

The energy transition: risks and challenges

Renewable Energy Market Review

January 2021



Style

Our Review uses a mixture of American and English spelling, depending on the nationality of the author concerned. We have used capital letters to describe various classes of insurance products and markets, but otherwise we have used lower case to describe various parts of the renewable energy industry itself.

Abbreviations

The following abbreviations have been used throughout this Review:

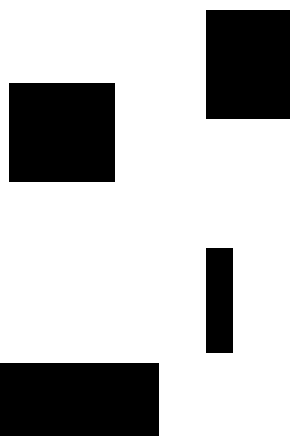
BI	Business Interruption
CEO	Chief Executive Officer
CFO	Chief Financial Officer
COVID-19	Coronavirus disease 2019
CRO	Chief Risk Officer
DSU	Delay in Start-Up
EML	Estimated Maximum Loss
EPC	Engineering, Procurement and Construction
ESG	Environmental, Social, and Governance
EU	European Union
FT	Financial Times
GDP	Gross Domestic Product

GW/h	Gigawatt/hour
IEA	International Energy Agency
LEG	London Engineering Group
IPP	Independent Power Producer
MFL	Maximum Foreseeable Loss
MW	Megawatt
Nat Cat	Natural Catastrophe
O&M	Operations & Maintenance
OEM	Original Equipment Manufacturer
OPEC	Organisation of Petroleum Exporting Countries
PD	Physical Damage
PML	Probable Maximum Loss
PPA	Power Purchase Agreement
PV	Photovoltaic
UN	United Nations
US	United States
WTG	Wind Turbine Generator
WTO	World Trade Organisation

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Introduction

Welcome to our Renewable Energy Market Review for 2021. They say that change is constant, but I think I can safely say that none of us had any idea of the changes that the world has experienced in 2020. It's astonishing to think that when we published the 2020 Renewable Energy Market Review last January, COVID-19 was being reported simply as an outbreak of an unusual strain of influenza in Wuhan, China, with little or no idea that there would be any implications at all for the rest of the world. We can only hope that the rollout of the various vaccines that have been developed are swift and successful globally and that we can look forward to better times as 2021 develops. In the meantime, we hope that all our readers are staying safe as the world tries to find exit strategies from a pandemic that has turned so many established assumptions on their heads.

But just as COVID-19 has challenged so many of these assumptions, so has the rapid development of the energy transition and the new risks and challenges that it poses for the renewable energy industry. It might seem strange from the perspective of early 2021, but in time the pandemic will pass as the global vaccination programme gathers pace. However, what won't pass is the onward march of climate change and the rapid changes in the energy mix that we are beginning to witness.

That's why we have called this year's Review "managing the transition", as the changes in the overall global energy mix have brought their own shift in the renewables risk landscape. For example, just how prepared is the renewables industry to meet the challenge of its own climate risk? In Part One of the Review, Margaret-Ann Splawn, an independent climate policy finance and investment consultant, names three: overcoming barriers for scale, the regulatory scrutiny arising from climate change and Environmental Social Governance (ESG). At the end of her piece she concludes, quite rightly, that renewable energy risk managers and business leaders will need to adapt to climate change and integrate it as a major consideration in decisions.

But how, exactly? The next article by Tony Rooke, Geoff Saville and Lucy Stanbrough of our Climate Resilience Hub, helps to show the way forward. In it, they set out a framework within which renewable energy companies can take the first steps in the process of identifying, quantifying and ultimately managing their climate risk, be it physical, transitional or liability exposure.

Part One continues with a variety of articles relating to the energy transition, including an excellent client perspective from Mainstream Renewable Power's Lesley O'Connor together with an underwriter's view of the future development of Offshore Wind, from Codan's Brendan Reed.

In Part Two we focus on some of the specific risks and challenges currently besetting the renewables industry, aside from the issue of the energy transition. Perhaps the most important risk management question bedeviling the industry right now is how to develop strategies to counter the effects of the current hard insurance market. One critical tool which risk intermediaries can offer is the use of advanced analytics to suggest new but viable risk transfer strategies to offset the increased costs of risk transfer. There's also a deep dive into the topical issues of Wildfire risk, Floating Solar, Offshore Wind turbine pitch bearings, microcracks and solar trackers - to name but a few.

But this year we make no apology for focussing Part Three of the Review on today's challenging insurance market conditions. Many of our readers will know enough about the renewables industry to acknowledge that its loss record has been far from perfect in recent years. Although we take a deep dive into conditions in the International and North American Property and Liability markets, with contributions from other markets around the globe, we begin Part Three with an overall analysis by Steve Munday, our Head of Renewables in GB. The challenges and issues that are concerning the Renewables markets across the globe are spelt out clearly: the risks



surrounding aged assets, the effective risk management of operations, maintenance and spares, their exposure to natural catastrophe risk, the experience (or lack of it) of the contractors involved in specific projects, lender obligations, the rapid escalation of technology and finally of course, COVID-19 and the consequent supply chain interruption issues. All of these challenges are currently making their own contribution to the current market conditions, which have not been experienced since the immediate aftermath of the 9/11 tragedy back in 2001.

We then conclude our Review with a detailed look at conditions in the various insurance markets around the world. Although the rate of market hardening is decreasing – from an average of 30-40% to 10-20% for most lines of business - conditions remain very challenging and buyers will need all the help they can get to navigate today's tough market conditions.

How can buyers respond? I'd like to conclude by the advice given by Steve Munday at the conclusion of his market article:

1. Make sure your risk retention, captive participation and risk transfer strategy is based on sound actuarial principles. Some of our clients have been pleasantly surprised at how much risk they can actually retain, having bought down their deductibles to successively lower amounts during the previous soft market.

2. Make a careful inventory of what should be insured, and what should not. The market is going to charge their rate increases regardless, so to keep insurance costs down, only insure what you need to. For example, how much of your miscellaneous general asset risk really needs to be transferred? And if so, does it really need to be on a Replacement Cost basis, or will Actual Cost Value suffice?

3. Ensure that your values are accurate, up to date and accountable. Insurers are going to demand to know how they stack up and the basis on which they have been calculated. Not only will this save you time when it comes to the renewal process, it will mean that any price caps that insurers will impose will be less punitive in the event of a loss.

4. Provide a high quality, comprehensive underwriting submission. This will be key to ensuring that the maximum potential capacity can be accessed and that the best possible results are achieved in an environment where risk selection is so prevalent.

5. Engage with your underwriters personally. Even if this is just by a video call in this COVID-19 environment rather than face to face, it can make all the difference. Take the time to engage with them to explain your operations and answer any questions.

6. Timing is everything. Work with your broker to ensure that you deliver your underwriting submission to the market at exactly the right time. Know in advance what the insurers will be looking for and so avoid any unwanted surprises.


We very much hope you enjoy reading the Review, and as ever we would be delighted to receive any feedback that you might have.



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Part One -
the energy transition: risks and
challenges for the renewables
industry



Wake up and smell the coffee: why the rise of renewables poses its own risks and challenges

Introduction: new developments, new challenges

In 2021, it seems that the weather is now the new oil; “black gold” is being replaced by “green gold” in the form of renewables, which is now the fastest-growing energy source globally. The velocity of change in the development of renewable energy has been beyond experts’ predictions; however, adjusting to on-going policy, regulation and market developments poses some specific, new challenges for renewable energy risk managers.

At the same time, overall corporate knowledge and understanding of the economic and societal impacts of climate change has evolved far beyond the original “bubble world” of the sustainability department. The UN Conference of the Parties (COP)¹ is now under the spotlight, with UK prime minister Boris Johnson stating that “the UK will lead by example” ahead of hosting this year’s COP26 summit in Glasgow.²

And it’s not just the UK showing leadership. Other countries are setting net-zero targets and Fortune 500 companies are doing so as well. More and more businesses are

embracing the science of climate change by setting strategies and targets aligned with the best available science through initiatives.³

“The future is uncertain, but electric,” stated Auke Lont, CEO of Statnett at the FT Energy Transition Strategies Summit in December 2020 on a panel discussion titled: *Industrial policy or markets? Transition perspectives – mapping a sustainable pathway to net zero.*⁴

New developments

Let’s begin with some exciting statistics. Renewables made up just 26.2% of global electricity generation in 2018, but this is expected to rise to 45% by 2040⁵. Renewable generation capacity increased by 176 GW (+7.4%) in 2019⁶, while hydropower accounted for the largest share of the global total, with a capacity of 1,190 GW. Meanwhile, solar and wind energy continued to dominate renewable capacity expansion, jointly accounting for 90% of all net renewable additions in 2019.⁷

Renewables are set to dominate the construction of new power infrastructure in the coming years, as costs continue to fall and demand increases. Wind and solar capacity will

¹ <https://unfccc.int/process/bodies/supreme-bodies/conference-of-the-parties-cop>

² <https://www.businessgreen.com/news/4020642/uk-lead-example-boris-johnson-urges-nations-ramp-paris-climate-pledges>

³ <https://sciencebasedtargets.org/>

⁴ <https://energy.live.ft.com/agenda/speakers/686914>

⁵ <https://www.c2es.org/content/renewable-energy/#:~:text=Globally%2C%20renewables%20made%20up%2024,from%207%20percent%20in%202006.>

⁶ https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Mar/IRENA_RE_Capacity_Highlights_2020.pdf

⁷ https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Mar/IRENA_RE_Capacity_Highlights_2020.pdf

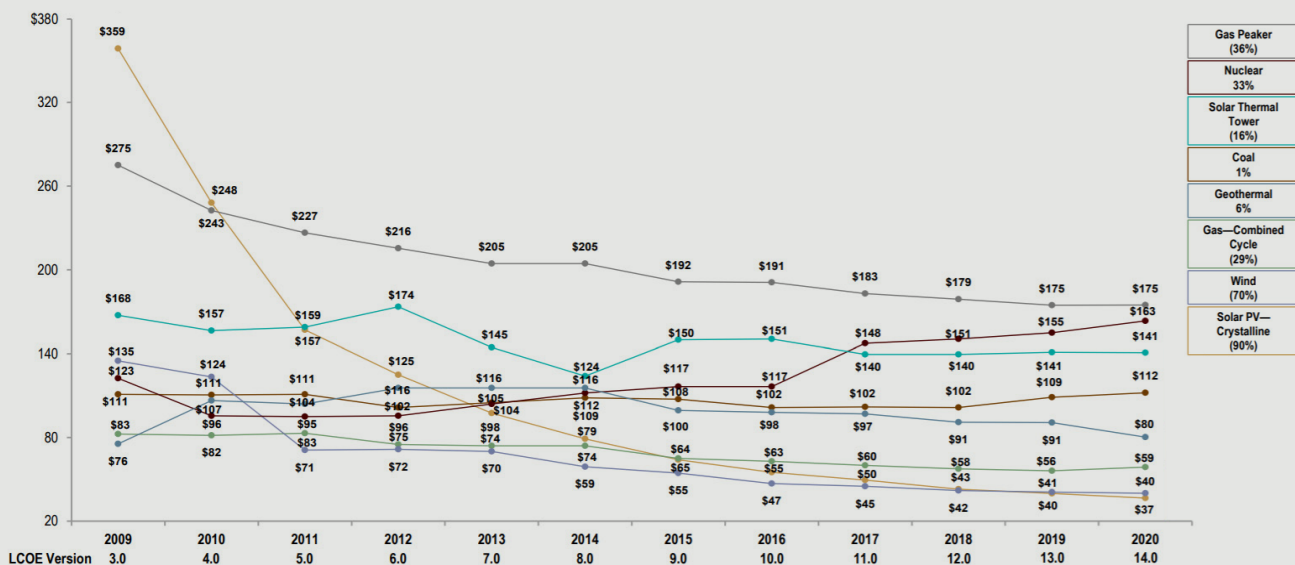
⁸ <https://www.iea.org/reports/renewables-2020>

Fig 1: Levelized Cost of Energy Comparison

Levelized Cost of Energy Comparison – Historical Utility-Scale Generation Comparison

Lazard's unsubsidized LCOE analysis indicates significant historical cost declines for utility-scale renewable energy generation technologies driven by, among other factors, decreasing capital costs, improving technologies and increased competition

Selected Historical Mean Unsubsidized LCOE Values⁽¹⁾



Source: Lazard, Levelized Cost of Energy Version 14⁽¹⁾

double over the next five years globally and exceed that of both gas and coal, according to the Renewables 2020 report from the International Energy Agency (IEA).⁸

At the same time, renewable power generation costs have fallen sharply over the past decade. According to an International Renewable Energy Agency (IRENA) 2019 report, the global weighted-average levelized cost of electricity (LCOE) of renewable power projects such as utility-scale solar photovoltaics (PV) fell 82% between 2010-2019, while onshore wind LCOE fell by 39% and offshore wind LCOE by more than 29% over the same time period.⁹ Figure 1 above shows the global weighted average levelized cost of electricity from utility-scale renewable power generation technologies between 2010-2019.

Furthermore, the projection is that renewable energy spending - for the first time in history - is now set to surpass upstream oil & gas in 2021, according to a research report by Goldman Sachs as shown in Figure 2 overleaf. According to their research, the clean energy sector is to reach \$16 trillion by 2030 and the main driver is the diverging cost of capital.¹¹

All of this of course is great news for the renewable energy industry. So why the suggestion to “wake up and smell the coffee?” Mainly because the renewable energy risk landscape is continuing to evolve as the industry faces up to three new challenges.

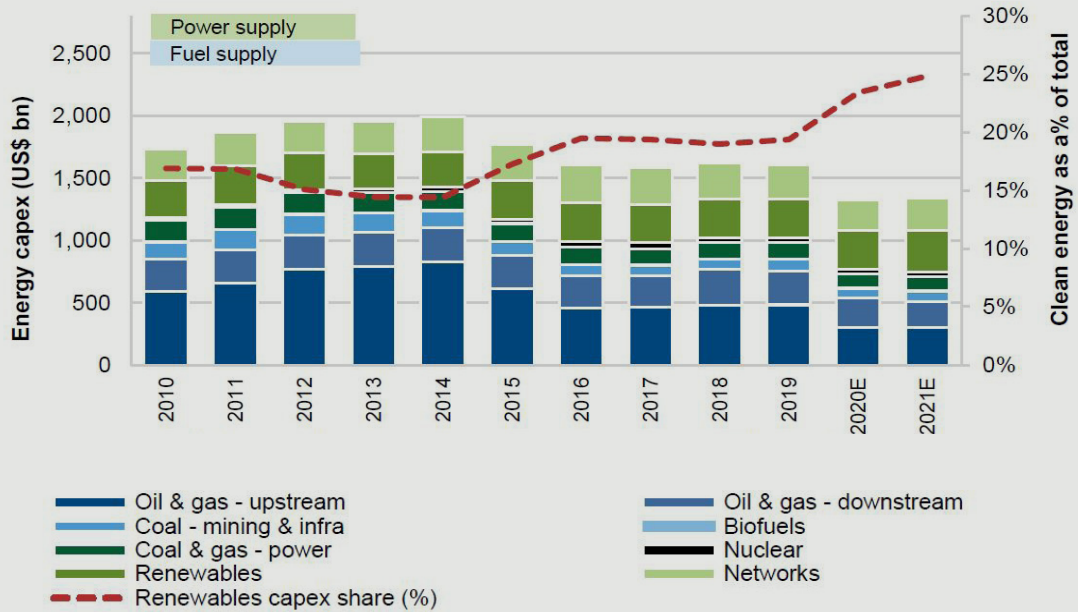
⁹ https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jun/IRENA_Power_Generation_Costs_2019.pdf

¹⁰ <https://www.lazard.com/media/451419/lazards-levelized-cost-of-energy-version-140.pdf>

¹¹ <https://www.goldmansachs.com/insights/pages/gs-research/carbonomics-green-engine-of-economic-recovery-f/report.pdf>

Fig 2: A new era for green infrastructure

Energy supply capex (US\$ bn), and clean energy as a % of total (%)



Source: <https://www.goldmansachs.com/insights/pages/gs-research/carbonomics-green-engine-of-economic-recovery-f/report.pdf>

New challenge number one - overcoming barriers for scale

While the solar and wind markets were largely kick-started by global subsidies or tax breaks depending on the region, it was the continuing advances in technology, decreasing prices and innovations in policy and financing that helped make renewables more attractive, affordable and bankable. Nonetheless, it's been a bendy road and the industry is now met with various barriers for scale challenges, including high set up costs, intermittency issues, and storage limitations.

New challenge number two - regulatory scrutiny arising from climate change

Declaring the climate emergency and setting net-zero targets was the easy part; designing low-carbon solutions that are widely available will be much more difficult and targets need to be underpinned by deliverable plans. This poses particular challenges for the renewable energy sector; while it may currently be the darling of the global energy market, renewable energy companies don't hold a Monopoly-style 'get out of jail free card' for simply delivering low carbon energy. Instead they will be subject to increased scrutiny, as several of the materials used in renewable energy infrastructure carry a heavy carbon footprint and /or carry supply chain risks. Furthermore, many renewable energy companies operate under the umbrella of larger utilities or oil & gas majors; new, more

stringent regulations are bound to be imposed on carbon intensive industries as government policy tightens across the globe to meet the objectives of the Paris Agreement.

And as most readers will be aware, there has been a constriction of insurance and access to capital for the coal industry, a trend which is now being directed increasingly to the oil and gas industry.

New challenge number three – Environmental, Social, and Governance

Alongside designing, implementing and executing a low-carbon strategy, renewable energy companies also have to confront another issue growing in importance – Environmental, Social, and Governance (ESG)¹². ESG has proven to be a safe haven in the pandemic for investors, while ESG ratings are proving to be an important driver for renewable energy stakeholders, from lenders, insurers, shareholders, regulators and even consumers.

Part One – barriers to scale: flexibility, transmission and storage challenges

While the lowering cost of capital as evidenced in Figure 2 is good news for the renewable energy industry, it still faces hurdles to become mainstream. One of these issues is that integrating renewables into the power mix poses challenges, as the grid doesn't stay stable with intermittency. Renewable energy creates uncertainty in load and power supply generation, which then puts additional strain on the system. This can impact the power quality and efficacy, system reliability, load management and security.

“The lower cost of capital and scaling of the renewable energy market will drive innovation further,” says Marina Valls, Chief Economist at Renewables UK, an industry association representing over 400 international member energy companies. I also questioned Valls as to how many of their members have net-zero targets and she replied: “most of our members have net-zero goals and this builds the business case for a network that allows flexibility to be valued.”

Flexibility - to fatten or flatten the “duck”?

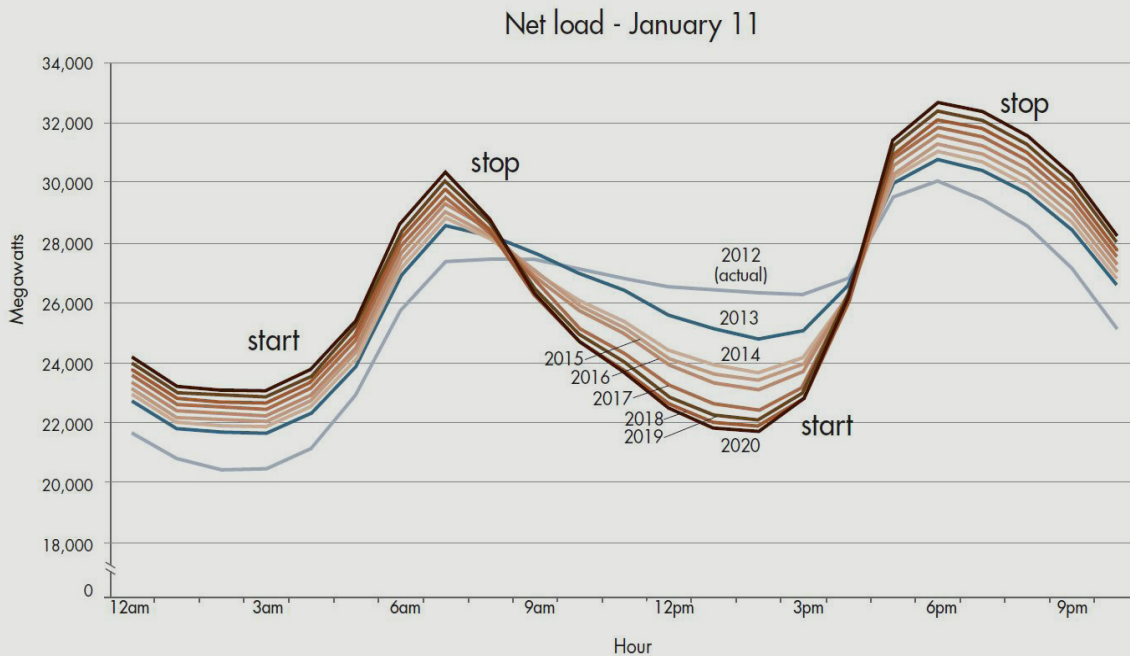
The grid therefore needs to be flexible and able to integrate renewables into the system. The fastest growing segment of new energy is solar, so let's consider what this means to integrate it into the grid. In some regions solar



can supply nearly all the electricity to customers for part of the day, which creates a mismatch between supply and demand. There is customer demand for electricity in the mornings and as the sun gets stronger, solar takes over. But just as soon as the sun goes down, utilities must ramp up their supply with conventional generation. Following this pattern, the utility supply curve can end up looking rather like a duck.

¹² ESG has been defined by the Financial Times as “a generic term used in capital markets and used by investors to evaluate corporate behaviour and to determine the future financial performance of companies. ESG factors are a subset of non-financial performance indicators which include sustainable, ethical and corporate governance issues such as managing the company's carbon footprint and ensuring there are systems in place to ensure accountability” <http://markets.ft.com>

Fig 3: The “Duck Curve”



California Independent System Operator

CAISO created future scenarios of net load curves to illustrate the changing conditions that require flexible resource capabilities to ensure green grid reliability. Net load is the difference between forecasted load and expected electricity production from variable generation resources. In certain times of the year, these curves produce a “belly” appearance in the mid-afternoon that quickly ramps up to produce an “arch” similar to the neck of a duck – hence the industry moniker of “The Duck Chart”.¹³

Source: https://www.caiso.com/Documents/FlexibleResourcesHelpRenewables_FastFacts.pdf

This demand curve situation was illustrated and created by California Independent System Operation (CAISO) in Figure 3 above.

