Summary of Wind Turbine Accident data

to 30 September 2024

The table includes all documented cases of wind turbine related accidents and incidents which could be found and confirmed through press reports or official information releases up to 30 September 2024. Scotland Against Spin (SAS) believe that this compendium of accident information may be the most comprehensive available anywhere

where workers had been injured on the UK's windfarms since 2014. Our data has only 15 of these (<19%).

In February 2021, the industry publication Wind Power Engineering and Development admitted to 865 off-shore accidents during 2019 – we only have 4 of these (<0.5%). In the 13 August 2018 publication by Power Technology https://www.power-technology.com/features/golden-hour-paramedics-saving-lives-offshore-windfarms/ The article reports 737 incidents were reported from UK offshore windfarms during 2016 alone, with the majority occurring during operations rather than development. 44% of medical emergencies were turbine related. In comparison, only 4 UK offshore incidents are listed in our data – equivalent to 0.5%.

More recently, safety incident data from UK onshore wind facilities has been published by SafetyOn. This data is summarised below, and illustrates that SAS data, mainly based on press coverage, only represents a small fraction of actual incident data world-wide.

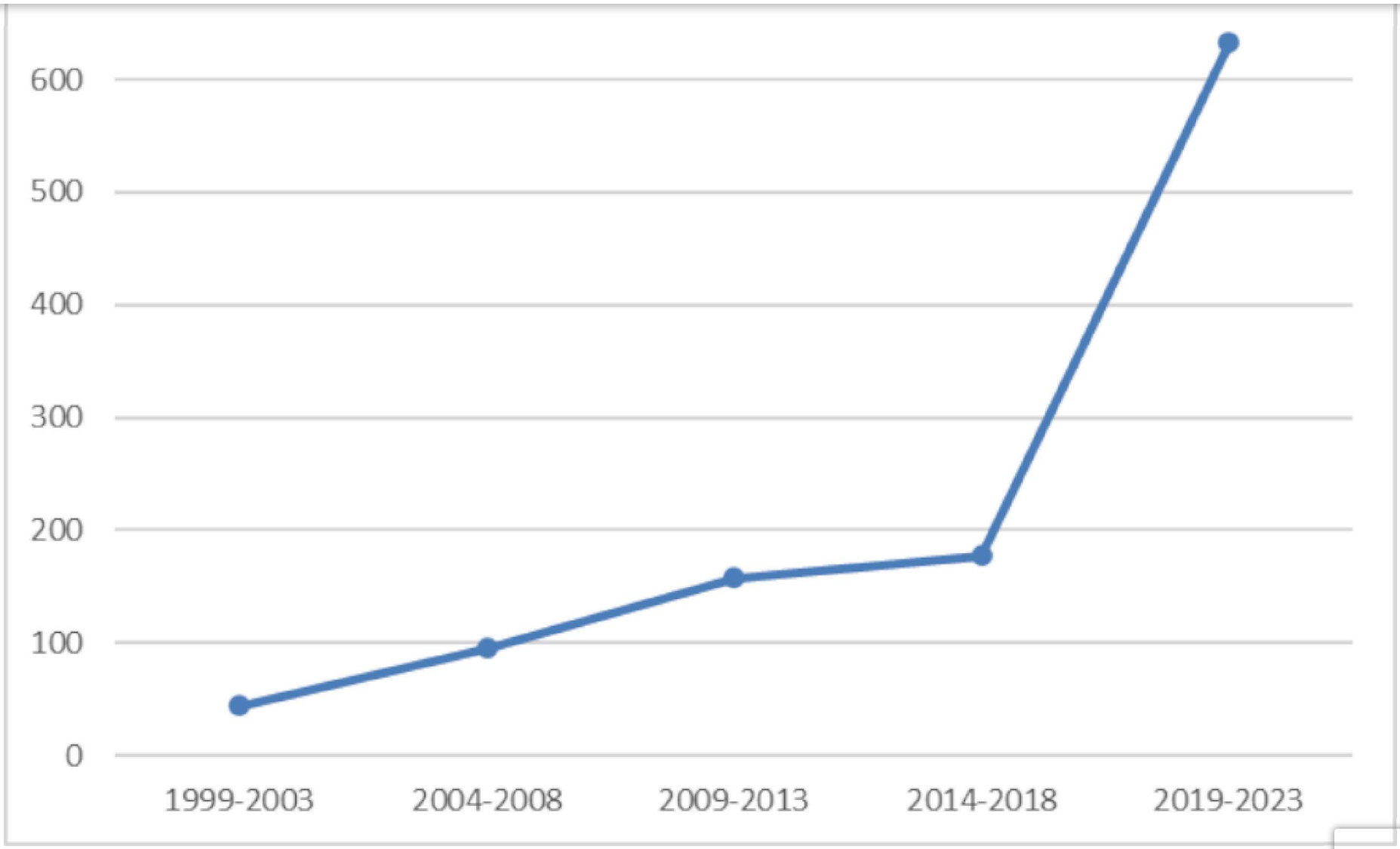
Year	Total no. incidents	Incidents on operational sites	Requiring first aid or worse	Others	No. incidents in SAS data	SAS data fraction
2020	532	455	111	421	8	1.5%
2021	593	468	124	469	8	1.3%
2022	523	454	95	428	10	1.9%
2023	606	512	94	512	5	0.8%

