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Wind turbine fires: expect the unexpected

Words: Angela Krcmar, Global Sales Manager, Wind, Firetrace

Nobody expects a wind turbine to catch fire, but it happens. Unfortunately, it is unknown just how much it happens, and this opens the industry up to significant losses due to a lack of best practice when managing fire risk.

As found in our recent report, 'In the Line of Fire', there is a serious lack of data and transparency around fire hazards at wind farms. Often, the logic goes that a lack of data must mean that it's a tiny risk, and one that will never happen on your own wind farm.

In a cost-competitive, optimization-driven market like wind power, who can blame them?

With the pressure to reduce LCOE and development costs for wind turbines, corners can often get cut and protecting turbines for low frequency events is considered financially unjustifiable.

But as the Texas freeze has shown, the unexpected can hit at any moment for power producers, and when it does, it can spell

disaster for energy providers.

The point of safety is to take proactive steps to reduce the chances of damage to assets or health. When the risk is unknown, due to a lack of a formal system in place to collect, measure, and share data around wind turbine fires, wind farm owners and operators have no baseline to form best practice.

For your assets to be fully covered and to prevent a huge loss of capital or worse, life, developers need to expect wind turbine fires to occur.

Imagine a 150 meter-high, titanium-based giant propelling three sharp and curved fiberglass blades at speeds as fast as a Formula 1 car. Now imagine it on fire.

The threat this poses to animals, forests, people, or other turbines would be unimaginable if we hadn't already seen the role that turbines can play in starting fires on bushland in recent years.

After a well-known Californian utility went bankrupt after electrical sparks fled from transmission lines, causing wildfires, it shows that the motivator for preventing serious fire accidents doesn't end at altruism. A major environmental disaster could, and has, forced the closure of several energy companies in the past. The best and only way to avoid that is by covering your assets with the most thorough health and safety standards possible, by expecting disasters to happen and investing in your safety.

You might be thinking the chances of a wind turbine causing a serious environmental disaster is very low. And you'd be right, the chances are small.

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However, the average loss per fire incident can be as high as $7-8 million dollars and that, the figure is expected to significantly rise with the expansion of larger, more advanced turbines.

As most turbine fires start in the nacelle, a part of the machine behind the gearbox, only fire suppression systems are capable of putting the fire out once it's started. The installation of fire suppression systems at three predictable ignition sources in onshore wind turbines typically costs less than $30,000, less than 1% of the average installation cost of a 3MW onshore wind turbine and less than 0.6% of the average cost of a fire loss.

In our 'Complete Guide to Wind Turbine Fire Protection', which explored the cost and benefit of managing fire risk, we suggest that owner operators should prepare for 1-2 catastrophic fire incidents on an average wind farm with 150 turbines to prevent financial losses to your company but also reputational losses.

There's an element of duty to the rest of the wind market too, including your competitors. Every time there's a wind turbine fire, the reputation of wind, as an energy source and market, can be, and is often severely damaged. Insurance rates also increase as the number of claims are paid out.

Though, you may only recall a few turbine fires personally, if owners and operators don't act and implement the correct fire safety standards to their assets, the reputational risk for global wind increases. Global wind capacity is expected to increase 8 fold for offshore wind to 234GW and 3 fold for onshore wind to 1.8TW by the end of the decade.

If fire hazards aren't taken seriously, how many turbine fires globally will we see? An increase of global installed wind power from 650GW today, to over 2.1TW in 2030 according to the Global Wind Energy Council.

Our report, 'In the Line of Fire' outlines how a lack of transparency into fire incidents has held the industry back from setting up a baseline to improve best practice.

Owners and operators are making fire risks based off the latest available data, which is at least five years old and hasn't accounted for new and evolving risks.

For example, wind turbines have adopted carbon fiber blades to decrease weight and increase production. While an effective material to lengthen the lifetime of an asset, they still pose a significant hazard in the event of a fire, as carbon composite dust can be even more explosive than previous designs.

