Dropsafe®

Drops Prevention Technology

January **2019**

THE NEGLECTED HAZARD

A GUIDE TO DROPPED OBJECT RISKS
IN OFFSHORE WIND

CONTENTS

FOREWORD

In offshore wind, reputation is critical.

In order to maintain current growth and momentum, it is the responsibility of businesses throughout the supply chain to consistently demonstrate that an offshore wind farm is not just a clean, reliable source of power, but also remains a safe place to work, all the way through its lifecycle.

The good news is that, thus far, the industry has done a pretty good job of safeguarding its reputation. The bad news is that it simply cannot afford to rest on its laurels.

As strike prices fall and developers and operators pursue an ever lower levelized cost of energy (LCoE), operational budgets are being squeezed - and scrutiny is growing on the performance of the sector. While the industry may point to rapidly falling technology costs, some may justifiably ask exactly where these cost savings are coming from.

The answer to that question must not be health and safety. But there are worrying signs that, despite a number of years of relatively incident-free offshore wind development and operations, the industry has not yet comprehensively addressed the major threats to the safety of its personnel.

Dropped Objects (DOs) may be a case in point. A common risk across offshore wind vessels and infrastructure, throughout the installation, operational and decommissioning phases, DOs present a fourfold threat to the safety of personnel, the integrity of equipment, financial performance and ultimately the reputation of offshore wind firms - and their high-profile stakeholders.

Yet, despite this ever-present threat, the offshore wind industry has yet to follow the lead of other marine industries, both in reporting incidents, and in adopting robust mitigation measures across turbine and vessel fleets. This ultimately puts the sector at risk of having uniform regulations and standards imposed upon it that jeopardize its ability to manage long-term costs in a sustainable manner.

With a view to helping offshore wind firms ‘self-regulate’ and tackle this neglected hazard, in this report we aim to assess the scale of the challenge, look at lessons learnt from other sectors and outline the key areas of DO risk in offshore wind development and operation.

Please don’t hesitate to get in touch directly with queries or feedback.

All the best,

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HOW BIG IS THE CHALLENGE?

The risk posed by dropped objects (DOs) in the rapidly-expanding and evolving offshore wind energy industry is a somewhat neglected subject. This is surprising, given the potentially devastating and far-reaching consequences of a serious occurrence of DO.

By way of definition, dropped and falling objects in offshore wind include materials carried by personnel, lifted or carried from CTVs or SOVs, or smaller items fitted to the wind turbine generator (WTG), like nuts and bolts, lights, ventilation louvres or hatches, falling from height, with the incidents occurring either on the wind turbines themselves, or on support vessels being used for turbine installation or maintenance tasks. It does not include the heavy lifts performed during construction, main component change-out, or decommissioning.

There are several facets to the safety challenge of DO risk for firms engaged in offshore wind. The industry is relatively young, at less than 30 years old, but is growing rapidly, therefore the potential problem is becoming increasingly widespread. It is predicted that by 2025 up to 20 countries across the world will have installed offshore wind farms. DO risk is consequently an issue of international resonance: all 20 of these countries will need to have fully understood and acted upon the risk posed by equipment or tools falling from offshore wind installations, if the risk of damage and injury is to be mitigated.

It is true that, since 2013, some progress has been made in this regard: DO risk in offshore wind has been acknowledged in significance and taken more seriously, and the industry has taken steps to promote safer working methods and standards. Formal recognition of the risk of DO was issued by the industry in 2014. However, although increased efforts have been made since this time to produce more accurate statistics relating to incidents of objects falling from installations, the amount of data available is still not fully comprehensive, which in turn limits the scope for raising awareness and for learning from past experience and from lessons specific to the industry.

