G+ Global Offshore Wind Health and Safety Organisation

2023 incident data report

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Health & Safety
Organisation

www.gplusoffshorewind.com

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Introduction from the chairperson

I am pleased to be introducing the 2023 G+ incident data to you in my first year as chairperson. Transparency and sharing information are key to improving standards; highlighting trends and discovering the key findings and insights in the data. The 2023 annual incident data report provides a comprehensive global overview of the health and safety incidents that occurred across member development, construction, and operation of offshore wind farm sites.

In 2023, we see an industry growing, maturing, and coming of age, with hours worked showing substantial growth, from 44.6 million hours in 2022 to a new high of 61.9 million hours in 2023, an increase of 39%. While activity has significantly ramped up, both the total recordable injury rate (TRIR) and lost time injury frequency (LTIF) have remained broadly steady, with only minor changes in 2023, with TRIR falling 3% from 2.83 in 2022 to 2.73 in 2023, and LTIF rising 3% from 1.03 in 2022 to 1.07 in 2023. High potential incidents, those with the greatest likelihood of causing serious harm, have seen a substantial decline over 2023, falling to 11% of the total, from 2022's 26%. Overall, while we are pleased that we have been able to maintain our high standards and the improvements made over the last few years, there is still room for improvement.

G+ is reporting a fatality this year. An individual lost their life while working on turbine assembly onshore. While on a mobile elevated platform (MEWP), the individual became stuck between the MEWP basket and the turbine blade bearing that was being worked on. Further details will be released on Toolbox once the full investigation is complete. Our thoughts are with the family, colleagues and friends of the individual involved. This tragedy reinforces the need for our industry to continue to work hard in striving to ensure our workforce remains safe and healthy. Over the course of this year, we will continue to work hard to address the issues flagged by the data, as we strive to improve safety performance across the whole global industry.

Three areas stand out as topics of interest in the 2023 data due to the substantial increases in incidents (excluding hazard observations/reports): substations, both onshore and offshore, where non-hazard incidents more than doubled from 35 in 2022 to 79 in 2023; SOV vessels in construction, which saw non-hazard incidents more than triple, from 35 in 2022 to 139 in 2023; and onshore turbine assembly, which rose by 75%, from 32 non-hazard incidents in 2022 to 56 in 2023.. This reinforces a belief that I have championed as a G+ Board Director over previous years, that whilst we are working on offshore projects, the onshore element of some of these projects is significant and also needs our focus. This is why G+ developed the "Contractor engagement and behavioural safety in onshore civils" Good Practice Guidance last year. We are also working in collaboration with the International Marine Contractors Association via the Industry Collaboration Committee to provide guidance to our members on safe practice when working on and with vessels.

The data presented in this report is based on our commitment to transparency and accountability. We hope that it will serve as a valuable resource for the offshore wind industry, and that it will help us to continue to improve our health and safety practices in the years to come. We are also using the information in this report to provide guidance to technicians and help get needed information closer to those working on site. If you would like to dive even deeper into the data, please do experiment with our new dashboard, available on our website, allowing users to research patterns and spot connections which we have not listed here.

David Griffiths
Chair – G+ Global Offshore Wind Health and Safety Organisation

Overview of G+ member sites

The G+ requires its member companies to provide incident data on a quarterly basis, which is then subject to anonymisation for analysis by the Energy Institute and widely reviewed and scrutinised by industry experts. The resulting report is then published each year for public use. In addition, throughout the year, quarterly reports are issued to the G+ Board and Focal Groups for in-depth examination and analysis. These reports are used to identify key risk areas, which are then incorporated into the G+ work programme.

To further enhance the analysis process, Deep Dive data meetings are held quarterly, bringing together the collective expertise of G+ member companies to scrutinise industry performance and determine specific areas of focus and attention. An annual data reporting review meeting is also held to assess the overall process and identify opportunities for improvement.

To continually improve the process, the template used for data collection is reviewed, streamlined, and enhanced each year in line with industry feedback. A full list of the incidents included in the G+ report, which includes information submitted by G+ members and associates, is published on the G+ website, through Power BI. In 2023, the G+ received data from Europe, Asia (South Korea and Taiwan) and the United States of America.

2023 highlights

2023 key facts and figures:

Key facts

1679 Incidents occurred

Distributed in the following areas as follows:

1049 Incidents occurred on a **construction site**

560 Incidents occurred on an **operation site**

67 Incidents occurred on a **development site**

3 Incidents occurred outside of any site type

The incidents include:

1 Fatality

65 Total **lost work day** injuries

31 Incidents resulting in **ERME**

33 Restricted workday Injuries

70 Medical treatment injuries

Top three work process are:

207 Incidents during **lifting operations**

169 Incidents during **vessel operations (including jack-ups and barges)**

109 Incidents during **routine maintenance**

Overall safety statistics

Table 1: Number of reported incidents and workhours 2019-2023					
Actual Consequence	**2019**	**2020**	**2021**	**2022**	**2023**
Lost work day injury	47	43	45	46	65
Restricted work day injury	23	30	20	36	33
Medical treatment injury	38	22	31	44	70
First aid injury	265	197	283	246	373
Near hit/miss	229	193	221	268	344
Hazard	102	106	81	70	339
Asset damage	137	148	85	157	387
Fatality					1
Other					67
Total	**841**	**739**	**766**	**867**	**1679**
Workhours (Mn)	20.4	25.3	31.3	44.6	61.9
Incident p/Mn hours	41.3	29.3	24.5	19.5	27.1

In 2023, the number of hours worked saw a substantial increase, rising from 44.6 million hours in 2022 to an all-time high of 61.9 million hours in 2023, an increase of 39%. The TRIR saw a 3% decline this year (from 2.83 in 2022 to 2.73 in 2023), continuing its downward trajectory. However, LTIF had a 3% rise this year (from 1.03 in 2022 to 1.07 in 2023).

In 2023, there were 1,679 incidents recorded by G+ members, an increase of 94% from 2022's 867 incidents. In terms of more serious incidents, medical treatment injuries rose 59% over 2023 to 70 incidents, a substantial rise. However, as there were far more hours worked in 2023 than in 2022, when we factor the number of medical treatment injuries per million hours, we see a somewhat more moderate increase of 15%, with 2022 having 0.99 medical treatment incidents per million hours, and 2023 having 1.13.

When examining restricted work day injuries, we see a slight decline of 8% between 2022 and 2023, dropping from 36 to 33. Factoring in hours though, we see a far more substantial decrease, from 0.81 restricted work day incidents per million hours in 2022 to 0.53 in 2023, a drop of 34%.

Finally, lost work day injuries rose 41%, from 46 in 2022 to 65 in 2023, but saw a very small increase in incidents per million hours, rising 2% from 1.03 in 2022 to 1.05 in 2023. For the first time in G+'s reporting history these numbers include a fatality. An individual lost their life while working on turbine assembly onshore. While on a MEWP, the individual became stuck between the MEWP basket and the turbine blade bearing that was being worked on. Further details will be released on Toolbox once the full investigation is complete.

Overall, this year shows a mixed picture as the industry grows, with an improvement in some areas while seeing a decrease in others. This is likely due to the increase in projects entering the construction phase – this will be explored further in our site type section. However, these figures remind us that we must remain vigilant to the increasing number of risks as major projects get underway and work hard to maintain our high safety standards.

TRIR

The number of recordable injuries (fatalities + lost workday injuries + restricted workday injuries + medical treatment injuries) per 1,000,000 hours worked.

