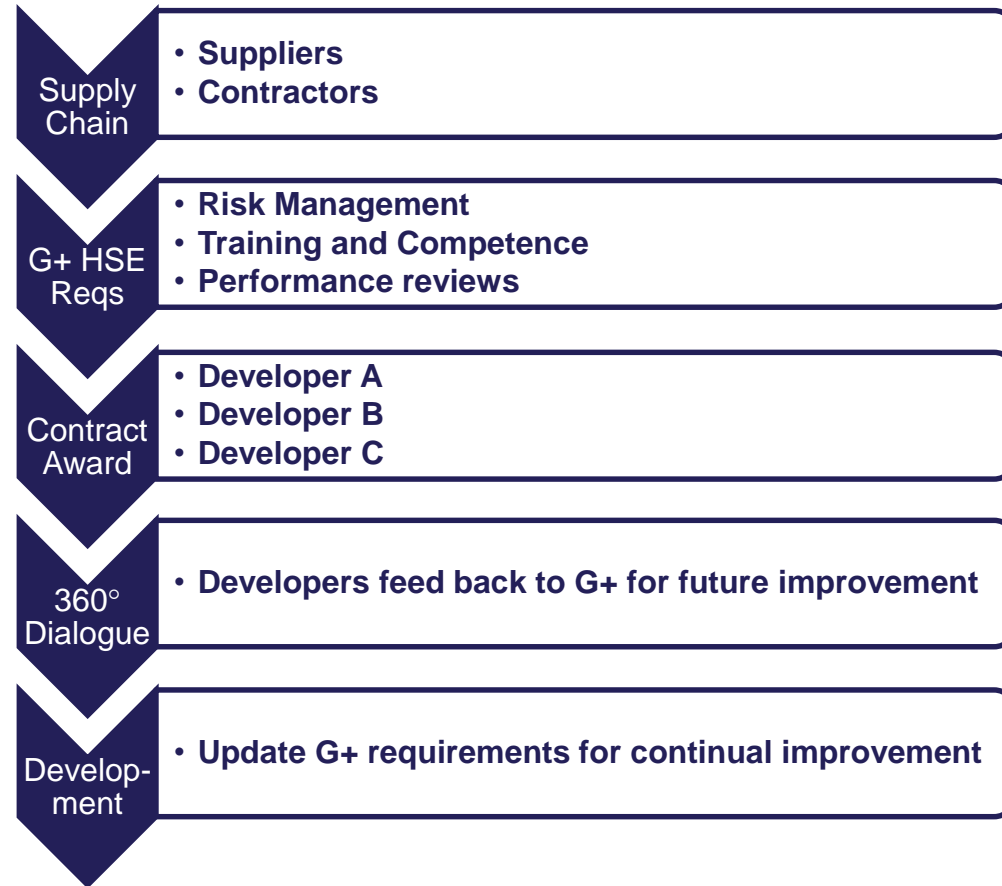
**$G + x = ?$**



# Our safety performance journey – heavily supported by standardisation



# The cycle of procurement excellence...



## Benefits of G+ alignment

- ✓ Standard requirements across industry enables a transparent approach for suppliers
- ✓ Opportunity for lean procurement setup due to common industry approved supplier landscape
- ✓ Faster maturation of supply chain in new and emerging markets
- ✓ Global industry standards for HSE reduce risk of duplicated efforts
- ✓ Shared cost of developing the supply chain

# A case example: Aviation guidance and standardisation



## purpose

Improving safety through standardisation of aviation operations in the offshore wind industry

## what are we aiming to standardise?

- Contracting helicopters (employers requirement)
- QA and audits
- Stakeholder management (regulatory, HSE and internal)
- Executing helicopter operations
- Responsibilities as a duty holder
- HSE, training and PPE

## how has this been done so far?

Ørsted and SGRE have aligned Employer Requirements which allows the same approach to crewing, technical requirements and HSE. This is an enabler to standardise audits and sharing of helicopters.

Ørsted, SGRE and MVOW are conducting QA and technical audits together (examples include Walney Ext, HOW01, GOW01+02 and Taiwan activities).

Immediate outcome is an agreed understanding of the suppliers competences, a plan to improve gaps and a common understanding of how to use the helicopter in a safe manner and we are sharing helicopters across windfarms in German Bight and Walney Ext with different owners (Taiwan as potential next sharing project and the first without a SWA as contractual enforcer).

Ørsted, SGRE and MVOW are working on the regulatory and procedural development of injured passengers transport to allow contracted helicopters to move our own employees in case of an accident (at the moment we rely on vessel transport or SAR helicopter).

# A case example: Aviation guidance and standardisation



## Commercial, operational and safety upsides – what have we gained so far?

We have saved work hours and skipped two actual audits due to shared audit reports between SGRE and Ørsted. Each audit is evaluated to use 120 internal work hours plus travel with a cost of EUR 25.000 (if consultant is used for the audit).

Ørsted, SGRE and MVOW have agreed on a way forward to introduce a helicopter service supplier for the entire industry in Taiwan. This could not have been done by either entity alone since there is no positive business case for stand alone windfarms with the subsidies regime – we are looking into same concept in the US market.

Ørsted, SGRE and MVOW are working together sharing helicopters in West UK and German Bight. This cooperation has minimised the amount of helicopters procured with 1-2 helicopters and an estimated saving of EURm 1.0 - 1.5 (i.e. the approximate extra cost of adding 1.5 helicopter to a windfarm per year).