ANALYSING THE STATISTICS

Figure 1: G+ and IMCA Safety Statistics, 2015-2017

Category	G+ 2015	G+ 2016	**G+ 2017**	IMCA 2015	IMCA 2016	**IMCA 2017**
Hours Worked (Million)	21	22	**27**	720	598	**537**
Fatal Accident Rate	0	0	**0**	2.22	1.0	**0.93**
Lost Time Injury (LTI) Frequency Rate	1.93	1.98	**1.83**	0.51	0.43	**0.42**
Total Recordable Incident Rate (TRIR)	5.99	5.52	**5.85**	2.17	1.81	**1.67**
Dropped Object incidents causing LTI	6	1	**8**	73	15	**8**

Safety statistics, including DO incidents, are issued annually by the International Marine Contractors Association (IMCA) and the G+ Global Offshore Wind Health and Safety Organisation.

Looking at 2017 figures, IMCA members performed slightly less work in 2017 over 2016, which was a significant reduction in working hours from 2015. Safety performance was improved year on year, reflecting the trend over previous years. With regards to the state of the offshore industry, this is important to note, as most companies will have reduced expenditure across the board, impacting maintenance, training and oversight, and thus can have a detrimental effect on safety performance. Over the last 3 years there has been a significant reduction in Lost Time Injuries (LTIs) caused by DOs, but IMCA has not provided any insight into what has caused this positive trend.

The G+ issued their 2017 Safety Statistics in September 2018. The headline figures are that the total working hours are up significantly (23%) while there has been an improvement in the LTI rate. However, the overall frequency of incidents increased slightly (TRIR) and is 3.5 times in excess of that of IMCA. The number of Dropped Object Incidents was 169, over twice that which was reported in 2016 (84) and 2.5 times the number in 2015 (69).

There is no explanation about why this increase occurred, but one explanation could be increased reporting through better awareness, as the industry, led by G+, has been putting more focus here. The number of Dropped Object incidents classified as HiPo (High Potential) reduced by 10% since 2016 which is a positive sign. 75% of Dropped Object incidents occurred offshore, whether on the turbine or support vessels while the remainder occurred onshore. Nearly 1/3 of reported incidents occurred during lifting operations and over half of those were considered as HiPo. 1/3 of incidents caused asset damage (54), which is a new metric in 2017. There is no explanation on the value of the asset damage or details on what occurred.

Despite a gradual move to more thorough reporting, as we will discuss below, there are several barriers to the consistent publication of complete and reliable statistics and to the dissemination of details about individual incidents of DO, which would help to inform an accurate assessment of the scale of the risk and also serve to increase awareness of the issue. Not least amongst these barriers is the fear of corporate reputational damage.

CASE STUDY 1:
SATELLITE DOME DROPS TO DECK

/ INDUSTRY

Maritime

/ INCIDENT

In two separate incidents, a satellite dome falls onto the deck during transit.

/ CIRCUMSTANCES

These incidents follow the corrosion of securing bolts and mounts, the use of unsuitable attachment systems, and corrosion within the dome itself. On both occasions, corrosion within the dome and its securing arrangement was hidden and therefore not spotted in previous visual inspections. Additionally, the location of the domes on the mast exposed them to weather and tangential g-forces.

/ IMPACT

Although no one was hurt, these incidents have a high potential to cause injury to personnel.

/ LESSONS LEARNT

It is easy to see an incident such as this being replicated on offshore wind vessels. Regardless of the industry, properly securing steel netting would prevent the uncontrolled fall and therefore eliminate the risk to personnel. Welding the dome pedestal to the vessel structure should also help to prevent incidents like these from happening, but it is also essential to ensure that the nuts and bolts used in the dome's attachment system are the correct size and a suitable material for the environment. Further guidance must be available for personnel carrying out visual inspections, particularly considering difficult to inspect arrangements.

A FOURFOLD THREAT

The risks posed by DOs can be divided into four categories: immediate safety risks, risks to the integrity of equipment, the potential financial risks, and the likely reputational risks. The safety risks involved in such incidences are clear: objects falling from height endanger lives - they risk seriously injuring personnel working directly below, and could cause fatality.