The National Energy Renewable Lab (NREL) suggests two approaches to re-shape the curve: “fatten the duck” or “flatten the duck”.¹⁴ Fattening the duck consists of figuring out how to make it cheaper and easier to turn on and off large power plants that normally run all the time. Flattening the duck consists of energy efficiency gains, storage capacity, transmission ties and shifting demand response. More often than not, to flatten the duck requires a combination of some or all of these; hence the need to optimise the grid. This is where technology, artificial intelligence (AI), and innovation come into play.

Transmission – “push” or “pull”?

Grid flexibility is challenging, as most grids were not built to accommodate intermittent renewables. Furthermore, for the most part transmission grids run inefficiently as they route power flows to the path of least resistance, which means that some transmission lines are overloaded while others are not utilised. Pushing or pulling power to transfer it in the most efficient way requires changes to the grid, which creates additional risk for utilities to manage. However, there are disrupters in the market coming up with innovative solutions for grid flexibility and transmission, such as Smart Wires based out of California.

¹³ https://www.caiso.com/Documents/FlexibleResourcesHelpRenewables_FastFacts.pdf

¹⁴ <https://www.nrel.gov/news/program/2018/10-years-duck-curve.html>



Smart Wires is a small compact modular solution using semi-conductor technology that enables grid operators to put more intermittent renewables on to the system and get more transfer capacity. Their team of consultants works with grid operators and they use automated tools to identify where to put Smart Wires equipment based on the objectives and unique circumstances of the grid. They use silicon and software to produce the same device, thereby providing both high reliability and quality.

The UK's National Grid Electricity Transmission awarded a five-year framework agreement to Smart Wires in November 2019 to help decarbonize the UK electricity grid by enabling greater volumes of renewable power to be efficiently transferred to customers.¹⁵ More utilities are looking for transmission solutions to accommodate renewables onto the grid and are turning to external providers for solutions.

Technology advances will allow power grids to become more intelligent and optimise transfer capacity. Furthermore, regulation can support and drive incentives such that the utility is incentivised to find the lowest cost and cleanest energy solution.

Storage - the struggle to be cost-effective

If the need for flexibility in renewable energy can be graphically represented in the duck curve, then solving the storage problem - in a cost effective, scalable way - could be considered as the goose that lays the golden egg.

Alas, this continues to remain a bit of a fairy tale at this time, as battery storage alone struggles to be cost effective. New and emerging technologies are happening in the industry, much of it driven by battery development in the electric vehicle market, but the investment case just isn't there yet as a cost effective, wide scale solution. The battery market remains fragmented and these assets are increasingly being put into hybrid configurations, primarily with solar power, to solve for resource adequacy. What's encouraging is that storage is versatile; it's capable of doing what it is configured to do and can derive efficiencies to ensure moving energy to when and where it is most valuable while maintaining grid quality and reliability along the way.

Part two - climate risks: physical, transition and liability

As many readers will already appreciate, climate change is not just about temperature rise – there may also be unpredictable changes to the weather. Chronic changes to temperature and sea level rise will accompany changes to acute extreme weather events such as tropical cyclones and wildfires. All of these changes are likely to impact the renewable energy industry to a significant degree, no matter where your assets are located.

¹⁵ <https://www.smartwires.com/2019/11/26/nget-release/>

Physical risks: wildfires, floods, droughts, and windstorms

Climate science shows that as average temperatures rise, more extreme weather events such as wildfires, floods, droughts and windstorms grow in frequency and severity. Renewables infrastructure assets, such as wind turbines and solar farms, could be damaged by flooding, fires and other hazards. If these assets are damaged or disrupted, the services they provide could decline or stop all together – as evidenced in California recently, where there was no electricity for days due to wildfires.

This is where the use of the Intergovernmental Panel on Climate Change (IPCC)¹⁶ scenarios are very useful because they provide an evidence-based framework to consider possible futures for asset management and capital expenditure.

Transition risk: pressure to enhance climate ambition

Transition risks occur as societies move toward a zero-carbon economy. In June 2020, the Energy and Climate Intelligence Unit (ECIU) shared an analysis that 53% of annual global GDP – more than \$45.9 trillion – was covered by regions of net zero targets.¹⁷ These figures are already obsolete as since this data was released, China, Japan and South Korea have all pledged to achieve carbon neutrality in the future.¹⁸ These announcements put pressure on other major emitters to enhance their climate ambition.

The recent change in administration in the US signals a shift in policy and approach from the Trump administration's somewhat conservative approach to the scientific reality of the crisis. President-Elect Biden has committed to 10 executive orders to combat the climate crisis and reduce emissions that he will take on his first day as president; none require congressional approval.¹⁹

Investors across the globe have a growing concern over the viability of high carbon business models in an increasingly carbon constrained world. All industries will be subject to more scrutiny and renewable energy companies will need to create effective climate risk mitigation plans; this will also include examining their procurement supply chains for lower carbon solutions in materials and construction standards.

Using a risk-based approach here is key for the renewables industry to move forward and find solutions. We are now seeing a shift in procurement to examine the carbon content of materials; building the cheapest to deliver is no

longer good enough and considerations for lowest carbon must now also be part of the project strategy. Some asset owners and project developers are working with their supply chains to understand what the possibilities and risks are for lower carbon materials such as cement, steel, and aluminium.

What's interesting is that this is being done without explicit regulation; forward thinking companies are seeing what's on the horizon and want to get ahead of policy changes. The European Union has a €1 trillion European Green Deal that aims to make the 27-nation bloc carbon neutral by 2050. To this end, the introduction of a WTO-compatible carbon border adjustment mechanism (CBAM) was announced for selected sectors to be introduced by 2021.²⁰ The exact design of the CBAM is still being worked out, but basically it will be a levy of sorts on imported goods from countries with weaker climate policies. The CBAM would place a carbon price on imported goods from outside the EU that fail to meet certain environmental standards. As the EU continues its climate ambition, it wants other countries to play ball by upping their climate game and reducing their risk of carbon leakage. Aligning the CBAM with World Trade Organisation (WTO) rules will be complex and politically challenging but the direction of travel is clear.



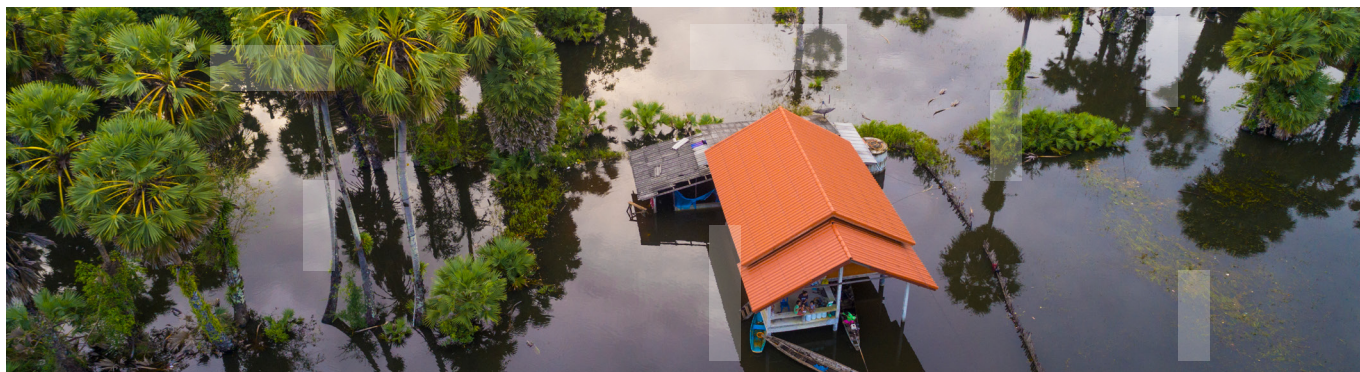
¹⁶ <https://www.ipcc.ch/>

¹⁷ <https://eciu.net/analysis/infographics/global-net-zero-ambition>

¹⁸ <https://www.climatechangenews.com/2020/10/28/south-korea-formally-commits-cutting-emissions-net-zero-2050/>

¹⁹ <https://edition.cnn.com/2020/11/11/politics/climate-executive-actions-joe-biden/index.html>

²⁰ <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12228-EU-Green-Deal-carbon-border-adjustment-mechanism->



Liability risk: deliverability a potential litigation issue

Climate change litigation is expanding across multiple jurisdictions as a mechanism to strengthen climate action.²¹

From 2020 to 2025, the IEA estimates that the main driver of 9% of renewable capacity expansion is expected to be corporate Power Purchase Agreements (PPAs) and merchant plants.²² Three drivers of PPAs include the lack of or insufficient support schemes, existing operations that will lose or are in the process of losing their support schemes, and corporate buyers wanting to ensure that they are purchasing carbon neutral electricity.

“Dealing with market vagaries such as these creates uncertainty for participants, alongside an increase of potential litigation risk in the form of deliverability”, according to Andreas Gunst, partner at DLA Piper, who specialises in renewable energy certificates and corporate PPAs. Most corporate PPAs are entered into for corporate ESG and carbon neutrality accounting and, increasingly, to support claims that the production of goods or provisions of services are carbon neutral. However, comparatively little thought is spent on whether the specific model of PPA or the way environmental attributes are claimed or retired correctly represent the picture communicated to the customers on a company’s carbon neutral activities.

“National laws on misrepresentation or misleading advertising can have severe and far reaching implications. Even keeping to industry guidance may not appropriately shield from compensation claims or rights to reverse consumer contracts concluded on the basis of factually incorrect or misleading statements about use of renewable energy in production or service processes. This is a significant sleeping risk,” says Gunst when I interviewed him about the growth of the market and potential PPA risk. “After all, there is not a great difference between customers seeking to reverse their purchase of a car because of a ‘defeat’ software or because the claim that the production of the car was 100% carbon neutral turns out to be factually incorrect,” concluded Gunst.

Part Three – rising ESG investment: implications for the renewables industry

Dealing with “unknown unknowns” as ESG funds increase

If there is one thing that the pandemic has taught us, it is how to deal with “unknown unknowns”. Some renewables companies are managing these better than others and the pandemic is revealing that the future materiality of a company is increasingly tied to its resilience.

Investors are seeing Environmental, Social, and Governance (ESG) as a safe haven of sorts, as global sustainable investment funds doubled to \$54.6 billion in the second quarter of 2020 over the first quarter.²³ ESG funds have outperformed conventional funds in the US during the pandemic,²⁴ while ESG is already prominent in Europe - in terms of the availability of ESG products, dedicated ESG labelled funds or funds focusing on sustainable investing available from the top 100 asset managers, the UK led the way at 80%, followed by 73% of European managers.²⁵

Furthermore, ESG investing now accounts for one-third of total US assets under management, according to the US SIF 2020 Trends Report, which tracked data as of year-end 2019 and found that investors are considering ESG factors across \$17 trillion of professionally managed assets, a 42% increase since 2018.²⁶ This is a continuation of the significant growth in money managers and institutional investors that consider ESG factors to be able to identify well managed companies that will be sustainable and resilient over the long term. The recent change in the US administration is likely to increase ESG investing further.

“Climate change litigation is expanding across multiple jurisdictions as a mechanism to strengthen climate action.”

²¹ <https://www.lse.ac.uk/granthaminstitute/publication/global-trends-in-climate-change-litigation-2019-snapshot/>

²² <https://www.iea.org/reports/renewables-2020/key-trends-to-watch>

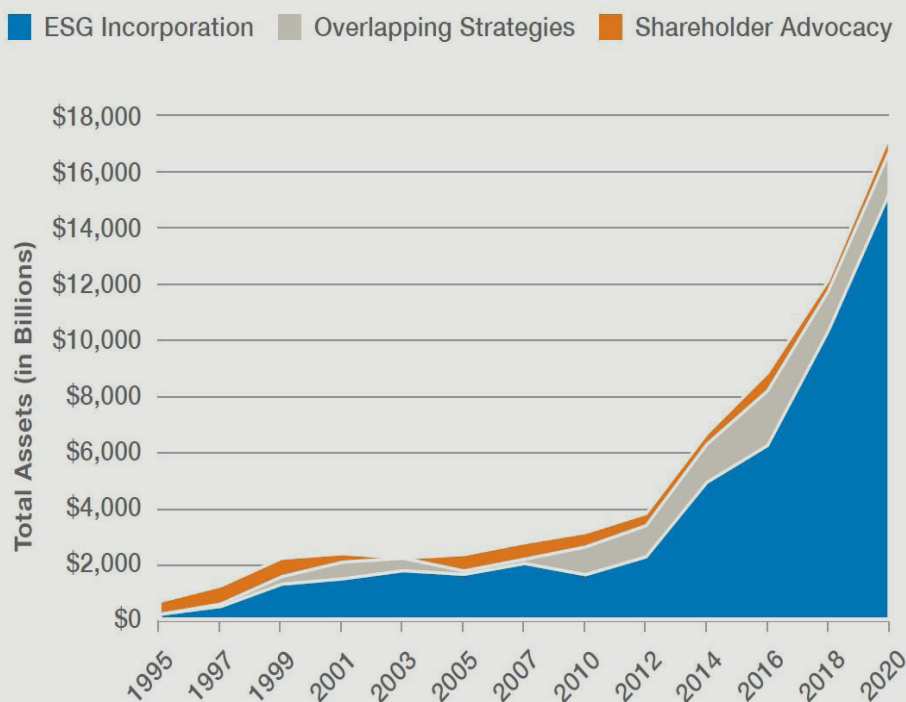
²³ <https://www.morningstar.co.uk/uk/news/207924/which-funds-launched-in-november.aspx>

²⁴ <https://www.wri.org/blog/2020/09/3-things-know-about-esg-fund-behavior-during-pandemic>

²⁵ <https://www.institutionalassetmanager.co.uk/2020/09/23/290000/europe-leads-way-esg-investing-finds-kurtosys-study>

²⁶ <https://www.ussif.org/files/Trends%20Report%202020%20Executive%20Summary.pdf>

Fig:4: Sustainable investing in the United States, 1995-2020



The figure above shows the healthy pace of sustainable investing in the US, with the most rapid growth occurring since 2012.

Source: US SIF Foundation

<https://www.ussif.org/files/Trends%20Report%202020%20Executive%20Summary.pdf>

Why ESG matters: the money will follow it!

The overall rationale for ESG, or sustainable investing, is that those companies who are managing their risk would, in theory, perform better in the transition to a low-carbon economy. There is research that demonstrates the positive relationship between high ESG performance and superior financial performance, and another study reported that companies with the highest ESG ratings out-performed lower rated firms by as much as 40%.²⁷ In addition, other research shows that companies with a higher risk of climate change have a higher cost of capital.²⁸

However, ESG criteria advances further and now demands that companies also deliver impact by seeking to do no harm, improving stakeholder wellbeing and benefits, and providing a societal and/or systemic solution. The shift to renewables is a systemic change solution to move towards a low carbon economy.

It is therefore likely that the money will increasingly follow those renewable energy companies with the highest proven ESG credentials, because recognition of the systemic nature of ESG issues and a plan to manage them are likely to be key indicators of appropriate risk management. Furthermore, regulators are paying increasing attention to socially responsible investing.

²⁷ <https://hbr.org/2019/05/the-investor-revolution>

²⁸ https://www.researchgate.net/publication/326350603_Relationship_between_Climate_Change_Risk_and_Cost_of_Capital

ESG reporting initiatives

Meanwhile climate risk disclosure and reporting is on the rise and will be mandatory in Europe for financial market participants and companies by the end of 2021 under the new EU Taxonomy rules.²⁹ This will create an additional administrative burden on renewable energy companies to comply with this new regulation.

At this time, there are already several voluntary disclosure initiatives in play; however, one of the main critiques of ESG reporting is that it is not designed for investors to use. Much work is being done in this space to address this and the recommendations of the Task Force on Climate-Related Financial Disclosure (TCFD) were constructed to provide a framework of guidelines on how to report on climate-related financial risk. At the end of the day, what matters is getting the right kind of data that allows for better risk management and decision making for all stakeholders.

ESG scores and ratings

But even as investors are calling for better ESG data, information asymmetry persists. ESG scores and ratings vary between agencies and these can be difficult to compare. Some ESG ratings might focus more on social purpose, while others might put more weighting on environmental issues.

Nevertheless, an interesting development is that Bloomberg announced in October 2020 that MSCI ESG Ratings are now available on the Bloomberg Terminal.³⁰ Bloomberg has their own ESG data and scores so including third-party data from providers like MSCI signals a move to increase transparency in the market.

In addition, while the quality of ESG data is incomplete at this time, directives such as the EU Taxonomy will help drive forward more transparent changes and increase accuracy of data, as it requires all companies of a certain size to report non-financial information once a year.

The role of the risk manager in ESG: navigating the changes

Climate change is a material risk that exposes companies to both financial and societal impacts. Investors need visibility from company accounts and reporting as to its ESG efforts and there is a real risk of companies getting left behind if they are not demonstrating thorough actions and transparent reporting. However, reporting is still

nascent; diverse developments in ESG ratings, scores, disclosure and standards are on-going, so figuring out which direction to navigate safely across this “Serengeti” landscape isn’t straightforward.

Simultaneously, ESG can impact the brand value and reputational risk of a company, which means that the role of risk managers will increase in importance in order to help renewable energy companies navigate changes in regulation, technology and innovation, as well as translating what this means for their company and its investors.



²⁹ <https://www.unpri.org/pri-blogs/eu-taxonomy-final-report-2020-starts-a-decade-of-action-on-climate-change/5547.article#:text=Financial%20market%20participants%20and%20companies,adaptation%20by%2031%20December%202021>

³⁰ <https://www.bloomberg.com/company/press/bloomberg-to-offer-msci-esg-research-data-on-the-bloomberg-terminal/>

Conclusion: implications for the renewable energy industry

The projected growth of the renewable energy market creates additional risks for companies to manage. Our future is electric; we are transitioning from a carbon-based energy system to an electron-based energy system. Setting a net-zero target was the easy part but hammering out the details of how precisely a company will get there is no easy task; issues around increasing flexibility, transmission and storage will take on greater importance as the market matures.

At the same time, managing the physical, transition and liability risks of climate change in order to transition to a zero-carbon economy for the renewable energy sector is extremely complex, with a number of moving parts. In addition, ongoing developments in ESG ratings, scores, disclosures and standards add additional layers of complexity for renewable energy companies to tackle. Company profit is no longer the only investment driver for shareholders; instead, companies now need to prove their Social License to Operate by demonstrating how they are dealing with climate-related risks and how their company impacts the environment and society in general.

Final thoughts: prudent risk management will be critical!

Renewable energy risk managers and business leaders will need to adapt to climate change and integrate it as a major consideration in decisions. Developing robust quantitative knowledge is complex and requires new metrics, new tools and new relationships alongside new technologies and approaches to manage climate risk.

To conclude: as stated at the beginning of this article, prudent risk management is at the heart of this piece. Renewable energy is driving the transformation of the energy markets, but further action is required to scale, and the risks involved along the way will have to be carefully managed. Be prepared: develop a climate risk management strategy, share information and work with other relevant stakeholders and governments to find solutions for the eventual transition to a zero-carbon economy.

So it's time for risk managers to "wake up and smell the coffee". Only in this way will the industry respond effectively to the future transformation of the renewable energy risk landscape.



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Enhancing your ESG response: the strategic role of the risk manager

Introduction: preparing to play on a level field

Environmental, Social and Corporate Governance (ESG) factors have been around for over a decade, but whereas they were once considered “nice to have” principles or an ethical stamp of approval to show that you were a good, moral company, times have changed. This is something that the renewables sector continues to leverage as a strategic opportunity.

ESG has now become a financial and strategic imperative, with many ESG factors demanding Board level attention. It may feel like a lifetime ago, but it was only last year that climate change dominated discussions at the 2020 World Economic Forum in Davos, at the beginning of what was supposed to be the “Year of Climate”¹. While COVID-19 has swept Board agendas and headlines clean, the issue hasn’t gone away.

Investors are demanding climate disclosure; central banks are continuing to work together to ‘green the financial system’ and expectations of employees and customers are rapidly shifting, as ESG truly enters the mainstream and accelerates with calls for a “Great Reset”². While the industry has a head start as a key enabler for climate mitigation, all players will demand a level playing field. So if your CEO or CFO hasn’t been asked yet about your company performance through an ESG lens, then rest assured: it’s coming, and coming soon.

A rounded ESG approach

Warren Buffett is often quoted as saying “a reputation takes 20 years to earn and five minutes to ruin”. But ESG is more than enhancing reputation and trust. By having a more rounded approach to ESG, the availability of finance could be enhanced. Clustering deployment with other infrastructure investments – such as charging stations for electric vehicles or green hydrogen production to feed into hard to abate industries such as steel and aviation – can make returns more attractive while providing community benefits in terms of pollution reduction and quality jobs. Good ESG performance is also often reflected in equity value outperforming the market.^{3 4}

For pureplay renewables companies, climate change and energy security have been key drivers for the gains in renewable power generation. For those companies with a mixed portfolio of energy generation assets, transitioning out of high carbon will need finance, with strict conditions on adherence to carbon budgets in alignment with the science of minimising global warming.

The renewables sector will play a key role in meeting the need for diversified sources of future-proofed energy production - indeed, it has the potential to create jobs and infrastructure projects at a scale not seen since President Franklin D. Roosevelt’s New Deal⁵ - but it will be needed in every country. And yet the sector will face the same questions from investors and financial institutions if they can’t meet the same reporting requirements and robust management of their stakeholder impacts.

¹ <https://www.euractiv.com/section/climate-environment/news/davos-wrap-up-forum-runs-out-of-steam-as-climate-becomes-king/>

² <https://www.weforum.org/great-reset/>

³ <https://www.morningstar.co.uk/uk/news/203214/do-sustainable-funds-beat-their-rivals.aspx>

⁴ Capturing the climate factor, XDC 2020 https://uploads-ssl.webflow.com/5d5db8f4d31f0fb0ad6f12fd/5f99aecef133db41b07e5934_Whitepaper_right_FINAL.pdf

⁵ <https://www.whitehouse.gov/about-the-white-house/presidents/franklin-d-roosevelt/>

Manging risk in a just transition

Transforming sources of energy needs to be done via a just transition – this means supporting targets set out in the United Nations' Sustainable Development Goals and considering ESG impacts. In particular, this will be critical as the technologies underpinning batteries, wind, solar and other renewables rely on the extraction of “earth metals” – which may result in other environmental impacts and involve high-carbon energy in the short term, as the deployment of low carbon technology scales.

While renewables have already carved out a market based on these principles, they will need to capitalise on communicating the intangible value that their proposition brings, despite the relatively new status in comparison to long-running industry players. These range from ensuring energy security to health benefits around the improvement in air and water quality from reduced pollution, and the creation of a brand-new industry of jobs. Scottish and Southern Energy (SSE) has recently included these wider factors into 20 principles underpinning its just transition plan⁶.