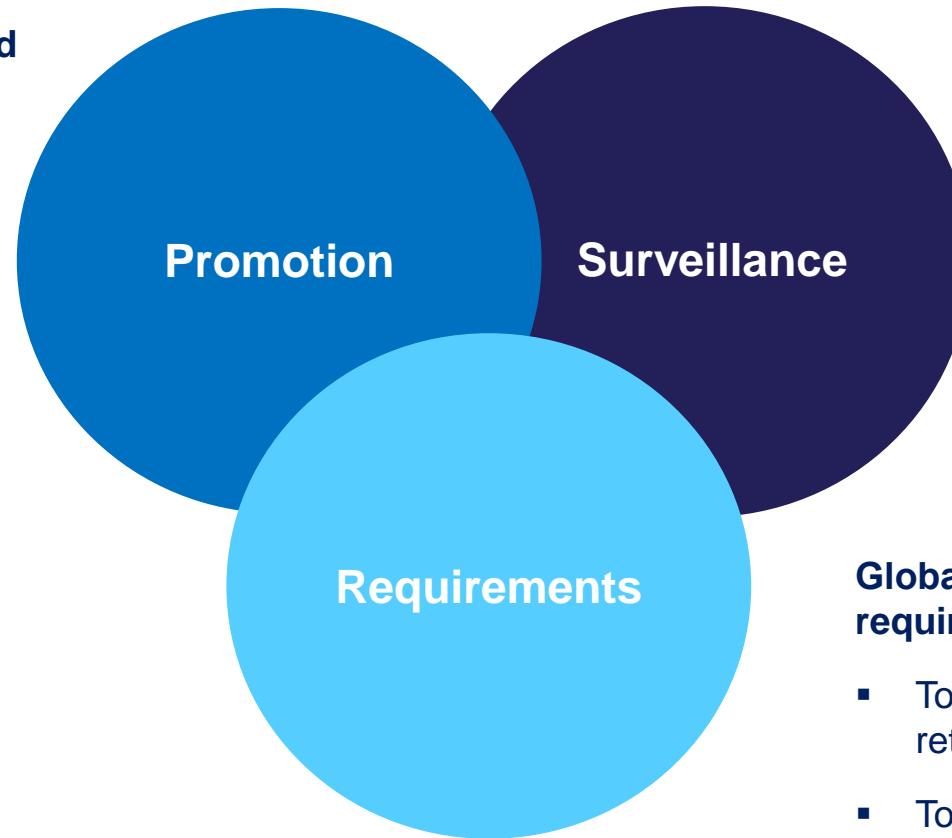
With regards to safety we have not had any larger helicopter accidents in the windfarm industry and we have little statistics since recorded incidents are few. The safety upside on the cooperation is primarily a commonly understood standard of safety which enables a fast ramp-up period for our operations.

# Accelerating the industry health performance



## Individualised promotion and intervention strategies

- To be initiated based on surveillance data (risk-based)
- To accelerate health performance including:
  - Cost and physical performance
  - Well-being, sickness absenteeism and presenteeism
  - Safety performance



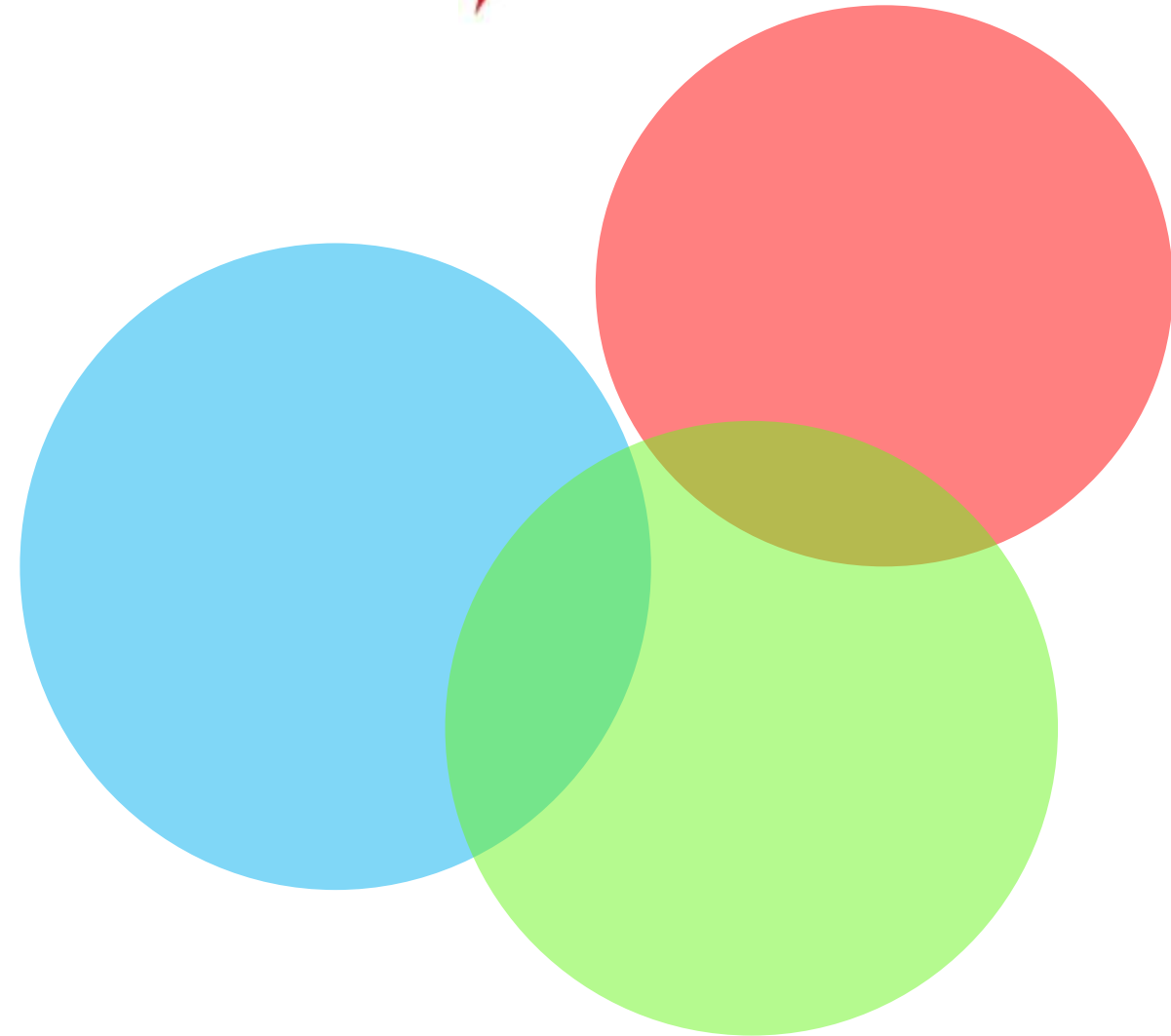
## Systematic health monitoring

- To monitor, manage and share findings – for the benefit of the industry, companies and the individual employees
- To form the data-driven groundwork for strategic interventions (promotion)

