Insuring the Transition: Risks and Opportunities in Renewable Energy

How (re)insurers can mitigate losses and tap into growth in the expanding market for green power

Gallagher Re

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Gallagher Re has formed a dedicated renewables team sitting within the broader Marine and Energy practice. It works with Gallagher Re's regional broking teams around the world to understand market and industry dynamics, share expertise, and advise and support clients.

(Re)insurance Market Overview

The renewables (re)insurance market is still in its expansionary phase, characterized by a growing industry, sufficient capacity and reasonable profitability for insurers, and a healthy influx of new entrants.

Many entrants are motivated by a need to transition their energy account and the need to create a perception that they are becoming more "green".

Yet credible leaders are in relatively short supply, leading to differential terms to cope with the volume of capacity.

Renewable energy is already a fast-growing industry, and this will only accelerate in the years ahead. Almost a third of the world's electricity is already generated by renewable sources, according to estimates from the International Energy Agency (IEA),[1] and that is set to grow to 45% by 2030 — representing new investments of over two trillion dollars.[2] Renewable electricity is the main component (more than three-quarters) of the IEA's predicted overall global shift to green energy and has a spillover effect that helps to decarbonize the heating and transport sectors as well — for example, through the shift to electric vehicles instead of petrol engines.

All of these new power projects will require financial protection — not least against the increased risk of severe weather events due to climate change. Swiss Re has estimated that if the world's governments build all of the renewable production they are targeting, this will generate new insurance premiums of USD237 billion by 2035.[3]

It remains an open question whether all the necessary renewable energy capacity will be built. According to the International Renewable Energy Agency, investments in new capacity reached a record high of USD570B in 2023 — but remain well short of the USD1.5T needed each year between 2024 and 2030.[4] Nevertheless, the sector will be a substantial new source of insurance business.

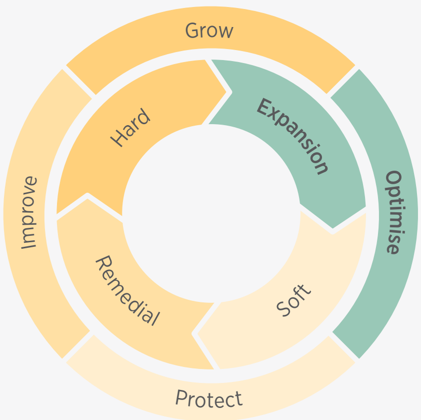
Renewable energy risks are covered within various insurance business lines, ranging from engineering to casualty to marine and energy. This is true in both the primary markets and the reinsurance market. However, it is starting to become a class of its own. In the past 12 months, cedants have approached Gallagher Re on four new treaties accommodating renewables specifically — while several others are looking to remodel their portfolios to have separate towers of risk for renewable energy and existing energy processes to facilitate better data and portfolio risk management through the energy transition. Gallagher Re is keen to play an active role in offering a greener, cleaner portfolio to reinsurance markets that are also focused on facilitating the climate transition.

The interest in standalone renewable treaties has been particularly strong in the Asia-Pacific region. In China, it is due to a combination of rapid growth in the renewables industry and an insurance sector shifting toward making more use of global reinsurance markets, while Japan has ambitions to grow its use of floating offshore wind turbines due to the geology around the country's shorelines.

For the moment, we see the renewables (re)insurance market as still very much in its expansionary phase, as illustrated in Figure 1 below. This phase of the insurance underwriting cycle is characterized by sufficient industry growth, market capacity to write and follow, and reasonable returns expected in a socially accepted class — all features we see present in the current renewables market.

Figure 1: The Underwriting Cycle

Source: Gallagher Re



Current (re)insurance market conditions

The premium pot in renewables continues to grow in line with the growth of the industry as new wind farms, solar power projects, and other generation facilities come on stream. In response, insurers are entering the market. New specialist MGAs are being set up, such as Novagen, launched by Fidelis in August 2024[5] or Volt MGA, launched by BP Marsh, in October 2024.[6] Meanwhile, Thomas Miller Specialty Offshore rebranded to Navata in September 2024, calling itself the "insurance partner for the energy transition".[7] In addition, large carriers are also setting up new renewables books, such as Munich Re, FM Global, and Fidelis.

Among the larger carriers, many entrants are motivated by a need to transition their energy account and to create a perception they are becoming more "green." In some cases, insurance groups have set ESG and/or net-zero targets that explicitly state goals for reducing the underwriting of new oil and gas projects and increasing the underwriting of renewables.[8,9]

This new capacity is heading to increased competition, with carriers now more comfortable and trying to take lead positions on underwriting projects. By doing so, they have the ability to set terms and conditions based on their own risk appetite and to tailor their share based on expertise developed from having previously acted as a follower. In addition, they may have added new hires with industry and engineering risk knowledge. This has also driven some rate reductions for well-performing businesses, and overall, we would describe the current primary market rating environment as stable but slightly softening.

Nonetheless, credible leaders are still in relatively short supply, leading to differential terms to cope with the volume of capacity.

For the more established renewable energy technologies, such as solar, onshore, and fixed-bottom offshore wind, insurance terms and conditions (T&Cs) are generally stable. Renewals in the past 12 months have seen only small adjustments being made, such as pandemic exclusions. However, carriers are beginning to impose more specific natural catastrophe sublimits in various geographical locations, such as hail in the US. Within the primary insurance market, there are still locations with very few nat-cat sublimits, while they are broadly implemented in other places. Generally, most nat-cat sublimits are seen in Asia and less so in Europe.

For newer renewable technologies, such as floating offshore wind or solar installations, or concentrated solar power, insurance T&Cs are still at an early stage of development. This means minimal exclusions and a need to ensure the risk is mitigated by engineering design or construction methods.

Meanwhile, costs have stabilized in the reinsurance market in 2024, after a period of significant rate rises during the general reinsurance hard market conditions of 2022–23. Those rises have helped to increase rate adequacy in the market ahead of the 2025 renewal season.

Insurers' profits and losses

Across the sector, profitability remains largely stable, and loss ratios have been acceptable (see **Figure 2** below), despite some notable claims in recent years. Examples include flood damage to concentrated solar power installations,[10] and tornadoes downing wind turbines in the US.[11] The US continues to be impacted by secondary perils, especially severe convective storms.