In terms of the financial risk, it is difficult to accurately assess the cost to businesses of individual incidences of DO, as little formal research has been completed on this topic, and, as with reputational risk, it is not in the interest of the companies involved to divulge such information. However, while there is little specific data available on the cost implications of DO risk, it is clear that injuries to personnel cost the company financially through working days lost, and falling objects risk damaging equipment, which could lead not only to the cost of replacing the damaged assets, but also potentially to a need to temporarily suspend at least some operations at the wind farm, which would in turn have a significant financial impact. Furthermore, there are potential financial compensation implications, and the legal consequences that go hand-in-hand with them.

Press coverage is sometimes the only way of uncovering the details of a significant incident of this nature, and it is certain that at least part of companies' reluctance to issue comprehensive statistics and provide potentially extremely useful case studies about incidents of falling objects relates to the reputational damage this could do to their business.

While all of the major reported DO events that have occurred to date in offshore wind have related to heavy lifting rather than to DO as defined above, without further risk mitigation action being taken now by offshore wind companies, it is only a matter of time before such a tragedy occurs in offshore wind. This would undoubtedly lead to the type of negative press coverage experienced during the construction of Greater Gabbard in 2010, when Fluor Ltd and Siemens Windpower A/S were prosecuted by the Health and Safety Executive, resulting in large fines for both companies.[1]

1. https://www.bbc.co.uk/news/uk-england-essex-34424017

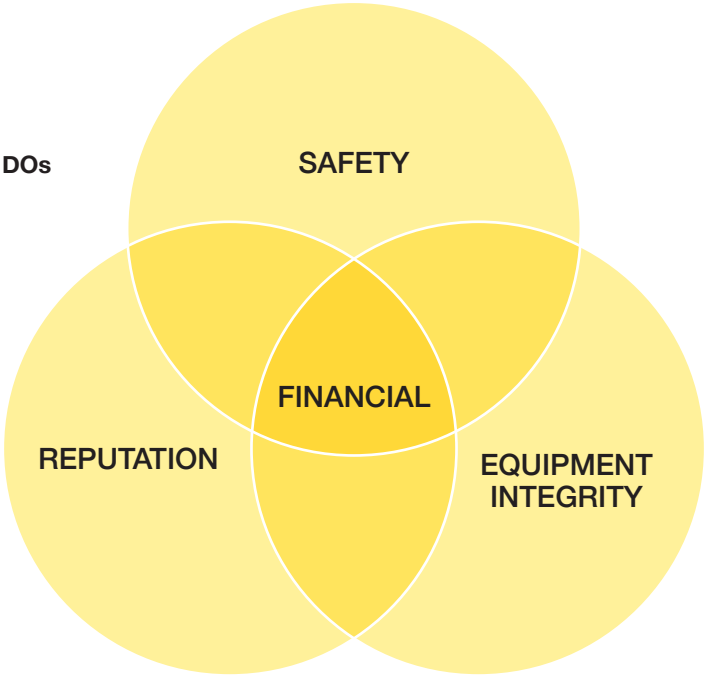


Figure 2: Key risks posed by DOs to offshore wind businesses

CASE STUDY 2:

STEEL COIL FALLS ON WIND FARM CONSTRUCTION SITE

/ INDUSTRY

Offshore wind

/ INCIDENT

A contractor breaks their wrist after being struck by a falling 50kg steel wire coil on the pre-construction site for an offshore wind farm off the East Coast of England.

/ CIRCUMSTANCES

Following an investigation by the Health and Safety Executive, the manufacturer was established to have failed to ensure a suitable and sufficient risk assessment and adequate control measures were in place.

/ IMPACT

At trial the company was found guilty of breaching Section 3(1) of the UK Health and Safety at Work Act 1974, and ordered to pay a fine of £66,000 and costs of over £10,000.

/ LESSONS LEARNT

This incident could have been prevented if the manufacturer had carried out a sufficient risk assessment, putting in place simple measures to reduce the risk of injury from dropped objects. This incident was covered in national press, resulting in multiple impacts including injury to personnel as well as financial and reputational damage.

WHAT IS THE REGULATORY SITUATION?