## Global standardisation of “Fitness and Medical” requirements

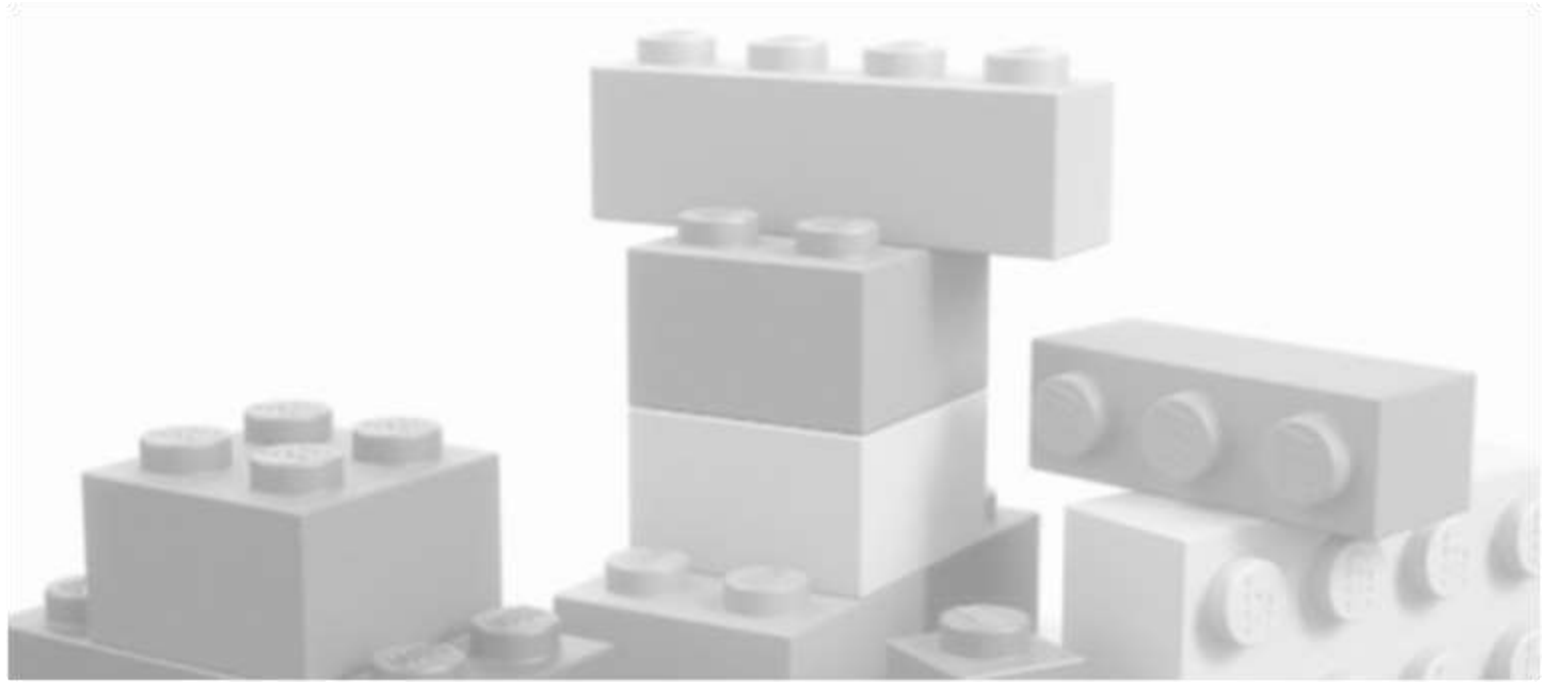
- To ease and improve mobility, recruitment and retention of employees across the industry
- To ensure that technicians are fit for purpose – short and long-term

# Legal compliance – a competitive element or a joint industry responsibility to drive?



# **The power of global standardisation for continued performance improvement**

**– a logic conclusion to  
derive...**



# Thank you..!

Contact:  
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[haaga@orsted.dk](mailto:haaga@orsted.dk)



The Orsted logo consists of a white circular icon with a vertical line and a small circle at the top, resembling a stylized 'O' or a power symbol, followed by the word "Orsted" in a bold, white, sans-serif font.

# Taking offshore wind global

Ben Backwell, CEO GWEC  
12 February 2020

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# GWEC'S MISSION

1

To act as an **authoritative voice** for the **global industry**, speaking out on policy issues that affect the industry, fostering best practices and technology innovation and ensuring fair market access and fair treatment for its members across global markets.

2

To **develop new markets** for the wind industry and accelerate the global growth of the sector. GWEC has a successful track record in places like China, India, Brazil, South Africa, Mexico, Argentina and Colombia. We are currently helping to develop crucial emerging markets such as Vietnam and the Philippines, while working to accelerate growth in others such as India and Mexico, and enable the expansion of Offshore Wind into global markets.