incidents is actually far higher, as only incidents reported by the press are included for UK off-shore facilities and for the rest of the world.

Incidents above “requiring first aid or worse” are now included under “human injury”, with those numbers assumed to represent wind industry workers and not members of the public. The “others” reported above are not specific and so are now included under “miscellaneous” incidents.

The SAS data does however give an excellent cross-section of the types of accidents which can and do occur, and their consequences. With few exceptions, before about 1997 only data on fatal accidents has been found.

Inclusion of the SafetyOn data from 2020 shows a marked increase in incidents below. It should be borne in mind that the real number of incidents is far higher, and so we are only beginning to see the true number of incidents involved.



The risk to wind industry workers is quite clear.

concluding: "The actors of development of wind energy should understand that no economic or political objective must not prevail over the well being and health of individuals." In 2016 Bavaria passed legislation requiring a minimum 2km distance between wind turbines and homes, and Ireland are considering a similar measure. In 2023, Buffalo County Nebraska voted to have a 3 mile separation distance between wind turbines and churches, hospitals and agricultural residential property, and a 5-mile separation distance between wind turbines and villages/towns.

Our data clearly shows that blade failure is the most common accident with wind turbines, closely followed by fire. This is in agreement with GCube, the largest provider of insurance to renewable energy schemes. In June 2015, the wind industry's own publication "WindPower Monthly" published an article confirming that "Annual blade failures estimated at around 3,800", based on GCube information. A GCube survey in 2013 reported that the most common type of accident is indeed blade failure, and that the two most common causes of accidents are fire and poor maintenance. A further GCube report in November 2015 stated that there are an average 50 wind turbine fires per year, and this remains unchanged in the latest 2018 GCube publication http://www.gcube-insurance.com/reports/towering-inferno/

The 50 fires per year is over double the reported SAS data below, further underpinning that data presented here may only be "the tip of the iceberg". Turbine fire prevention company FireTrace International estimate that 91% of wind turbine fires go unreported. https://www.thecheyennepost.com/news/turbine-fire-at-new-roundhouse-industrial-wind-facility-west-of-cheyenne/article_cebaf080-423a-11eb-bebe-97b85cbceb3f.html

The 2018 GCube report also notes the following:

- Wind turbine fires are greatly outnumbered by problems relating to blades and gear boxes;

Data attached is presented chronologically. It can be broken down as follows:

Figures for 2024 are to 30th September, 2024

Number of Accidents

Total number of accidents: 5737

Year	Before 2000	2000 2005	2006 2010	11	12	13	14	15	16	17	18	19	20	21	22	23	24
No.	109	316	602	174	175	182	169	163	166	189	199	235	731	766	693	738	130

Fatal Accidents

Number of fatal accidents: 176

Year	Before 2000	2000 2005	2006 2010	11	12	13	14	15	16	17	18	19	20	21	22	23	24
No.	24	16	37	16	17	5	3	8	6	9	4	5	9	3	3	3	8

Please note: **There are more fatalities than accidents as some accidents have caused multiple fatalities**.