In terms of current safety regulations and mechanisms in place in the offshore wind sector regarding DO awareness, prevention and mitigation, the UK Health and Safety Executive, for instance, places a duty of care under the CDM Regulations on Operators to identify and mitigate foreseeable risks.

Official guidance on the subject remains limited. Industry guidelines for Working at Heights in offshore wind scenarios, first produced by the Global Offshore Wind Health and Safety Organisation, G+, in 2014 and updated this year[2], cover the risks of DO. In the 2014 version of the guidelines, this included recommendations regarding suitable devices to mitigate the risk. The 2018 version refers the reader directly to DROPS (Dropped Objects Prevention Scheme) guidance on the issue, which G+ will be adopting as standard; however, updated guidance on this issue is currently still in development by DROPS. With a gap of over six months since G+ issued their updated guidelines, there is a shortfall in best practice advice for offshore wind firms.

Moreover, anecdotal evidence suggests that safety procedures such as those discussed above are not always adhered to. Indeed, although in theory using lifting bags for equipment and secondary retention tethers for tools has for example become a standard expectation within offshore wind farm operations, it is reported that such guidelines are still frequently being ignored or overlooked.

2. Good practice guideline: Working at height in the offshore wind industry. Second edition, July 2018, G+, Energy Institute

WHAT CAN WE LEARN FROM OTHER INDUSTRIES?

Overall, there is a significant and unfavourable difference between health and safety performance in the offshore wind industry in regards to DOs and that in the offshore oil and gas and marine construction industries. Much greater strides need to be made in offshore wind if it is to replicate the high standard of risk mitigation shown by these other industries.

Safety was from the outset a key priority in the oil and gas sector, and it remains so. The reason for this is clear: the combination of remote drilling platforms located in harsh conditions and intense activity involving the use of much heavy machinery creates an environment ripe for potential accidents. Within the offshore oil and gas safety remit, DO risk features highly: DOs are in fact one of the most frequent reported causes of accidents in the oil and gas industry.

In this context, much has been done to try and avert the risk posed by DOs in oil and gas operations. The use of robust and cost-effective secondary retention solutions such as metal nets and barriers, as well as smaller-scale solutions such as pouches worn by operators for tool storage, has become commonplace, reflecting a move by oil and gas health and safety managers towards self-regulation in this regard.

Indeed, the oil and gas example has shown that self-regulation is very much a suitable answer to the wider issue of DO risk: it allows tailored solutions to each individual project to be devised and implemented, and avoids the need for adherence to generic regulations imposed from outside, which could hinder operations, delay projects, and result in additional, unwelcome costs. This has proven particularly critical in an industry that shares a common interest with offshore wind in reducing the cost of operations, and reputational damage.

CASE STUDY 3:

CORRODED AND POORLY-SECURED FLOODLIGHTS CAUSE SERIOUS NEAR MISS

/ INDUSTRY

Maritime

/ INCIDENT

A floodlight and fitting weighing 8kg falls 20 meters to the deck, narrowly missing a member of the crew. In a separate incident, a failed weld causes a floodlight to fall from its position on the vessel's crane.

/ CIRCUMSTANCES

In the first incident, the light was fitted to a post which had previously been identified as heavily corroded, but no corrective action had been taken. In the second incident, inadequate engineering meant that the welding was of an unsuitable standard. Both of these floodlights were located in areas exposed to vibration and the marine environment.

/ IMPACT

Whilst crew members were not hurt in these incidents they mark serious near misses that may have resulted in a fatality.

/ LESSONS LEARNT

Should an object such as a floodlight be located at a site exposed to the environment, retrofitting a security attachment such as steel netting will prevent a dropped object incident. Offshore wind is situated in similarly harsh conditions, so this is a common risk. It is also essential that objects and fittings previously identified as corroded and posing a risk of dropped objects are categorised as dangerous and be removed or rectified.

WHAT ARE THE SPECIFIC RISKS, AND HOW CAN THEY BE MITIGATED?