# JOIN THE GLOBAL COMMUNITY!

## CO Members



renewables



## Associations



# JOIN THE GLOBAL COMMUNITY!

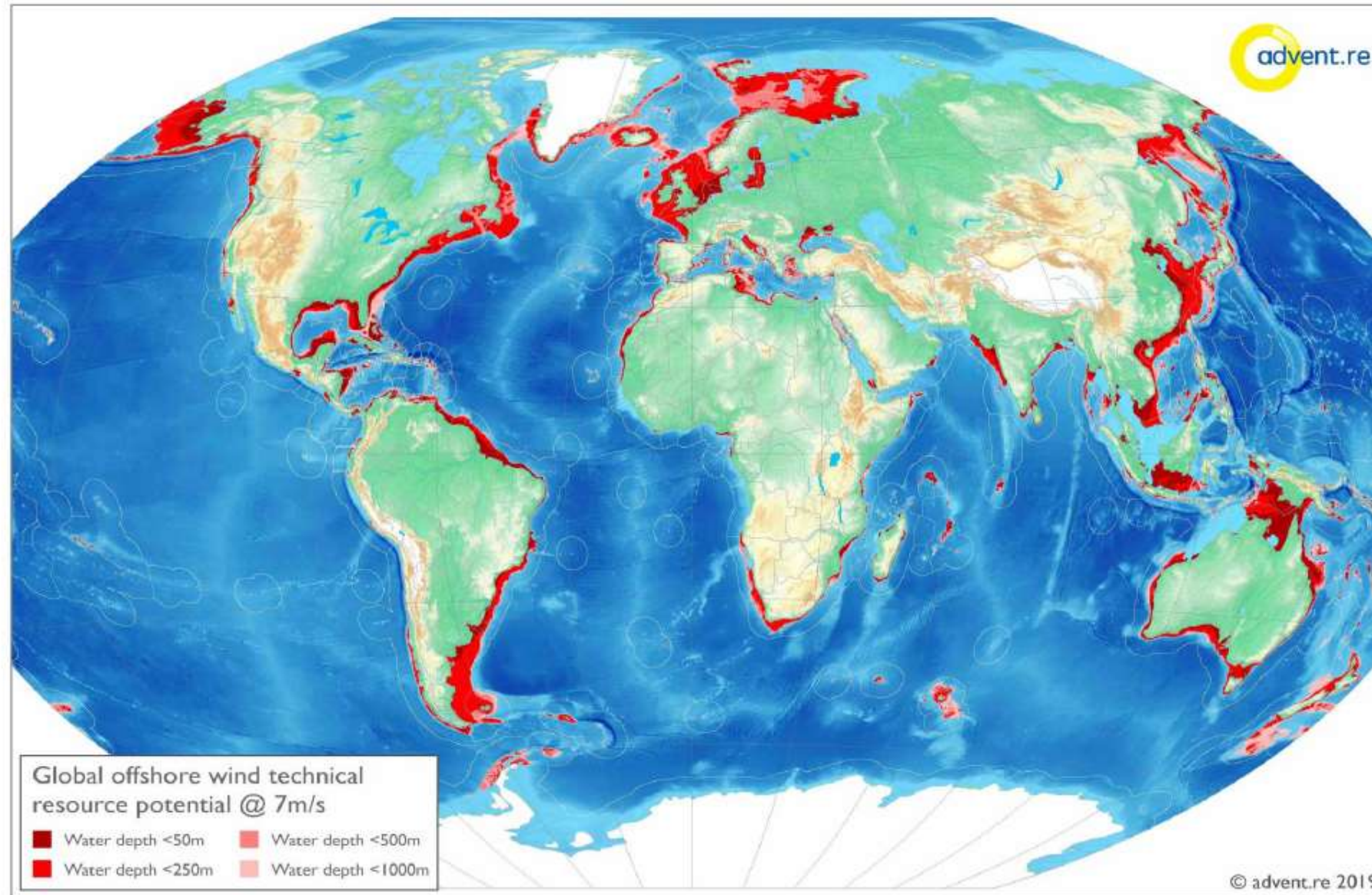
## C1, C2, and C3 Members



# Global Offshore Wind Market

- Potential, Dynamics, Outlook

# Global offshore wind potential



- 3.1 terawatts is technically available in selected emerging markets

# Characteristics of the offshore wind market

## Large, complex projects

Offshore projects have an minimum size of 100MW+, normal project size is now more like **300 MW to 1.2 GW**

## Capital-intensive projects

For a 500MW wind farm, it takes **50mn USD to develop** and **2bn USD to build**

## Long development time

It takes **7 to 10 years** from gaining the option to the full commissioning of the wind farm, emerging markets take longer

## Strong reliance on political support

**Long-term political support** including targets and to drive legislative and administrative change

“No easy way to enter the offshore wind industry”



Experience gained in mature markets over the past 15 to 20 years



Projects are now on time and on budget, providing stable revenue stream



Offshore wind has become attractive for institutional investors, now even entering at pre-construction stage

# Market-based mechanisms dominate the global wind market

## Support scheme and capacity allocation mechanism

Status Jan 2020



Global wind auction results 2015-2019



- Technology-specific auctions and tenders (“Wind only”) dominate to allocate offshore capacity



# LCOE and bid levels

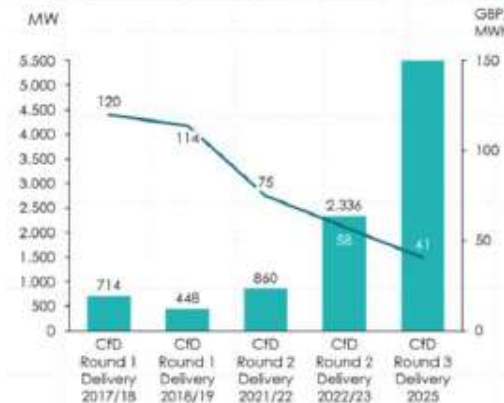
## Mature offshore wind markets

### Germany

LCOE - 78-138 USD/MWh  
Bid - 50 USD/ MWh (2018)

### UK

LCOE - 69 -93 USD/MWh  
Bid - 50 USD/MWh (2019)



## Developing offshore wind markets

### USA

LCOE - 62-121 USD/MWh  
Bid - 100USD/MWh PPA

### China

LCOE - 82 -115 USD/MWh  
FIT - 110-125 USD/MWh  
Bid - 102 USD/ MWh (2019)

### Vietnam

•n. a.  
•98 USD/MWh (FIT)