And it's not just the technology that needs to be adopted and monitored for fire safety. Having the right people in place to maintain wind turbines can be as important as the regulation that puts them there.

In an industry striving for the optimization of everything, combined with the dropping LCOE that many markets face, forcing developers to lower costs and improve technology simultaneously. This often encourages developers to reduce costs in areas that aren't related to the technology, such as the staff.

Most energy disasters have actually been caused by human error, take Chernobyl or the Exxon Valdez oil spill. Having an overworked, understaffed and unhappy workforce is one of the leading factors that can influence the chances of fire at a wind turbine.

Unfortunately, there's a gap between the MW's installed globally, and the number of skilled technicians available to maintain these assets. There are currently 60,000 turbines in operation in the US totalling 109.9GW, but only around 7,000 technicians to maintain that capacity.

This presents challenges for the wind sector regarding the proper maintenance and health and safety of wind turbines, subsequently having an impact on the chances of fire risk.

Especially as many wind turbines across the world reach the second half of their lifespan. Currently, 7% globally are over 15 years old, and 28% are in Europe. Without enough technicians available and correct fire suppression systems in order, the chances of fire hazards are increased yet again, as unmaintained turbines have an increased likelihood of sparking fires.

But the immediate threat to people, wildlife and financial structures isn't the only threat that fires pose. Wind energy already possesses a somewhat, fragile, public perception in some areas. With occasional lobby groups against the visual pollution that wind turbines come with, or climate change deniers in general, the renewables sector needs to keep public perception as positive as can be.

We saw this happen with the Texas freeze event that disabled 16GW of renewable capacity. Wind turbines were often, and wrongly, accused of being responsible for the energy loss, tainted as an unstable source of energy, even though in reality the outages were due to issues with natural gas supplies and the grid's isolation.

Just one turbine fire, or accident, is all it takes for a whole new narrative around wind power to be created. What may, in reality, be an isolated event, can be exaggerated and generalized across the whole wind sector. So, it is vital that the image attached to wind turbines remains 'green' and 'zero-emissions' instead of 'dangerous' and 'a fire hazard'.

With so many uncertainties around fire risk, how is this being regulated now, and as more incidents occur, how might regulations change?

In the United States, many states mandate that all fires are reported to local authorities, but this reporting lacks detail about the precise nature and cause of the fire. These are often categorized as building fires, and so wind turbine fires are never recorded as such, with the results of fire investigation kept strictly between the