DO incidents can occur at offshore wind sites as a result of a number of factors, including unsuitable operational processes, human error such as equipment being inappropriately or inexpertly secured, or environmental factors, for example. They can occur throughout the installation, maintenance or decommissioning processes - at the foundations, nacelle or blades, in the tower, or on installation and service vessels. They can also occur during normal operations, for example if a hidden part of the machinery suffers severe corrosion over time and consequently falls from the installation.

Whether caused by human error or environmental factors, it is clear that dropped and falling objects are a significant concern: to the technician working on an individual installation, to the corporate team back at HQ, and to the industry as a whole. But what can be done to mitigate the risk?

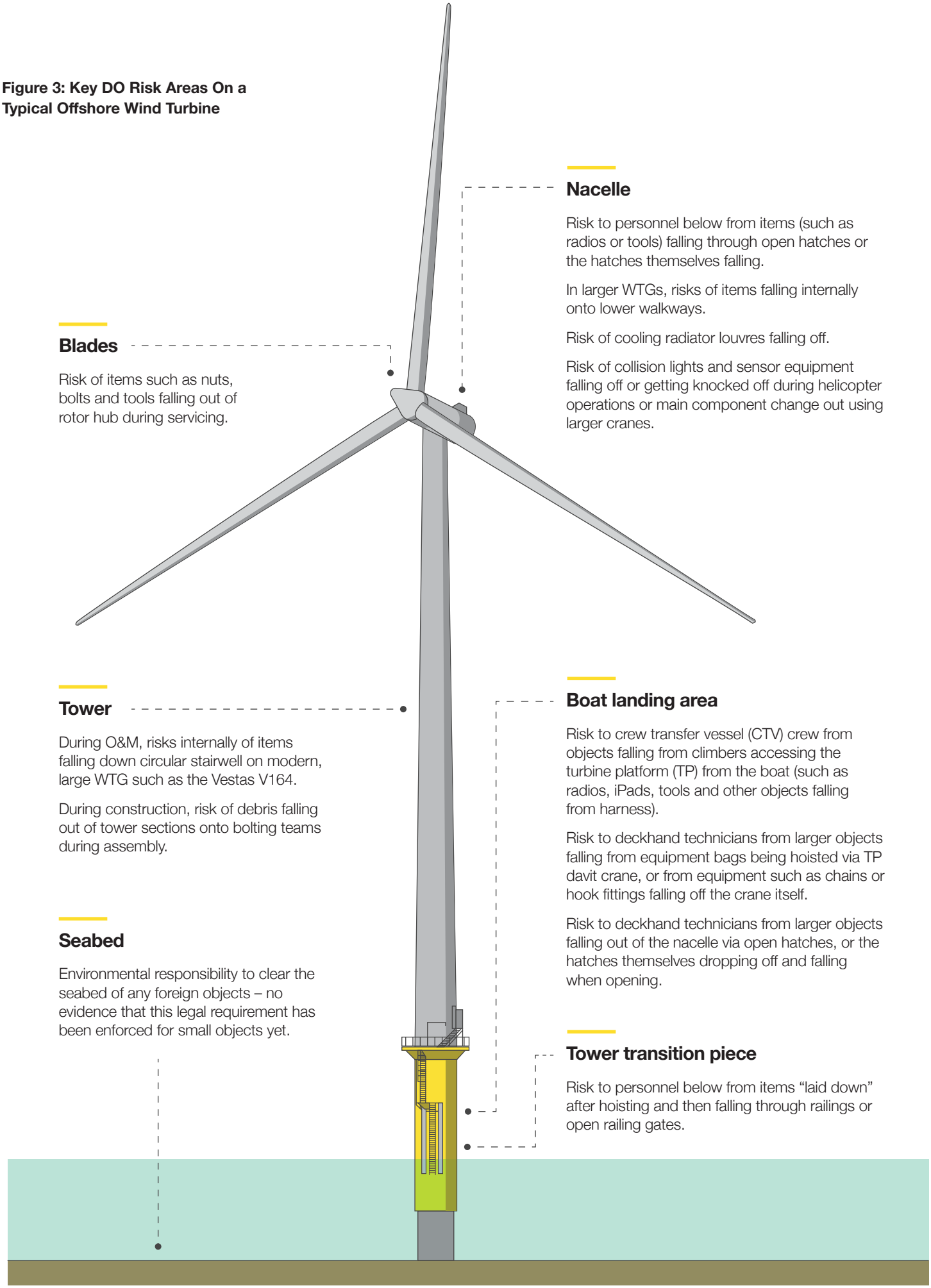
As we have seen from the oil and gas experience, it would be in the interest of the offshore wind industry to demonstrate that it too can self-regulate, to avoid the imposition of generic regulation, which would bring with it its own problems, including a loss of independence for the industry and for individual operators and their developments.