Figure 2: Renewable insurers' loss ratios — past 10 years

Source: Gallagher Re

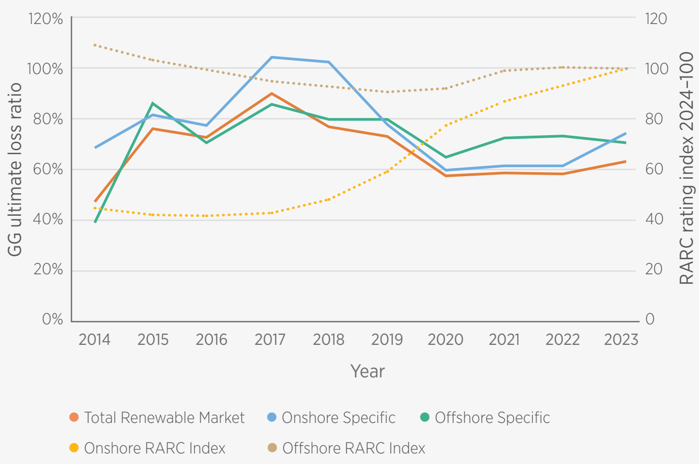


Figure 2 shows loss ratios (the three solid color lines) against Risk Adjusted Rate Changes or RARCs, in the primary market (the two dotted lines). The data relates to policies and treaties in Gallagher Re's database, which we estimate gives visibility over about three-quarters of the market. In the early part of the past decade, rates were kept down by increases in available capacity for renewables insurance — which can be seen particularly strongly in the RARC index for onshore wind above. From 2017–2018 onwards, however, losses have eased as both expertise and technology have improved, while rates have also climbed. This has made the class more profitable — particularly with regards to policies that cover renewable assets during their construction periods. This may be due to construction periods shortening in both onshore wind and solar.

This brings us to the key challenge facing insurers as the demand for renewable energy coverage expands. As new technologies push the envelope, renewable installations are growing larger and being placed in riskier areas. The rapid development of the wind-power industry, including floating offshore turbines, is a case in point. Turbines have become larger,[12] construction and logistics more complex,[13] and the weather/climate risks are rising.[14] The same broad trends apply across other renewable technologies, such as solar.

As it becomes larger, is this sector set to become riskier again and therefore harder to insure? In the remainder of this report, we will consider these issues via several case studies. We will explore the causes and consequences of recent insurance losses and the lessons that can be learned from them by industry practitioners and their insurers alike.

Significant Insurance Losses in the Renewable Industry

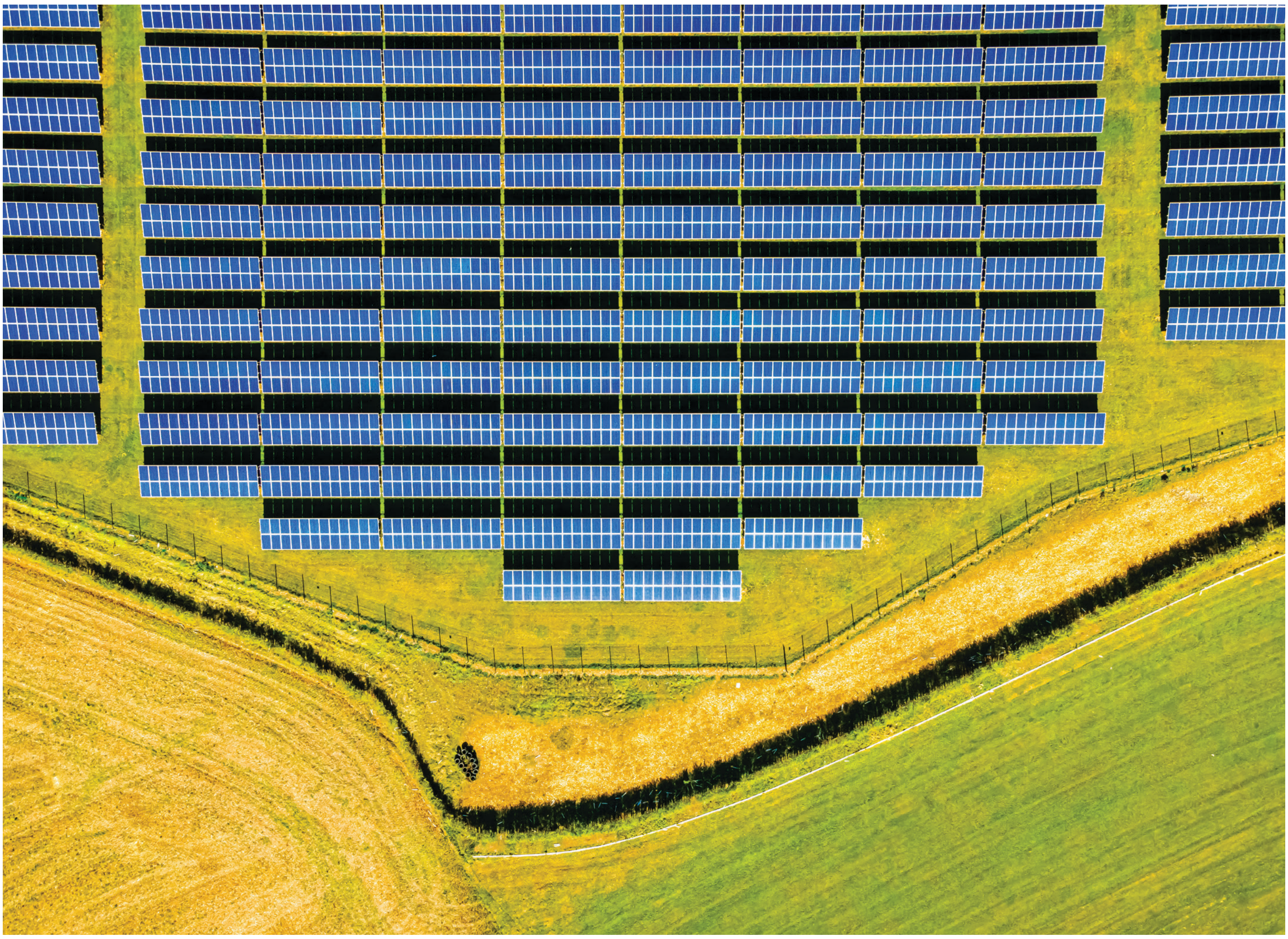
As with all insurance, the business of renewables insurance is to cover losses. But it is also to learn from them to better assess and price risk and to mitigate or avoid future losses.

As a new industry overcoming formidable engineering challenges, renewable power has had no shortage of loss experience to learn from. Loss events can be broken into several categories:

- Project design errors: Failures to properly design or deploy equipment (such as wind turbines or power cables) to work in known operating conditions
- Serial defects: Latent manufacturing defects that cause repeated failures in a given model or system
- Extreme or catastrophic weather events, beyond the operating envelope of fully functioning equipment
- Sabotage, terror, and war, where external negative influences are unavoidable through normal security means

This is a non-exhaustive list. Like operators in any industry, renewable power operators can also suffer business interruption losses due to disruptions in their supply chains, for example.

In this report, however, we will examine each of the above areas that directly affect operations and present a recent example of a high-profile loss event in that category. We will then discuss mitigation and preventative measures that can be considered both by the renewable power sector itself and by its insurance partners.