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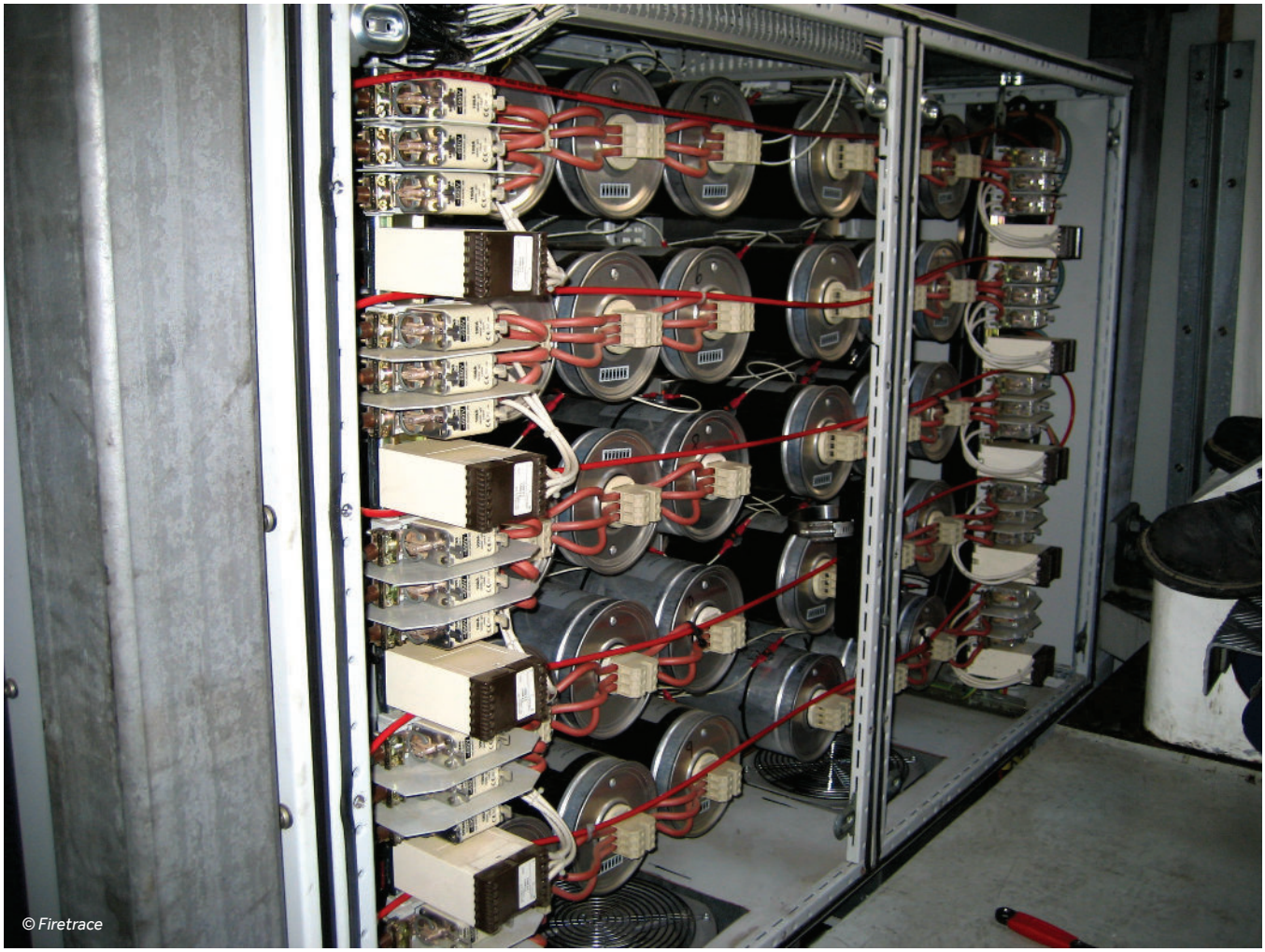
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developer and their insurer. Therefore, the risk management lessons that could be learnt through the detail, aren’t available to other owners, exposing them to similar risks and underplaying the number of turbine fires that occur.

Regulations need to catch up with the changing energy system. And though some countries and some local jurisdictions have some regulations in place, proper steps are yet to be taken by leading nations. For example, in the US, though the National Fire Protection Agency provides recommendations for turbine fire safety, these are not mandatory as they are for conventional power stations.

However, given the mass roll-out of wind that is expected across the US, wind farms could soon join nuclear and coal plants in having to adhere to these standards, or face major fines.

Owners and operators of wind farms need to be prepared for that change. Though fire events in wind turbines may seem isolated and unlikely, it is quite clear that the risk is real and highly dangerous to both life and financial agreements. Due to the low likelihood of hazard, wind hasn’t prepared itself for fire, until owners and operators can guarantee turbines have a 0% chance of catching fire, the industry must expect the unexpected.

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About Firetrace

Firetrace designs and manufactures automatic fire suppression systems that keep your business, people, and equipment safe. Based out of Scottsdale, Arizona, USA, Firetrace has global sales and support capability, with over 250,000 systems installed in 75 countries.

Firetrace is owned and operated by Halma plc, a global group of life-saving companies. Halma companies provide innovative solutions to many of the key problems facing the world today, from water security to preventable blindness.