Positive steps towards risk mitigation taken so far by the offshore wind industry include the annual reporting of performance in this regard, and guidance on DO risk and prevention being included in the Working at Height guidelines. Increasing awareness and encouraging proactivity are key. The more the issue is discussed, the more likely that relevant parties will take note and take action.

Indeed, as well as ensuring high-quality engineering and correct, regular maintenance of equipment, offshore wind businesses need to be proactive in equipping their installation and maintenance teams, as well as the installations themselves, sufficiently to guard against DO risk.

Solutions include a variety of specialised nets and barriers that sit directly on the installation, or the fitting of secondary retention devices, such as that which was affixed to the reinstalled floodlight following the near-miss incident described earlier in this report. Indeed, it is clear that solutions provided for example by Dropsafe, such as secondary retention and barrier devices, can significantly reduce or eliminate risks, providing a potentially life-saving back-up in case of disaster.

Figure 3: Key DO Risk Areas On a Typical Offshore Wind Turbine



Nacelle

Risk to personnel below from items (such as radios or tools) falling through open hatches or the hatches themselves falling.

In larger WTGs, risks of items falling internally onto lower walkways.

Risk of cooling radiator louvres falling off.

Risk of collision lights and sensor equipment falling off or getting knocked off during helicopter operations or main component change out using larger cranes.

Blades

Risk of items such as nuts, bolts and tools falling out of rotor hub during servicing.

Tower

During O&M, risks internally of items falling down circular stairwell on modern, large WTG such as the Vestas V164.

During construction, risk of debris falling out of tower sections onto bolting teams during assembly.

Boat landing area

Risk to crew transfer vessel (CTV) crew from objects falling from climbers accessing the turbine platform (TP) from the boat (such as radios, iPads, tools and other objects falling from harness).

Risk to deckhand technicians from larger objects falling from equipment bags being hoisted via TP davit crane, or from equipment such as chains or hook fittings falling off the crane itself.

Risk to deckhand technicians from larger objects falling out of the nacelle via open hatches, or the hatches themselves dropping off and falling when opening.

Seabed

Environmental responsibility to clear the seabed of any foreign objects – no evidence that this legal requirement has been enforced for small objects yet.

Tower transition piece

Risk to personnel below from items “laid down” after hoisting and then falling through railings or open railing gates.