A sustainable reset

Add to this the idea that COVID-19 may accelerate the broader appetite towards ESG, as financial markets look to build resilience to systemic risks, and there is an even stronger case for enhancing your ESG response. It is becoming increasingly apparent that ESG performance is going to be an important driver for energy industry stakeholders – lenders, insurers, shareholders, regulators – and even consumers. Indeed, it's likely that the money will increasingly follow those companies, with the highest proven ESG credentials, as recognition of the systemic nature of issues beyond climate change mitigation (such as resilience to acute and chronic physical events) and a plan to manage them increasingly become key indicators of appropriate risk management.

So there has never been a better time to ensure that your company performance can be articulated through an ESG lens. Much like the warning signs of the 2008 financial crisis, it is time to pay attention to the ripples before they turn into waves, and to enhance organisational resilience to steer through the rapids of change - before you hit a rock.

The strategic role of the risk manager

The good news is that risk managers can be proactive in addressing ESG and the renewables industry is well placed to meet that challenge; furthermore, many industries are finding that the insurance sector is uniquely placed to help them, given its experience of being on the front-line of managing the impacts of a changing climate over many decades.

An ideal time to demonstrate value

As we navigate the challenges of a COVID-19 infected world, it will be critical to maintain momentum and interest in this area; the effects of oil prices dipping into negative figures and disruption to global cargo markets are placing a sustainable recovery high on the agenda and triggering new infrastructure projects in an effort to bolster GDP. With green strings being attached to national bailout schemes⁷, and green debt issuance over-subscribed⁸, this is the ideal time for the renewables sector to demonstrate its value over other industries and take advantage of the opportunity to accelerate the transition.

The sector's expertise and services will be in demand to commission, operate and decommission renewable infrastructure for other companies. In Texas, a new \$1.6 billion solar farm is set to provide 1,310MW of energy in the largest solar project in the United States⁹. Currently under construction, the Samson Solar Energy Center is designed to support the sustainability objectives of five major consumer brands and supply power to three Texas municipalities. These types of partnerships – between utilities, corporations and local governments – demonstrate the leadership opportunity for renewable energy companies to share their knowledge with the value chain and establish new business models¹⁰. They will also provide a foundation of knowledge, and the sector should look to share this through partnerships with other sectors – this could be working groups, or by taking non-executive director roles on Boards.

Demonstrating ESG performance

Demonstrating ESG performance will help reduce cost of capital, enhance partnerships within industries and municipalities and increase the ability to win lucrative corporate contracts. In the next 10 years, renewables

⁶ <https://www.sse.com/media/km5ff0fx/sse-just-transition-strategy-final.pdf> Nov, 2020

⁷ <https://www.carbonbrief.org/coronavirus-tracking-how-the-worlds-green-recovery-plans-aim-to-cut-emissions>

⁸ “Majority of ESG funds outperform wider market over 10 years” FT, Siobhan Riding JUNE 13 2020 <https://www.ft.com/content/733ee6ff-446e-4f8b-86b2-19ef42da3824>

⁹ <https://electrek.co/2020/11/20/texas-largest-solar-project-us-samson/>

¹⁰ <https://invenergy.com/news/invenergy-powers-daily-life-with-largest-solar-project-in-the-u-s>



deployment will accelerate and branch out from power production and storage into supporting new transport infrastructure, as well as industrial production and use of hydrogen. Risk managers will need to understand, quantify and manage the risks from expansion into new partnerships with these technologies and the associated business models, and to be ready to support these strategic developments. There's never been a better time for risk managers to bring together a system-wide perspective, play a critical role in guiding the Board's strategy and pivot from risk to opportunity.

ESG drivers: a changing climate, and a climate of change

Since the industrial revolution, and particularly over the last 50 years, the world has experienced significant economic growth, powered by ever increasing use of natural resources, driven by a substantial increase in global energy demand. This increase in human activity is known as 'The Great Acceleration' and has resulted in many benefits, lifting millions out of poverty and creating our modern world; however, it has also had some unintended consequences, including unprecedented changes in our climate.

Indeed, events that would have seemed unimaginable only a few years ago, such as PG&E becoming the first recognised corporate casualty of climate risks in the energy sector¹¹, or the Chairman and CEO of Black Rock discussing climate risk and referring to a fundamental reshaping of finance¹², are now becoming the norm and receiving Board level attention. It should also serve as a reminder to consider complex climate exposures in transmission networks, which could include fire, flood or wind to name a few potential perils that could cause severe disruption.

In July, Blackrock announced that they had identified 244 companies that were making insufficient progress on climate risk. 53 had voting action taken against them on climate issues, and 191 were warned they would risk voting action against management in 2021 if they do not make significant progress.

Source: Blackrock¹³

Environmental threats dominate senior leaders' agendas

For the first time in the history of the World Economic Forum's Global Risk Report 2020, environmental threats dominate issues on senior leaders' agendas. While the industry is very much part of the story, it is useful to more fully understand why there has been such a significant shift in the ESG zeitgeist, current views of the science, the frameworks being used and the actions that central banks, regulators and investors are taking.

These factors will have a big impact on your role as a renewable energy risk manager, and there has never been a better time to get up to speed with the ESG landscape and help your Board develop a strategic response that meets all the questions you will be asked.

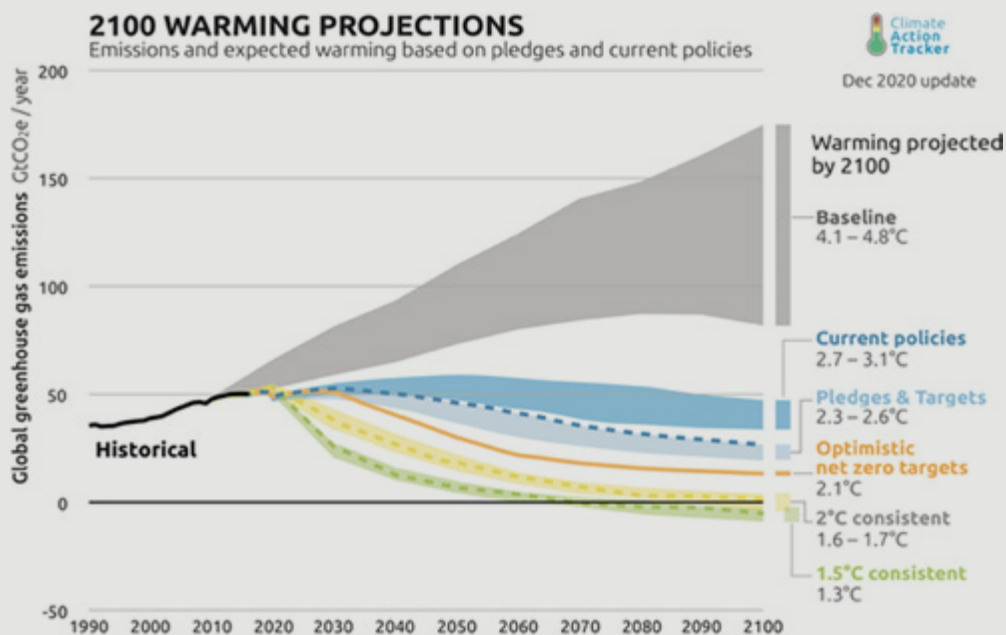
"There's never been a better time for risk managers to bring together a system-wide perspective, play a critical role in guiding the Board's strategy and pivot from risk to opportunity."

¹¹ <https://www.wsj.com/articles/pg-e-wildfires-and-the-first-climate-change-bankruptcy-11547820006>

¹² <https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter>

¹³ <https://www.blackrock.com/corporate/literature/publication/our-commitment-to-sustainability-exec-summary-en.pdf>

Fig 1: The science landscape¹⁶



If we are to keep global temperatures to ‘well below 2°C’, the guardrail which scientists view as important to reduce the risks of severe, irreversible and pervasive changes in our climate, we need to make substantial and sustained reductions in the rate of emissions and reach ‘net zero’.

Source: Climate Action Tracker, Dec 2018 update
<https://www.unpri.org/download?ac=9833>

The science landscape

As shown above, 2020 represents a fundamental fork in the climate change road. The actions we take now, and in the coming years, may well determine the future of the world’s climate system. Views on how extreme weather events will change in a warmer world vary, depending on the type of event and its individual characteristics. This is where modelling future climate scenarios using state of the art scientific knowledge can play a key role in your strategic planning and risk management processes.

While a 2°C increase in temperature may not seem important, it’s worth bearing in mind that for the last 10,000 years, it’s the relative climate stability of +/- 1°C that has, at least in part, been the foundation of our collective progress today: a climatically stable nursery for civilizations to grow. Beyond 2°C, or even 1.5°C according to a recent IPCC (Intergovernmental Panel on Climate Change) report¹⁴, we are going in to uncharted territory with increasing risk of climate tipping points.

There has been a significant and rapid increase in concentrations of atmospheric carbon dioxide (CO₂), especially since the 1970s, reaching levels unprecedented for at least 800,000 years, during which time we’ve been through many ice ages and warm periods (inter-glacials, such as our pre-industrial climate). In fact, palaeoclimatological evidence shows that the last time CO₂ concentration was this high was at least 3 million years ago. Temperatures were two or three degrees higher than pre-industrial climate and seas were 15-25 metres higher.

CO₂ is a greenhouse gas that acts like a thermal blanket around the Earth, and it’s getting thicker every year. In response, our planet is warming, sea levels are rising and weather patterns are changing. The rapid increase in CO₂ takes time to exert these impacts on the planet, and so the emissions produced already will continue to affect our climate for centuries to come. If we continue along a similar pathway – continuing to increase carbon emissions – global temperatures could rise over 4°C by the end of the century, and this has been quoted by some as being an uninsurable world¹⁵.

¹⁴ <https://www.ipcc.ch/sr15/>

¹⁵ https://www.axa-com.cdn.axa-contento-118412.eu/www-axa-com%2Ff5520897-b5a6-40f3-90bd-d5b1bf7f271b_climatesummit_ceospeech_va.pdf

The current ESG landscape: a framework for climate-related financial risks

As the worlds of ESG, climate science and finance have come together in recent years, a new language of climate-related financial risk and disclosure has developed.

One framework you may be increasingly aware of is the “physical, transition, and liability” financial risks from climate change, which Margaret-Ann Splawn referenced in the previous article. This framework was first set out in a report by the Bank of England in 2015¹⁷, published alongside a seminal speech on ‘Breaking the Tragedy of Horizon’ by the then Governor of the Bank of England, and Chair of the Financial Stability Board, Mark Carney¹⁸.

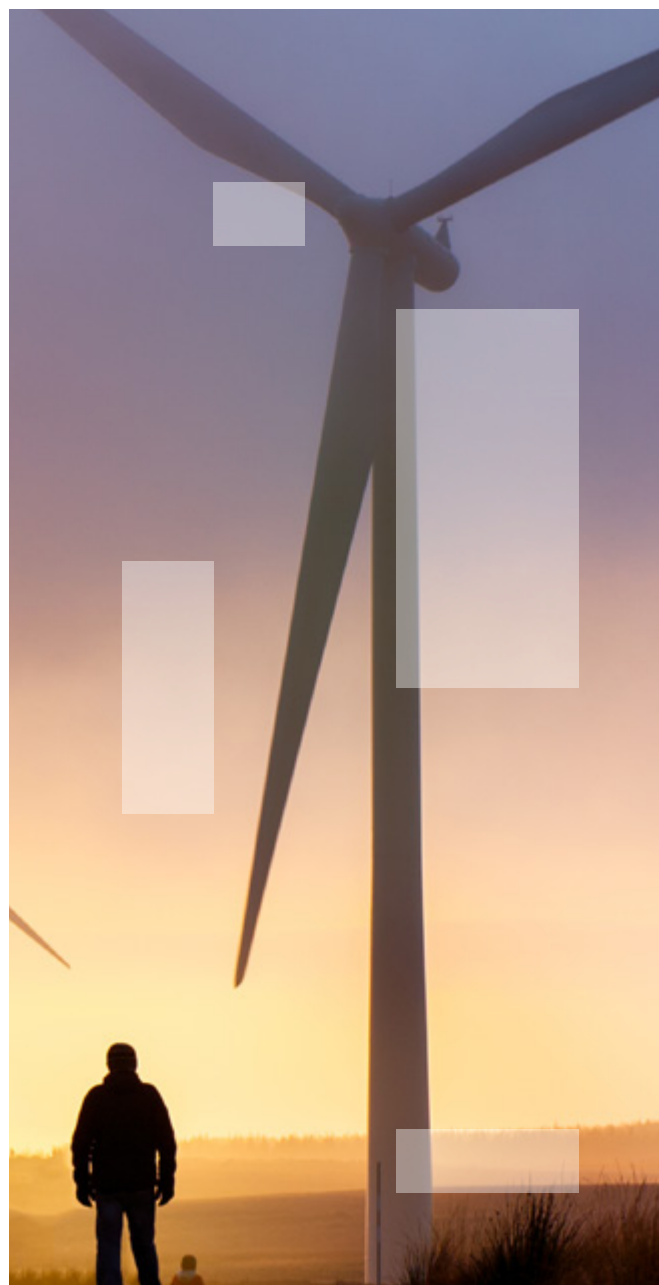
These three channels of climate risk are highly relevant to the renewable energy sector and are already having a meaningful financial impact across natural resource sectors.

Physical risks

Physical risks are the direct risks arising from damage, loss of business or supply chain disruption due to increasing intensity of extremes of weather and climate. For the renewables sector, with numerous sub-sectors each having different physical location requirements, sites are often located in remote and climate-vulnerable areas. Extreme weather events and climate variability have the potential to damage fixed assets and disrupt supply chains. For example, in Mexico the construction of one major solar plant was delayed for several months due to Hurricane Odile¹⁹, and yet climate risks were not acknowledged.

Assessment of physical risk can help renewable energy companies understand their operational risks and respond to extreme events. Key locations may not be impacted by water stress or flooding right now, but that could change and soon. This is where the use of Intergovernmental Panel on Climate Change (IPCC) scenarios is incredibly useful because they give an evidence-based frame to consider possible futures for asset management and new capital expenditure.

Insurance industry catastrophe modelling techniques can be applied to assess risks to infrastructure or incorporate IPCC-projected climate scenarios to investigate extreme events and changes to resource demand, as well as identifying which assets are most exposed to physical risks.



Transition risks

Transition risks are the financial impacts of moving towards a low or zero-carbon economy, such as re-pricing of carbon intensive assets. For the renewables sector, transition risks may arise from changes in government policy, for example through the alteration or elimination of revenue support schemes, or the risk of technology substitution in the next few years. As an emerging sector with numerous competing sub-sectors, leaps in technology are both welcomed and a disincentive to large-scale investments. As ‘subsidy free’ renewable energy developments become more common, there is uncertainty around future policy support and commercial development²⁰.

¹⁶ <https://climateactiontracker.org/global/temperatures/>

¹⁷ <https://www.bankofengland.co.uk/climate-change>

¹⁸ <https://www.bankofengland.co.uk/speech/2015/breaking-the-tragedy-of-the-horizon-climate-change-and-financial-stability>

¹⁹ <https://energytransition.org/2017/06/unknown-climate-risks-for-renewable-energy-projects/>

²⁰ <https://eciu.net/news-and-events/press-releases/2020/almost-half-of-global-gdp-under-actual-or-intended-net-zero-emissions-targets>

The transition to a low carbon economy is also the greatest opportunity for the industry; understanding these changes will be essential, as risk managers consider how to make investments in the most sustainable way, whether this is by improving the efficiency of existing infrastructure, investing in new technology or committing expenditure to new projects. Investors have a growing concern over the viability of high carbon business models in an increasingly carbon-constrained world; this is where the industry can communicate awareness of these challenges and provide disclosures that clearly set out the benefits of their proposition as more viable assets. For instance, some renewable energy companies are producing TCFD (Taskforce for Climate-related Financial Disclosures) reporting and showcasing their negative direct emissions impacts²².

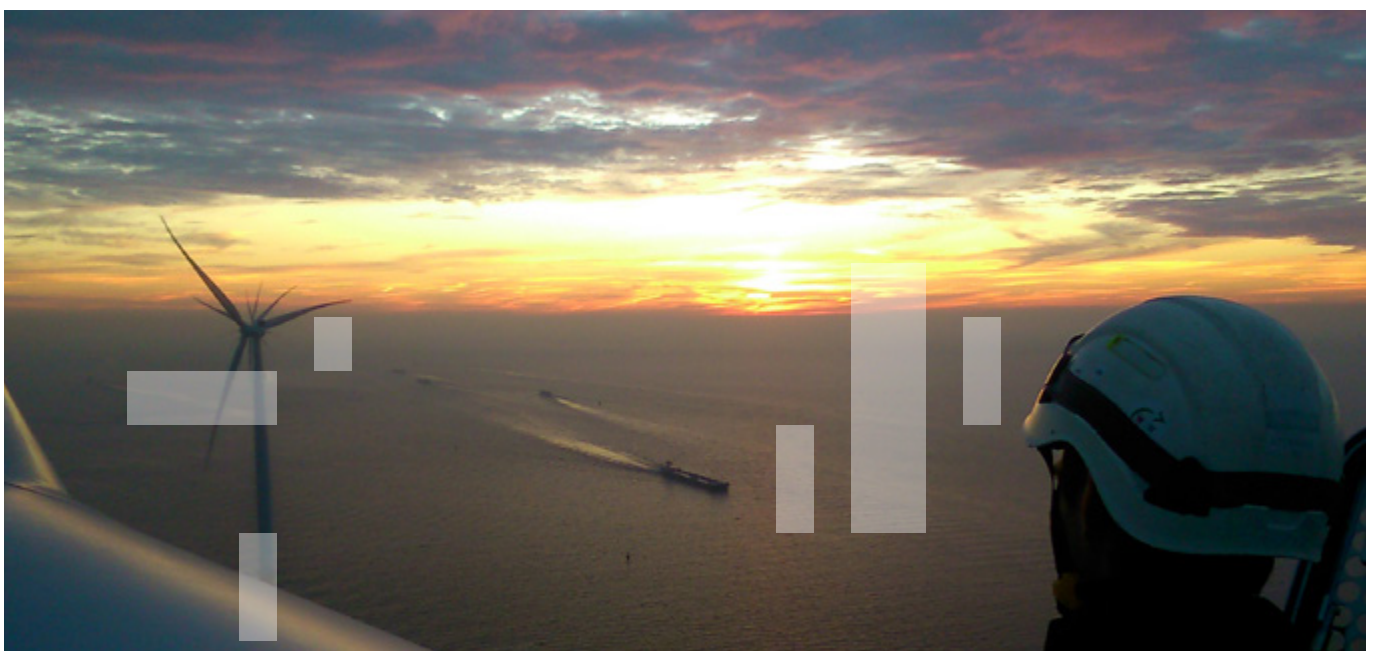
Creating an effective climate risk mitigation plan is not impossible, and renewable energy companies have the potential to play a leading role in conversations with the whole value chain, for example by leading discussions around evaluating and improving ESG impacts from their suppliers. While lithium supplies look relatively robust for the future (although its own issues can be found in our Mining Risk Review, published in September 2020²³), cobalt demand is sourced in large part (64%) from the Democratic Republic of Congo, a region at the heart of concerns around military conflict and human rights²⁴. No industry is immune from its supply chain, and reputation

2020 has seen an acceleration in global commitments to action to reduce emissions dramatically. In February 2020, 49% of annual global GDP was committed to net zero targets (\$39trillion)²¹. In June this had grown to 53% and \$46trillion. Since then Japan, South Korea and China have all set net zero targets as well. Amongst many initiatives, we have The Race To Zero initiative and Climate Action 100+ calling for businesses to set net zero targets, importantly underpinned by large cuts in emissions in this decade.

risks around being a responsible business will go hand in hand with the ESG trend. This is where trusted partnerships to enhance research and development will become business essential.

Liability risks

Liability risks include those that arise from parties who have suffered loss or harm due to climate change and seek to recover damages from those who they view as responsible. These risks could arise from a failure to adapt, mitigate or disclose the financial risks from climate change.



²¹ https://www.lloyds.com/-/media/files/news-and-insight/risk-insight/2020/renewables-media-items/renenergy_keytrendsandterritories.pdf

²² https://www.ntrplc.com/images/uploads/files/20200326_-_TCFD_Examples_of_Climate_Related_Risks_Financial_Impacts_-_NTRs_Funds_Assessment_-_FINAL.pdf

²³ <https://willistowerswatson.turtl.co/story/mining-risk-review-2020-ungated/>

²⁴ https://www.lloyds.com/-/media/files/news-and-insight/risk-insight/2020/renewables-media-items/renenergy_storage-final.pdf

As highlighted by Margaret-Ann, there are over 1,800 climate laws and policies which are increasingly viewed as a tool to influence policy outcomes and corporate behaviour²⁵. While the renewables sector looks to shift towards climate progressive solutions, each subsector can hold their own risks and complexities.

Within Wind, Offshore and Onshore, environmental damage can range from construction and operation to liabilities from property damages and bodily injuries²⁶; as yet, the decommissioning risks for early and subsumed technologies have not been tested²⁷. While liability risks can be passed to insurance firms - if policies allow - and the market capacity is there, damage to reputation and subsequent uninsurable claims could be significant. With increasing interest for climate-related disclosure reporting from investors, the renewable sectors can be proactive and demonstrate a lower comparative risk and diversification point. As regulatory and legal frameworks adapt, litigation risk may benefit from much greater attention.

New sources of financial risk present new challenges

In many ways, these risks are not new per se; they translate into existing categories of financial risk such as credit, market, business, operation and legal risks that risk managers have been managing effectively for many years. For example, physical risks, such as storms or droughts, can lead to operational risks in the form of risks to key infrastructure, such as ice on turbine blades or lack of rain to clean solar panels reducing operational efficiency, or even causing damage if it falls as hail²⁸.

But as new sources of financial risk, they do present new challenges, not least a more extensive modelling of the natural world and developing a much more granular understanding of the transition to a 'net zero' future (see Figure 1 above for more details). That's one of the reasons why Willis Towers Watson is now working in multiple sectors and geographies across the world to help clients manage and respond to ESG and climate risks.

“As new sources of financial risk, they do present new challenges, not least a more extensive modelling of the natural world and developing a much more granular understanding of the transition to a 'net zero' future.”



²⁵ <https://climate-laws.org/>

²⁶ https://www.lloyds.com/-/media/files/news-and-insight/risk-insight/2020/renewables-media-items/renenergy_risksandtechnologies.pdf

²⁷ <https://www.wired.com/story/solar-panels-are-starting-to-die-leaving-behind-toxic-trash/>

²⁸ <https://insuranceinsider.com/articles/129660/texas-solar-farm-faces-likely-70mn-80mn-hail-loss>

What's coming next: a strategic opportunity for risk managers

Over the last year or two, there has been an equally important development which is only just beginning to filter into financial markets, and in turn, into the natural resources sector and through renewable energy markets.