Of the 240 fatalities:

Human Injury

671 accidents regarding human injury are documented

Year	Before 2000	2000 2005	2006 2010	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
No.	5	17	67	13	15	9	9	9	10	14	5	48	118	127	102	100	3		

Please note: **There are more injuries than accidents as some accidents have caused multiple injuries**.

During the accidents, 621 wind industry or construction/maintenance workers were injured, and a further 85 members of the public or workers not directly dependent on the wind industry (e.g. fire fighters, transport workers, fishermen) were also injured. Eleven of these injuries to members of the public were in the UK.

Human Health

Since 2012, 228 incidents of wind turbines impacting upon human health are recorded.

Year	12	13	14	15	16	17	18	19	20	21	22	23	24		
No.	6	27	19	13	17	36	28	22	20	14	9	8	9		

Authorities in France appear to have taken the lead in the fight for resident's health and human rights over those for "environmental benefits". Two separate French courts have recently successfully ruled against the noise nuisance and human health impacts from two wind projects, in favour of resident's rights. Hopefully this will set precedents which will roll out across other countries.

Blade Failure

By far the biggest number of incidents found was due to blade failure. "Blade failure" can arise from a number of possible sources, and results in either whole blades or pieces of blade being thrown from the turbine. A total of 544 separate incidences were found.

Year	Before 2000	2000 2005	2006 2010	11	12	13	14	15	16	17	18	19	20	21	22	23	24
No.	35	65	106	20	29	37	32	22	21	19	28	25	32	18	23	13	18

Pieces of blade are documented as travelling up to one mile. In Germany, blade pieces have gone through the roofs and walls of nearby buildings. This is why we believe that there should be a minimum distance of at least 2km between turbines and occupied housing or work places, in order to adequately address public safety and other issues including noise and shadow flicker.

Year	Before 2000	2000 2005	2006 2010	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
No.	7	77	86	23	24	26	21	24	28	26	27	25	25	21	19	17	21		

The biggest problem with turbine fires is that, because of the turbine height, the fire brigade can do little but watch it burn itself out. While this may be acceptable in reasonably still conditions, in a storm it means burning debris being scattered over a wide area, with obvious consequences. In dry weather there is obviously a wider-area fire risk, especially for those constructed in or close to forest areas and/or close to housing or work places. Five fire accidents have badly burned wind industry workers.

Structural Failure

From the data obtained, this is the third most common accident cause, with 275 instances found. "Structural failure" is assumed to be major component failure under conditions which components should be designed to withstand. This mainly concerns storm damage to turbines and tower collapse. However, poor quality control, lack of maintenance and component failure can also be responsible.

Year	Before 2000	2000 2005	2006 2010	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
No.	15	39	56	13	10	15	13	12	11	15	9	8	10	13	16	8	12		

Ice Throw

47 reports of ice throw were found. Some are multiple incidents. These are listed here unless they have caused human injury, in which case they are included under "human injury" above.

Year	Before 2000	2000 2005	2006 2010	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
No.	9		12		11		1	1	0	1	1	3	1	2	3	1	0	0	1	0

Ice throw has been reported to 140m. Some Canadian turbine sites have warning signs posted asking people to stay at least 305m from turbines during icy conditions.

These are indeed only a very small fraction of actual incidences – a report* published in 2003 reported 880 icing events between 1990 and 2003 in Germany alone. 33% of these were in the lowlands and on the coastline.
**("A Statistical Evaluation of Icing Failures in Germany's '250 MW Wind' Programme – Update 2003", M Durstwitz, BOREAS VI 9-11 April 2003 Pyhätunturi, Finland.)*

Additionally, one report listed for 2005 includes 94 separate incidences of ice throw and two reports from 2006 include a further 27 such incidences. The 2014 entry refers to multiple YouTube videos and confirmation that ice sensors do not work.

blocking major highways. Transport fatalities and human injuries are included separately. Most accidents involve turbine sections falling from transporters, though turbine sections have also been lost at sea, along with a £50M barge. Transport is the single biggest cause of public fatalities and injuries.