CONCLUSION

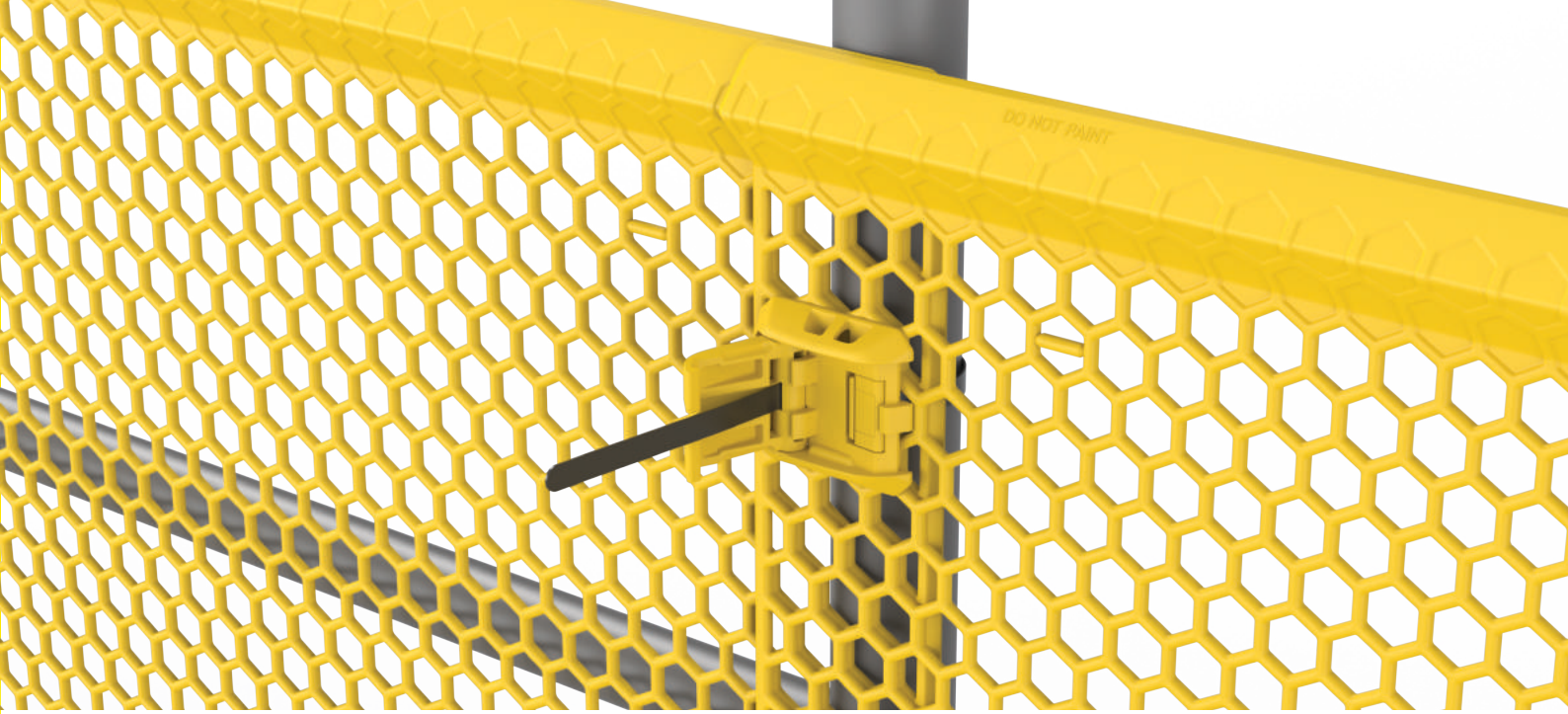
Offshore wind is, and will continue to be, a vital and thriving industry. However, with this positive growth comes increased safety risk, and an increased need to take further responsibility, now. Dropped and falling objects, whether caused by poor construction, a lack of adherence to existing safety guidelines, or environmental factors, continue to pose a significant risk during the construction and operation of offshore wind farms.

This issue has in the past been somewhat overlooked and underreported, however we predict that as the industry expands, businesses will be forced to take the issue of DO risk more seriously, and be proactive in self-regulating and adopting preventative measures to reduce or eliminate the associated risks.

Although there are still gaps in terms of the reporting of occurrences of DOs, and of near-misses involving DOs, data gathering and dissemination in relation to DO risk is improving, and will continue to do so. By rising to the challenge of preventing DO incidents, accelerating the adoption of best practice gleaned from other industries such as offshore oil and gas, and forging ahead with improving safety performance by installing innovative drops prevention technology such as that supplied by Dropsafe, companies engaged in offshore wind have a chance to act as industry safety pioneers.

In doing so, they will avoid costly damage to corporate reputation and finances, and prevent the potential loss of life or serious injury to technician or contractor, as could be caused by a severe DO incident. By taking a best practice approach, they may also set themselves apart and gain a commercial advantage in an industry with a growing focus on improving standards.

More significantly, and as we would be likely to witness first-hand, should further action not be taken by the offshore wind industry in the immediate future, mitigation steps such as tethering small equipment or installing a safety net could literally mean the difference between life and death.