NGFS upgrades views on climate change financial risks

Many of the world's central banks and supervisors, through the Network for Greening the Financial System (NGFS)²⁹, have upgraded their view on the financial risks from climate change. As highlighted in Figure 2 opposite, the risks from climate change are now increasingly seen as having 'distinct characteristics' which means these risks need to be 'considered and managed differently'. Key areas where questions are now being asked include:

- **Board response:** regulators are setting clear expectations that managing the financial risks from climate change requires a long-term strategic response owned by the Board, with the premise of 'if you don't consider climate risk to be material, then tell us why'.
- **Individual accountability:** In some countries such as the UK, banks and insurers are being required to nominate a specific senior executive to be responsible for climate risk³⁰. A common home for this is the Risk Management team, with the CRO named as the individual accountable.
- **Climate stress testing:** at least 15 countries are now preparing climate stress tests³¹, including the need to consider risks up to 2050 and how banks and insurers are adapting their business model to a changing climate and net zero future. Stress testing is not a new activity and Willis Towers Watson has been helping its clients explore the resilience of their business and risk management strategies for decades. However, designing stress tests to represent current and future impacts of climate change is an emerging field of climate risk analytics, and new developments are being adapted from the scientific community to support this activity. Risk managers should keep an eye on the outputs, because they are testing future lending conditions.

From understanding to action

The conversation continues to move from understanding to action. The UK's Prudential Regulation Authority recently issued a letter to the CEOs of its regulated firms – banks and insurers – requesting that they fully embed approaches to managing the financial risks from climate change by the end of 2021³². Furthermore, the Network for Greening the Financial System (NGFS) recently published a set of reference climate scenarios which support the economic case for an early and orderly low carbon transition³³.

This step change in action by central banks is being matched by the private sector, with many companies already signed up to voluntary climate risk disclosure initiatives such as the Task Force on Climate-related Financial Disclosures (TCFD).

Growing TCFD support

The number of organizations expressing support for the TCFD has grown more than 85% in the 15 months to October 2020, reaching over 1,500 organizations globally, including over 1,340 companies with a market capitalization of \$12.6 trillion and financial institutions responsible for assets of \$150 trillion³⁴. And there's already clear signs from multiple jurisdictions that TCFD could soon become mandatory, at least for listed companies and large asset owners³⁵.

Realignment of investor and loan portfolios

Some of the world's largest investors and banks are now going further, not only disclosing risk but also committing to align their investment or loan portfolios to the 'well below 2°C' goal of the Paris Agreement on climate change³⁶. In 2018, the Global Sustainable Investment Alliance (GSIA) estimated that ESG investments, i.e. sustainable investing, represented in excess of \$30 trillion globally, with industry research suggesting that this would double in the next three years.³⁷ The next GSIA review is due out in Q1 2021 and will be one to watch for shifts, alongside the ongoing work of the Coalition for Climate Resilient Investment (CCRI) which is chaired by Willis Towers Watson CEO John Haley. The CCRI represents the commitment of the

²⁹ 66 central banks and supervisors and 13 observers <https://www.ngfs.net/en/communique-de-presse/ngfs-publishes-first-set-climate-scenarios-forward-looking-climate-risks-assessment-alongside-user>

³⁰ <https://www.bankofengland.co.uk/prudential-regulation/publication/2019/enhancing-banks-and-insurers-approaches-to-managing-the-financial-risks-from-climate-change-ss>

³¹ <https://www.bankofengland.co.uk/-/media/boe/files/speech/2020/the-road-to-glasgow-speech-by-mark-carney.pdf?la=en&hash=DCA8689207770DCBBB179CBADBE3296F7982FDF5>

³² <https://www.bankofengland.co.uk/prudential-regulation/letter/2020/managing-the-financial-risks-from-climate-change>

³³ <https://www.ngfs.net/en/communique-de-presse/ngfs-publishes-first-set-climate-scenarios-forward-looking-climate-risks-assessment-alongside-user>

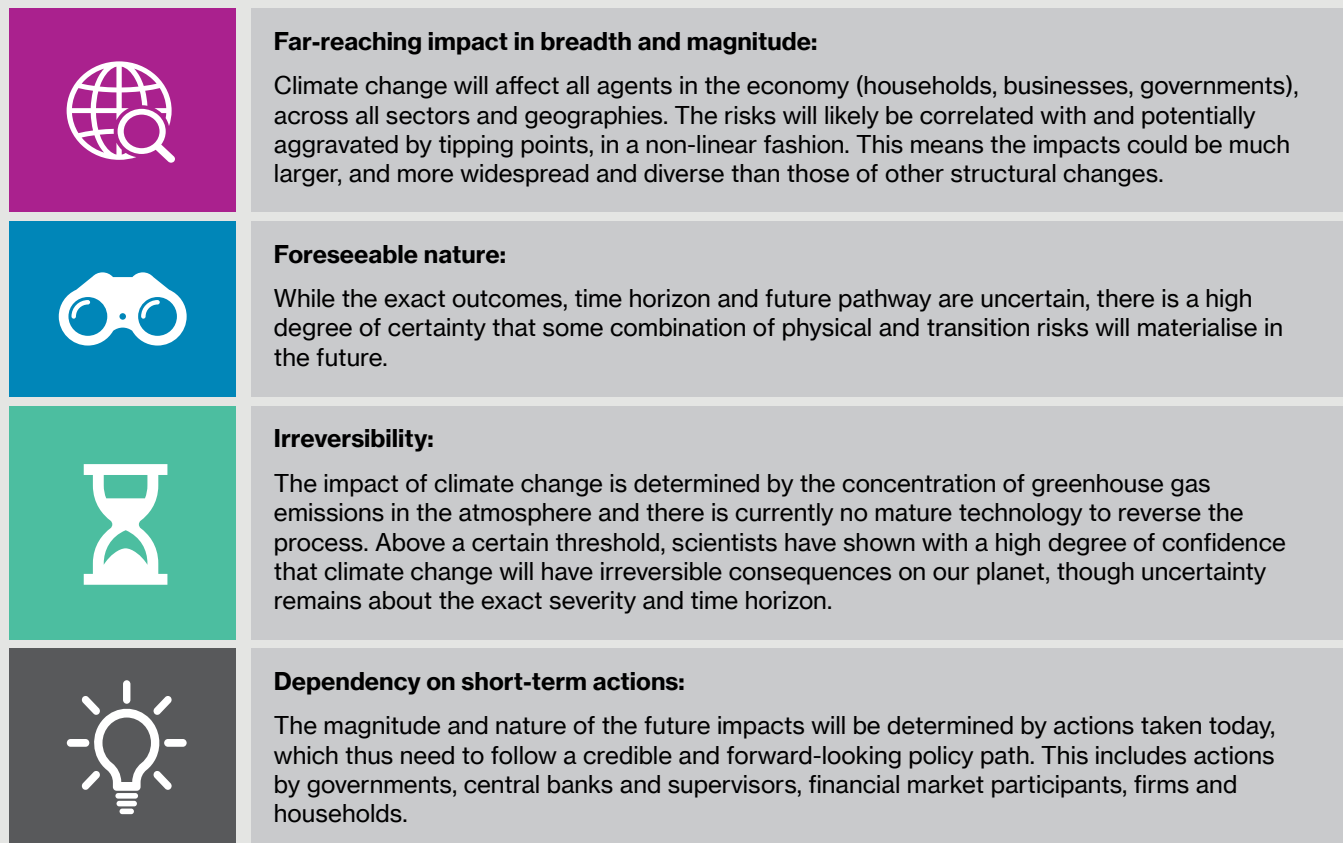
³⁴ https://assets.bbhub.io/company/sites/60/2020/09/2020-TCFD_Status-Report.pdf

³⁵ For example, see the Green Finance Strategy <https://greenfinanceplatform.org/national-documents/green-finance-strategy-transforming-finance-greener-future>

³⁶ See, for example, <https://www.unepfi.org/net-zero-alliance/> and <https://www.unepfi.org/banking/bankingprinciples/>

³⁷ <https://www.greenbiz.com/article/global-sustainable-investing-assets-surged-30-trillion-2018>

Fig 2: the distinct characteristics of risks from climate change



Source: NGFS³⁸

global private financial industry, in partnership with key private and public institutions, to foster the more efficient integration of physical climate risks (PCRs) in investment decision-making³⁹.

ESG response demands can only increase

As the landscape continues to shift, the demands on firms in the wider economy to respond to ESG measures will only increase. And sectors such as renewable energy, that represent the future of energy and a net zero future, are likely to thrive in the face of the oncoming storm.

Climate Quantified: a new way of enhancing your ESG response

Climate Quantified brings together our deep weather and climate analytical experience from the (re)insurance and investment markets, our extensive academic, research and institutional investor relationships, and our multi-discipline expertise and capabilities in a fully integrated, strategic offering. Furthermore, it embodies a proactive approach to helping shape the global community’s response to climate risks. For example: through our \$50 million investment in the award-winning Willis Research Network⁴⁰ to support open climate and natural hazard research, insights from our Thinking Ahead Institute⁴¹ to influence change in the investment world, and our founding role, with the World Economic Forum, in the CCRI⁴².

³⁸ https://www.banque-france.fr/sites/default/files/media/2019/04/17/ngfs_first_comprehensive_report_-_17042019_0.pdf

³⁹ <https://www.willistowerswatson.com/en-GB/News/2020/10/california-joins-the-coalition-for-climate-resilient-investment-to-advance-the-inclusion-of-climate>

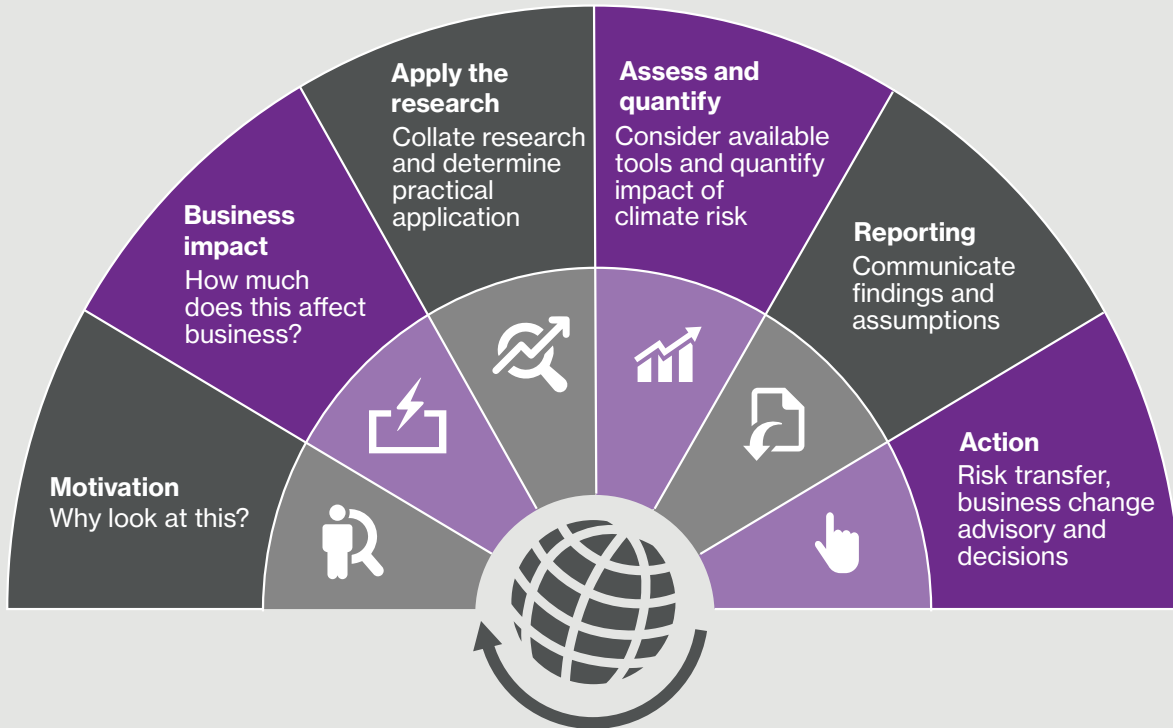
⁴⁰ <https://www.willistowerswatson.com/en-GB/Insights/research-programs-and-collaborations/willis-research-network>

⁴¹ <https://www.thinkingaheadinstitute.org/>

⁴² <https://www.willistowerswatson.com/en-GB/Insights/trending-topics/climate-risk-and-resilience>

Fig 3: Willis Towers Watson Climate Quantified™ framework

To turn organisational words into action, whether the drivers are ethical, legal, investors or something else, the framework below underpins the diverse ways in which we support clients.



Since the early 1990s, Willis Towers Watson has supported private and public sector organisations to enhance their approach to managing climate-related risks in response to market and regulatory developments.

Our heritage, skills and connections across markets help our clients quantify the financial risks and opportunities from a changing climate and develop a strategic response to supporting an orderly transition to a low carbon and resilient economy.

A starting point: modelling physical risk

We find the starting point for many clients is modelling the impact of the current physical risks from a changing climate, such as storms, floods and other extreme weather events, on an operational site-by-site basis. We've helped a number of clients along this journey - for example, supporting a large bank to understand its climate risk exposure on a large rail infrastructure project. This engagement focused on physical risks to assets and anticipated downtime following damage as part of creating a common asset resilience language.

Managing transition risk

Increasingly our clients are also asking them to help them identify, quantify and provide input into managing transition risks and opportunities as the 2020s start as a decade

where transition accelerates, possibly exponentially across Energy, Transport, Agriculture, Manufacturing and Finance systems. This involves producing climate transition scenarios of changes in policies (e.g. carbon prices, net zero targets), technology innovation and disruption (e.g. rapid decrease in solar, wind and battery pricing), market changes (e.g. movement of finance and customer sentiment to transition and green only finance) and increasing successes in liability from lawsuits.

Making impacts of future climate change more tangible

Modelling the likely amounts of damage or financial losses linked to future climate projections, i.e. 2030, 2050, 2100, and under different climate scenarios, can help to make the impacts of possible future climate change more tangible.

Knowledge fosters understanding, and then action. This might include modelling flooding risks to electric substations⁴³ to estimate potential business interruption, or the impacts of extreme weather on the construction and ongoing maintenance of different types of turbines⁴⁴ and solar panels⁴⁵ – issues that can move from operational concerns to strategic imperatives.

Through this type of climate risk assessment, your company will also be much better prepared to respond to increasing expectations of consumers, lenders and investors around climate disclosures, and to guide future planning, risk management and strategy.

Conclusion: the unique position of the risk manager

Risk managers are uniquely placed to ensure their companies are prepared to meet the increasing expectations of disclosure by investors and regulators, embed climate risk into existing frameworks and ensure Boards are taking a strategic approach.

Transitioning to low-carbon energy technology and considering sustainability in a holistic way represents a tangible opportunity for market differentiation and talent acquisition, and the renewable energy sector can take advantage of uncertainty to bring in longstanding workers whose knowledge can support the long-term management and processing of assets.

There are roles for everyone, and risk managers have a unique opportunity to facilitate them in key areas, including:

- **Governance**, including the board's role in providing oversight of climate risk responses and defining management responsibility for climate risk and ESG
- **Risk identification**, identifying the key channels through which climate risks can impact the company
- **Risk appetite**, including forming a view as to whether climate risk should be considered as a separate element or part of aggregate risk
- **Risk measurement and reporting**, including how to incorporate climate risk into financial risk models and reports and deciding on relevant metrics for decision making, a key element of TCFD disclosure
- **Reputation risk**, including identifying public communications needs and a strategy for communicating a firm's climate and ESG response
- **Opportunity identification**, informing strategic decisions on changes (or not) to operations, products and services

Having a solid understanding within the business will not only prepare you for the changes that are already happening, but also those that are coming down the pipeline. By engaging with Climate Quantified™, risk managers can benefit from a structured, data driven and strategic approach that delivers deeper insights into ESG issues. And by being pro-active, risk managers can be far better prepared to meet the demands of their regulators, investors and Boards.

Is it time to quantify your climate risk and develop a strategic response?

While there may be challenges ahead, the mainstreaming of ESG presents a strategic opportunity for risk professionals, particularly in the renewable energy sector. As Boards grapple with the ESG onslaught, risk managers can play a lead role, providing not only risk quantification and analysis but also insight to inform strategy in a rapidly evolving ESG landscape.



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⁴³ <http://www.resccue.eu/sites/default/files/sustainability-12-01527-v3.pdf>

⁴⁴ https://www.vwrm.rw.fau.de/files/2016/05/Wind_Insurance_2016-02-18_WP.pdf

⁴⁵ <https://webstore.iea.org/download/direct/2999>



A client's perspective: managing the new risk landscape as the industry expands its footprint

Introduction: de-risking our projects

Mainstream Renewable Power's mission is to lead and accelerate the transition to sustainable energy, or, in our founder Eddie O'Connor's words "to rid the world of CO₂ and save the planet." We are a global pure-play Wind and Solar energy developer, with a total asset pipeline of 12.3GW in 13 countries on five continents. Our business model involves the early identification of greenfield sites in high growth markets (typically with high carbon intensity grids), which we then develop, build and operate.

Everything we do is about de-risking our projects – taking them from concept, to operational renewable generation plants. As we de-risk, we realise and optimise the value of our investments of time, expertise, capital, and, not least, passion.

Focus on LatAm: delivering 1.3GW in Chile

Mainstream entered Chile in 2008 as our first international market, lured by world-class wind and solar resources, high power prices (at the time) and a national mandate for energy independence. We had significant successive success in the technology-neutral public procurement auctions of 2015 and 2016, winning 27%¹ or 3,366GWh² in the latter, displacing operational coal³. The incumbents declared our pricing too low, and that our projects would never be built.

However, backed by clubs of international commercial lenders, our team proved them wrong – closing two major portfolio project finance deals, Condor (570MW) in November 2019 and Huemul (630MW) in August 2020, for a total of US\$1.25 billion⁴ and a further US\$280 million in construction finance with AMP Capital⁵. These deals were

¹ <https://www.mainstreamrp.com/insights/mainstream-wins-7-government-contracts-in-chile-to-build-1gw-of-wind-energy-plants-worth-usd-1-65bn/>

² <https://www.bnamericas.com/en/news/mainstream-signs-final-ppas-from-2016-chile-auction>

³ <https://www.mainstreamrp.com/insights/renewables-outperform-fossil-fuels-in-chile-tender>

⁴ <https://www.prnewswire.com/news-releases/mainstream-renewable-power-closes-second-phase-of-cus1-8-billion-wind-and-solar-financing-deal-in-chile-301122099.html>

⁵ <https://renews.biz/63754/mainstream-secures-280m-chile-construction-finance/>

closed in spite of hurdles such as the Servion insolvency, which necessitated a complete technology replacement on three of four projects in Condor, the 2019 Chilean social unrest kicking off two weeks before Final Completion (FC) and, of course, a global pandemic!

Construction of the first nine (1.2GW) Wind and Solar projects is progressing very well, with the last of the ten projects in the “Andes Renovables” (AR) platform to follow in 2021. Once operational, AR will power 1/6th of Chilean homes, having contributed extensive FDI to the Chilean economy at a challenging time, permanently reduced the cost of power in the developing country⁶ and contributed significantly to its decarbonisation goals, securing its leadership role in the region.

The significant COVID-19 and related supply chain challenges facing our industry in 2020 were overcome by our team through the close management of our relationships with all stakeholders, who collaborated to mitigate delivery and financial risks. The insurance sector – with RSA leading on Condor and SwissRe and CV Starr on Huemul - have proven to be supportive partners, covering the residual Physical Damage, Nat Cat and Liability risks, and allowing our delivery teams to focus confidently on the business of realising this first of our huge ambitions in the region.

The role of mission and values

Delivering large scale renewables from greenfield through to operations, at value, is about managing the wide range of development and business risks that, with expertise, ingenuity, foresight and planning, are ultimately in our control. Mainstream is a genuinely mission and value-based organisation.

If our mission is the Why - our passion, providing resilience and fortitude - our values are the How – not just a set of guiding principles, but deep-rooted qualities and standards which structure how everything is done, by everyone:

- **Safety**
- **Integrity**
- **Sustainability**
- **Entrepreneurship**
- **Working Together**
- **Innovation**
- **Respect**

They are inherently designed to ensure we can tackle risk strategically. For example, our value of *Respect* means that we work closely with communities from Day 1 on any project, earning social license and developing strategic relationships from which local project champions/guardians emerge. Respect is hard earned; it's a strategic investment, helping us mitigate a variety of social risks which for others are external, rather than internal and influenceable.

For example, security and security of access to remote projects in developing countries, some with particular social sensitivities around indigenous, or informal communities, are flagged as potential project risks early on, and managed out: *Working Together*, using *Entrepreneurship* and *Innovation* to create meaningful, valued, long-term initiatives, always with *Integrity*, and *Respect*; no Denial of Access cover is therefore required.

Insurance & risk management in the mainstream: evolving with the high-growth global business

As a developer, we have high tolerance for risk, and confidence - precisely because of the tried and tested values, passion and systems we have established. Our track record has been validated by over US\$3 billion in project finance, raised in the notoriously conservative international commercial lending markets of the last decade. But there is always residual risk, and genuine external risks whose impacts we need to mitigate. Now, as our business model evolves and a strengthening balance sheet allows us to retain increasing control through construction and operation, further emphasis is rightly placed on the role of insurance as the ultimate safety net to secure and maintain optimal value.

The new Group risk and insurance role, created in Q4 2020, is designed to work cross functionally across our global business, to secure optimal asset value. As Group Insurance Manager, I work with risk owners to assess residual risks, and help take informed decisions on their management to monitor, mitigate and transfer risk, contractually or through insurance.

“Delivering large scale renewables from greenfield through to operations, at value, is about managing the wide range of development and business risks that, with expertise, ingenuity, foresight and planning, are ultimately in our control.”

⁶ <https://fr.reuters.com/article/energia-chile-licitacion-idESKCN10S1SY>

This new function will establish a Centre of Excellence, rolling out learnings and best practice across the Mainstream Group as we build out our global pipeline, which currently spans 13 markets on 5 continents. It is facilitating knowledge capture and feedback loops to inform decisions throughout the project lifecycle, across functions and geographies. It is enriching market entry analysis, and ongoing market monitoring. The scope ranges from physical and technological risks onshore and offshore, to political, financial and credit risks, including leveraging surety capacity to help make our capital go further in a sector where bonds are increasingly demanded for grid capacity, land control and power supply bids, both public and private.

Climate change-related risks – and opportunities!