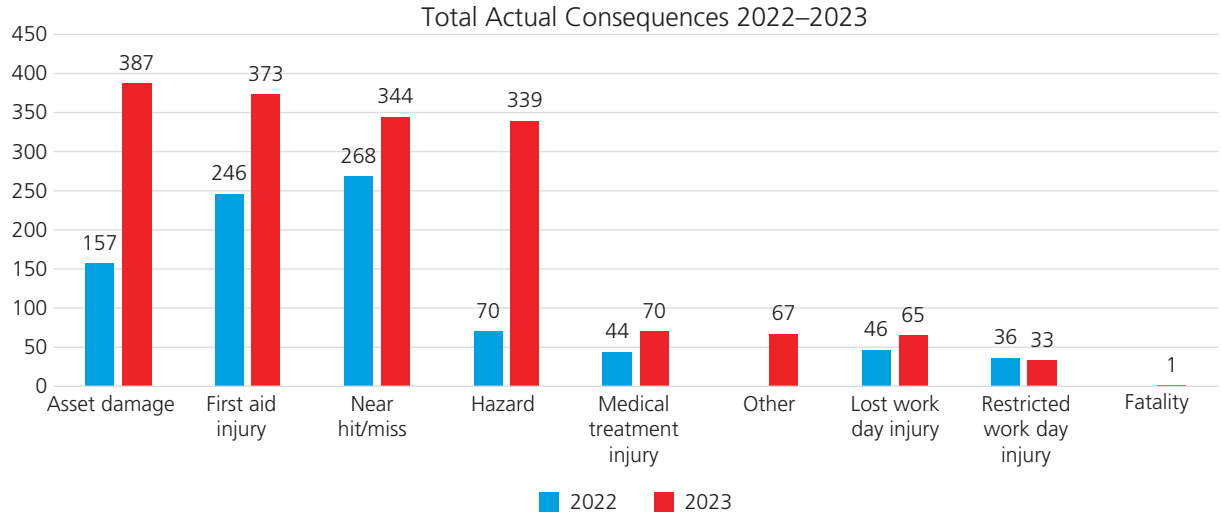
LTIF

The number of recordable injuries (fatalities + lost workday injuries) per 1,000,000 hours worked.

Analysis by actual consequence

In 2023, there were 1,679 incidents, an increase of 94% from 2022's 867 incidents. When these incidents are broken down by actual consequences, we see that the largest reported category was asset damage, with 387 incidents, accounting for 23% of the total, and an increase of 146% from 2022. This was followed by: first aid injuries, with 373 incidents, accounting for 22% of the total and an increase of 52% from 2022; near hit/misses, with 344 incidents, accounting for 20% of the total and an increase of 28% from 2022; and hazards, with 339 reports, accounting for 20% of the total and an increase of 384% from 2022.

When examining more serious incidents, we see that medical treatment injuries saw an increase year on year, with these incidents rising 59%, from 44 in 2022 to 70 in 2023. Restricted work day injuries fell, from 36 in 2022 to 33 in 2023, while lost work day incidents increased, rising 41% from 46 in 2022 to 65 in 2023. The G+ is reporting a fatality this year, as mentioned earlier. Further details will be released on Toolbox once the full investigation is complete.



High potential incidents and injuries

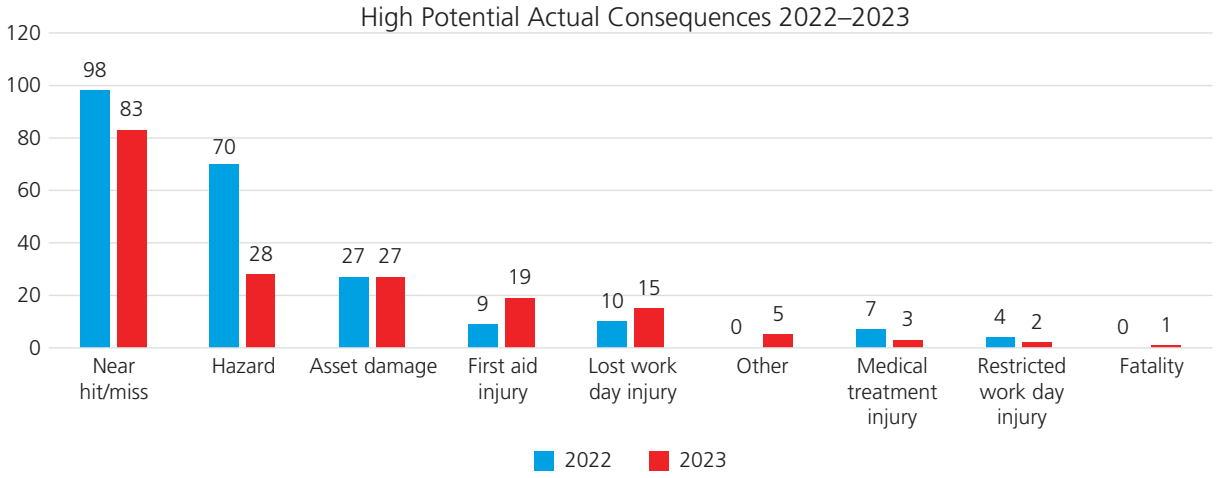
In 2023 there were 183 high potential incidents, 11% of the total. This shows a substantial decline from the previous year's 225 high potential incidents, as well as a substantial decrease in the proportion of incidents being high potential, more than halving from 2022's 26%. Construction sites stand out as they have the greatest number of high potential incidents, with 105 categorised as such, followed by operation sites at 67, and development sites at 10. This is in contrast with 2022, where operation sites were the largest source of high potential incidents.

CTVs have the largest number of high potential incidents in 2023, with 22 incidents, followed by jack-up vessels/barges with 18, non-high voltage areas of offshore substations with 14, turbine: nacelle with 13, and onshore: civils works with 12. Among these top 5, CTVs, non-high voltage areas of offshore substations and onshore: civils works are particularly worth noting, as the proportion of their high potential incidents is far higher than the average proportion. CTVs consist of 7% of all incidents, but also consist of 12% of all high potential incidents. For non-high voltage areas of offshore substations, these figures are 4% and 8% respectively, and for onshore: civils works, these figures are 3% and 7% respectively.

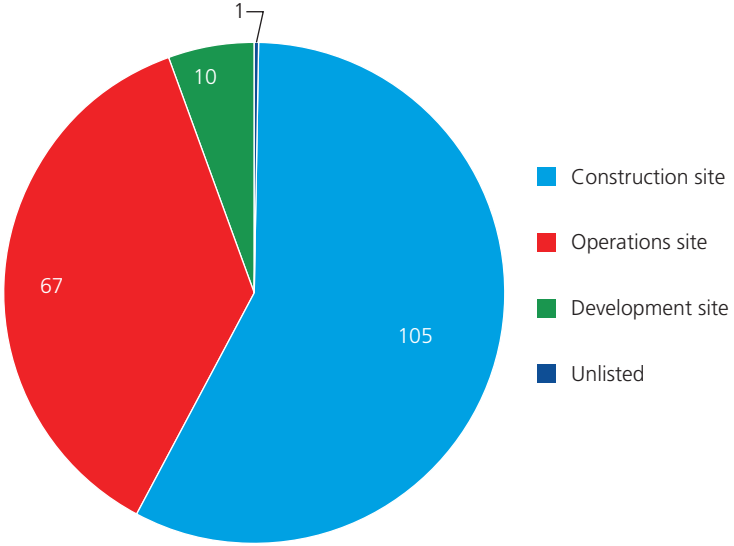
When examining the actual consequences of high potential incidents, we see a major portion of these incidents being listed as near hit/misses, with 83 incidents being listed as such, 45%. This is a slight decrease of 15% compared to last year's 98 incidents. Hazards reported as high potential also fell, declining 60% from 70 in 2022 to 28 in 2023, while asset damage incidents remained stable at 27. High potential first aid injuries more than doubled from 9 to 19, high potential lost work day injuries increased 50%, from 10 to 15, while medical treatment injuries dropped 57%, from 7 to 3, and restricted work day injuries halved, from 4 to 2.