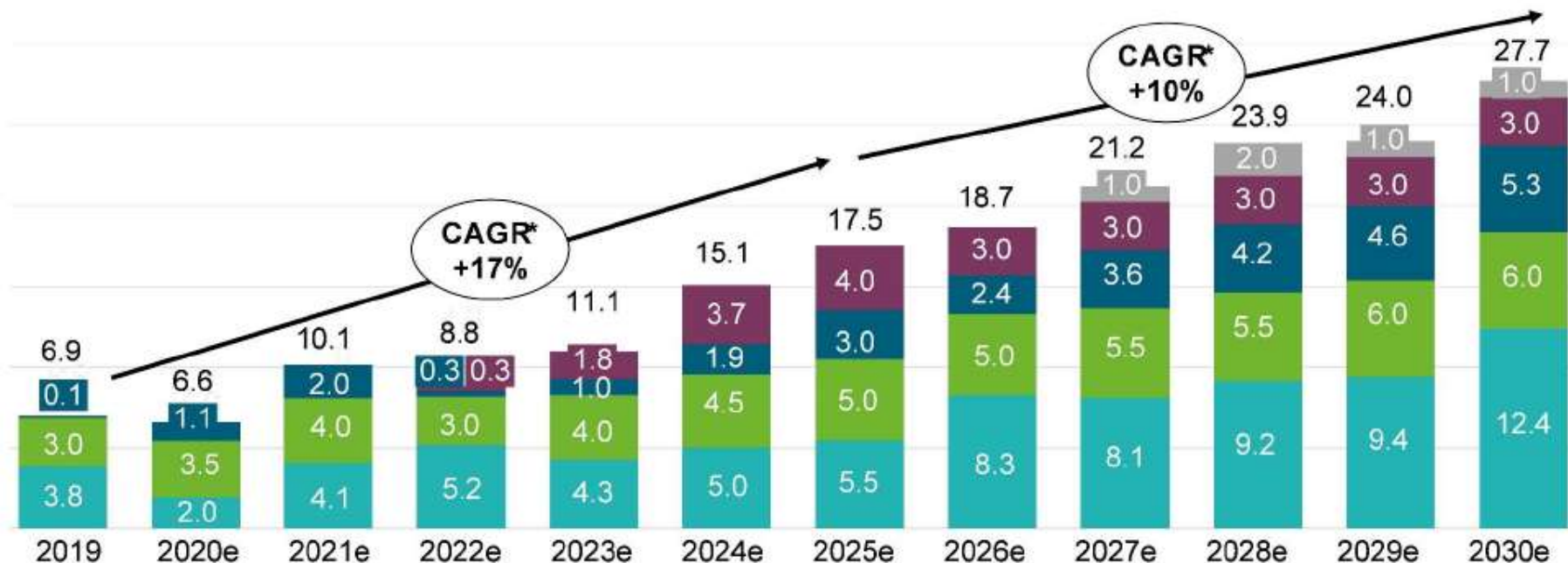
In 2017, 1.38 GW of offshore wind out of its first German competitive auction totalling 1.49 GW won the tender with a **zero-subsidy**, then followed by the Netherlands in 2018. Zero- subsidy bids mean the projects will only receive the wholesale electricity price, which introduces merchant risk.

**Different LCOE and bid levels in mature and developing offshore markets underline different risk profiles**

# Growth of the global offshore wind market- 2030

**New installations**  
Business-as-usual scenario  
GW, offshore

Other China Europe  
North America Asia ex China

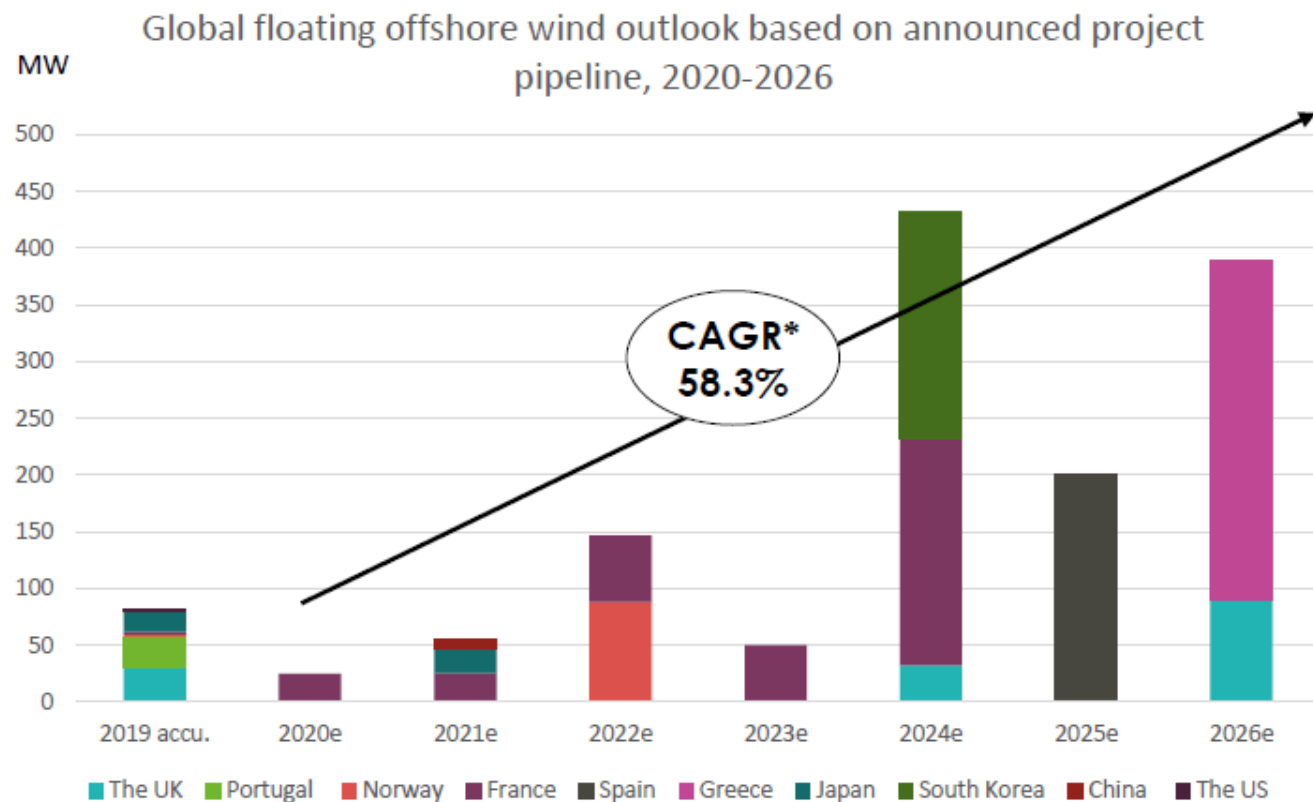


- According to GWEC Market Intelligence's forecast, **185 GW** of offshore wind is likely to be built **between 2020 and 2030**, bringing the global total to about **215 GW**, of which 96 GW (45%) located in Europe, 89 GW (42%) in Asia, 25 GW (12%) in North America.
- China** is expected to install **52 GW** new offshore wind in 2020-2030, making it the **largest** offshore wind market in the world in both new and accumulative installation

\* CAGR = Compound Annual Growth Rate

Source: GWEC Market Intelligence Offshore Wind Outlook 2030 (April 2019)