“Transition risk” is the opportunity that fuels the renewable energy sector – pardon the pun. As regards the physical risks of climate change – we can all see and feel the impact on the global (re)insurance sector through this worsening hard market. Overall though, as evidenced through TCFD disclosures, renewable assets are proving resilient to the physical risks of climate change when compared with thermal plants, whose yield is adversely affected by mean temperate change, and whose profitability is reduced by falling market prices as cheaper RE is built out.

However, the increasing frequency and impact of acute Nat Cat events - floods, lightning, windstorm – emphasise the importance of technology design, plant engineering and business continuity planning for wind and solar generators. As Mainstream moves from low-Nat Cat zones in EMEA to seismic zones in LatAm and now on to APAC, and with huge-scale ambitions offshore, we are acutely aware of climate change-related physical risks to our assets, to our neighbouring communities, and the pressing need for resilience and adaptation. With a front row seat, as our met masts are battered by typhoons in the Philippines, or our neighbouring communities and their crops are devastated by drought or floods (while our sites remain unaffected), our mission is ever more tangible.

Conclusion: towards a strategic alignment of the renewable energy and insurance sectors?

Our sector was created to address the root cause of this ultimate existential global threat. Escalating insurance operational expenditure, and the financial risks of climate change to insurance sector balance sheets, can, Mainstream believes, be stemmed through the strategic alignment of the renewable energy and insurance sectors; a risk-focused approach to collaboration and information.

We call on leaders in the insurance sector to *Work Together* with us, for Innovation and Entrepreneurship to help us in our mission to accelerate the transition to sustainable energy, to “rid the world of CO₂ and save the planet”. Sustainable value in our respective businesses - and the world - rely on it.



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Geopolitics of an electrified world: transformative threats to the resilience of the renewable industry

Introduction: new geopolitical challenges and risks

Geopolitical risks apply to almost every area of the economy, and the renewable energy industry is no exception. But how do these risks manifest themselves and how can they be mitigated?

For the renewable energy sector, exploring geopolitical risks is important not only because the industry experiences the global ripples of geopolitics, but also because the sector is making waves of its own. The desire to build forwards and integrate sustainability is becoming a global trend for COVID-19 loans made by governments, and the interruption of planned investments and budget cycles for other sectors of the energy mix could open the door for acceleration. It will also bring about operational challenges as countries reopen borders and global supply chains start again – this period of relative hibernation will require skills and equipment to be re-tested.

No risk can be considered in isolation

Geopolitical risks for an organisation arise from its unique exposure and vulnerability to multiple, inter-related political, economic and geographical factors that impact its ability to successfully operate and execute its strategy. As 2020 has clearly demonstrated, no risk or stage in project development and maintenance can be considered in isolation. New challenges and risks will unfold when the world emerges from its post-COVID-19 hibernation that, if not managed correctly, could threaten the very resilience and long-term profitability of a project.

A more holistic view of risk

It has never been more important to consider new ways in which geopolitical risks can be managed more effectively than by simple insurance purchase. The coming 12 months are going to require a holistic view of risk in an already charged landscape and have also highlighted the need for organizations to create stronger links between their C-suites and operational management to produce the required integrated and rehearsed responses.



Understanding geopolitics

Geopolitical risks have always been with us, yet industry dynamics and global trends have caused their importance to rocket up board agendas over the last few years; what's more, they look firmly set to stay there, given the major shift in energy policy that a Biden-Harris administration will bring in the US. In September 2019, the new European Commission President, Ursula von der Leyen, stressed the importance of the transatlantic relationship to meet current and future challenges, both globally and within Europe¹, while the appointment of John Kerry to lead the climate agenda and the position being embedded within the National Security Council² will likely be welcome news for some markets as well as a closing of a window of opportunity for others.

IRENA new working group

With changes such as these it has never been more important for the renewables sector to understand these new dynamics. In the middle of 2020, as the pandemic was picking up momentum, the International Renewable Energy Agency (IRENA) announced the formation of a new working group³ with a two-year programme of research focusing on building understanding around the need to explicitly consider geopolitical risks. This group will be supported by a 'community of experts' for each workstream, including stakeholders from other international organisations, regional institutions, academia and the private sector as appropriate. This will be one to keep an eye on and for the sector to feed into as it develops.

Interconnected problems require integrated thinking

Many of us think geopolitics is limited to events in political hotspots and scattered terrorist incidents among Western nations, but it encompasses much more than just war and terrorism. In an increasingly connected world, many of the geopolitical drivers of risk are interrelated, and effects often cascade beyond local geographies or individual industry sectors.

A data breach will be reported across the world in a matter of seconds and public perceptions of a brand or an organisation can be severely damaged. Worse still, a breach of an electrical grid could shut down whole regions of a country, leading to widespread loss of revenue across a range of industries.

There isn't one answer to considering geopolitical risk – every company's exposure is different, and the real value is in uncovering different perspectives to ask useful questions that will build resilience and increase risk understanding.

Six lenses – an integrated approach to geopolitical drivers of risk

Analysing the geopolitical risks through 'six lenses' and their drivers is a framework approach that will help organisations begin to understand their exposure from a 360° perspective and the interconnected nature of the challenge in front of them.

Once an organisation identifies, understands and prioritises the risks it faces, it should be better prepared with response plans, including contingency and crisis management plans. Interconnected risks require integrated solutions that must be tailored and address insurable and non-insurable risks seamlessly.

¹ <https://www.atlanticcouncil.org/blogs/new-atlanticist/experts-react-von-der-leyen-outlines-vision-for-europes-post-covid-future/>

² <https://thehill.com/policy/energy-environment/527189-biden-selects-john-kerry-for-climate-czar>

³ <https://irena.org/events/2020/Jun/Members-Advance-IRENA-work-on-the-Geopolitics-of-the-Energy-Transformation>

Fig 1: The six lenses within the context of other geopolitical risks



Source: Willis Towers Watson

The six lenses that we deploy to examine geopolitical risk fall into the following categories:

- People risk.** Safety and security issues can pose clear risks to employees; however, there are also risks associated with workforce management, including recruitment and retention, which must be understood and managed.
- Investment and return.** Exposure across multiple geographic locales means geopolitical drivers of risk can be diverse. In order to protect assets and investments, this diversity of risk must be critically considered, and appropriate risk management tools then deployed.
- Business resilience and value chain.** When risks materialise as incidents and events, it is crucial to have effective business continuity practices in place. Response and recovery plans, which have been properly tested and exercised, can limit the impact of incidents and help companies quickly resume business operations.
- Climate and environmental.** The risks presented by climate and environmental factors, including storms and earthquakes, can be better understood with advanced analytics. By modelling environmental events and physical assets, risks to property and people can be quantified and managed.
- Cyber risk.** Digital ecosystems and connected devices fundamentally underpin the modern power sector. Having a comprehensive understanding of a company's cyber footprint is critical to managing this source of risk, including network outages and regulatory impositions.
- Reputational risk.** Impacts on brand and reputation can affect the ability of a company to attract customers, recruit talent or even to gain an operating licence in a country. Being attuned to the relationships between geopolitical drivers and reputation helps anticipate and mitigate these risks.



Using scenarios to bring the lenses to life

As our contribution to this Review, we wanted to set out three themed scenarios that bring our Geopolitical Risk lenses to life, and which could be used to construct bespoke scenarios for clients. Organisations need to identify and understand their geopolitical risks and the connections between them in order to mitigate the risks and seize new opportunities.

These scenarios provide stress tests for renewable energy companies to stretch their thinking, and to do this effectively they will need to:

- **Understand:** They need to understand their new environment through relevant intelligence, assessment and quantification to comprehend the drivers and impacts on their business. Boards must look beyond the most obvious, and work with stakeholders across their business to identify interconnected risks. They need to examine everything from complex supply chains through to human capital policies and reputational damage to help protect the company and fulfil its duty of care.
- **Identify and assess:** They should employ all the tools available to enable them to collate and interpret the information and then deploy subjective (depth of experience, industry insight, research and analysis) and objective (using analytical tools) assessment to inform the organisations' decision making.
- **Prevent and protect:** As the geopolitical landscape changes, so must the way in which risk leaders protect their businesses. A thorough understanding of the interlinked geopolitical risk drivers and their impacts provides a strong foundation for prevention and protection against them.

Scenario planning

Scenario planning uses alternative narratives about the future, many with improbable and radical twists, to develop future-proof strategies. They are also becoming increasingly interesting to investors and financial institutions as a way of surfacing information around companies' understanding and management of climate risks.

These can range from fully quantified scenarios, that harness data from digital twins to provide a live view of risks, to qualitative storylines that require no technical experience to decipher and correspond to how people perceive and respond to risk.⁴ Both approaches are valid and should be considered as different tools in the box to challenge and support thinking.

⁴ The summer reader's guide to scenario planning <https://www.willistowerswatson.com/en-GB/Insights/2019/08/the-summer-readers-guide-to-scenario-planning>

As we have seen during 2020, there is value in considering extreme versions of your risk list and scenarios with secondary impacts to stress test your thinking and processes. The unfamiliar is not the improbable; the real value is in identifying the stress points and then considering why these will cause issues, so that any future investment, strategic decision-making or operational changes can enhance overall resilience.

Scenario One – the systemic risk of solar storms: climate and environment, business resilience, investment and return lenses

While the distribution and use of renewable energy is often designed to have a low risk of interacting with many hazards - and we've seen the resilience in the face of this pandemic - there are other systemic risks that may be considered extreme but still plausible. One serious threat to the reliability of electric power is geomagnetic storms – severe disturbances caused by solar storms in the upper layers of our atmosphere that induce currents in long conductors on the Earth's surface, such as power lines.

Electric grid risks

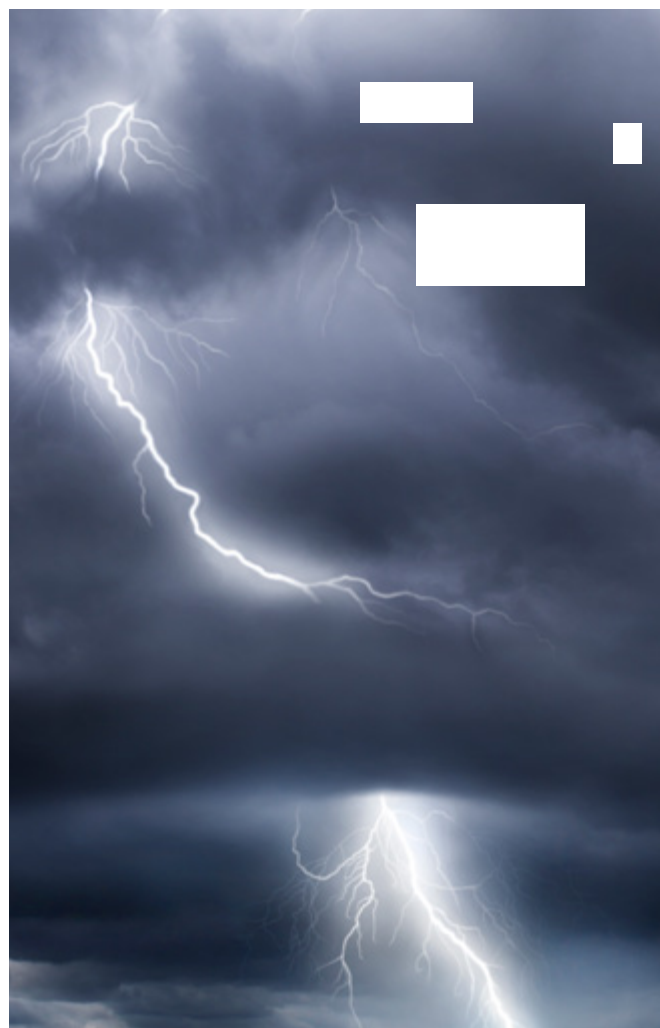
Globally, risks to electric grids are greatest at the higher latitudes since the largest currents are 'funnelled' towards the poles. Depending on the geology of a given region, the currents a geomagnetic storm induces in the power lines can destabilize the power grid's operation and can damage or even destroy transformers. In 1989 the transmission system for Canada's Hydro Quebec electricity provider collapsed during a solar storm, leaving millions of people without power for nine hours or more⁵. In 2003 similar storm triggered blackouts in the city of Malmö, Sweden, and may have caused transformer failures in South Africa⁶.

A case of not if but when...

The worldwide geophysical community has been warning against this risk for years - much like pandemics, it is a case of not if but when. Within the US, new research by the US Geological Survey (USGS) points to Minnesota, North Dakota, and Wisconsin needing to take extra precautions against this kind of solar "weather"⁷. The study is two thirds through mapping the country, so companies with operations in the south and southwestern regions should look for the final results during 2022. While the cycles of activity happen over a longer timescale, and it can be tempting to focus on more immediately apparent risks,

investments in new technology and business continuity plans should incorporate this event into planning so there are operational plans for how to respond. Cyber planning often uses the complete compromise of equipment and may form a useful basis for integrated thinking.

From an operational perspective, a new power transformer could be replaced in two months, if there's a spare one nearby – but it is more likely to take anywhere up to two years to deliver⁸. Investing time in preparing a business continuity and crisis communication plan is imperative; while it may never be needed, it could save a company's reputation and protect employees from potential harm. As we've seen this year, with countries and even some states competing for the same resources, having a plan is essential.



⁵ <https://www.nationalgeographic.com/news/energy/2011/08/110803-solar-flare-storm-electricity-grid-risk/>

⁶ <https://www.nationalgeographic.com/news/energy/2011/08/110803-solar-flare-storm-electricity-grid-risk/>

⁷ <https://spectrum.ieee.org/energywise/energy/the-smarter-grid/us-regions-most-vulnerable-solar-storms>

⁸ <https://www.nationalgeographic.com/news/energy/2011/08/110803-solar-flare-storm-electricity-grid-risk/>

Scenario Two – proving sustainability: reputation, investment and return lenses

Decommissioning and recycling of obsolete technology

Despite calls by many for a green recovery from COVID-19, there is also a risk that operational survival and other risks take priority. One area that needs to be promoted up the agenda is the decommissioning and recycling of obsolete technology. Calls to build forwards and focus on electrification could lead to further investments in research and development to accelerate energy efficiency that sees more iterations in the field. New processes and technology will need to be developed to recover valuable materials and prevent environmental hazards - solar panels contain toxic materials such as lead that can leach out as they break down⁹.

Resource challenge

This will also create a resource challenge with geopolitical connotations. Owning a key component, or 'node' in a supply chain gives a company or nation leverage over the entire network¹⁰. There are a small number of dedicated recycling firms providing this service but, with so many different types of renewable energy on distinct technology pathways, meeting this challenge will need both supportive policies and regulations and for companies to factor this into their strategic planning. In the European Union, producers are required to ensure their solar panels are recycled to defined standards¹¹. In Japan, India, and Australia¹², recycling requirements are under development, and in the US, only Washington has a state law¹³.

Proactive climate action and partnerships

Proactive climate action and partnerships to meet these challenges will put organisations at a competitive advantage, given that all listed companies and large asset owners in the UK are expected to make disclosures using the Task Force Climate-related Financial Disclosures (TCFD) guidelines by 2022. Working to evidence the ESG elements outlined in the two climate risk articles in this Review will be essential. The pandemic crisis has also shown that an organisation's corporate brand is very important for its performance and a clear climate agenda is increasingly a lever for corporate reputation.

Scenario Three - designing for safety and efficiency: reputation, cyber and business resilience lenses

People-induced risks to your business exist in every geography you operate in. As employees began to work from home in compliance with the lockdowns around the world, this exposed their organisations to increased cyber risks and breaches – because data normally accessed in the secured office environment is now taken into homes. Organisations will need to improve their cyber and business resilience to continue to operate in this way and maintain their reputations.

New working environment impacts

There are also far reaching impacts that may emerge in this new environment. Whether your employees are working remotely, or they're back in the workplace taking new safety measures and precautions, the changes, disruption and isolation they're facing have the potential to increase their stress levels. Social distancing is essential to protect our physical wellbeing, but it could potentially increase the risks around emotional, financial and social wellbeing¹⁴.

A new wave of Euroscepticism?

In Europe, the COVID-19 pandemic threatens to spark a new wave of Euroscepticism and populist politics. For instance, in Italy, the first epicentre of the pandemic in Europe, a poll found that 88% of its people felt the EU had failed them – which could provide fertile ground for anti-Europe campaigns, radicalisation of malicious actors, and internal employee dissatisfaction. Against industry-wide challenges of talent shortages and recertification needs after national lockdowns, there is a complex web of people-related issues to navigate, but which can be explored through risk culture surveys and managed through talent strategies to reduce risks. Risk managers should be asking themselves whether they are confident that the far-reaching impacts of a pandemic on their people and business are understood.

“Organisations will need to improve their cyber and business resilience to continue to operate in this way and maintain their reputations.”

⁹ https://www.researchgate.net/publication/342671383_Metal_dissolution_from_end-of-life_solar_photovoltaics_in_real_landfill_leachate_versus_synthetic_solutions_One-year_study

¹⁰ <https://www.nature.com/articles/d41586-020-02499-8>

¹¹ https://ec.europa.eu/environment/waste/weee/index_en.htm

¹² <https://www.wired.com/story/solar-panels-are-starting-to-die-leaving-behind-toxic-trash/>

¹³ <https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Solar-panels>

¹⁴ <https://www.willistowerswatson.com/en-GB/Insights/2020/08/lets-talk-wellness-managing-employee-mental-health-in-a-pandemic>

Conclusion: building forwards

If organisations can pre-empt the changes in the way businesses and the economy will operate in the ensuing six to 12 months, they can move from reacting into strategic planning; this will help to gain a competitive advantage in the new normal and improve resilience. This is essential because all the other risks are still in play – cyber-attacks, floods, earthquakes, terrorism incidents could, of course, all still occur.

This structured, evidence-based approach provides an effective framework to assess, quantify and mitigate geopolitical risks in an integrated fashion; it also allows the development of Red Teaming initiatives that use an adversarial approach to challenge or test the adopted plans and thinking, and risk register stress testing. The ability to use Red Teaming to get c-suite and operational risk managers around the table with external voices can bring about intra- and inter-organisational insights that shines a light on the human elements of decision making and operations.

It isn't all negatives – the COVID-19 experience may bring opportunities, such as the opportunity to evaluate different and more cost-effective ways of working, build a more resilient society, larger home markets and establish more reliable supply chains.

Whatever the size of your organisation, geopolitical circumstances demand a high degree of engagement and understanding. Risk professionals need to be able to identify and understand geopolitical risks, their drivers and the connections between them, so they can mitigate the risks and seize new opportunities. This is the approach that our geopolitical team takes, and it reduces the possibility of blind spots.

Different functions within businesses need to look at these connected risks collectively and manage them using an integrated approach. They need credible and up-to-date information and relevant risk insight and analytics to see the potential impacts to their business. In short: risk leaders need to speak to their CEOs and boards about geopolitical risk.



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Hydrogen: an option to meet climate change goals?

Introduction: what do we want to use hydrogen for?

As the world adjusts to the “new” normal that the pandemic has thrust on us, there is still the growing challenge of climate change and the questions of how both industry and the general public meet the challenges of a transition to a low-carbon future.

Even with the significant damage the pandemic has caused to the global economy, energy demand is still expected to rise over the next 30 years, as the world population increases, along with global GDP and living standards.

So world governments are faced with a dual challenge: meeting the increased demand for energy and at the same time charting a credible decarbonisation path to a low-carbon global economy.

Renewables increase their share of the global energy mix

A review of the total primary energy demand illustrates the current state of the global energy mix and how it is anticipated to change in the years to come. An analysis of 2020's 3IEA's World Energy Outlook¹ and OPEC's World Oil Outlook² shows a significant increase in overall renewables (e.g. Solar, Wind, Hydro) from now through to 2030/45. However, it also suggests that oil, gas and coal will continue to play a significant role for the immediate future.

These views of the future represent little in the way of new regulations issued by national governments to influence decision-making in the energy sector and will not result in achieving the Paris Agreement emission and temperature reductions.

¹ <https://www.iea.org/reports/world-energy-outlook-2020>

² <https://wo.opec.org/pdf-download/>

Fig 1: The global energy mix, 2019-45

Energy Type	International Energy Agency 2020 ^(a) (%)		World Oil Outlook 2020 ^(b) (%)		
	2019	2030	2019	2030	2045
Coal	26	22	32	30	28
Oil	31	30	27	23	20
Gas	23	24	23	24	25
Nuclear	5	5	5.0	5	6
Renewables ^(c)	10	15	5	8	12
Biomass	4	4	9	10	10
Total Change		9.4		11.3	25.0

(a) International Energy Agency (IEA) World Energy Outlook 2020 . Based on their STEP scenario.

(b) World Oil Outlook 2020, OPEC

(c) Renewables includes: Solar, Wind, Hydro

It is difficult to postulate whether and what new regulations could come into being. However, many organisations, including the IEA, have made forecasts³ on what needs to occur in terms of changes in the global economy over the next 20 years or so. This projection suggests a large swing to renewables moving up to a 29% share of the primary energy demand, over the same period as above.

Additional to this fuel mix shift, there is also a general move where renewables will provide 50-60% of the electrical power generation pool, with solar being the most prominent of the renewable types.

From a range of organisations who are analysing the future global energy landscape, there is broad agreement that renewables will become more prominent, which is probably not a great surprise. However, what maybe more of a surprise is the continued significant role that oil and coal may play through this period.

For the global economy to move forward and meet its climate change objectives, other options need to be considered for inclusion into a decarbonisation pathway to a low-carbon economy, as renewables alone cannot meet the demand.