Moving to work processes, we see that, much like last year, the process with the highest number of high potential incidents is lifting operations, with 38 incidents. This is a slight decline from 2022, which had 40 incidents. Transfer from/to vessel saw a substantial increase compared to 2022, rising from 12 to 17*, while vessel operations (including jack-ups and barges) fell from 17 to 13, working with electrical systems halved, from 22 to 11, and working at heights declined from 16 to 11. Working at heights is unusual in that such a large proportion of these incidents are considered high potential – a third of all working at heights incidents, 11 out of 33, are classified as such. Lifting operations, transfer from/to vessel, and working with electrical systems also have a disproportionately high number of high potential incidents.

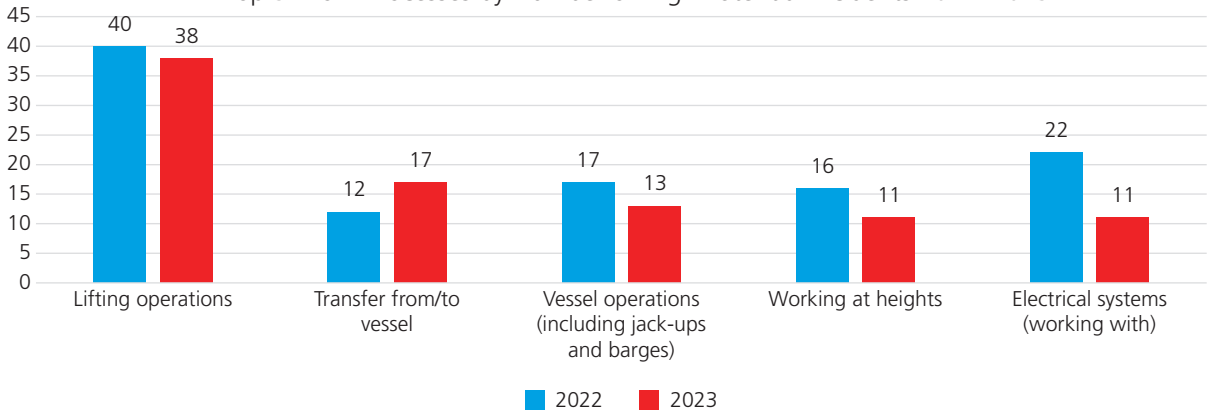
It is good to observe the continued reduction in the number of high potential incidents, against the increased workhours and continued high levels of reporting. The G+ uses Toolbox [https://toolbox.energyinst.org/] to share lessons learnt and encourages all within the industry to access this source of information and its freely available resources.



Number of High Potential Incidents by Site Type (2023)



Top 5 Work Processes by Number of High Potential Incidents 2022–2023



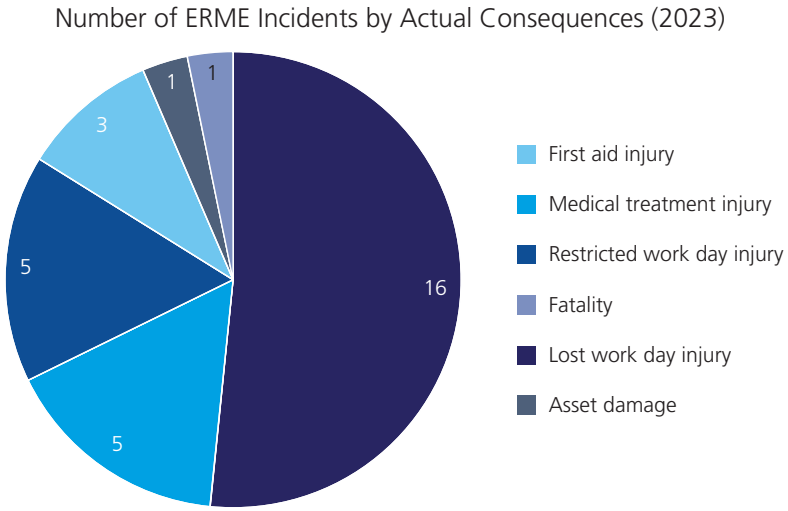
Incidents resulting in Emergency Response and Medical Evacuation (ERME)

2023 saw ERME incidents increasing, rising 63% from 19 in 2022 to 31 in 2023. When factoring in hours, we still see an increase, although not as pronounced: 2022 had 0.43 ERME incidents per million hours, while 2023 had 0.50 ERME incidents per million hours, an increase of 17%.

Manual handling stands out as having the largest number of ERME incidents, at 6, despite having no ERME incidents in 2022. This makes manual handling among the processes with the highest proportion of incidents (6%) requiring ERME. Overall, we see a greater spread of work processes having ERME incidents, with 17 processes having at least 1 EMRE incident, while in 2022 there were 14.

Looking at incident areas, the area with the highest number of ERME incidents is turbine: foundation internal with 5, followed by SOVs with 4 and turbine: nacelle with 3. Turbine: foundation internal has a major proportion of their incidents being ERME, with 15% of all incidents in this area being ERME, while SOVs, despite being in the top 3, had only 2% of their incidents being ERME.

In terms of the actual consequences, ERME involved 16 lost work day injuries, meaning that almost a quarter of all lost work day incidents in 2023 required an ERME, and being higher than 2022's 6 lost work day ERME incidents. 3 first aid injuries also required an ERME (up from 1 in 2022), as well as 5 medical treatment injuries (down from 9 in 2022) and 5 restricted work day injuries (also up from 1 in 2022).



Incidents resulting in dropped objects

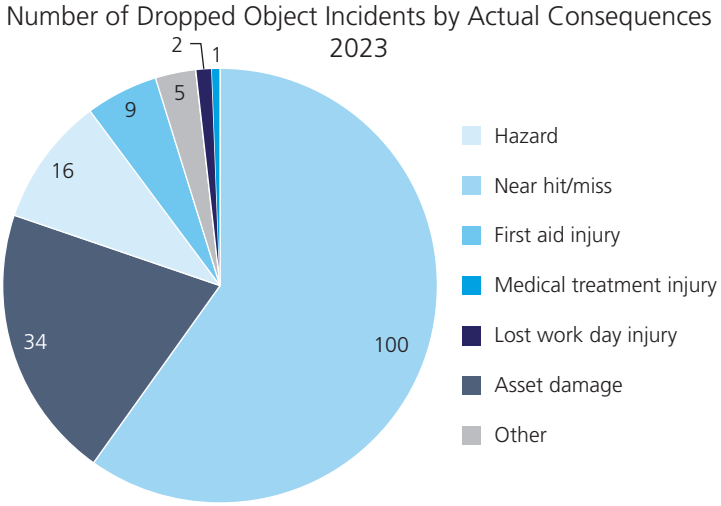
There were 167 dropped object incidents in 2023, more than double the 77 seen in 2022, and an increase in dropped object incidents per million hours, rising 56% from 1.73 in 2022 to 2.70 in 2023.