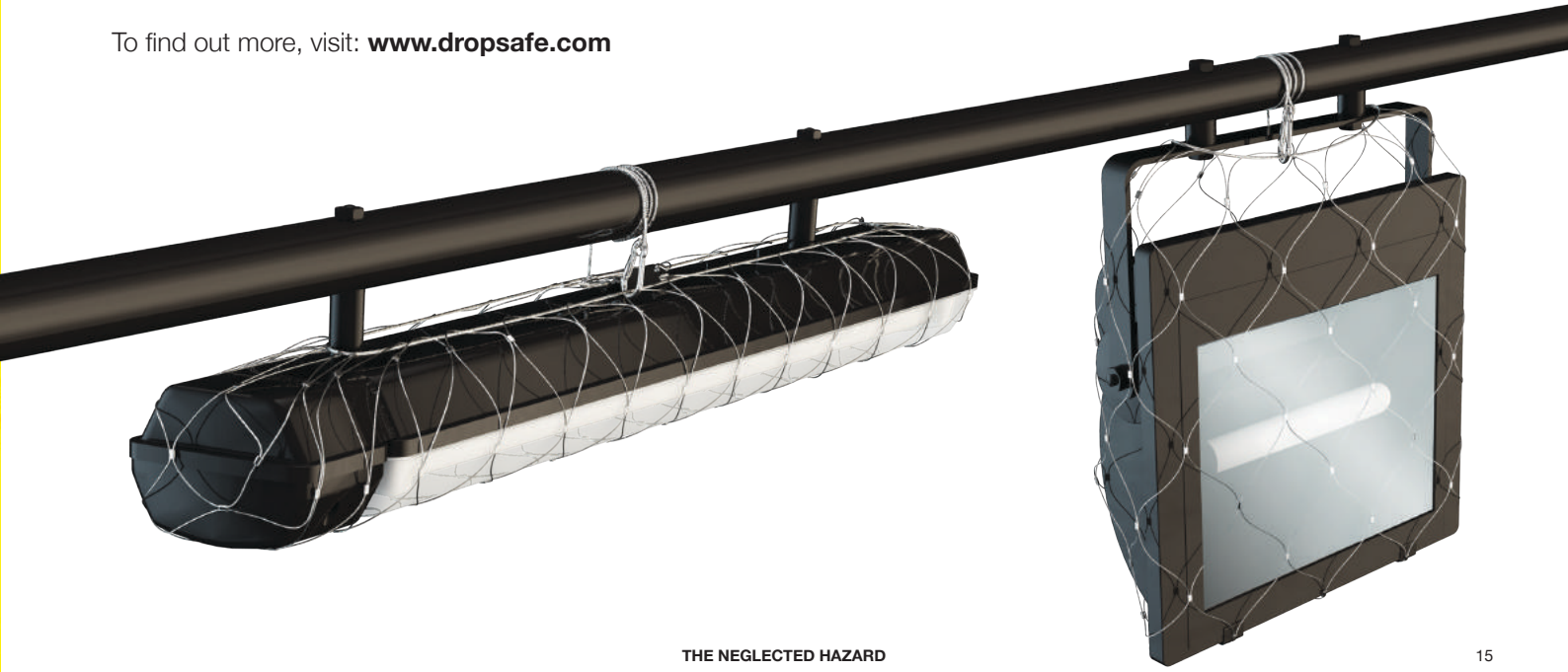
About Dropsafe

Dropsafe is the global leading provider of dropped object prevention solutions for the global energy and infrastructure markets, with a range of innovative and patented products including its pioneering mesh-security and mesh-safety products.

Dropsafe has come to set the industry standard for Drops prevention in the onshore and offshore energy sectors, collaborating with industry professionals to lead the market in enabling customers to improve workplace safety.

Dropsafe's track record in the industry is illustrated by its customer base of over 300, encompassing exclusive fleet-wide agreements with the largest global Oil & Gas drilling contractors.

To find out more, visit: **www.dropsafe.com**



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