Project Design Errors: Failures of Prevention

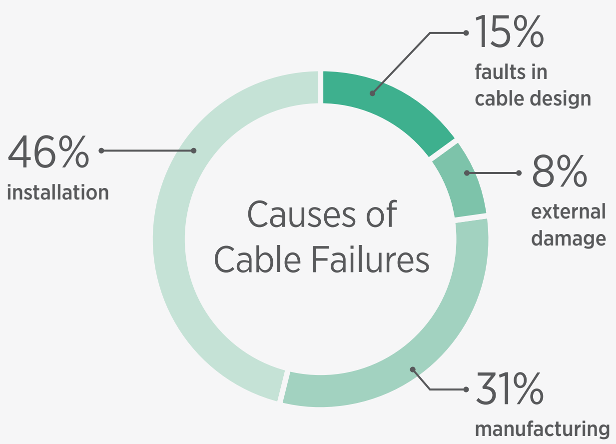
Some of the most significant renewable losses in recent years have been due to project design errors — such as failure to ensure proper installation, for example. One well-known case is the problems experienced by several offshore wind developers in adequately protecting under-sea cables with sufficient trenching, laying, rock laying and cable protection systems. This issue has caused some significant losses (reportedly as high as USD490M in one case[15]) and will be discussed in greater detail below.

According to ORE Catapult, a UK government research agency that supports the offshore renewable energy sector, subsea cable failures are the biggest insurance cost for the industry and account for 75%–80% of claims in the UK. Cable failure takes an average of 2 months to repair and can cost over GBP10M (USD13M).[16]

ORE Catapult runs a research program on offshore cable failures called Electrode, aiming to build an industry database that will collect anonymous data on cable failures and provide trend analysis, ultimately leading to the reduction of risks and costs. To find out more about this project, see here.

Figure 3: Causes of Subsea Cable Failures in Offshore Wind

Source: ORE Catapult *Data taken from the operational phases of offshore wind farms



CASE STUDY

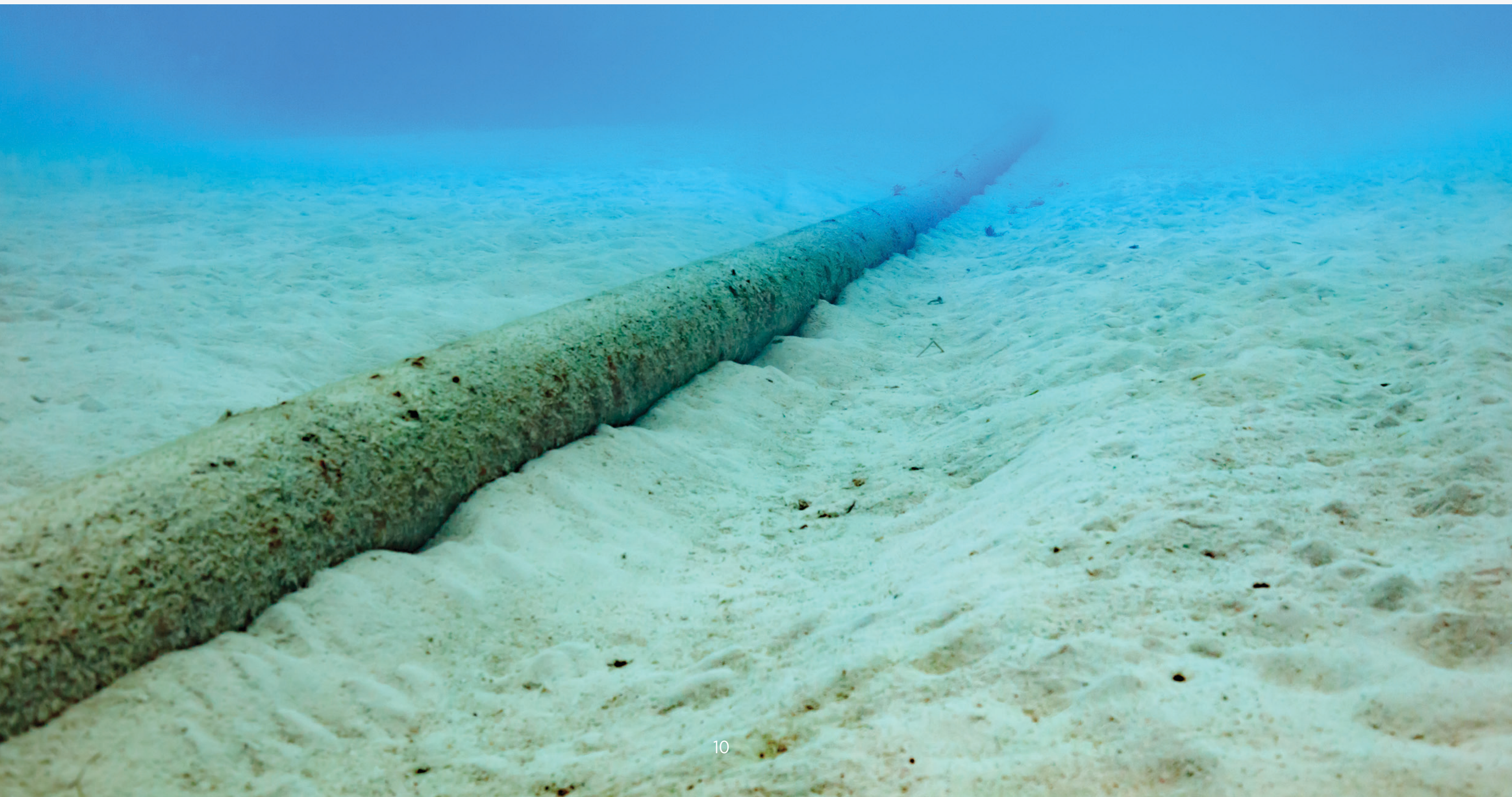
Cables Unprotected

In 2021, the Danish wind farm operator Orsted reported an array cable issue in several of its offshore installations across the UK and continental Europe, potentially affecting up to 10 of them. The issue occurred when the cable protection systems — bend restrictors or cable sleeves — moved across rocks that had been placed on the seabed around turbine foundations to prevent erosion, known as scour protection. This movement wore down the CPSes and, in the worst cases, caused the cables to fail. Orsted reported that the total financial impact of the problems, including the cost of remediation and repair, could be up to DKK3B (USD450M on current exchange rates) between 2021 and 2023. This also included a potential cost of DKK800M to cover warranties paid to partners.[17] This element of the cost was reduced to DKK300M the following year.[18]

In May 2021, the trade publication *Insurance Insider* reported that Orsted had submitted a claim under its insurance policy for this cost, making it one of the most expensive offshore windfarm claims in the industry up until that point.[19] That said, any risk transfer to reinsurance that was in place would obviously spread the financial impact of the losses to a degree.