100 incidents, 60% of all dropped object incidents, were near hit/misses, 20% (34 incidents) resulted in asset damage, 5% (9 incidents) resulted in first aid, and 1% (2 incidents) resulted in a lost work day injury.

Breaking down by site type, we see that the majority of dropped object incidents, 62% (103 incidents), were in construction sites, with 33% (55 incidents) in operation sites and the remaining 5% (9 incidents) in development sites. The rise in construction site dropped object incidents from 2022 is the most profound, with construction site incidents rising 171% from 2022.

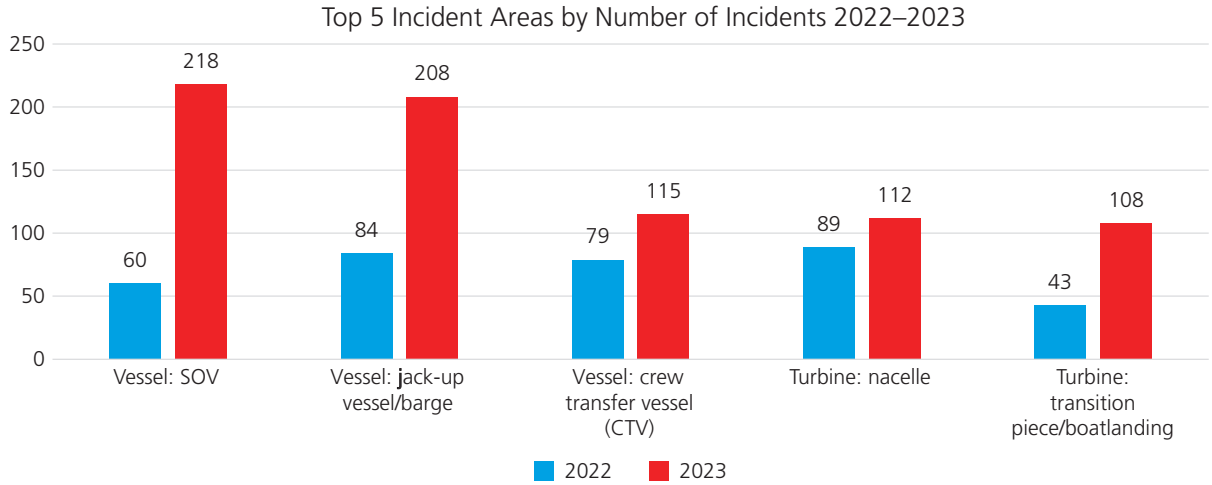
Looking at work processes, lifting operations stands out as having the largest number of dropped object incidents, with 51 incidents, 31% of the total, up from 19 incidents in 2022. This is followed by routine maintenance, with 18 incidents, and operating plant and machinery, with 13 incidents. Examining incident area, we see that the area with most dropped object incidents is jack-up vessels/barges, with 22 incidents, followed by turbine: transition piece/boat landing with 19, SOVs with 15, and survey vessels with 14.

56 dropped object incidents were considered high potential in 2023, 34% of all dropped object incidents, a figure far higher than the 2023 average, although this proportion could be seen as a slight improvement from 2022, where 55% of dropped object incidents were high potential. Even so, the actual number of high potential dropped object incidents has still risen compared to last year, increasing by 33%, from 42 to 56.



Analysis by incident area

Two incident areas stand out in 2023 – SOVs, with 218 incidents, and jack-up vessels/barges, with 208 incidents. These two incident areas make up 25% of all incidents in 2023, and both areas have seen substantial rise from 2022, with SOVs rising 263% from 60, and jack-up vessels/barges rising 148% from 84. The remaining top 5 incident areas are CTVs with 115 incidents, accounting for 7% of the total, and an increase of 46% from 2022, turbine: nacelle with 112 incidents, accounting for 7% of the total, and an increase of 26% from 2022, and turbine: transition piece/boat-landing with 108 incidents, accounting for 6% of the total, and an increase of 151% from 2022. One incident area which saw a decline was turbine tower incidents, which fell 22%, from 67 in 2022 to 52 in 2023.



The nature of the offshore wind industry means that a large proportion of work activities occur on vessels. It is therefore expected that this is reflected in the G+ incident data and with 2023 seeing a 40% increase in the workhours reported for construction sites compared to 2022, it was unsurprising to see an accompanying rise in the number of incidents reported in 'incident area: vessel', particularly for construction sites (from 188 in 2022 to 435 in 2023, excluding hazard observations). While this is an increase of 66% for incidents per million workhours reported in this category[1], the largest rise since 2019, it should be noted that many of the incidents reported in this category simply reflect the working environment. Asset damage was the most frequent outcome of an incident, with 41% of all vessel incidents on construction sites resulting in asset damage. This is followed by near misses, representing 26% of all vessel incidents. These incidents range from snared thrusters/propellers, to contact between vessel and harbour/quayside resulting in minor damage ranging from engine room faults and power issues to damage to fenders. It is reassuring to report that proportionally the number of high potential incidents fell, with 18% of 2022 incidents being high potential, while only 9% of 2023 incidents were high potential, below the 5-year average of 12%.

Offshore wind related vessel incidents and lessons learnt are available to review on the Toolbox website, see for example "Walk to work gangway incidents with high potential" available at: https://toolbox.energyinst.org/c/presentations/walk-to-work-gangway-incidents-with-high-potential. Additionally, IMCA has a large number of resources available on their website on the topic of vessel safety and is an organisation who the G+ works closely with on vessel safety.

In the next deep dive sections, we describe the types of incidents reported for three incident areas that saw a notable rise against historical data: 1) vessels: SOV, 2) Substations both onshore and offshore, and 3) Onshore turbine assembly. These deep dive topic statistics exclude hazard observations, negligible incidents, environmental incidents, and unclassified incidents.

[1] Note that the G+ does not collect workhours data on vessel activity and therefore this is rated against overall construction workhours.

Deep dive—Incident area vessels: SOV in construction

There was a particularly sharp increase in incidents reported (139) in the 'vessel: SOV' sub-category for incident area in construction sites. These rose by 334% against 2022's 32 incidents. They take up an 88% larger proportion of all vessel incidents, representing 32% of all construction site vessel incidents in 2023, compared to 17% in 2022. SOV incidents are also 40% higher as a proportion of incidents when compared to the five-year average of all construction site vessel incidents (23%). As the industry has moved towards larger and further offshore projects, the use of SOVs has increased, which may be driving this rise.

The use of SOVs also leads to greater time spent offshore and aboard vessels. By the nature of activities aboard SOVs, there is a greater frequency of incident types which tend to have lower severity profiles, for examples we see incidents occurring in mess areas/catering, or slips/trips/falls in accommodation areas, which do not tend to occur as frequently for other vessel types. This is seen in the data with SOV incidents having a relatively low proportion of high potential incidents: 6 incidents, 4%, of the 139 incidents being listed as such. The 6 high potential SOV incidents involved: a gangway system suffering damage during transit, a case of legionnaires aboard the ship, a fall on a staircase, a sharp worsening of weather conditions leading to momentarily uncontrolled cargo during a lift, a fall into water when a walk-to-work system unexpectedly retracted during transfer from SOV to transition piece, and a tumble dryer fire in the laundry area.