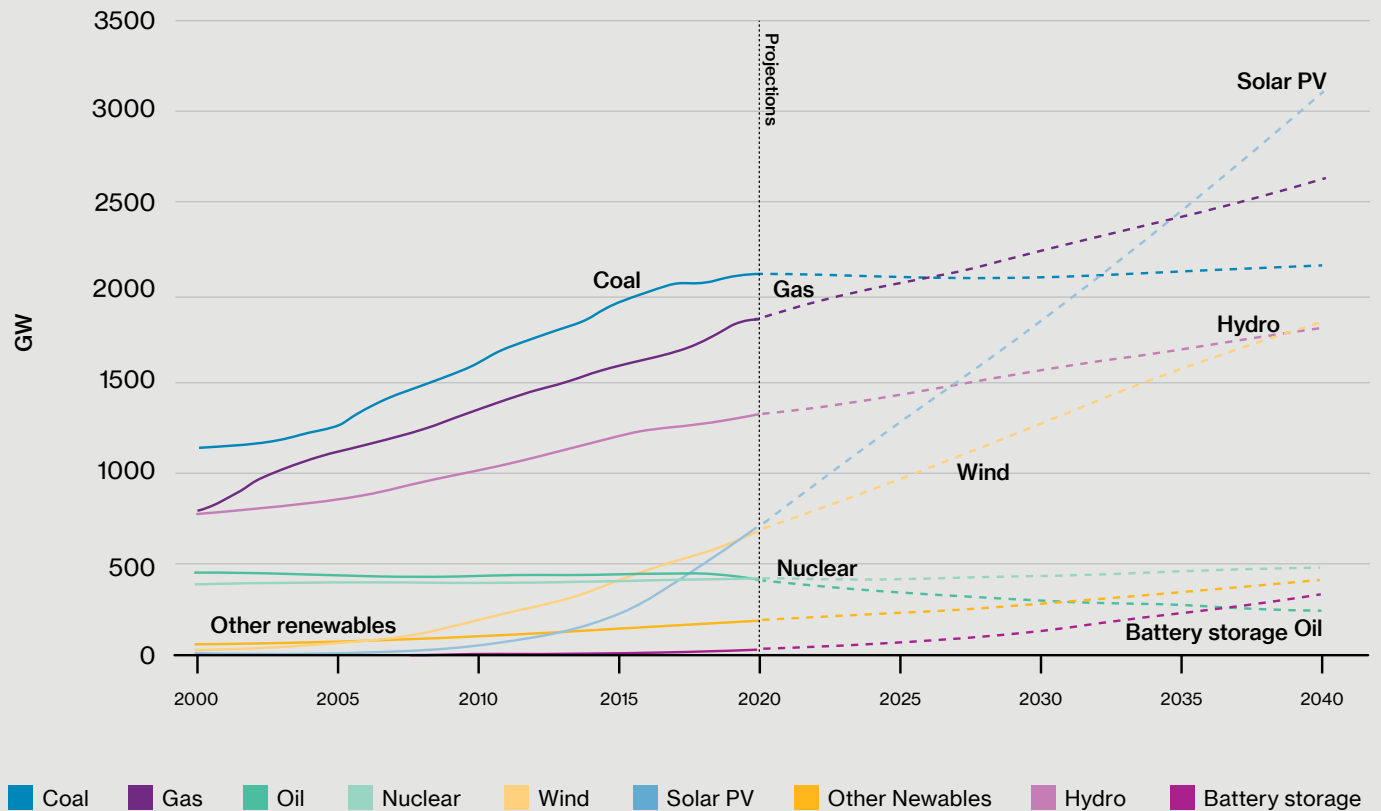
There are many possible options but one that hold real promise - albeit currently clouded in uncertainty - is hydrogen.

Hydrogen overview

Hydrogen has been considered many times over the years as a fuel source without it gaining any traction. This is somewhat puzzling, as hydrogen can play multiple roles in a de-carbonisation pathway, providing a welcome degree of flexibility. Furthermore, hydrogen has been used in industry for many years; as such, the requirements and risks around processing, transporting and storing activities are well understood. The many ways that hydrogen can potentially be employed in the drive to a low-carbon

³ IEA Sustainable Development Scenario (SDS) - where a surge in clean energy policies and investment put the energy system on track to achieve sustainable energy objectives in full, including the Paris Agreement, energy access and air quality goals.

Fig 2: Installed power generation capacity by source in the Stated Policies Scenario, 2000-2040



Source: IEA (<https://www.iea.org/data-and-statistics/charts/installed-power-generation-capacity-by-source-in-the-stated-policies-scenario-2000-2040>)

economy are extensive, but this may be part of the reason why uncertainty still exists on where to invest.

As we can see from Figure 5 to the later in this article, there are many ways to produce and consume hydrogen, but all manufacturing approaches are not considered equal when viewed from a climate change perspective. This is expressed in the “colour of hydrogen” and is an important factor when considering the role that hydrogen may play in the journey to a low-carbon environment.

Green Hydrogen

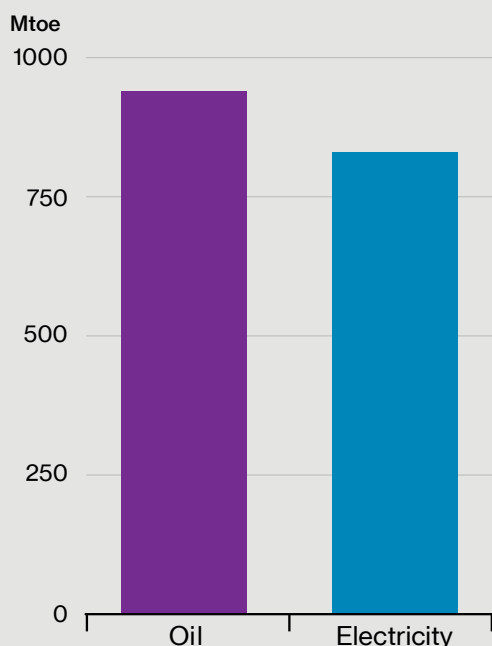
The production of hydrogen using electrical power generated from renewables – Green Hydrogen – is the ultimate goal for many who are active in the decarbonisation arena, as it holds great attraction as a means of displacing many fossil fuels from the transport sector.

However, focusing on the near-term transition period, this doesn’t seem to be a prudent course of action. Given the direct impact that renewables electricity can have on powering electric cars, thereby displacing the use of traditional internal combustion engine cars, it would seem wasteful to convert this electricity to hydrogen, transport it to filling stations and then, through hydrogen fuel cells, convert it back into electricity.

Furthermore, due to the relatively small quantities that may initially be available and where it will be generated, perhaps a more modest use of green hydrogen should be considered in the years ahead. For example, more prudent applications in the short term could be in the following areas:

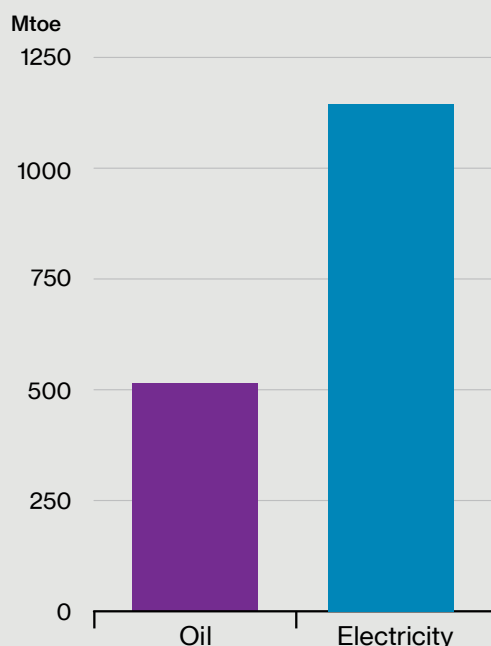
- **Increased renewables efficiency:** Green Hydrogen could be produced from existing (and future) renewable

Fig 3: Change in oil and electricity consumption, 2000-18



Source: <https://www.iea.org/reports/world-energy-outlook-2019>

Fig 4: Changes in oil and electricity consumption in the Stated Policies Scenario, 2018-40



Source: <https://www.iea.org/reports/world-energy-outlook-2019>

operations when supply and demand are out of alignment. When the wind blows and the sun shines but there isn't the demand, this excess electrical power could be used to produce hydrogen from current alkaline electrolyser (most scalable technology at present). Produced hydrogen could be stored in tanks or caverns and then either be transported to end user operations or injected into natural gas grids. This latter option appears to be available now as industry analyses indicate:

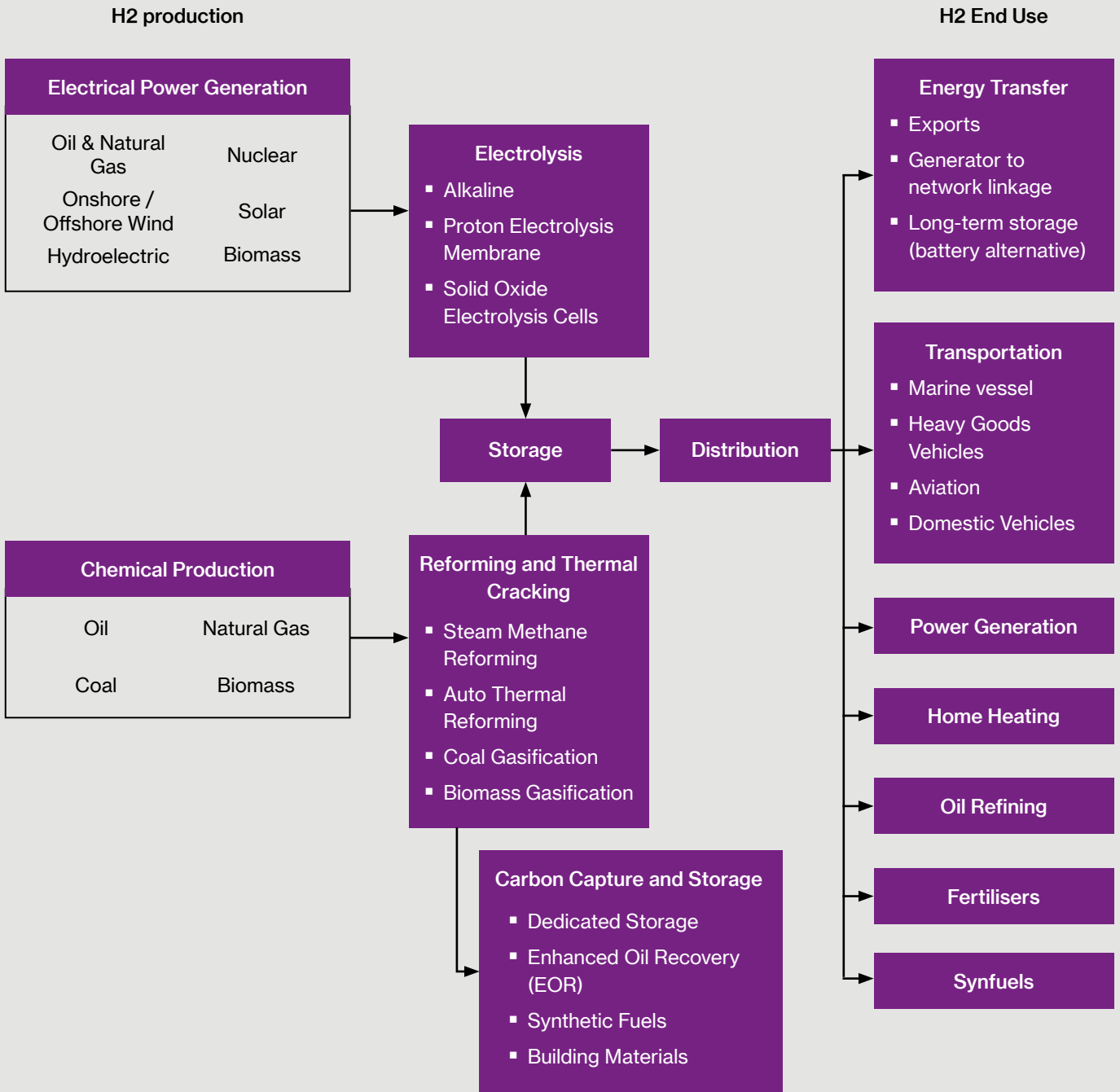
- **Industrial:** gas turbine manufacturers (Siemens and GE) have stated that their respective fleets can handle up to 10% of hydrogen in feeds streams without any modifications⁴. Also, the gas distribution system is also able to accommodate this concentration level.
- **Domestic:** residential natural gas systems should be able to handle up to 20% without any modifications⁵.

- **Battery alternative energy storage:** Electrical battery stores are being installed at various renewable locations to handle the supply/demand phasing. However, over the past few years installations have been plagued with losses, which has hampered their uptake. Hydrogen could be employed as an alternative.
- **Linking remote locations:** As the growth of the renewables sector intensifies, the location of facilities may become less optimal and could result in difficulty connecting these new operations to the existing transmission and distribution networks. Hydrogen could be used to link remote renewables generating assets to distribution networks where the cost of linking the generating assets to the existing network is uneconomical.

⁴ Siemens Energy Insurance Meeting – Nov 17-19, 2020., <https://www.siemens-energy.com>, <https://www.ge.com/power/gas/>, <https://www.iea.org/reports/hydrogen>

⁵ <https://www.iea.org/reports/hydrogen>

Fig 5: The hydrogen value chain



Source: Willis Towers Watson

Fig 6: Hydrogen colours and production methods

Increasing Climate Change Credentials	Hydrogen Colour	Production Method
	Brown	- From coal gasification
	Grey	- From natural gas reforming
	Turquoise	- From thermal cracking of natural gas to hydrogen and solid carbon
	Blue	- From natural gas reforming with carbon capture and storage
	Green	- From electrolysis using renewable electrical power sources

Source: Willis Towers Watson

There are other possible uses for hydrogen, but these applicates may be better serviced by Blue Hydrogen.

Blue Hydrogen

Blue Hydrogen is created from fossil sources, where the carbon emissions are captured and stored. The potential advantage of blue hydrogen is that it is can be developed at scale and can either be produced from new purpose-built facilities or from current grey (natural gas) and brown (coal) hydrogen production assets. Both options offer significant carbon reduction possibilities, although not as much as green hydrogen; for example, blue hydrogen is reported to be up to 90% efficient at carbon reduction⁶.

Due to the production levels that can be achieved, there are a large range of benefits by adopting blue hydrogen:

- **Heavy Good Vehicles:** As significant quantities of blue hydrogen can be produced; economies of scale could be employed to switch HGV vehicles away from diesel to hydrogen fuel cells. High production levels are important as it offers an attractive investment opportunity to build the necessary infrastructure to accommodate such a change. Furthermore, electrification of HGC vehicles is hampered by battery size/weight issue and the need to travel long distances. As such, blue hydrogen could offer an alternative option to electric motors enabling the decarbonisation of this part of the economy.

- **Marine vessels:** much the same rationale as HGV.
- **Augment power generation:** Major gas turbine manufacturers are well into their development process for manufacturing 100% hydrogen feed machines. This development would allow for companies to generate blue hydrogen at purpose-built facilities and transport it to power stations, or power stations themselves could install hydrogen production facilities on their site utilising their natural gas feed.
- **Domestic gas supply:** As for green hydrogen, blue hydrogen could be injected into the domestic network.
- **Rare metal hedge:** As the electrification of the domestic car market intensifies, there will be an increasing demand for rare earth metals such as Lithium, Nickel, Cobalt and Manganese. Their price and availability will increase and become strained, to a point where there may even be a potential shortage. Hydrogen could provide an alternative, reducing the reliance on these metals.

Additional to this point, as many of these metals are only found in specific countries, it is possible that their supply could well be used in a geopolitical manner. So, hydrogen would also offer a pathway to energy security which shouldn't be overlooked.

⁶ [ioconsulting.com/what-colour-is-your-hydrogen/](https://www.ioconsulting.com/what-colour-is-your-hydrogen/), <https://about/bnef.com/blog/liebreich-separating-hype-from-hydrogen-part-one-the-supply-side/>



All these benefits are based on Carbon Capture Storage (CCS/CCUS) technology being available and commercially viable. There are currently around 20+ projects being developed; however, governments and industry need to work together to clarify the regulator landscape and accelerate the deployment. Not only does CCS unlock Blue Hydrogen's potential but may well assist other industry sectors reduce their carbon footprint, so the potential benefits are significant.

Conclusion: Blue Hydrogen should be embraced

If the global community wish to meet key climate change goals such the Paris Agreement, then hydrogen development and utilisation needs to be embraced and fast-tracked. As part of this, we shouldn't shy away from including Blue Hydrogen into the energy mix (which includes deploying CCS/CCUS options), as it can provide scale and enable increased investment in infrastructure.

Concerns that are raised in some quarters that accepting Blue Hydrogen into the decarbonisation pathway could lead to stagnation, which could eventually move on to Green Hydrogen are, I believe, unfounded at this stage. Adopting Blue Hydrogen (and CCUS) would result in a rapid reduction in CO₂ emission levels; that in itself would create quite an impact, in that these levels would not be reached so fast if they had not been adopted and embraced. Given the potential benefits, it seems an acceptable leap of faith for the world to to make, in order to build much needed momentum towards a low-carbon economy.



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"If the global community wish to meet key climate change goals such the Paris Agreement, then hydrogen development and utilisation needs to be embraced and fast-tracked."



The future of Offshore Wind: an underwriter's view

Introduction: from 3MW to 3GW

When I first was introduced to the world of Offshore Wind, the general turbine had an output of around 3 MWs and there was some excitement surrounding the latest turbine that was going into factory production, which had an output slightly greater than 5 MW - this was a mere fifteen years ago!

Today we are seeing the start of the Dogger Bank project, with turbines having an output of 13 MW and whole total project having an output capacity of 3.6 GW, with all the modern infrastructure to manage this. These numbers are simply staggering and represent a massive and impressive engineering evolution - in a very short period of time.

Where will the improvements stop? What size can a turbine/transformer/cable be? What different methods of construction will be needed? What size vessels? I have asked these questions on several occasions over the years, but time has invariably proved the answer wrong.

Insurer challenges

From an insurer view these changes can present challenges; historically, the industry has only provided limited coverage for prototypical projects and this is accepted by the wind industry. However, an insurer's nerves can be further unsettled when a turbine enters the first phases of production and construction; this is not only limited to changes in the output of the turbine but any major component of the turbine, for example foundation varieties (floating).

Cable laying also needs a special mention; it is by no means an easy task for the contractor, but it is the major contributor to insured losses in the construction phase of a project. The projection of this trend does not seem to show any short-term improvement and is an area that needs urgent attention from the industry. The Marine Warranty Surveyor (MWS) is the only protection for the Owner and insurer alike for these circumstances; in too many instances, the MWS is undervalued or worse, disregarded. There is room for improvement here from the contractor quarters.

Currently the insurance market is in a "hard market" that has been brought on by several elements but has mainly been driven by a continued overly competitive environment that could not sustain itself in certain areas of the industry, one of them among many being the Offshore Wind sector. So where does this leave the reliance on insurance in the sector, and how can Offshore Wind farm owners obtain more equitable terms and conditions?

Transparency

Insurance underwriters will evaluate the risk based on several factors. I have already mentioned the evolution of technology, but there many more: experience of contractors, policy coverage, sea depth, transformer technology, fire detection and prevention, cable depth and length, Marine Warranty Surveyor, foundation, supply chain logistics, geographic location etc., to name but a few. However, there is also a more intangible element; transparency is paramount to any underwriter's decision process.

Responses to insurer questions

At Codan, we enjoy a close tri-partite relationship with most of our brokers and clients. This starts with the quality of the insurance tender document; the less we learn from it, the more insecurity we feel about the success of the project. This is then followed up by quality presentations to the underwriting fraternity from the owner and broker – but most important to us are the quick and accurate responses to the questions from underwriters and insurance engineers that attend the presentation. Slow or vague answers will be viewed as a red flag, with the underwriter taking a more conservative approach than may be warranted.

Contractual obligations to contractors or sub-contractors

In general, we find the tender process professional; again, this is something that has gone through an evolutionary improvement in recent years. However, we now come to the most important issue regarding transparency – a claim. On some occasions, the insurance market still experiences elements of transparency being challenged in the event of a claim; but rest assured, by no means am I suggesting any dishonesty! This is usually because of contractual obligations to contractors or sub-contractors; it is unfortunate that this can quite often lead to frustration for both parties.

This should be a focus going forward; if a lead insurer is sufficiently skilled at what they do, the action will be proactive, if they can get involved before money has been spent and have an involvement in the repair/settlement, it creates more bankability for the project and a much faster claims handling process. This has the potential to reduce claims costs; of course, reducing claims costs will logically lead to lower premiums.

Insurance workshops

Another tool that gives more understanding to insurers are workshops, where all parties can offer qualified opinions/concerns and in turn gain technical insight into a project. Typical subjects for operational risks would include business continuity, spare parts and contingency planning, including all the “what if?” type questions.

Data

From an insurance industry perspective, the next improvement would be one of data. Being relatively young, the Offshore Wind industry has presented a challenge to an insurance industry which relies heavily on data for pricing and risk evaluation; however, with maturity comes more empirical understanding. Codan has been notified with in excess of 1100 offshore wind claims; these can now be broken down by component, contractor, cause, location, vessel etc. In addition, there are claims patterns, for example average notification and settlement times, including movements in that period. It is not the insurer’s intention to utilize this data simply in the actual underwriting process but also to interact with the brokers and owners to assist in risk management and risk “heat mapping”.

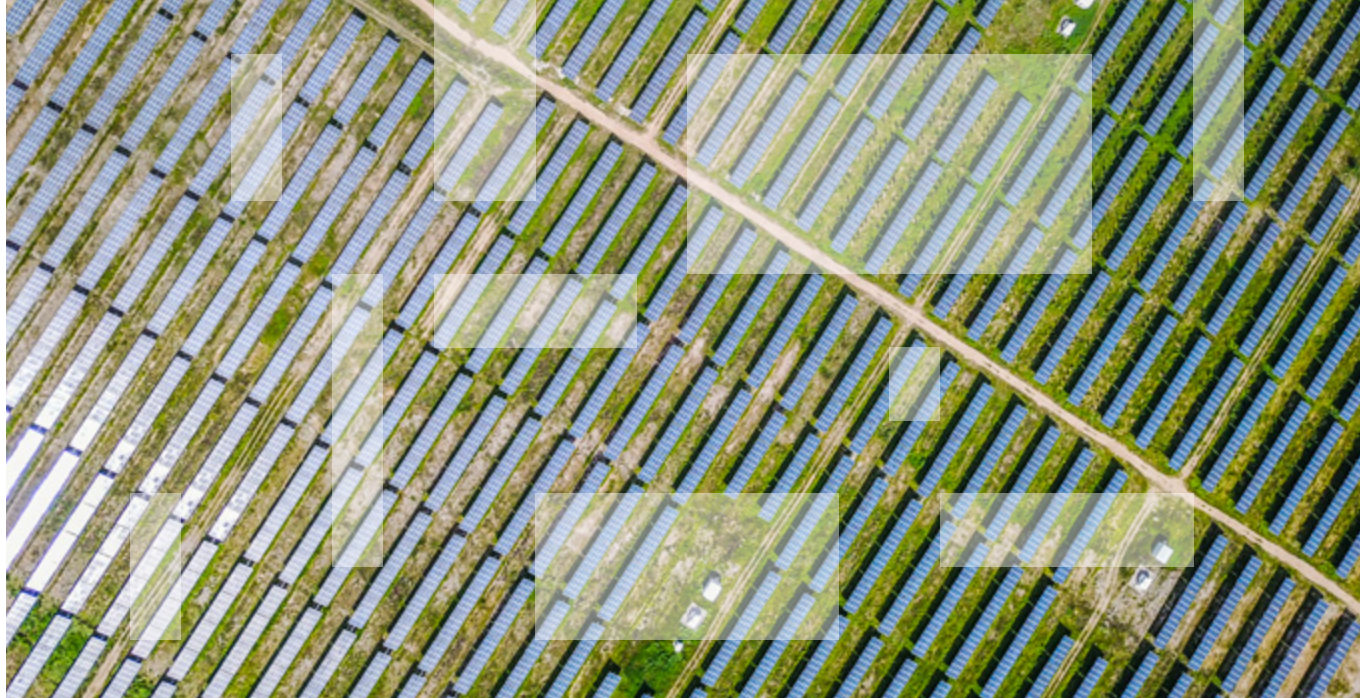
Conclusion: toward a more interactive future

The end result of this process should mean a more secure project for the owner and insurer/s and a growing understanding of the frequency and severity of losses as the years progress. Being involved in the Offshore Wind industry is a highlight of my insurance career, it’s an energetic, motivating area to work in and ever changing. To the industry – keep up the great work!