Orsted is one of the largest wind farm operators in Europe, and its market position means these losses attracted media and industry attention. But other developers may have had similar difficulties. The issue was significant enough for the Lloyd's Market's Joint Natural Resources Committee to address it by creating a specific exclusion for Cable Protection Systems,[20] and to specify that quality checks should be undertaken in its guidelines for Marine Warranty Surveyors.[21] This sent a clear signal to the industry, manufacturers, operators, and insurers alike.

It is now common practice for offshore wind (re)insurance contracts to include clauses on the design of cable protection systems, requiring implementation according to the accepted quality standards used by marine warranty surveyors. Whilst not all projects globally are at the same maturity with regard to quality, standards, and manpower, there does appear to have been a positive impact upon risk mitigation from these kinds of requirements. Nonetheless, it remains an issue that prudent (re)insurers should consider and make themselves comfortable with project by project.



Serial Defects and Technical Issues

The term serial defects refers to manufacturing, construction, material, or design problems that are widespread in nature, i.e., likely to recur wherever the affected system or component is used. Not all defects are serial defects, of course, but it is the serial defects that have the greatest potential to lead to widespread damage and losses.

One recent well-known example was the aerodynamic loading design error that affected the initial performance of Siemens Gamesa's SG4X and SG5X onshore wind turbine models. This case is explored in more detail below.

Of course, it is expected that renewable power plants — whether solar, hydroelectric, BESS, or wind farms — will be designed and built according to engineering best practices. In many jurisdictions, there is the further enforcement of regulatory standards. In the EU, for example, this means meeting the EU Single Market Product Safety Directives, whose purpose is not only to ensure safety but also confidence in the order and sale of systems and components across the trade bloc. Not only are the standards themselves a legal requirement upon manufacturers, but there are many subsidiary directives and standards attached; for example, machinery such as wind turbines have to meet the Machinery Directive 2006/42/EC — MD and many 64100 Standards specific to wind turbines. These mandated standards often form the spine of any certification process.

Yet with even the most stringent product safety and design standards, the human element will always mean mistakes are possible. The well-known risk-management doctrine of the Swiss Cheese Model[21] calls for multiple safety systems to be stacked like slices of Swiss cheese: the more layers, the less chance their holes or gaps will align and allow a problem to slip through.

So how are these risks mitigated for operators and their insurers? The first line of defense is the manufacturer's warranty.

Manufacturers' warranties and the implications for insurers

Most manufacturers involved in big energy construction projects are robust and stand by their products and associated commitments. Thus, there are warranties in place to meet expectations and conditions of contract to protect all parties.

Most warranty periods end 2 years after project completion. Often, wind farm clients will extend at least some protections against defects by agreeing full-service and supply maintenance contracts with manufacturers or self service in conjunction with manufacturers. These agreements can last for anything between 5 to 20 years and usually oblige the Original Equipment Manufacturer (OEM) to keep the turbine in a condition to safely continue operation — but this is not the same as an extension of the warranty. Attention needs to be paid to carve-outs in the scope of the liability the manufacturer takes on in the service contract as opposed to a warranty. It is not practicable to maintain a product to the same standard it was on day one for an elongated period, but standards of performance are generally met by availability gaurantees and agreed levels of liquidated damages if those levels are not met.

When a defect leads to damage and loss and either a manufacturer's warranty or service contract is in place, then dependent on its terms, the manufacturer may ultimately have to make good this loss. However, to ensure its own financial stabililty a prudent wind farm or solar plant operator will also have an "all risks" insurance policy in place. Usually these will cover two distinct time periods — a "construction — all risks" policy covers the initial period of construction and will then be replaced with an "operation — all risks" policy once the plant begins generating. Under such policies, when damages occur, the insurer will first make good the operator's loss and then pursue recovery from the manufacturer.

However, this is not always straightforward. Several factors can hinder insurers from doing so, set out below:

Coinsurance

Manufacturers and their suppliers will often be named as co-insured or additional insured parties under such policies. This can apply even where a "construction — all risks" policy is placed as an owner-controlled insurance program, i.e., under the control of the wind farm owner. This co-insurance status normally removes the insurer's ability to pursue a claim against manufacturers. Therefore, all parties involved in the project need to carefully discuss the intended limitations of a co-insurance status — before placing the policies.

It is commonly intended and understood that manufacturers' warranties should be paramount after the project has been taken over by the final client (i.e., once the operation period begins and the "operation — all risks" policy applies). This would improve insurers' chances of recovering a loss. However, manufacturers do often push for co-insurance status during the operation phase as well. Once again, this is something for all parties to consider carefully, as to whether it is what they intend or are comfortable with.

Definitions of Damage

Most insurance covers require a physical damage to trigger an insured event under the policy, but the understanding of what the term "physical damage" means may differ between legal and regulatory jurisdictions. Furthermore, there are two commonly used exclusions in the offshore wind market that cover technical defects, known as LEG2 and LEG3. The scope of LEG2 is narrower; that is, it excludes more of the cost consequences of a defect. (Re)insurers and policy holders should always check their understanding of such exclusions.

Burden of Proof

Assuming there is no co-insurance arrangement, insurers and reinsurers must often rely on their policy holder to support a claim against a manufacturer. Yet the burden of proof remains with the insurer; they must show the manufacturer was at fault. Manufacturers might have restricted their liability within the supply agreement to the cost of replacements, i.e., seeking to avoid having to compensate for any delays to the project or loss of electricity production.

Serial Loss Clauses

Most project policies contain a serial loss clause, which limits the number of turbines that can be claimed for having been affected by the same technical fault. There is considerable variability in how these clauses operate and how many turbines will be covered against the same fault. Insurers need to consider carefully how many they are willing to cover and not rely on standard clauses.

Bad Vibrations

In mid-2023, Siemens Gamesa acknowledged it had suffered some significant headaches with quality issues on its onshore SG4X & SG5X Wind Turbine designs.[23] Excessive vibrations caused problems that led to the curtailment, if not halting, of operations. According to Siemens' statement at the time, "The expected costs for remedying the quality problems have been considered in the third quarter, with charges for future expenses amounting to EUR1.6B [USD1.7B]."

New turbines are often cutting-edge in their performance, and in this case the 4X and 5X brought to market turbines capable of almost double the energy production. This was extremely attractive to developers, and thus order books may drive manufacturing goals. It is also attractive if the design change is only a partial step where other previous designs have just been mildly updated — this gives a swifter certification where processes have been duplicated, and thus not all elements of the certification process may be required. Unfortunately, due to these omitted steps in process and prototype turbine proofing periods being adjacent to serial builds, the errors manifested in live projects. The compression of the process due to the demand in the market proved to have a costly result.

In this instance, from the perspective of the wind farm operators and their insurers, the situation was mitigated by manufacturers' warranties — but the issues caused Siemens Gamesa to make year-on-year losses despite a bulging order book.