Year	Before 2000	2000 2005	2006 2010	11	12	13	14	15	16	17	18	19	20	21	22	23	24
No.		13	59	24	17	14	17	14	16	19	15	25	23	15	13	3	5

Environmental Damage (include Bird Deaths)

433 cases of environmental damage have been reported.

Year	Before 2000	2000 2005	2006 2010	11	12	13	14	15	16	17	18	19	20	21	22	23	24
No.	1	18	69	20	20	16	21	18	22	16	25	27	27	30	36	41	25

All involved damage around the site itself, or reported damage to or death of wildlife. 137 incidents reported here include confirmed deaths of protected species of bird. Deaths, however, are known to be far higher. At the Altamont Pass windfarm alone, 2400 protected golden eagles have been killed in 20 years, and about 10,000 protected raptors (Dr Smallwood, 2004). In Germany, 32 protected white tailed eagles were found dead, killed by wind turbines (Brandenburg State records), and a total of 158 dead sea eagles were found between 2002 and 2019 as victims of

bird fatalities per annum are estimated if the US reaches its 20% target for wind generation. Between 2 million and 4 million birds and bats are estimated to be killed annually by wind turbines in Spain alone. 1,500 birds are estimated to be killed per year by the MacArthur wind farm in Australia, 500 of which are raptors.

Also included are thirty-six reported whale deaths off the New York/New Jersey shore from December 2022 to June 2023, attributed to offshore wind turbine construction operations. The effects of microplastics upon humans and our food chain, from disintegrating wind turbine blades, has also started to appear as a recurring topic.

Recently, significant environmental pollution has occurred along the eastern seaboard of the USA, from a disintegrating offshore wind blade. Actual environmental damage to the coast, sea life and the seabed will only become apparent with time.

Environmental damage to the surrounding area from turbine fires and plastic pollution from disintegrating blades are becoming more acknowledged by environmental groups and by the press.

Other (Miscellaneous)

2574 miscellaneous incidents are also present in the data.

Year	Before 2000	2000 2005	2006 2010	2011 2015	16	17	18	19	20	21	22	23	24	
No.	13	59	111	187			32	34	56	47	466	525	470	544	29

strike has not resulted in blade damage or fire. A separate 1996 report** quotes 393 reports of lightning strikes from 1992 to 1995 in Germany alone, 124 of those direct to the turbine, the rest are to electrical distribution network.
***(Data from WMEP database: taken from report "External Conditions for Wind Turbine Operation – Results from the German '250 MW Wind' Programme", M Durstewitz, et al, European Union Wind Energy Conference, Goeteborg, May 20-24, 1996)*

Resources

A printable version of this Turbine Accident Summary is available.

This is Global data – see Detailed incidents, which includes sources and locations.

Acknowledgements

For the 15 years prior to June 2021, this data has been collected and reported on by **Caithness Windfarm Information Forum**. We gratefully acknowledge the time and effort spent gathering the data and hope that we can continue their good work and keep reporting these statistics on a quarterly basis.

Featured Group

REF

RENEWABLE ENERGY FOUNDATION

The Renewable Energy Foundation is a registered charity promoting sustainable development for the benefit of the public by means of energy conservation and the use of renewable energy.

REF Blog (RSS)

MORAY EAST WINDFARM: THE BENEFITS OF DEFERRING CFD UPTAKE & A REMOTE LOCATION

THE ECONOMICS OF UTILITY-SCALE SOLAR GENERATION: SUMMARY

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National Wind Watch® (NWW) is a coalition of groups and individuals working to save rural and wild places from heedless industrial wind energy development.

Scottish News (RSS)

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TURBINE BLADE SNAPS AT CONTROVERSIAL SHETLAND WIND FARM

INVESTIGATION INTO WIND TURBINE BLADE DAMAGE

HIGHLAND COUNCIL TO OBJECT TO ACHEILIDH WIND FARM WITH CONCERNS OVER 'POSITIONING AND PROMINENCE' OF TURBINES