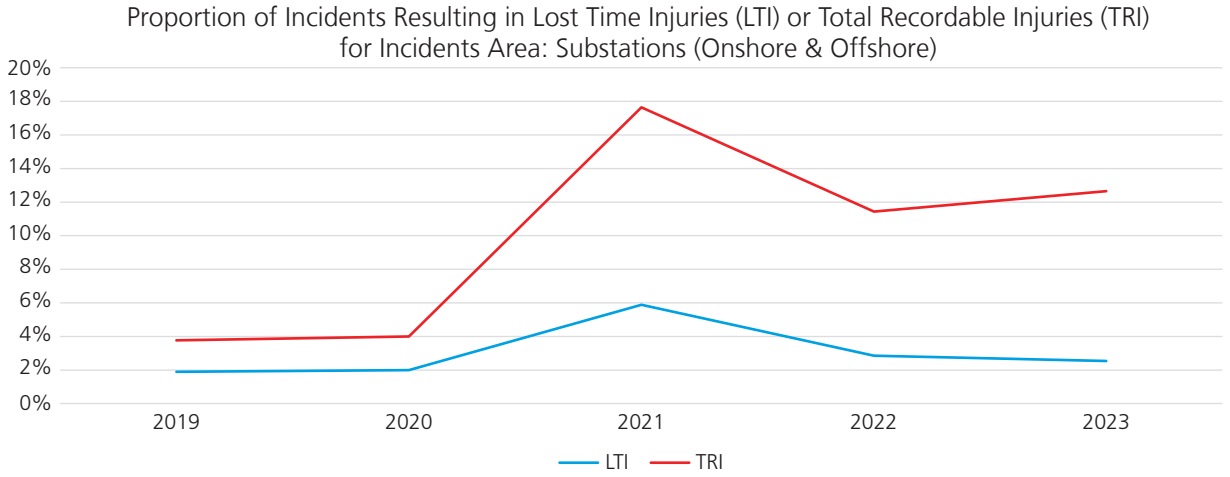
Looking at the most severe incidents in the SOV sub-category, 10 incidents resulted in a LWDC or a RWDC: 3 back injuries from manual handling/lifting tasks, 2 related to blade injuries during cable related tasks, 3 injuries from slips/trips resulting e.g. sprained ankles, a case of legionnaires and a dropped object during a lifting operation that resulted in a crushed fingertip.

Table 2: Top-10 work process by number of incidents in incident area—Vessels: SOV, by actual consequence (2023)

	Near hit/miss	Asset damage	First aid injury	Medical treatment injury	Restricted work day injury	Lost work day injury
Vessel operations (including jack-ups and barges)	17	17	8	4	1	1
Lifting operations	9	12			2	
Mechanical systems (working with)	5	2	1	1		
Operating plant and machinery	5	3				
Hand tools/power tools	2		2	1		2
Manual handling	1		3		2	
Transfer from/to vessel	1	2	2			
Walking from A to B			5			
Catering/cleaning	2		2			
Vessel mobilisation/demobilisation	1	1	2			
All other work processes	7	6	4		1	1
	50	43	29	6	6	4

Deep dive—Incident area: Substations* (onshore and offshore)

Work on substations, both onshore and offshore, showed a significant increase in incidents in the year of 2023. This was largely due to a major increase in construction site incidents, as more development sites now begin the construction phase. Incidents (excluding hazard observations**) on substations rose by 126%, from 35 in 2022 to 79 in 2023. When examining the proportion of incidents which resulted in medical treatment or lost time (i.e. qualifying as TRIR incidents), we see this proportion rising from 11% in 2022 to 13% in 2023, while the proportion of incidents which were lost work day incidents (i.e. qualifying as LTIF incidents) stayed steady, remaining at 3%.



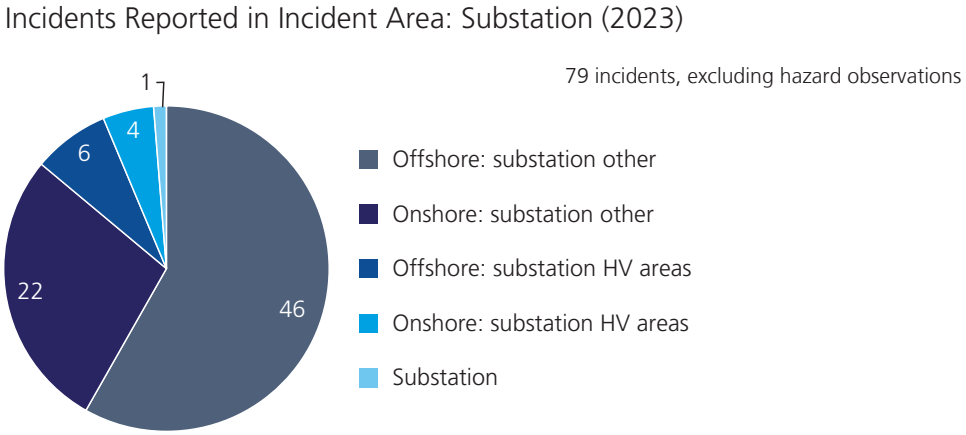
When we break down the 2023 incidents by site type, we see that 82% of substation incidents occurred on construction sites. It could be said that this increase is due to the significant increase in hours worked. However, when factoring in hours as a ratio against incidents, we see an increase from 0.79 incidents per million hours in 2022 to 1.28 incidents per million hours in 2023, an increase of 63%. Between 2022 and 2023, construction site incidents (excluding hazard observations) jumped from 23 to 65, an increase of 183%, while operation site incidents rose slightly from 12 to 14, an increase of 17%. One possible reason for the increase in substation incidents is that a large number of wind farm construction projects began in 2023 and substations are usually one of the first parts of the wind farm to be installed, meaning that early construction sites would have a higher proportion of substation related activity, and therefore a higher number of substation incidents.

Broken down into each substation area, there were 46 incidents in non-high voltage areas of offshore substations, 22 in non-high voltage areas of onshore substations, 6 in high voltage areas of offshore substations, and 4 in high voltage areas of onshore substations, with 1 in an unspecified substation area. 10 high potential incidents occurred in non-high voltage areas on offshore substations, meaning that this area consisted of 77% of high potential incidents, while only consisting of 58% of total substation incidents.

*The G+ collects incident data from its members and associates. They are offshore wind farm developers and operators and WTG OEMs. In some countries offshore wind farm owners plan, build and even operate the offshore and onshore substations for the wind farm or even different combinations of these elements. In other countries a transmission network operator, like Tennet or RTE, plan, build and operate the substations and the wind farm operator is provided with an offshore connection point from the offshore substation. When the latter occurs, in countries like Germany and the Netherlands, G+ does not collect the incident data as G+ does not currently have any members or associates who are transmission network operators. The data that is included in this report covers more of the WTGs and inter-array cabling than offshore substations, due to this ownership arrangement.

**These deep dive topic statistics exclude hazard observations, negligible incidents, environmental incidents, and unclassified incidents.