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The advent of Green Finance: here to stay!

Introduction

A watershed for the global economy, including the finance sector, occurred in December 2015 with the signing of the Paris Agreement on Climate Change. Article 2¹ committed the signatories to strengthening the global response to the threat of climate change including the following actions:

- Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change.
- Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production.
- Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

Combined with the seventeen Sustainable Development Goals² adopted by all UN Member States in 2015, a framework has been set for a worldwide commitment to achieving a low carbon future with a shift towards a less carbon intensive and more climate-resilient economy. This has had a significant impact on the financing of infrastructure projects around the world, in terms of the types of projects financed, the development of green finance and the emergence of specialist green banks in response to this agenda.

Green projects

It has been estimated that up to US\$90 trillion will be needed between 2015 and 2030 to finance the global sustainable development and climate objectives³. Investors and financiers are increasingly focussing on projects in the following sectors which will help to achieve this:

- Renewable Energy
- Energy Efficiency
- Clean Transportation
- Coal Plant Retirement
- Waste Management
- Bioenergy
- Climate Adaptation and Resilience
- Agriculture and Land Use

One of the most successful results of this has been the rapid expansion of renewable energy projects. Investment into new renewable power projects has grown from less than US\$50 billion per year in 2004, to about US\$300 billion (94% in wind and solar) per year in recent years⁴, exceeding investments into new fossil fuel power by a factor of three in 2018. Yet despite this, renewable investments remain below their potential; investment in the sector will need to be scaled up to achieve the current climate and development targets. It has been estimated that annual investment in renewable energy power alone will need to double until 2050 to meet these goals.

¹ https://unfccc.int/sites/default/files/english_paris_agreement.pdf

² <https://www.un.org/sustainabledevelopment/>

³ The Global Commission on the Economy and Climate (2014) The New Climate Economy Report: Better Growth Better Climate https://newclimateeconomy.report/2016/wp-content/uploads/sites/2/2014/08/NCE-Global-Report_web.pdf

⁴ <https://www.fs-unep-centre.org/global-trends-in-renewable-energy-investment-2020/>

For example, the United Kingdom government has recently released plans to power every home in the country with offshore wind by 2030, which would require almost £50 billion in investment and the equivalent of one turbine to be installed every weekday for the whole of the next decade⁵.

At the same time as green project financing has increased, there has been active moves by global financial institutions to exit projects which are dependent on carbon fuels. The World Bank has stopped financing new coal projects; this was followed in 2019 by 100 financial institutions (including 40% of the top 40 global banks and 20 globally significant insurers) divesting from thermal coal projects⁶. This has been followed up in September 2020 with the announcement by the International Finance Corporation (“IFC”, the private sector arm of the World Bank Group) that they will no longer make equity investments in financial institutions that do not have a plan to phase out support for coal, as a means to encourage commercial banks in Africa and Asia to reduce their support for coal projects⁷. The World Bank has also announced that it will not be financing upstream oil and gas projects after 2019⁸.

Green Finance

Although there is no single, agreed definition for Green Finance, the term is increasingly being used worldwide. The Organisation for Economic Co-operation and Development (OECD) defines it as finance for achieving economic growth while reducing pollution and greenhouse gas emissions, minimising waste and improving efficiency in the use of natural resources. The IFC defines it as the financing of investments that provide environmental benefits in the broader context of sustainable development. The definitions may vary but there are characteristics that are shared:

- The aim of the finance is to allocate capital towards sustainable, climate resilient purpose.
- A wider scope of environmental issues needs to be considered, with a focus on environmental benefits or reducing harm to the environment.
- The project risks will be considered from an environmental standpoint. This will include the physical risks, the risks associated with transition towards a carbon neutral Position (including stranded assets).
- Taking account of sustainable development and/or economic growth.

In most circumstances, the finance products utilised are the same, regardless of the type of project being financed. The difference here is that the proceeds of the finance are directed at a green project, while a further major difference is in the way that the projects are assessed and managed. Financiers have adopted defined principles to ensure that projects are developed in a socially responsible way, reflecting good environmental management practices. A good example of this are the Equator Principles⁹, IFC’s benchmark performance standards which have been adopted by over 90 banks and financial institutions (including 32 OECD export credit agencies). Projects seeking to raise finance will need to be aware of the principles that their financier has adopted and make allowance for the environmental focus of the assessment and management processes that will be required. This is a particularly important consideration when multilateral development banks are involved, as they play a key role in mobilizing and scaling up finance for green projects.

However, there are now specific Green Finance products which have been developed. The best known of these are green bonds (historically referred to as climate bonds). These are fixed income instruments, specifically designed to finance climate-related or environmental projects. They usually benefit from tax incentives to enhance their attractiveness to investors. The green bond market began over a decade ago with the European Investment Bank’s first issuance of a Climate Awareness Bond in 2007. Since then the market has grown significantly with issuances in 2019 of US\$ 270 billion.¹⁰



⁵ <https://www.theguardian.com/environment/2020/oct/06/powering-all-uk-homes-via-offshore-wind-by-2030-would-cost-50bn>

⁶ http://ieefa.org/wp-content/uploads/2019/02/IEEFA-Report_100-and-counting_Coal-Exit_Feb-2019.pdf

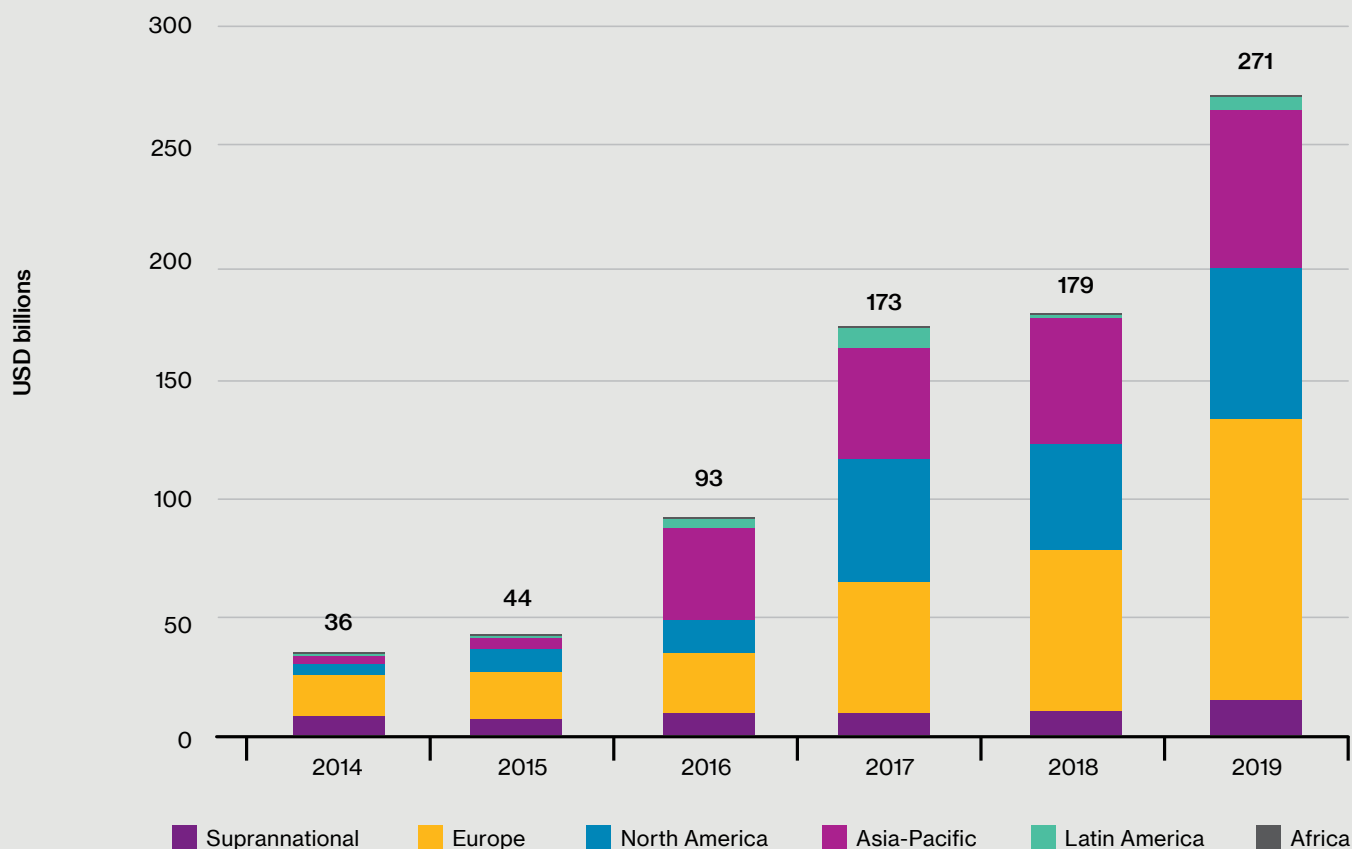
⁷ <https://www.reuters.com/article/climate-change-coal-idUSKCN26F06Y>

⁸ <https://www.worldbank.org/en/news/press-release/2017/12/12/world-bank-group-announcements-at-one-planet-summit>

⁹ <https://equator-principles.com/wp-content/uploads/2020/05/The-Equator-Principles-July-2020-v2.pdf>

¹⁰ <https://irena.org/newsroom/articles/2020/Feb/Financing-the-Global-Energy-Transformation-Green-Bonds#:~:text=Renewable%20energy%20finance%3A%20Green%20bonds,energy%20and%20other%20green%20assets.&text=Like%20conventional%20bonds%2C%20green%20bonds,specific%20projects%20or%20ongoing%20business>

Fig 1: Annual green bond issuances, per region, 2014-2019, USD billion



Source: IRENA analysis, based on data from the Environmental Finance Bond database (subscription required)

The cumulative issuance of green bonds are below US\$1 trillion; this needs to be measured against the total global bond market which is valued at around US\$ 100 trillion, accounting for less than 1% of cumulative global bond issuances. These bonds alone will not provide enough finance to achieve a global shift to the Paris Agreement goals.

Other examples of green finance products are green tagged loans, green investment funds and climate risk insurance. Green tagging is a systematic process which banks the environmental attributes of the loans and the underlying assets to allow easier access to the green bond market and better tracking of green loan performance. Green investment funds are mutual funds or investment vehicles which only invest in environmentally responsible companies. Climate risk insurances are designed to mitigate the financial consequences and other risks associated with climate change.

Green banks

As the shift to a sustainable future has accelerated, many countries have set up or promoted the establishment of green banks to increase the level of low carbon, climate resilient and sustainable development. These banks have usually been capitalised through state investment; a recent report identified nearly 30 existing green banks with US\$24.5 billion capital invested in green projects attracting US\$45.4 billion of private co investment¹¹.

Public Green Banks and other dedicated green investment entities have been established at a national level in Australia, Japan, Malaysia, Switzerland & United Kingdom, at a state and county level in the United States (California, Connecticut, Hawaii, New Jersey, New York, Rhode Island and Montgomery County, Maryland) and at city level in the United Arab Emirates (Masdar).

¹¹ <https://www.greenfinanceinstitute.co.uk/wp-content/uploads/2020/11/state-green-banks-2020-report.pdf>

With specific mandates to invest in low carbon, climate resilient projects, these banks' primary functions are to encourage co-financing for green projects, build pipelines of financeable projects, address the risks associated with these projects and provide green experts with local market knowledge.

Conclusion: Green Finance is here to stay!

The shift needed to achieve the Paris Agreement goals is driving significant changes in the types of projects being financed, the way that the financing is approached and the emergence of new finance providers and tools. These changes have resulted in new risk exposures and increased the complexity of the technologies employed. This means that financiers have an increased focus on the assessment, management and transfer of the risks arising from green projects and will seek to ensure that any collateral they have is fully protected. Companies seeking to raise finance need to be aware of their financiers' concern and to allow for the costs and time to allow for full technical, legal and insurance assessment of the project risks.

Given the size of the investment that will be needed, together with the rapid development of new technologies to manage and adapt to climate change, the availability and importance of Green Finance is only likely to increase in years to come.



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“This means that financiers have an increased focus on the assessment, management and transfer of the risks arising from green projects and will seek to ensure that any collateral they have is fully protected.”





Southeast Asia: the rise in renewable energy

Introduction: ASEAN energy consumption continues to rise

With over 670 million people, growing affluence, industrialisation and urbanisation, Southeast Asia's energy demands continue to rise, by an estimated 60% by 2040.

The 4% annual growth rate of energy consumption in Southeast Asia is nearly twice as fast as the rest of the world, citing immediate opportunities for operators to capitalise on.

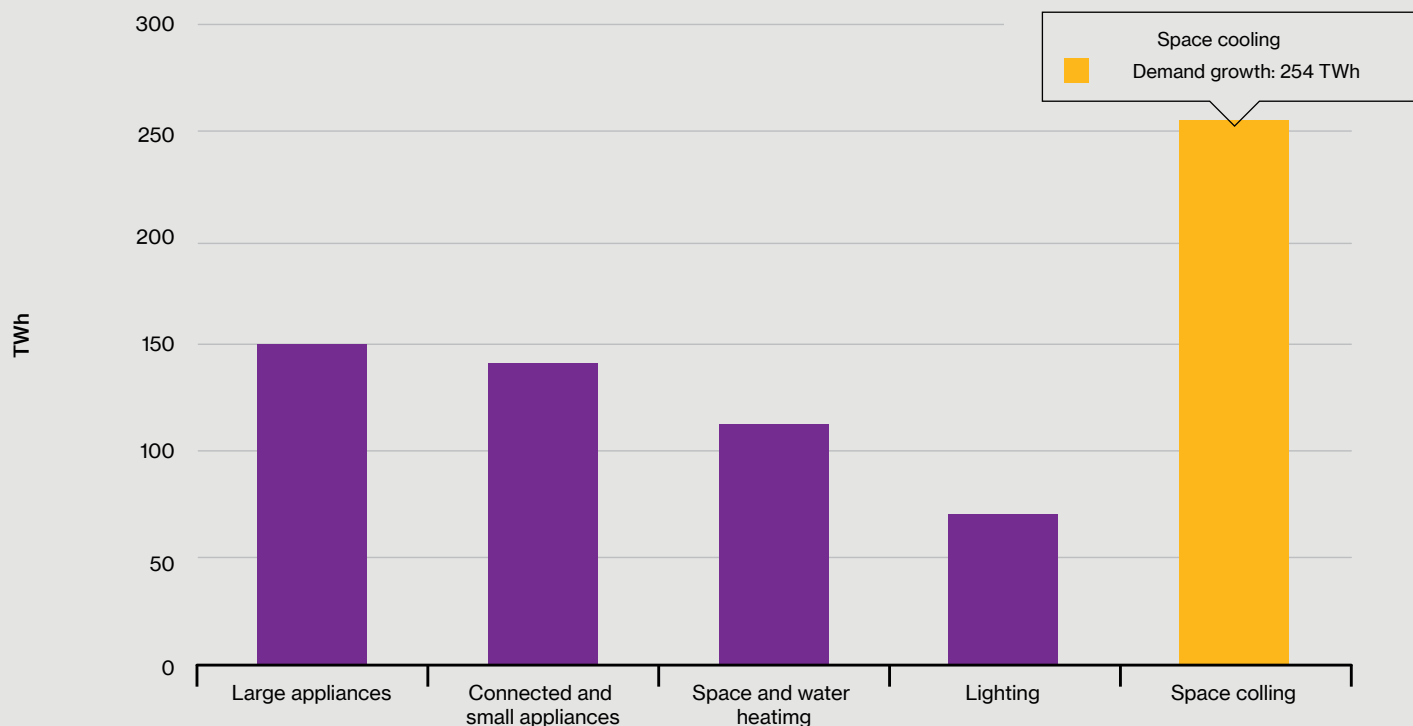
As illustrated by Figure 1 on the next page, space cooling was identified as one of the fastest growing uses of electricity in the Association of Southeast Asian Nations (ASEAN), accelerated by higher incomes and cooling needs at home or work.

However, just less than 20% of households across the region have access to air-conditioning, a trend that is likely to “skyrocket”, according to projections by the International Energy Agency – a trend that will raise overall electricity demand, and place ever-increasing strains on power systems.

Concurrently, Southeast Asia is well on the way to achieving universal access to electricity by 2030. Millions of new consumers have gained access to electricity since 2000, yet some 45 million people in the region still do not have access, and many more continue to rely on solid biomass as a cooking fuel.¹

¹ <https://www.iea.org/reports/southeast-asia-energy-outlook-2019>

Fig 1: Annual green bond issuances, per region, 2014-2019, USD billion



Source: <https://www.iea.org/data-and-statistics/charts/sources-of-electricity-demand-growth-in-buildings-to-2040-in-southeast-asia-in-the-stated-policies-scenario>

All this culminates in an “energy gap” across every level of society and presents a broad spectrum of concerns that governments and energy operators must address.

Energy demands continue to be largely met by traditional sources

Southeast Asia has considerable potential for renewable energy, but currently meets only around 15% of the region’s energy demand, excluding the traditional use of solid biomass.²

Rising fuel demand, especially for oil, has far outpaced production from within the region. Southeast Asia as a whole is now on the verge of becoming a net importer of fossil fuels for the first time.³

Within Southeast Asian countries, oil continues to dominate transportation demands, despite an increase in biofuels consumption. Electric mobility, with the exception of electric 2-3 wheelers, continues to make limited progress in the market, suggesting that little progress that region has made as a whole with renewables and transportation.

Though hydropower output has quadrupled since 2000, and the modern use of bioenergy in heating and transport has also increased rapidly, its use in modern-day applications remains limited. Moreover, despite falling costs, the contribution of Solar Photovoltaics (PV) and Wind remains small, though some markets are now putting in place frameworks to better support their deployment.⁴

² <https://www.iea.org/reports/southeast-asia-energy-outlook-2019>

³ IEA (2019), Southeast Asia Energy Outlook 2019, IEA, Paris <https://www.iea.org/reports/southeast-asia-energy-outlook-2019>

⁴ <https://www.iea.org/reports/southeast-asia-energy-outlook-2019>



Energy transition urgency needed across ASEAN

However, the steady rise in demand for energy has now exposed various environmental, social, economic, and political concerns throughout the region that place energy transition as a top priority for nations and the region.

Today, ASEAN countries share a common challenge of solving the drastic gap between the amount of energy production and consumption, as they face the increasing implications of over-reliance on traditional energy sources.

As a benchmark, Southeast Asia is projected to register a net deficit in payments for energy trade of over \$300 billion per year by 2040, almost entirely due to imports of oil – created as a result of the widening gap between native production and the region's projected oil and gas needs.

From declining resource availability to energy security and environmental problems, governments are under significant pressure and stress to enact policies and initiatives to transit to renewables.

Energy: a medium for social, economic, cultural and political transformation

Since energy is such a pervasive part of society and urbanization, the shockwaves of traditional energy reliance are amplified and can be felt at almost every level of society, spanning environmental, social, economic, cultural and political issues as time runs out.

That being said, cracking the energy transition equation promises multiple novel benefits for entire societies to unlock new value, innovation, and ways of life that make energy transition an opportunity too good to miss.

“Governments are under significant pressure and stress to enact policies and initiatives to transit to renewables.”

Health and climate concerns continue to strengthen the case for energy transition

Outdoor and household air pollution in Southeast Asia is estimated to be responsible for over 650,000 deaths by 2040, up from an estimated 450,000 deaths in 2018.⁵ If traditional energy continues to pervade our society, that number could go even higher.

Assuming fossil fuel consumption and demand in the region continues on the projected path, CO₂ emissions are expected to rise by almost two-thirds to almost 2.4 gigatonnes (Gt) in 2040. As a reference, emissions grew strongly in Southeast Asia in 2019, lifted by robust coal demand, as shared by the International Energy Agency⁶.

Multiple social benefits to be realised with energy transition efforts

Making the transition to renewables promises multiple benefits throughout entire societies that can lead to a more efficient, healthier, and happier society. The transition to renewable energy can create new local employment opportunities, creating immediate value to the economy.

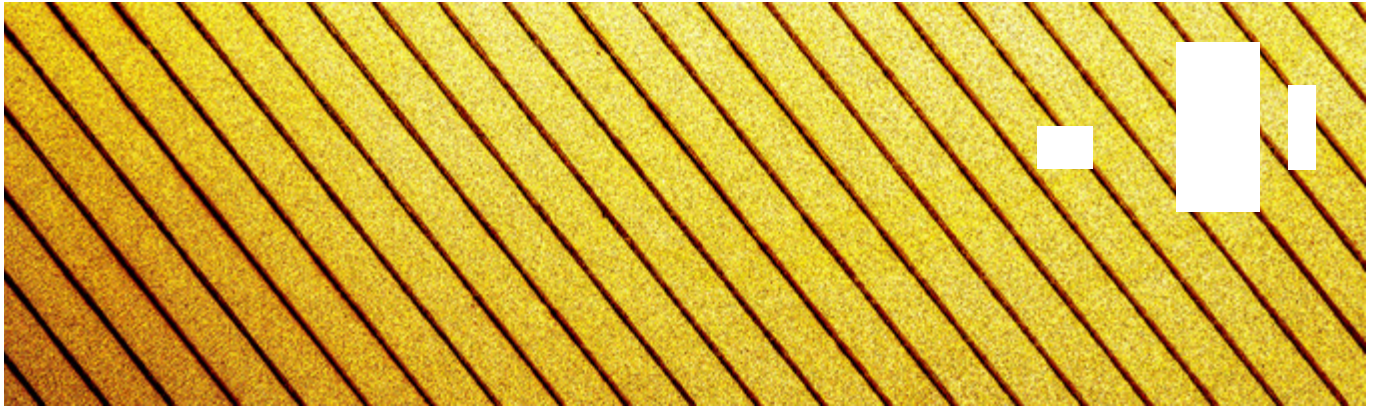
With the rise of the “conscious” consumer, renewables promise better quality options for the customer, creating more value than typical, traditional-fueled transactions. Social development initiatives can be elevated too, with renewable energy enabling life standard improvements, the establishing of social bonds, and mature community development.