# Floating offshore wind outlook 2030 - up to 19GW



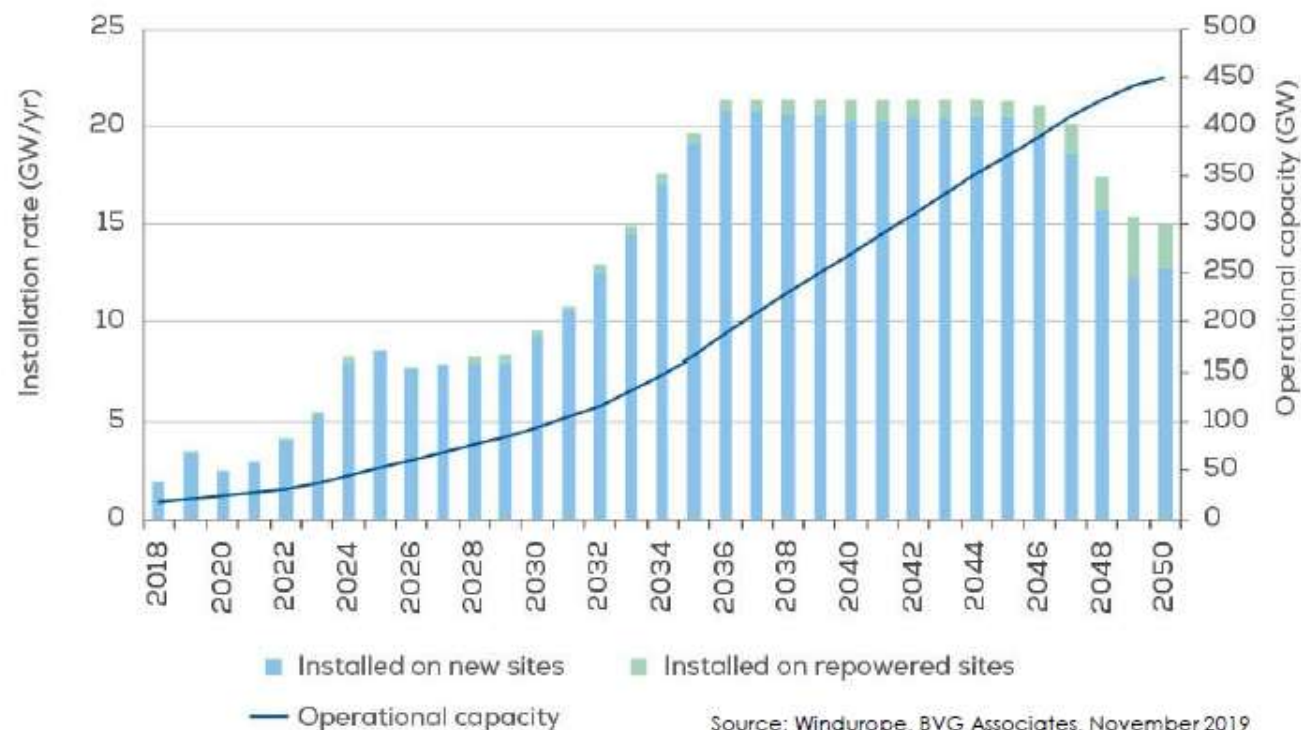
- The next large scale floating project, Hywind Tampen, will be installed **140 km** off the coast in the water depth of **260-300m**.

- The world's **first floating turbine**, SWT-2.3MW, was installed by Equinor in **Norway** in **2009**.
- As the end of 2019, **80.5 MW** of floating wind were installed in **ten countries** with **the UK** taking the lead followed by **Portugal** and **Japan**.
- **1,308 MW** planned to be built **by 2026**, of which 82% is located in **Europe** and the rest in **APAC**.
- **2030 floating forecasts** spread from **6GW** up to almost **19GW**, all influenced by how quickly levelised cost of energy numbers can be brought down to below €50/MWh (\$55/MWh).
- Floating wind will be considered as simply another choice of foundation solution rather than as a separated offshore wind sector, **100-150 GW** is projected to be built **in EU** by **2050**.

# European offshore wind vision for 2050



Installation rate required to achieve 450 GW by 2050



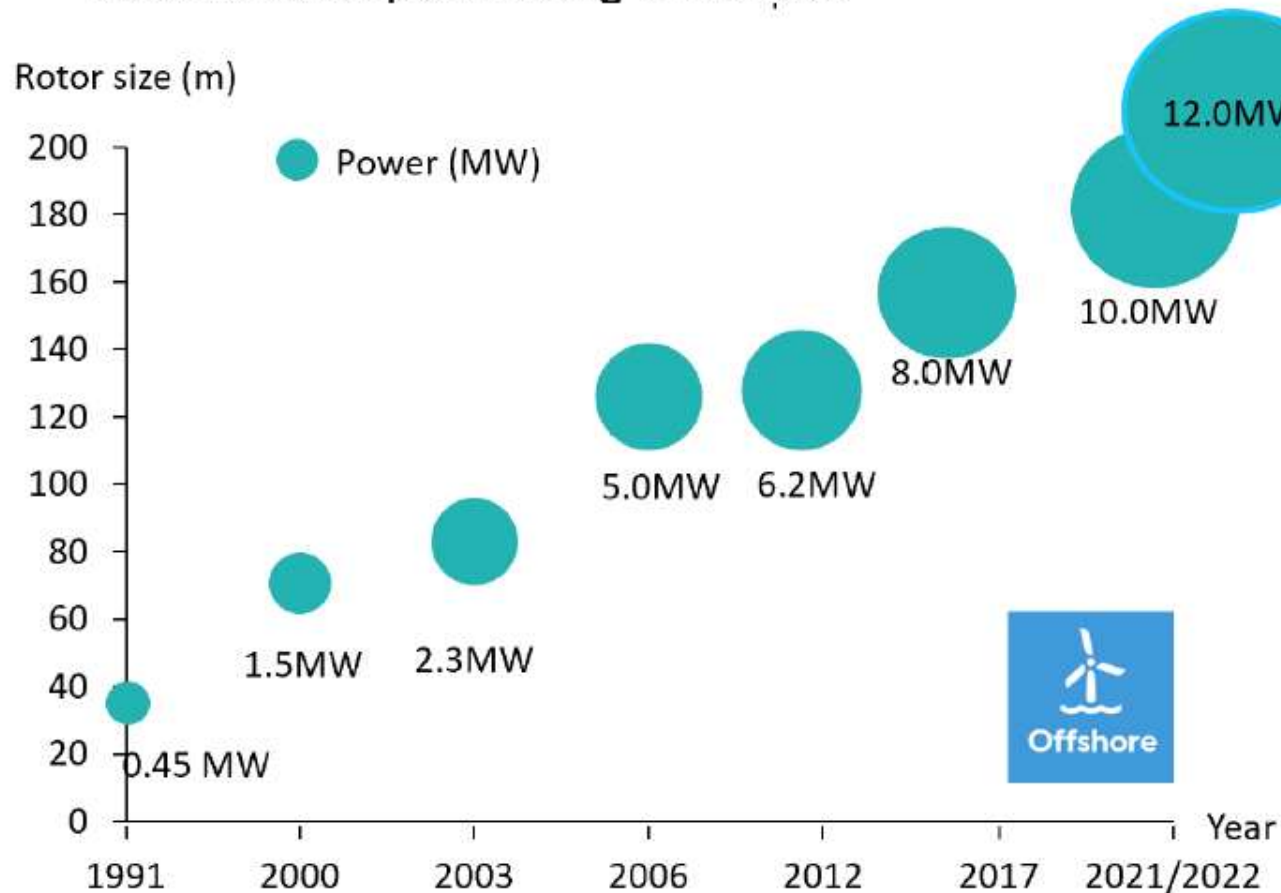
- **450 GW by 2050 vision:** 380 GW in the North Seas and 70 GW in Southern European waters;
- The 2050 vision is not only to help Europe **go carbon-neutral** and **keep the technology leadership**, but also to bring huge opportunities for **economic growth**, **industrial restructuring** (O&G) and **job creation** (local industry and supply chain);
- To reach the 450 GW target, **annual installation rates** need to increase from **today's 3 GW** per year to over **20 GW** per year in **2030**;