Deep dive—Incident area: Substations* (onshore and offshore) (continued)

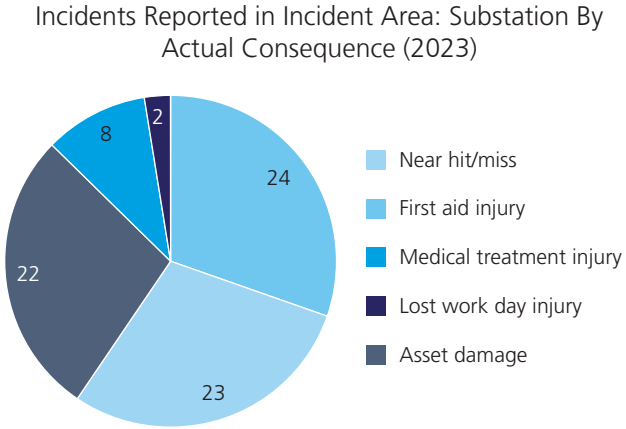


When breaking down substation incidents by work process, we see that the top 6 work processes account for over half of all incidents. These are working with electrical systems (12 incidents, accounting for 15% of the total), manual handling (9 incidents, 11%), lifting operations (7 incidents, 9%), working with hand tools/power tools (7 incidents, 9%), operating plant and machinery (5 incidents, 6%), and routine maintenance (5 incidents, 6%). Working with electrical systems being the highest is obvious, as the substation is a major electrical component of the wind farm, while the rest of these work processes are fairly typical in a large number of areas, with the four of them appearing in the top 5 most frequent work processes in terms of incidents in 2023. One process which stands out is working with electrical systems. Half of all incidents, 6 out of 12, were considered high potential, which is understandable when considering the voltages involved in a substation.

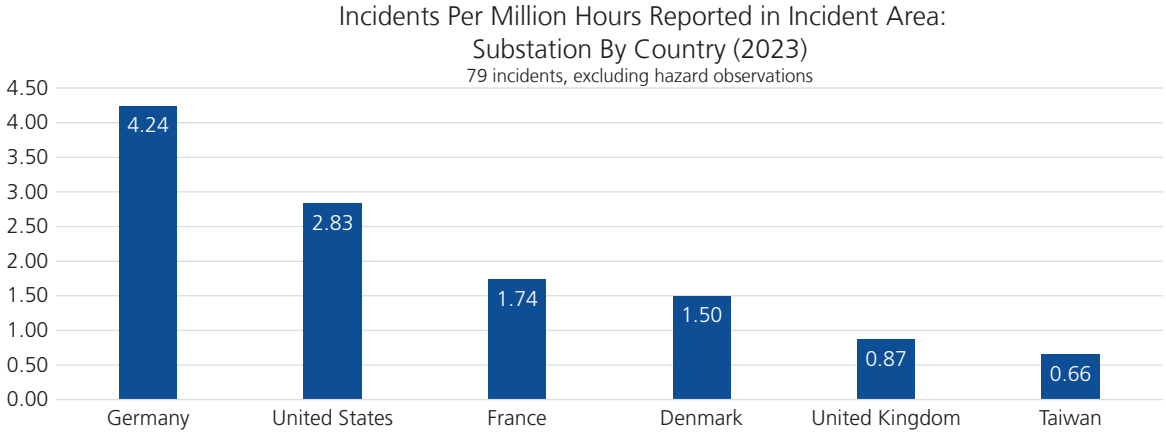
In terms of actual consequences, 29% of incidents were a near hit/miss, 30% were first aid injuries, and 28% were asset damage, which is broadly in line with the average of all areas in 2023. There were also 8 medical treatment injuries, which is above the 2023 average by 84%, and 2 lost work day incidents, which is 50% lower than the 2023 average. There were no restricted work day injuries, but there were also three incidents which required an emergency response/medical evacuation, which is slightly above the 2023 average. Overall, we can say that substation incidents are broadly typical in their outcome, being similar in proportion to the proportions of the actual consequences of all incidents in 2023.

When examining the descriptions of incidents which resulted in actual bodily harm to a worker, we see the majority of actual harm caused by incidents is colliding with an object, tool, or piece of the substation structure, while there were two incidents where individuals suffered electrical shocks. When examining high potential incidents, we see that 13 of the 79 incidents which occurred in 2023 were considered high potential, 16%. This is significantly higher than the proportion of high potential incidents in 2022, 9%, although identical to the five-year average of 16%.

Deep dive—Incident area: Substations* (onshore and offshore) (continued)



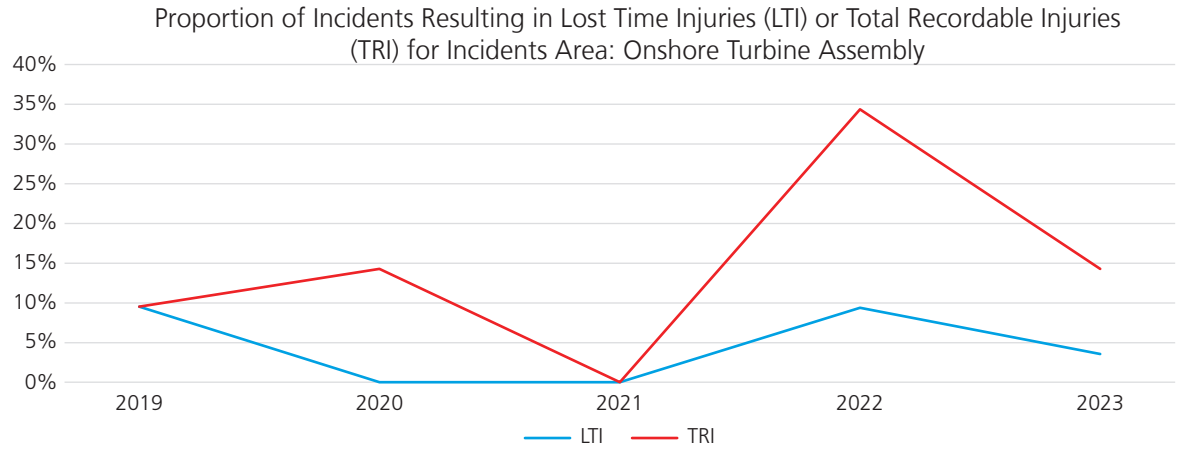
When comparing substation incidents by country, the highest number of substation incidents are seen in Germany, with 19 incidents, coming to 4.24 incidents per million hours, and United States, which had 20 incidents, which comes to 2.83 incidents per million hours. This is likely due to new wind farm projects beginning construction this year in these countries. We see a decrease in incidents per million hours in the UK, falling from 1.23 to 0.87, and in France, falling from 2.21 to 1.74, likely due to projects moving out of the construction phase and into the operations phase.



To increase offshore wind electrical safety, we have worked with offshore wind developers and OEMs to standardise processes related to arc flash and shock labelling and a recommended framework will be published soon under "Guidelines for Arc flash and shock labelling and associated signage in the offshore wind industry". Further guidance when working with electrical systems is provided in the Energy Institute's Wind Turbine Safety Rules.

Deep dive—Incident area: Onshore turbine assembly

In this section, we examine the onsite assembly of wind turbine components. In 2023, we saw a distinct rise in onshore wind turbine assembly incidents, with 56 incidents (excluding hazard observations) occurring during the year, up from 32 in 2022, a rise of 75%. All incidents occurred on construction sites, as is expected. Wind turbine assembly does also include pre-assembly in preparation for major component exchange for a site once it entered its operation phase, rather than purely the construction of new wind turbines. When excluding hours from other site types, the rate of incidents per million construction site workhours is 1.39, up from 1.11 in 2022, and above the five-year average of 1.06. Examining the proportions of incidents which would qualify as TRIR, we see a sharp decline, from 34% in 2022 to 14% in 2023, while incidents which would qualify as LTIF also declined, from 9% to 4%.