These kinds of technical defects — whether it is a problem originating with the manufacturer or their supply chain — often bring about complaints from insurers that their purpose is not to bankroll the R&D of new products. At times, this is valid, yet there is capacity to underwrite such prototypical designs in the knowledge that the risks and rewards are greater.

Serial defects have afflicted other OEMs too. In July 2024, GE Vernova suffered a "turbine blade event" at its offshore Vineyard Wind Project in Massachusetts, US. A blade detached from one turbine and fell into the ocean, according to reports.[24] GE Vernova CEO Scott Strazik told analysts on an earnings call in July that early analysis suggested the affected blade had suffered a "manufacturing deviation" and added, "Through the inspection or quality assurance process, we should have identified [this]".[25] In October, he updated analysts that the company has "just got guidance to start to begin reinstalling blades at Vineyard yesterday" and has "learned a lot from the last three or four months".[26]

In an industry that continues to push the envelope of what is technically feasible — for example, as large-scale floating wind turbines move from concept to prototypes to reality — we will likely not have seen the last of this reluctance from insurers. The road to net zero will not be completely smooth for any parties, and there is always risk in engineering and in power generation. Insurance and reinsurance are there to smooth out the bumps.

Extreme or Catastrophic Weather Events

Renewable energy technologies are built where it is profitable to do so. The same is true for other power technologies, of course — nuclear plants are often built near water because they need it for their cooling systems — but by their nature, renewable sources are particularly tied to locations that have a lot of the natural resources they are designed to exploit.

It is all too easy for "a lot" to become "too much." A location naturally susceptible to high winds is also susceptible to hurricanes. A large, flat area exposed to the sun is also exposed to hail. And so renewable resources are likely to be on the front lines as the world warms and the risk of extreme weather phenomena increases.

Weather-related losses vary not only by location but also according to the technology used. For example, many solar farms in the US Midwest have suffered from severe convective storm damage that can be upward of USD50M per loss event. But this is eclipsed by the reported losses from a single event in the Middle East earlier this year, when torrential rains affected the salt fluid used within the Noor Energy 1 Mohammed Bin Rashid Al Maktoum Concentrated Solar Power plant in the United Arab Emirates. According to the *Insurance Insider*, losses could be anywhere in the range of USD100M to USD700M, though there is uncertainty whether insurers will have to cover this. None of the principals offered any comment to the *Insider*.[27]

In this section, we will discuss the main weather risks that each technology is exposed to and the mitigation strategies that insurers can explore.

Mitigating risk for solar installations

For solar projects, some of the biggest losses can arise from fire, flood, wind, and hail. Wildfires in particular can move extremely fast and have devastating consequences. But there are several mitigation techniques that operators and their insurers can consider.

- **Regular reviews of fire procedures.** Since few solar plants are constructed near forests, the most common route for fire transfer is through tinder-dry conditions in nearby grass or shrub. Most installations will have management plans to cut or clear nearby vegetation, but since installations are often in isolated locations, if the worst does occur, then fire crews may not have easy access to water supplies. This leads us to one of the most important mitigants: regular reviews of fire procedures. Such reviews should explore fire scenarios in alignment with local fire services if possible.
- **Ensure the solar equipment is properly isolated.** Isolation using switchgear — equipment such as circuit breakers that can cut off parts of a system to prevent overload — is now standard practice across the industry, but the triggers for interrupting the flow of power should be regularly reviewed and can be improved for very little cost if necessary. This is extremely important to protect from arcing and lightning strikes and is often coupled with surge protection. Through isolation, damage can be limited to the localized fault.
- **Consider "sense and stow" solar panels.** To guard against other weather risks, particularly hail and flood, there may also be a business case for these automated systems, which can orient panels from vertical to horizontal depending on weather conditions:
  - Verticalizing the panels can dramatically reduce damage from hail, make agricultural land between solar panel arrays available for crop cutting, and minimize the amount of surface area that severe wind contacts under the arrays.
  - Orienting the panels horizontally reduces their vulnerability to flood waters by raising the lowest point of contact to the electrical panel.

  Of course, as with all operational improvements, the business case needs to stack up — but such mitigating factors could help reduce premiums and increase safety.

New project construction sites that employ the newest mitigation design features will have an opportunity to present these mitigation efforts to the insurance market and agree to premium levels that reflect these efforts — rather than being inflated due to losses at other solar farms.

Mitigating risk for wind-power installations

For both onshore and offshore wind installations, one of the first risks that comes to mind is that of extreme wind events, for obvious reasons. Tropical cyclones, also known as hurricanes or typhoons depending on their location, are of particular concern as more wind farms are constructed in regions susceptible to these events, particularly in Asia-Pacific and East Coast USA. Nevertheless, they are not the only hazards wind turbines face, with fire a significant driver of loss for onshore wind farms.

Common mitigants include:

- **Compliance with international standards on wind resistance**. For manufacturers, a principal consideration is that wind turbines' mechanical structure, blades, and failsafe operating systems withstand natural forces without major damage, as per the certified class of design. Most turbines are built with onboard systems that automatically stop them rotating once wind speeds exceed around 55mph,[28] and additionally "feather" the blades so they de-power the aerodynamic capability. However, particularly strong storms can still cause vibrations that lead to breakage. The first thing for operators and their insurers to ensure, then, is that turbines comply with the required manufacturing standards.

  The International Electrotechnical Commission (IEC) requires wind turbines to be built to withstand sustained winds of 50.1 meters per second and peak 3-second gusts of 70m/s. This is known as standard IEC 61400-01,[29] and wind turbines in the EU must be built to this standard by law. In Japan and Taiwan, it is a requirement that turbines are certified to this standard (but this is not a guarantee or warranty). Turbines built to this standard should be able to withstand hurricanes of up to Category 2 on the Saffir-Simpson scale, which describes those with sustained wind speeds of up to 49m/s.[30]

  In addition, the IEC also sets a higher standard for turbines specifically designed to withstand typhoons, known as T-class turbines. These are required to withstand wind speeds of 57m/s, equivalent to a Category 3 according to Saffir-Simpson. For Category 4 or 5 hurricanes — the latter with sustained wind speeds of over 70m/s — these standards offer robustness in said environments and thus resilience — but they are not guaranteed to be unharmed.

- Nevertheless, it remains the case that incidents of blades either overspeeding, breaking loose, and/or damaging the tower are relatively rare, even in high winds. Regulations in some leading jurisdictions (for example, the UK) call for equipment to "fail safe," and thus controls over yaw, pitch, and rotation have been developed. These maximize catching the wind in normal conditions but also help turbines to fail safely in dangerous conditions.

  Offshore turbines, which are larger and more sophisticated machines, tend to have a suite of in-built monitoring and safety features, with greater control over the rotor and how it catches the wind. In addition, the between-turbine spacing is much greater, thus reducing the risk of one damaged turbine causing damage to others. In combination, these factors make them less susceptible to damage from excessive wind even than their onshore cousins.