# Global Offshore Wind Market

- Technology trends

# Innovation and efficiency are key growth drivers (Turbine)

## Rotor sizes and power rating to increase



- Capacity factors continue to improve

FX. GE Haliade-X 12 MW DD turbine claims **63%** capacity factor, 5-7 points above the industry standard.

- Increase of AEP

FX. SGRE SG10.0-193 DD turbine will have up to **30%** AEP increase compared with SG8.0-167DD. GE Haliade-X 12 MW DD turbine AEP is likely to be **twice** as much as the Haliade 150-6MW

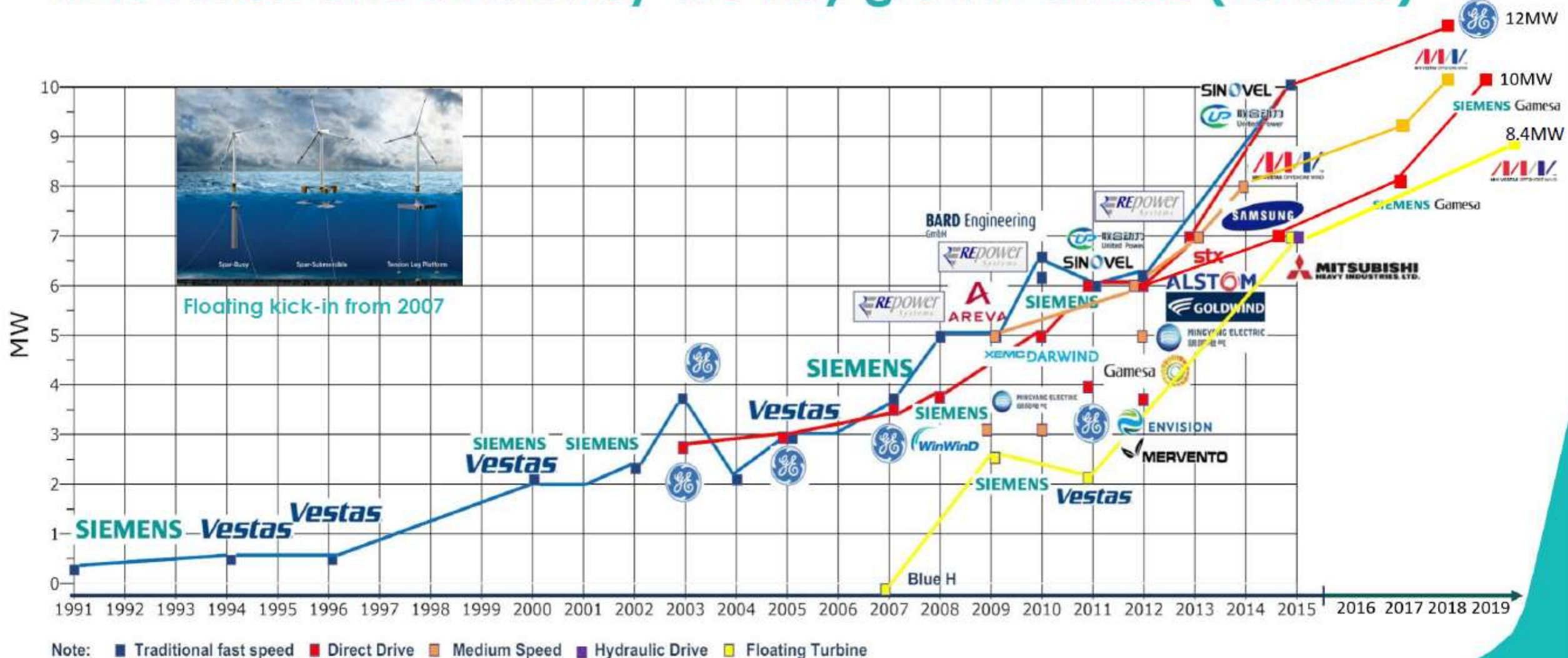
- Cost reduction of BOP

FX. Less unit means **saving** for foundations, inter-array cable, installation for foundation, turbine and cable.