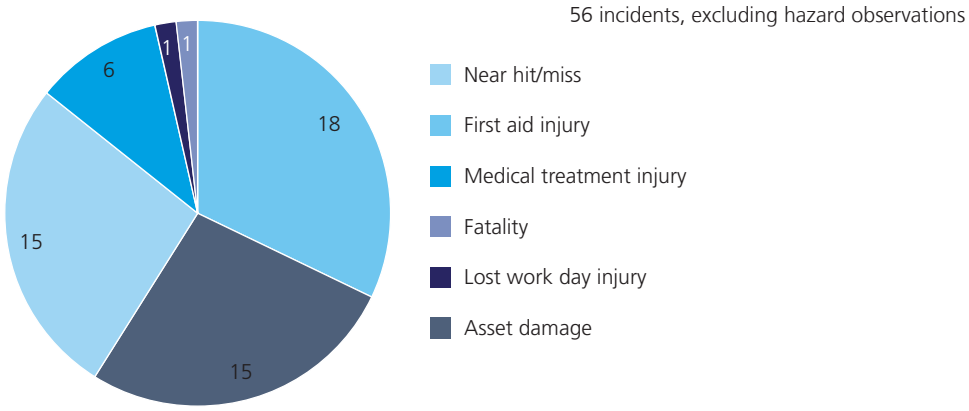


Examining work processes, we see that the six most listed processes are lifting operations (13 incidents), operating plant and machinery (7 incidents), hand tools/power tools (working with) (6 incidents), walking from A to B (5 incidents), working at heights (4 incidents), and commissioning (hot/cold) (4 incidents). These six processes account for 70% of total onshore turbine assembly incidents. Partially notable are lifting operations, which saw a rise of 550% against 2022, as well as accounting for a 271% higher proportion, and hand tools/power tools (working with), which saw a 500% rise, and accounted for a 243% higher proportion. However, lifting operations incidents were less severe than other incident types, with 7 incidents resulting in asset damage and 6 in near hit/miss, meaning no lifting operation incident resulted in actual bodily harm.

When looking at actual consequences, we saw a major rise in incidents resulting in asset damage, rise from 4 in 2022 to 15 in 2023, an increase of 275%. Near hit/miss accounted for 15 incidents, up 88% from 2022, while first aid injuries doubled, from 9 in 2022 to 18 in 2023. However, medical treatment injuries stayed stable at 6, while lost work day injuries reduced from 3 in 2022 to only 1 in 2023, and there were no restricted work day injuries this year, down from 2 last year. There was only one ERME this year, down from two last year. When compared to the five-year average, 2023 was generally less severe, with more asset damage as a proportion of the whole, but also less lost and restricted work day injuries. Tragically, this emergency response was for a fatality. While the broader picture may suggest a broad reduction in the seriousness of onshore turbine assembly incidents, this fatality reminds us to remain vigilant.

Deep dive—Incident area: Onshore turbine assembly (continued)

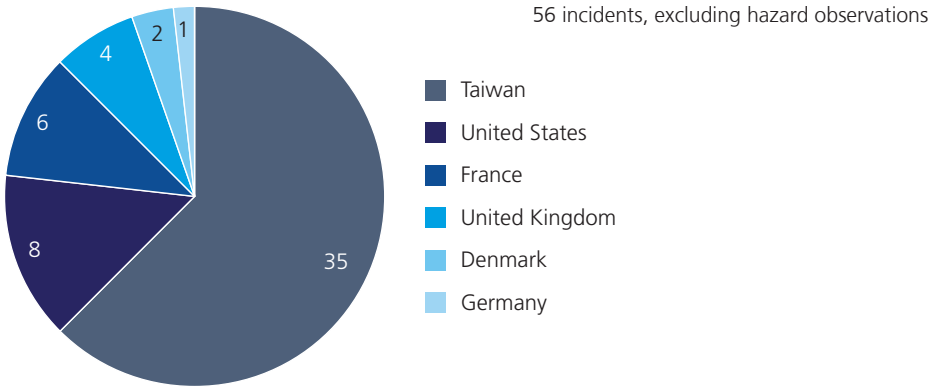
Incidents Reported in Incident Area: Onshore Turbine Assembly by Actual Consequence (2023)



Of the 56 onshore turbine assembly incidents, 4 were considered high potential – one of these is the fatality described previously. Of the remaining three, one was a lifting operation in the United States, where a sling failed, dropping 2000lbs of metal. The remaining two were both commissioning incidents in Taiwan, one where a bolt snaped and flew 15 metres across the site, and another where a twist lock cover plate fell 10 metres to the ground.

Breaking down the incident by county, we see that Taiwan is by far the largest source of onshore turbine assembly incidents with 35, 63% of the total, and an increase from 29 the previous year. However, when examining construction hours, we see that incidents per million hours have decreased, from 2.68 in 2022 to 2.19 in 2023, suggesting improvements in safety standards. Elsewhere, the United States, France, Denmark, and Germany all suffered incidents in 2023 when having none in 2022, having 8, 6, 2, and 1 incident respectively. The United Kingdom had double the number of incidents, from 2 in 2022 to 4 in 2023.

Incidents Reported in Incident Area: Onshore Turbine Assembly by Country (2023)

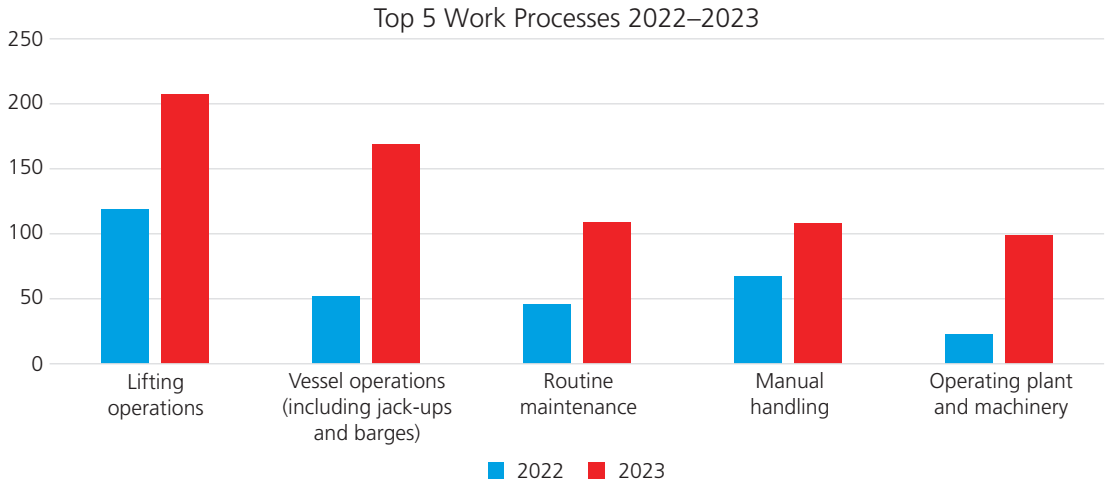


*These deep dive topic statistics exclude hazard observations, negligible incidents, environmental incidents, and unclassified incidents.