- **Where storms do occur, ensure robust checks and due diligence afterward.** While catastrophic failures due to excessive wind have not been common, any significant storms that do occur should necessitate thorough checks afterward, both subsea and above sea level.

- **Consider the use of fire protection systems.** For onshore wind farms, fire is actually a larger cause for concern than high winds. It can be combated with detection systems, revised material usage to remove flammable fuels, and even through industrial fire suppression systems.

  Modern-day fire suppression systems shouldn't be confused with the older systems often used in gas turbine enclosures. These older systems had significant safety problems since they typically release carbon dioxide or other gases to starve flames of oxygen; depleting oxygen can cause asphyxiation for workers caught in the area. Modern systems use the inert and inexpensive gas nitrogen to dilute the oxygen. These systems can be used for larger and more expensive turbines and protect both the asset and the personnel. It's also rare for turbines to be generating when people are present, which also vastly reduces the exposure to personnel.

  For operators, such systems are very much worth considering. Turbine manufacturers also want to avoid further losses for their clients and can be reasonable when approached on the topic. Insurers can assist clients by requesting the appropriate (and often legally required) risk assessments and operator manuals that support the resilience of the turbines being purchased.

CASE STUDY

Typhoon Yagi Downs Turbines in Hainan

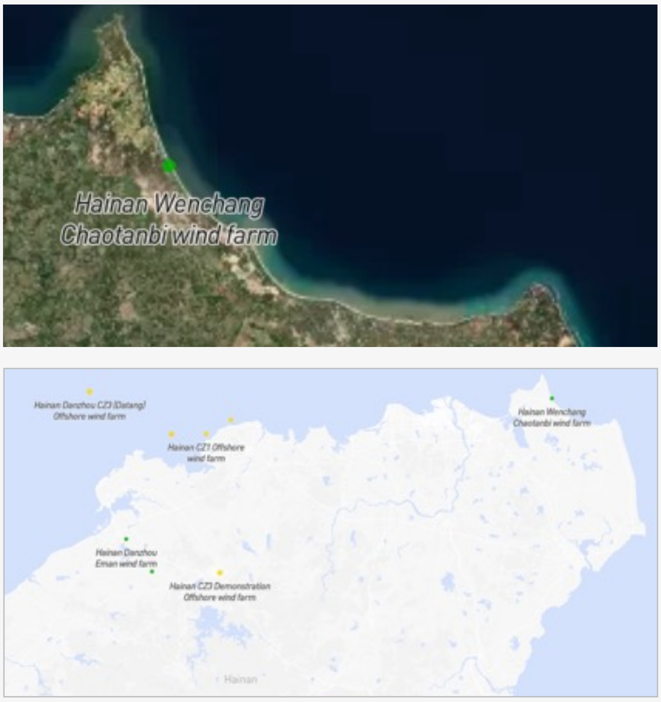
Typhoon Yagi tore through Vietnam, the Philippines, and the south China coast in early September 2024, with insurance losses put at USD920M, according to Gallagher Re estimates.[31] One of the areas hit was China's Hainan province, a large island off the south coast known as "China's Hawaii."

The city of Wenchang on its northeast coast was among the areas to suffer significant damage, including the wrecking of five or six wind turbines along the coast of the island's Mulan Bay, near the city.[32,33]

According to Global Energy Monitor, a US nonprofit that compiles information on the sector,[34] the Wenchang wind farm dates from 2008 and initially featured around 30 turbines manufactured by the Chinese OEM Sinovel.

Figure 4: Location of Wenchang Wind Farm

Source: Global Energy Monitor



However, judging by photographic evidence of the disaster available on Chinese media (see **Figure 4** below), it appears that a replant of these turbines was under way — replacing the Sinovel machines with a smaller number of larger turbines. According to various Chinese media reports,[35] 16 new turbines were in the process of installation, each with a capacity of 6.25MW for a total capacity of 100MW, and it is these turbines that were knocked down or damaged by the storm. Chinese media have also reported that the project was insured, but the identity of the insurer was not confirmed.

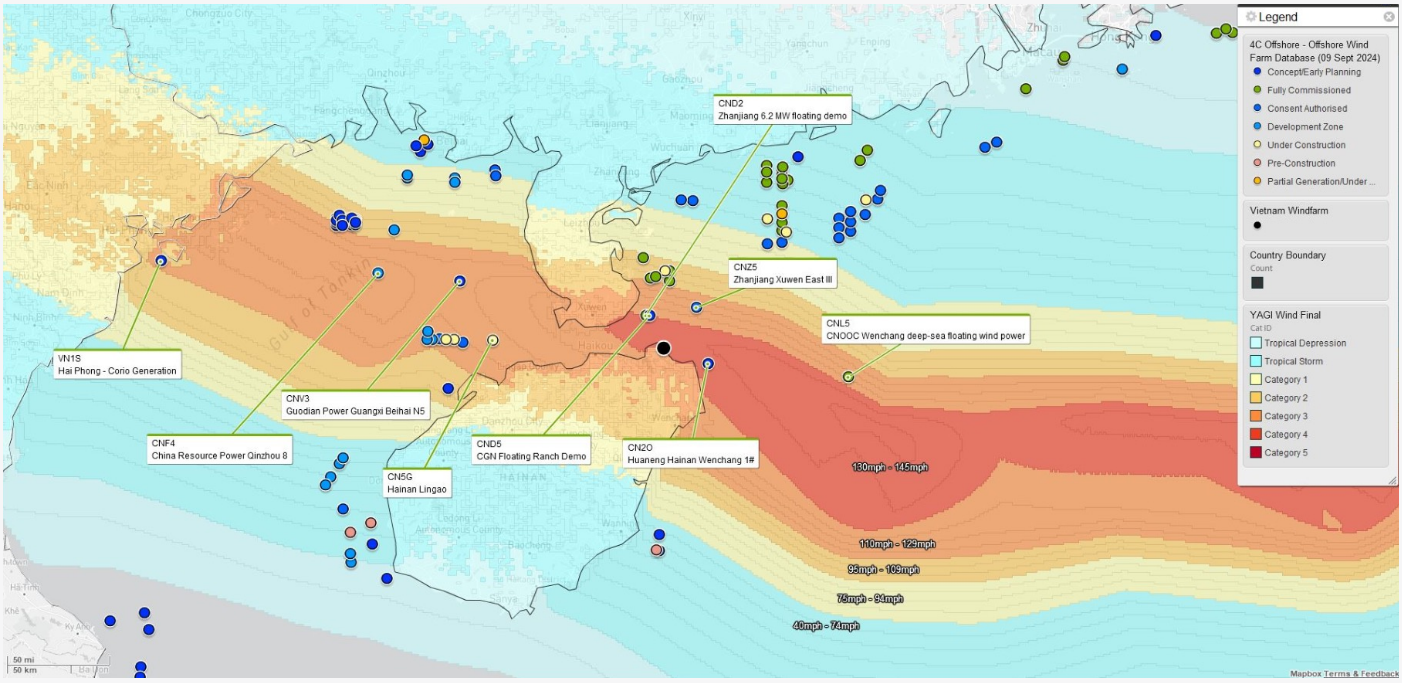
Figure 5: Before and After Typhoon Yagi

Source: Weixin.qq.com

Typhoon Yagi easily ranked as one of 2024’s most powerful storms, with windspeeds of up to 62 m/s, making it the equivalent of a Category 4 hurricane.[36] It was the strongest storm to make landfall in Hainan in a decade.