- Reduction of OPEX

O&M costs account for approximately 25-30% of total project life-cycle costs. Less unit also means saving in Project OPEX

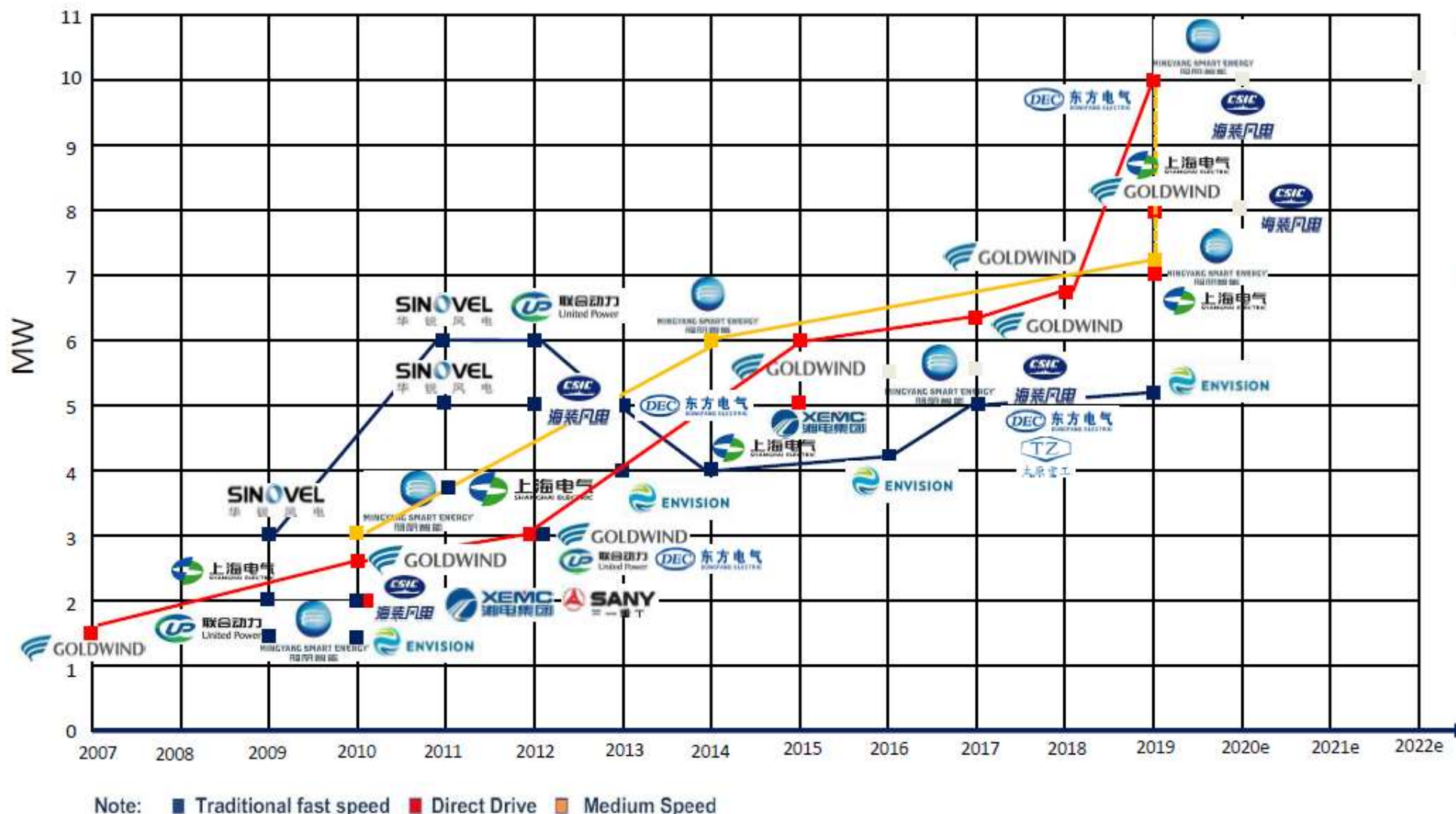
# Innovation and efficiency are key growth drivers (Turbine)



- Where the **offshore turbines** is headed: rated capacity of **20 MW** (with rotor larger than 260m) by **2030**;
- Floating challenge: **too many designer** ( 15+), needs **consolidation** and needs to **be modularized**.

Source: GWEC Market Intelligence, BTM Consult, April 2019

# Chinese Offshore Wind OEMs Playing the Catch-Up



Source: GWEC Market Intelligence, December 2019

- Six Chinese turbine manufacturers have introduced large offshore models in the past 12 months, of which **only one** model is below 6MW.
- A **10 MW PMG** generator has also rolled off the production line at **Dongfang Electric** in August 2019 and the second 10 MW model is expected to be launched by **CSIC Haizhuang** in 2020, followed by **Mingyang** in November 2019.

# Thank you!

For more information please contact:

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**13.00 –  
13.30**

## **Panel Session – Opportunity to question**

Tove Lunde – Equinor - G+ Board chairperson

Jakob Nielsen – Vattenfall – G+ Board member

Fritz Wiedemann – Van Oord – G+ Associate

Dave Griffiths – SSE– G+ Board member

Clark McFarlane – SGRE – G+ Board member

Kate Harvey – G+ General Manager

**13.30 –  
14.00**

## **Roundtable discussion**

### **Celebrating the successes of G+**

- What has worked well ?
- How can we reach a wider audience ?
- How can we improve engagement ?
- Suggestions for the way forward for the G+ ?

# G+ Global Offshore Wind Health & Safety Organisation 6<sup>th</sup> Stakeholder Forum

Date: Wednesday 12 February 2020, Start 09:00, Finish 15:00 (CET)

Venue: NH Hotel, Near to Schiphol Airport, Kruisweg 495. Hoofddorp, 2132 NA, Amsterdam



In partnership with the



## Agenda

- 9:00 Registration, refreshments and networking
- 9:30 **Opening address from the new G+ Chairperson**  
Tove Lunde, Head of Safety, Security and Sustainability for New Energy Solutions, Equinor and Chairperson, G+ Board
- 9:50 **G+ work programme summary – Update from 2019 and plans for 2020**  
Kate Harvey, G+ General Manager  
Beate Hildenbrand, Manager Offshore Wind, Energy Institute
- 10:20 **Insight from IMCA and Workboat Association members**  
Subsea7, Boskalis, IMCA and the Workboat Association
- 10:45 Networking and refreshments
- 11:15 **Implementing G+: view from a Focal Group and member company**  
Hasse Andreasen, Director of Offshore HSE, Ørsted

- 11:40 **Taking offshore wind global**  
Ben Backwell, Chief Executive Officer, Global Wind Energy Council (GWEC)
- 12:00 Lunch
- 13:00 **Panel session – opportunity to question**  
Comprising supply chain representatives, G+ Board and Focal Group members
- 13:30 **Celebrating the successes of the G+ - what has worked well, engagement improvement and suggestions going forward?**  
Roundtable discussions
- 14:00 Networking and refreshments
- 14:15 **Feedback from roundtable discussions – celebrating the successes of the G+**
- 14:45 **Close of Stakeholder Forum**