Analysis by work process

Lifting operations remained the work process with the highest number of incidents, increasing 74% from 119 in 2022 to 207 in 2023, accounting for 12% of all incidents in 2023. The other top 5 work processes were: vessel operations (including jack-ups and barges), with 169 incidents, accounting for 10% of the total, compared to 6% in 2022; routine maintenance, with 109 incidents, accounting for 6% of the total, compared to 5% in 2022; manual handling, with 108 incidents, also accounting for 6% of the total, compared to 8% in 2022; and operating plant and machinery, with 99 incidents, also accounting for 6% of the total, compared to 3% in 2022. Two areas that saw a decrease in 2023 were working with electrical systems, which fell 6%, from 54 in 2022 to 51 in 2023, and working at heights, which fell 3%, from 34 in 2022 to 33 in 2023. Climbing / rope access also declined, dropping from 19 incidents in 2022 to 11 incidents in 2023. One work process with a major increase in incidents was communication, which had only 1 incident in 2022, but has 28 incidents in 2023.

When examining the work processes by site type, we see that vessel operations is the process with the most incidents in construction sites, at 149, with routine maintenance being the highest for operation sites, at 71, while survey incidents dominated development sites, at 29 incidents.



A focus on—Work process: Transfer to/from

Although not making the top 5 in total numbers, transfer to/from vessels is notable as a work process because of the historical higher proportion of high potential incidents reported (32% of all transfer to/from incidents in 2022). In 2023 this decreased to 19%, with 17 out 90 incidents reported as high potential. For construction sites, however, the proportion remained as 32% of all transfer to/from incidents and an increase from 2022's 18%. The six high potential incidents reported as transfer to/from at construction sites involved: a fall into water when a walk-to-work system unexpectedly retracted during transfer from SOV to transition piece, a fall to the CTV with no resulting injury during transfer from an offshore substation when the CTV lost grip on the boat landing, a transferee losing their footing and becoming suspended when descending to a CTV before safely being brought back to the deck, and a transferee becoming suspended after attempting transfer against deckhand instruction before being safely returned to deck, and finally two falls in staircases during transfer. The G+ is committed to maintaining a focus on this topic, with published good practice guidance on offshore wind farm transfer, which is currently being updated, and current workstreams on transfer risk assessment, CTVs and walk-to-work.

Analysis by site type

Offshore wind farm projects are either in the development, construction, operational or decommissioning phases. These are defined as:

Development site: Development and consenting phase of the project. Site area has been awarded by the landowner and surveys are being undertaken for consenting and pre-construction.

Construction/project site: Construction and commissioning are being undertaken.

Operation site: The site is in operation and producing power. (Note: Turbines will often be commissioned and handed over to operations as soon as they are built. In the case where a site has both project and operational activities, the incident should be evaluated to determine what activity was performed and classified accordingly.)

Decommissioning: The offshore wind farm has stopped operation and work is underway to remove the wind farm.

No hours or incidents were reported as decommissioning in 2023.

In 2023, 61.9 million hours were reported, an increase of 39%. Broken down by site type, we see an increase of 40% for hours in construction sites, from 28.78 million in 2022 to 40.23 million in 2023, a 24% increase in hours for operation sites, from 10.65 million to 13.2 million, and an increase of 65% in hours for development sites, from 5.14 million to 8.47 million.

When calculating total incidents, we see that 1,679 incident were reported by G+ members over 2023, an increase of 94% from 2022's 867 incidents. Broken down by site type, we see an increase of 147% for construction site incidents, from 424 in 2022 to 1049 in 2023, an increase of 44% for operation sites, from 388 in 2022 to 560 in 2023, and an increase of 22% in development site incidents, from 55 in 2022 to 67 in 2023. Interestingly, while incidents per million hours rose for both construction sites (rising 77% from 14.73 in 2022 to 26.08 in 2023) and operation sites (rising 16% from 36.42 in 2022 to 42.42 in 2023), incidents per million hours fell for development sites, falling 26%, from 10.71 in 2022 to 7.91 in 2023.

Looking at ratios for high potential, we see that 10% of all construction site incidents in 2023 were considered high potential, halved from 2022s 20%. For operation sites, 12% of incidents were high potential, more than halving from 2022's 32%. For development sites, 15% of incidents were high potential, down from 27% for 2022.

In the table below, we can see that construction sites have generally become more prone to serious injuries over 2023, while development and operations sites have had less serious incidents per million hours.

	Site type	2022	2023
LTIF	Development	0.58	0.12
	Construction	0.59	0.92
	Operations	2.44	2.12
TRIR	Development	2.14	0.83
	Construction	1.95	2.46
	Operations	5.54	4.77

Conclusions and next steps

This annual report helps to provide a summary of the year, as well as providing a deep dive into key areas of significance. It shows us that the number of hours worked has increased by 17.33 million. The main work process area is lifting, as per previous years, but vessel operations (including jack-ups and barges) and routine maintenance are new to the top three, albeit that we have discussed the limitations with the data of recording a substation portion of the hours on vessels due to the nature of an offshore wind farm. Onshore civils has increased as an area the G+ needs to focus on, especially given that the data from all countries is not captured. 2024 will be about delivering on the workstreams that the G+ has underway, such as a lifting framework, manual handling videos and transfer methods, whilst also ensuring that the work that has already been produced, such as the onshore civils and small service vessel good practices are being fully embedded into sites. As always it takes the whole offshore wind industry to keep striving to maintain a safe place to work so G+ will continue to collaborate with other organisations like IMCA, to ensure areas like vessel operations, continue to improve and develop. 2024 is about connecting with the frontline worker and collaborating with the entire industry.

Annex A – Glossary

Throughout the report, some terms are used to mean a group of work processes or incident areas. The definitions of these terms are as follows:

Lifting operations	Lifting operations comprise the following work processes: lifting operations and rigging/slinging/banking. They do not include davit crane lifting operations or cable pull/winching operations.
Operational site	Site in operation producing power.
Construction site	Site under construction and commissioning.
Turbine	The turbine includes internal and external foundations, hub and blades, nacelle, service lift, tower, transition piece/boat landing areas, external and internal foundations, helicopter area and yaw gear space.
Development site	Development and consenting phase of the project.

The following incident consequence definitions have been used in the G+ dataset:

Fatality	An incident that involves death as a result of a work-related incident or occupational illness. Deaths that occur after an incident but are a direct consequence of an incident are to be included.
Hazard	A hazard is a condition or a situation where there is a potential to cause an incident. It is important to remember that nothing has happened, and no impact/harm has occurred. Only hazards which are considered to be high potential are included.
Near hit/near miss	A near hit or miss is any incident which could have resulted in a work-related accident but did not, either by chance or timely intervention.
First aid	An incident which requires simple treatment that is self-administered or by a first aider, doctor or nurse but does not result in lost time or long-term medical care.
Medical treatment	An incident not severe enough to be reported as a fatality, lost work day incident or restricted work day incident, but which is more severe than requiring simple first aid treatment.
Restricted work day	An incident that does not result in a fatality or a lost work day but does result in a person being unfit for the full performance of the regular job or any work on any day after the occurrence of the occupational injury.
Lost work day	Non-fatal incident that involves a person being unfit to perform any work on any day after the occurrence of the occupational injury. 'Any day' includes rest days, weekend days, leave days, public holidays or days after ceasing employment.
Asset damage	An event where there is damage to plant, equipment or facilities (no injury to persons).
High potential incident	High potential incidents are incidents or near misses that have the potential to cause a fatality/life-changing injury.

The following statistical definitions have been used in the G+ incident data analysis:

Total recordable injury rate (TRIR)	The number of fatalities, lost work day incidents, restricted work day incidents and medical treatment injuries per million hours worked.
Lost time injury frequency (LTIF)	The number of fatalities and lost work day incidents per million hours worked.