Figure 6: Path of Typhoon Yagi

Source: Gallagher Re



Wind farm operators will consider storm likelihood and intensity when undertaking risk assessments prior to construction. Typically, they might consider the likelihood of a “one-in-50-year” and “one-in-100-year” storm as benchmarks for the purposes of choosing a class of turbine.

Around the world, many new offshore wind turbines are constructed according to the IEC 61400 Class T standard, which requires the WTGs to withstand a reference wind speed of 57 m/s (defined as a 10-minute average wind speed at hub height). This would give operators and insurers confidence that turbines should be able to withstand up to a Category 3 storm. The wind intensity at Wenchang and the exposed location mean it would be questionable if even T-Class WTGs with all wind controls fully operating could have avoided significant damage.

According to a report in China’s National Business Daily publication, the new Wenchang turbines were built according to a specification that they should withstand a one-in-50-year storm with windspeeds of 50 m/s, a far lower level than the wind speeds actually recorded during Yagi’s landfall.[36]

And if the turbines were still under construction when the typhoon hit, as the media reports suggest,[38] then they may not have had power running to them. This means that any advanced control systems that could have pitched (feathered) the blades into the wind and/or yawed the rotor out of the wind would not have yet been operational.

It is also worth noting that despite the considerable severity of this storm, many other windfarms in the region reportedly went undamaged.[39] This even included one offshore floating turbine built by Mingyang Smart Energy, according to a statement from the company on LinkedIn.[40]

Sabotage, Terror, and War

(Re)insurers of grid infrastructure are increasingly concerned about geopolitical conflicts and the application of terror, sabotage, and war exclusions. Renewable power infrastructure is no exception.

Grids are expanding globally; in the EU, for example, member states' annual spending on grids hit EUR63B (USD68B) in 2022, according to the UK energy-research firm Ember.[41] In its REPowerEU Plan,[42] published that year, the European Commission called for a "particular focus" on cross-border connections, which allow the exchange of power between countries that specialize in different renewable energy sources; for example, solar energy from Spain and offshore wind in the UK and Denmark.

Thus, more and more high-voltage direct current interconnectors are being built between countries, with project sizes varying between several hundred million euros and multiple billions of euros.

These grid infrastructure projects are usually covered by insurers on an "all risks" basis, with only a limited number of exclusions. Whilst war risks are usually excluded for such interconnectors, terror risks are largely covered. Further complicating the picture, there is the term "sabotage," used by media and politicians but largely absent from insurance definitions. This is discussed further in the case study below.

Losses could be significant

An event destroying such interconnectors would not only affect grid security but also have an important economic impact upon (re)insurers. Some of these projects are transporting gigawatts of energy with annual revenues of several billion euros. A damaging event could also impact consumer electricity prices, as demonstrated by a 2021 fire event at an onshore substation in Kent[43] that forms part of the IFA 1 interconnector between Belgium and the UK.

Recommendations for (re)insurers

As will be seen from the case study below, there remains substantial confusion in the insurance market about whether acts of "sabotage" should count under the war exclusions already common in this part of the market.

The (re)insurance markets need to come to a shared understanding on this issue. In particular, (re)insurers who underwrite many insurance contracts subject to English law may want to examine an influential case from 1998, *Investors Compensation Scheme Ltd. vs. West Bromwich Building Society*,[44] in which Lord Hoffmann set out five main principles on how to interpret any commercial contract. According to the judge, these should be construed according to:

- What a reasonable person having all the background knowledge would have understood;
- Where the background includes anything in the "matrix of facts" that could affect the language's meaning;
- But excluding prior negotiations, for the policy of reducing litigation;
- Where the meaning of words is not to be deduced literally but contextually;
- And the presumption that people do not easily make linguistic mistakes.

Who Attacked Nord Stream?

On 26 September 2022, a series of underwater explosions damaged the Nord Stream 1 and 2 natural gas pipelines that run between Russia and Germany through the Baltic Sea. The pipelines are owned by a company majority-controlled by the Russian state-owned gas company, Gazprom.

At first, various European experts and media advanced theories that Russia was behind the sabotage, with speculations over motive turning quickly to Russia's invasion of Ukraine that February. Equally, others speculated that Ukraine or groups sympathetic to its cause might have been behind the action. Both Russia and Ukraine loudly denied responsibility, and no one has since claimed it.

Germany, Denmark, and Sweden announced investigations into the explosions, describing them as acts of sabotage. The Danish and Swedish probes closed in February 2024 without identifying any perpetrators.[45,46] The German investigation is still ongoing. In August 2024, Germany issued an arrest warrant for a Ukrainian man it suspected of carrying out the attacks.[47]

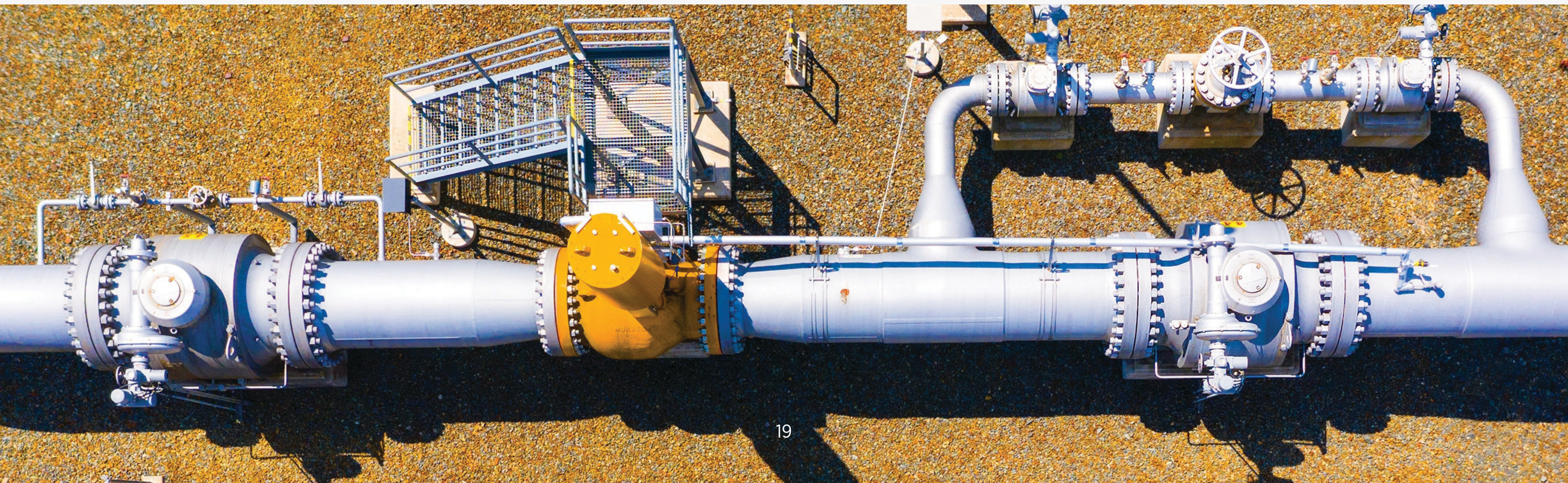
The (re)insurance implications of the case are tricky to pin down. At the time of the blasts, Reuters reported that it was unclear whether any claim could be made due to uncertainty over whether acts of war — or potentially sabotage — could be covered under Nord Stream's policies.[48] In March this year, the newswire reported that Nord Stream is suing its insurers in London's High Court for as much as EUR400M, confirming they are in a contractual dispute over its "operations — all risks" and "excess — all risks" policies, but giving no further details on the nature of that dispute.[49]

Currently, sabotage is often not explicitly mentioned as an exclusion to "all risks" policies, which, as the name implies, tend to cover any physical damages caused by events that are not specifically excluded.

To argue that the pipeline attack was not covered, insurers will therefore have to be able to demonstrate why it forms part of any exclusion within the policy wording. Given the political clouds hanging around this particular event, they may try to rely on the war exclusion — arguing that the explosions must be considered a war attack.

As far as the dictionaries are concerned, the Cambridge Dictionary suggests that war is to be understood as an armed conflict between two or more countries,[50] whereas sabotage is defined as damage or destruction of equipment to prevent the success of an enemy. Sabotage is not defined as occuring exclusively in war contexts in the dictionaries, which note the word can also cover actions such as industrial sabotage.[51]

For the (re)insurance markets, some central clarification of this issue would certainly be helpful — perhaps a standard exclusion drawn up by the Lloyd's of London market, which has undertaken similar exercises in other contentious or uncertain areas in the past.



Conclusion: Insuring the Risk

With the energy transition firmly underway and researchers, engineers, and manufacturers committed to pushing the envelope of the possible, insuring renewable energies means covering prototypical risks as well as mature technologies. As we have noted throughout this paper, this can be challenging for insurers. On top of this, nat cat exposures are becoming more material as climate change increases the probability of extreme weather events.

As we noted in the first section of this report, insurance rates have risen in recent years even as losses have ameliorated. This means the class is profitable for insurers, but securing appropriate nat cat coverage and protection against the risks inherent in developing new technologies can still be difficult for renewable energy developers. This is a matter of crucial importance for the energy transition because insurance markets still have the most effective measures of risk transfer.

A key question is how much insurers are willing to be proactive in this space during the coming years, especially in pricing the risk. It will no longer be possible to rely on past data and lagging indicators to navigate this market. Modeling both the weather and projects' vulnerabilities will become more important. Insurers who fail to adopt such forward-looking techniques in this market and thus balance an appropriate premium and cover as needed will surely fall behind in the renewable energy market.

How We Can Help: Gallagher Re's Renewable Energy Practice

Gallagher Re's dedicated Renewables Team was formed in 2022 and sits within the broader Marine & Energy practice. Based in London, the team works with Gallagher Re's regional broking teams around the world to understand market and industry dynamics, share expertise, and advise and support clients. The core team features two key hires from the renewables sector who are connected both to the industry and the reinsurance markets.

Robert McMillan

A Fellow at the Institute of Mechanical Engineers and Chartered Engineer, Robert joined Gallagher Re in March 2023. He was previously Global Head of Product Safety and Head of Engineering UK for Siemens Gamesa and their Onshore/Offshore Wind business. He started work at Siemens in 2006 in oil and gas in the Far East and then worked as Head of Sales for Wind from 2011. Prior to joining Siemens, Robert spent over 24 years serving in the Royal Air Force as an aircraft engineer and also served in the global operations function, planning, and coordinating overseas deployments. Robert now leads Gallagher Re's Renewable Practice, together with Kirsten Bonke.

Kirsten Bonke

Kirsten joined Gallagher Re in January 2024, also from Siemens Gamesa, where she was Head of Insurances for Asia-Pacific. She has 14 years' experience in renewable energy risks in the primary insurance market; her areas of expertise include liability, marine, operation, and construction insurance covers within several legislation systems (mainly Germany, France, and the UK). She has reviewed and negotiated risk allocation, liability, warranty, and insurance clauses for contractor, supplier, and customer contracts. Kirsten has a master's degree in engineering and a second degree in insurance law.

Joe Lone

Joe is a partner at Gallagher Re and worked at Capsicum Re before the buyout of Willis Re. Joe leads the firm's experienced Renewables broking team, drawing upon his many years of experience and numerous contacts in the City of London.

Gallagher Re offers the following support to clients in Renewables

Treaty Reinsurance
In addition to several standalone renewable treaties, we also manage multiple energy treaties with renewables embedded within them and are being trusted with new business and organic growth.

Facultative Reinsurance
Where clients are looking to reinsure significant portfolios or construction projects, we are very adept at finding the following support.

Inwards and Outwards Structure
Whether for Leaders, Followers, Consortium, or MGA business, our flexibility, deep industry knowledge, and market connections make us a prime broker.

Market Advice
Our overview enables Gallagher Re to build and refine terms and provide market-leading information on capacity, losses, and rates.

Technical Advice
Having both an experienced and competent engineering leader has enabled Gallagher Re to upskill the established broker team in understanding renewable energy sources and the market for them. Additionally, six seminars in Japan, one in Shanghai and another in Singapore, were aimed at sharing similar knowledge with reinsurance clients. These were conducted in late October 2023 and May 2024 and were warmly received. Four new treaties have been established for clients since that period.

Our company licenses the main commercial catastrophe models for Marine and Energy. In addition, our proprietary tools enable enhanced interpretation of model loss outputs, and our geo-visualization platform SpatialKey can be used to facilitate exposure management and event response analysis.

The claims team works in tandem with the placing team to identify complex issues and systemic issues. The claims team draws on analytics expertise to assess reserving and capital management options. Enhanced management of individual reinsurer relationships creates better leverage to secure optimal client outcomes on complex claims.

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