Economic gains to be achieved with renewable energy

Southeast Asia has large potential for the sustainable use of modern bioenergy, both in terms of today's technologies and in the development of advanced biofuels to improve the sustainability of its infrastructure, with a particular focus on the transport sector. Significant economic growth and progress throughout all facets of the economy can be realized by making the transition to renewables as the root power of economic development and prosperity.

⁵ <https://www.iea.org/reports/southeast-asia-energy-outlook-2019>

⁶ <https://www.iea.org/articles/global-co2-emissions-in-2019>



Renewable energy in ASEAN: a regional effort with individual ambitions

While Southeastern Asia is a largely diversified, dynamic and ever-evolving region, one common element that policy makers share is an ambition to establish a secure, affordable and more sustainable pathway for the energy sector. That ambition has led to successful talks for a regional push to commit a set of goals for the region, with each country taking its own initiatives and leadership to meet these goals and beyond.

Agreements such as the establishment of regional targets of sourcing 23% of its primary energy from renewables by 2025 and the establishment of the ASEAN Power Grid – an ambitious project to interconnect the power systems in the region and establish multilateral power trading – have pushed energy transition efforts forward⁷. These efforts point to the successful raising of a common renewables grid in the region, promising stable supply of renewable energy that is stable, predictable, reliable and flexible to meet regional demands for energy.

ASEAN energy intensity reduction examples⁸

There are several examples of energy intensity reduction efforts in the ASEAN region:

- **Singapore** has set a target to reduce its energy intensity by 35% by 2030, made by using energy-efficient standard lamps with labelling as introduced in 2015.
- **The Philippines** has targeted to reduce energy intensity by 40% by 2030. It has also introduced an energy efficiency roadmap from 2014 to 2030, including action plans such as generating codes for energy efficiency, establishing efficiency standards, and equipment labelling. The Philippines also aims to raise the share of renewables in the energy mix to 26.9% by 2030, up from less than 17% presently.
- **Laos** targets an increase in the share of small-scale renewables in its total energy consumption to 30% by 2025.
- **Vietnam** has set targets to increase renewable power mix to 21% by 2030 from the total installed capacity to achieve a 43% reduction in coal capacity by 2030 – coming off the adoption of feed-in tariffs (FiT) for solar photovoltaic, solid waste, biomass, wind and hydropower in 2017.
- **Thailand** has also set a target for 2030 to increase its power mix to include 30% of renewable energy by adopting a FiT for renewable energy, while also providing tax incentives to Electric Vehicle manufacturers to spur economic growth. Thailand has also built its EV manufacturing industry to spur its economic development, by providing tax incentives to manufacturers.
- **Indonesia** has also updated its energy policy and modified its power purchase agreements to lean more towards renewables in its sourcing efforts. In 2017, Indonesia has updated its energy policy and modified its power purchase agreements. On the transportation front alone, Indonesia has promoted 14 related policies to use Electric Vehicles (EV) in transportation.
- **Malaysia** has also committed to solve renewables in the transport sector, targeting to have as many as 100,000 EVs operating on the road and as many as 125,000 renewable energy charging stations by 2020.

“one common element that policy makers share is an ambition to establish a secure, affordable and more sustainable pathway for the energy sector.”

⁷ <https://www.irena.org/publications/2016/Oct/Renewable-Energy-Outlook-for-ASEAN>

⁸ All data set out in this section is from the following sources: <https://www.nea.gov.sg/our-services/climate-change-energy-efficiency/climate-change/singapore's-efforts-in-addressing-climate-change> https://policy.asiapacificenergy.org/sites/default/files/philippines_energy_efficiency_action_plan2016-20.pdf <https://www.eco-business.com/news/running-out-of-excuses-where-does-southeast-asias-energy-transition-stand-in-2020/> https://www.researchgate.net/publication/331908353_Renewable_energy_in_Southeast_Asia_Policies_and_recommendations

Singapore a key mover in the renewable energy transition

Singapore, one of the sunniest cities in the world, currently generates about 95% of its power from imported natural gas, with solar energy being its most viable renewable energy option⁹. As the city-state looks to diversify its energy supply and meet its goal of cutting net greenhouse emissions to net zero by the second half of the century, Singapore is also looking to import solar electricity to meet its energy transition goals.

In order to reduce its energy intensity by 35% in 2030; Singapore has initiated the use of energy-efficient standard lamps with labelling since 2015. In addition, the Energy Market Authority (EMA) aims to achieve a solar target of at least two gigawatts of peak power by 2030, up from the 260 megawatt-peak in the second quarter of 2019. That new capacity could meet about 4% of Singapore's current total electricity demand and could play an important role in its energy transition efforts.¹⁰

In 2014, the Singapore Government announced its commitment to raise the adoption of solar power to 350 MWp by 2020, which would constitute approximately 5% of the projected 2020 peak electricity demand. This target was achieved in the first quarter of 2020.¹¹

Conclusion: renewable energy in Southeast Asia - a largely untapped market brimming with potential

Despite promising initiatives by regional leaders collaboratively and individually, Southeast Asia is currently not on track to meet these goals. Coal, oil and gas are currently supporting 80% of ASEAN's energy demand growth, and in the absence of a central body that monitors progress, there are no political consequences for governments that fall behind on their targets.¹²

Without a stronger policy push, the share of renewables in the energy mix is projected to stay flat at around 15 per cent through to 2025. The International Energy Agency estimates that current energy plans could see the region more than double its coal-fired power capacity by 2040, when coal use is steadily declining around the world.

⁹ Jessica Jaganathan (2020, April 9th). Singapore considers solar energy imports to cut emissions Reuters. Retrieved from <https://www.reuters.com/article/singapore-energy-imports-idINKN21R0VC>

¹⁰ Jessica Jaganathan (2020, April 9th). Singapore considers solar energy imports to cut emissions Reuters. Retrieved from <https://www.reuters.com/article/singapore-energy-imports-idINKN21R0VC>

¹¹ https://www.ema.gov.sg/media_release.aspx?news_sid=20200422F0KvcWTR1Urf

¹² <https://www.iea.org/reports/southeast-asia-energy-outlook-2019>





In order to truly transform the energy landscape to one that is renewable, specific attention must be placed on the removal of subsidies to fossil fuels, regional market integration, common energy infrastructure and rapid implementation of initiatives of new and existing projects.

Nonetheless, significant potential and opportunities await operators who are willing to put in the right investments to facilitate supply and demand in the region; working alongside government to provide much needed focus, infrastructure and talent on critical challenges that the energy sector faces.

Today's investment levels still fall short of the IEA's projected needs in the Stated Policies Scenario and are more than 50% lower than what would be required in the Sustainable Development Scenario.¹³ Mobilising investment to accelerate renewable energy transitions must be a joint participation from both the private sector and governmental efforts.

Public sources have been vital to financing thermal power plant projects and large-scale renewables (such as hydropower or geothermal) that have large upfront capital requirements. In contrast, Wind and Solar PV projects have been more reliant on private finance, spurred by specific policy incentives.¹⁴

As the cost of renewables decline, and the environmental, social, economic and political aches of traditional energy becomes more evident, the need to push towards sustainable energy into the power mix is clear, making the renewable energy space an exciting space to watch (and operate in) in the near future.



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¹³ IEA (2019), Southeast Asia Energy Outlook 2019, IEA, Paris <https://www.iea.org/reports/southeast-asia-energy-outlook-2019>

¹⁴ <https://www.iea.org/reports/southeast-asia-energy-outlook-2019>



The “Green Belt and Road”: China’s journey to carbon neutrality

In late September 2020, President Xi Jinping announced that China will achieve domestic carbon neutrality by 2060, showing a clear direction for China’s future energy investments. By exporting technologies and policies necessary for decarbonization, the new target is expected to pave a greener way for growth for the countries participating in China’s Belt and Road Initiative (BRI).

The current status and challenges in de-carbonising the BRI

A recent study by Tsinghua University’s Institute of Energy, Environment and Economy provides a roadmap for reaching carbon neutrality.¹ It shows steep declines in domestic fossil fuel investments and use, with a 96% drop in coal use by 2050, a 75% drop in fossil gas and a 65% drop in oil. If the power sector and heavy industries can’t adapt well to this transition, they may tend to participate in more high-carbon BRI projects.

According to statistics from the China’s Global Power Database², published by the Global Development Policy Center at Boston University, Chinese companies and policy banks invested in or financed for at least 777 overseas power projects between 2000 and 2018. Coal projects are mainly in Southeast Asia, South Asia and Africa, accounting for 40% of these projects’ generating capacity. Three policy banks – China Development Bank,

Exim Bank of China, and Agricultural Development Bank of China – were involved in the financing of 73% of those projects, significantly more than foreign direct investment from China, which was more focused on natural gas power generation.

Overseas coal-fired power capacity with investment from China increased by 34% a year between 2009 and 2018. The non-hydropower renewables capacity is growing faster than coal, at 46% a year rather than 34%. However, it accounts for only 11% of China-invested overseas power capacity.

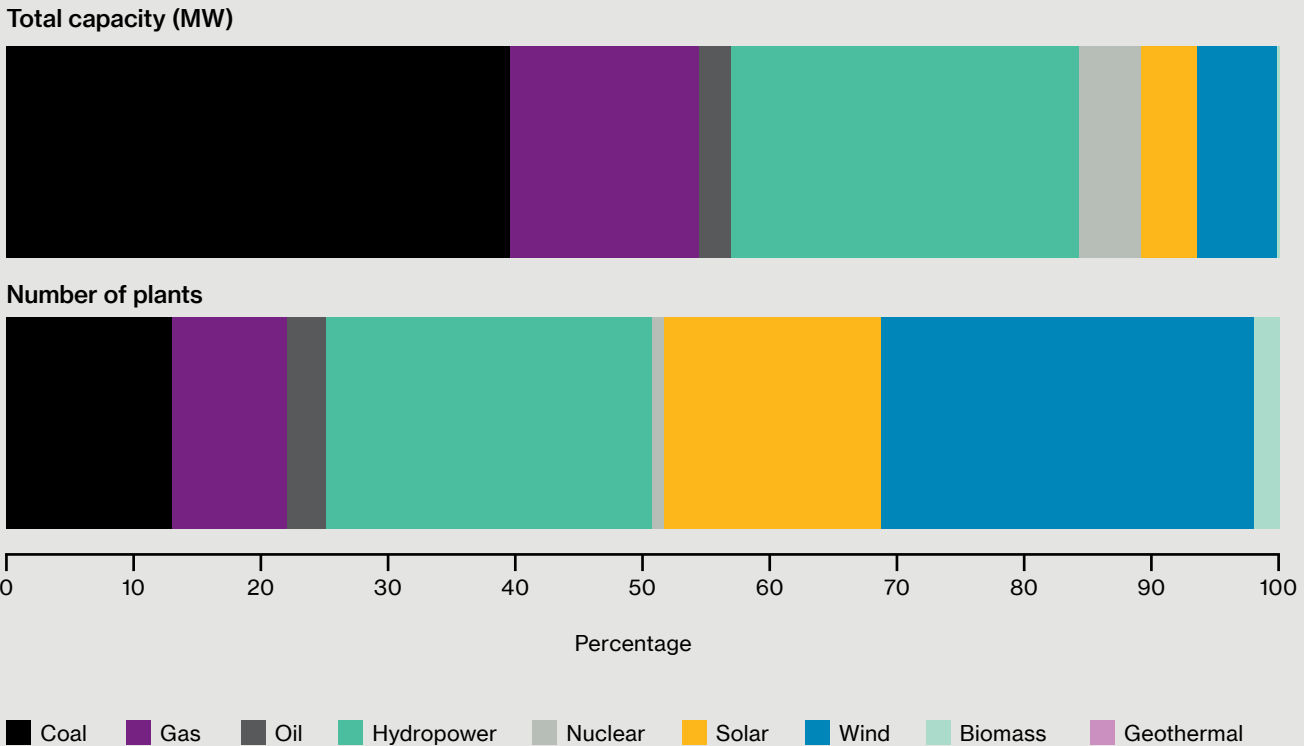
Renewable energy companies in China often face challenges in investing overseas. They tend to be smaller and privately owned compared with the large state-owned enterprises that have decades of experience in developing traditional power plants in foreign countries.

Although wind and solar account for a small share of the total generating capacity of Chinese investment overseas, they are much greater in number. Wind power projects account for 29% of all projects and solar projects represent 17%. It could be a good opportunity for Chinese policy banks and large State-Owned Enterprises (SOEs) to learn and expand their investment and business direction into these cleaner sectors.

¹ Tsinghua University Institute of Energy, Environment and Economy <https://chinadialogue.net/en/energy/greening-chinas-overseas-energy-projects/>

² All statistics for this article other than footnote 1 are from China’s Global Power Database, Boston University Global Development Policy Center <https://www.bu.edu/cgp/>

Fig 1: Overseas power plants with Chinese investment and finance (by energy source)



Source: China's Global Power Database, Boston University Global Development Policy Center

Chinese SOEs that negotiate large infrastructure projects with host countries may hold a lot of the power in their energy development plan. China may not make the final decision, but it could stop fossil-fuel investments and incentivise SOEs to focus on renewables. It could also reinforce the supervision of climate risk assessments for all BRI projects and introduce targets for low-carbon investments. This would support BRI de-carbonising and reduce the risks of over-investing in high-carbon projects and technology.

China's commitment to carbon neutrality is a market signal to its overseas investments

In Egypt and Oman, proposals for coal plants involving Chinese companies have stalled, while renewable projects have succeeded. The Chinese company GCL signed a contract to build its first solar panel factory in Egypt in 2018. The Chinese solar company Yaowei stated in

2019 that it will set up a solar panel production plant in Zimbabwe, increasing access to the African market. Chinese firms are constructing the massive 950 MW concentrated solar power (CSP) and photovoltaic (PV) hybrid projects in the United Arab Emirates. Chinese SOEs have been involved in large renewables projects in Myanmar, Vietnam, Chile, Laos and the Philippines among others, and Chinese solar equipment is exported to dozens of other countries. Recent high-profile plans include Uganda's 500 MW solar plant with China Gezhouba and Zambia's 600 MW solar project with PowerChina.

Investment in Vietnam

As Vietnam's government has designed policies to incentivise the development of its renewables industry, Chinese companies have exported hundreds of millions of dollars' worth of solar PV equipment to the country. The 600 MW Dau Tieng PV complex in Vietnam, the

Fig 2: Top 10 Chinese companies investing in power generation overseas

Chinese Investing Companies	Capacity (MW)
China General Nuclear Power Group	19,740
China Three Gorges Corporation	16,718
China Huaneng Group	14,420
State Power Investment Corporation	9,178
PowerChina	7,887
State Grid Corporation of China	7,409
China Huadian Corporation	5,317
Shenhua Group	3,408
China Datang	3,211
Canadian Solar	3,167
Proportion of total Chinese FDI in power generation	77%

Source: China's Global Power Database, Boston University Global Development Policy Center

largest of its kind in Southeast Asia, will be developed by PowerChina, which also developed the 99 MW Bac Lieu offshore wind project, the 73 MW Soc Trang wind farm, the planned 550 MW Luning PV project and the 24 MW Fuhlen wind farm, which was Vietnam's first wind development in 2016. Several other large renewables deals have been signed in the last year.

Conclusion: towards a greener future

Willis Towers Watson works closely with Powerchina, Gezhouba, China Three Gorges, China General Nuclear and other Chinese SOEs, assisting them in implementing and investing in renewal energy projects including the above-mentioned Bac Lieu & Soc Trang Windfarm in Vietnam, various other onshore and offshore windfarms in Vietnam, Pakistan and Brazil, and PV projects in Myanmar, Pakistan, the Maldives and Africa.

Following China's commitment to carbon neutrality, it will be interesting to see whether other developing countries will announce their own carbon neutrality targets, helping to achieve a greener future.



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Part Two – key issues affecting renewables risk



State of the art analytics: a critical risk management tool in a hardening insurance market

Introduction: setting the scene

The long period of soft market conditions, characterised by an excess of (re)insurance capital and an emphasis on meeting premium income targets, has finally come to an end. Instead, faced with deteriorating loss ratios and increasing costs, the Renewable Energy insurance market seems to have come to a tipping point as truly hard market conditions have emerged during the course of the last year.

This means that state of the art analytics more than ever needs to play a centric role to underpin proactive, strategic and optimized risk management/financing, such as the use non-recourse debt financing and, in this context, the position of raising and securing senior debt to finance the generation asset.

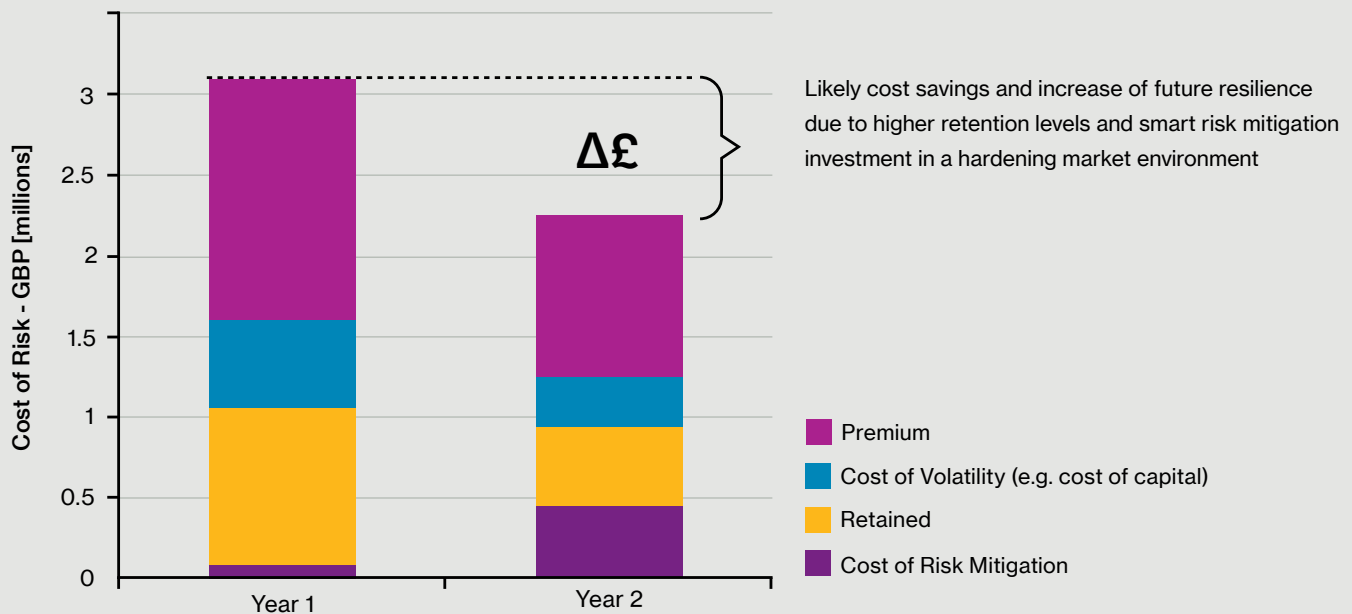
Why is using analytics critical for risk managers?

We already are seeing risk managers using state of the art analytics and engineering to position their respective organisations strongly in their conversations with the insurance markets. Others, who have not yet taken this step, may already have found themselves in a position where the markets have dictated the pricing, resulting in significant premium increases.

This means that in order to achieve a future resilient risk management strategy and successful renewal, it should be now more than ever prerequisite to have an analytically empowered view of the organisation's risk profile; "what doesn't get measured, doesn't get done".

Figure 1 on the next page illustrates how risk managers are proactively using analytics to evaluate the total cost of their risk financing strategy by analytically optimizing risk transfer (insurance versus higher retention levels) as well as the measurement of return on investment for physical risk mitigation as an alternative to risk transfer in a hardening market environment.

Fig 1: The proactive use of analytics



Source: Willis Towers Watson

The value of analytics - a plausible case study

Let's take a closer look on how the above figure could be realised using a plausible case study by drawing from experiences and key lessons learnt in working closely with corporate risk managers.

- A global renewable energy company that operates wind farms is facing a difficult insurance renewal in the ongoing hardening insurance market and suffers a large earthquake related claim.
- The portfolio is exposed to a whole range of natural perils and this latest event has further weakened this organization's position.
- In the wake of the global coronavirus crisis, all budgets including risk financing, are now being closely reviewed and heavily scrutinized by the CFO.

However, on the plus side:

- The risk manager of this company has always proactively used catastrophe analytics and risk engineering measures to understand the impact of catastrophe risk on their assets and consequent interruption of the organisation's business.
- Based on these assessments, the risk manager has already gained a solid understanding of the company's risk profile as well as the exposed assets that are driving the key risk within the portfolio's assets.

Based on this understanding, the risk manager decides to engage the broker for a deeper analytical dive and assessment to consider if an adjustment to the risk management strategy response to the hardening market environment is required and can be accommodated within internal budget constraints.



The risk manager is also aware that focus of this assessment needs to be on higher retention levels and a cost benefit assessment of physical mitigation in the retained portion of the risk management strategy in order to achieve cost savings. The assessment therefore focusses initially on the risk tolerance for key performance indicators on the renewable's company's balance sheet.

- Based on this assessment, it soon becomes clear that the organisation could increase retention levels by over 50% before KPIs on the balance sheet would be affected in a material way.
- This process also highlighted that retention vehicles such as captives could be a feasible option to better manage the retained portion of the risk.
- The modelled damages and derived modelled 'technical risk pricing' indicate to this risk manager that insurance premium levels, even in the hardening market environment, could potentially be reduced by increasing risk retention levels on the balance sheet by staying within the company's risk tolerance levels.
- The analysis conducted by the broker also identified that some of the freed-up capital resulting from this change in risk management strategy could be utilized in the investment of targeted physical risk mitigation measures of exposed assets, which would likely reduce the cost of risk of the physical asset portfolio.

The risk manager, with the help of the broker's analytical team, now firstly engages with the CFO of the organisation and demonstrates, with a similar figure to the one outlined in Figure 1 above, the potential cost savings that could be made over the coming years by retaining more risk as well as investment into targeted risk mitigation measures.

Based on this successful discussion, the green light has been given by the CFO to engage with the markets in changing the current risk management and financing strategy, as well as exploring retention vehicles such as captives going forward.

Despite challenges from the markets in the follow-on renewal discussions, which are also heavily influenced by the recent claim, the broker supporting this risk manager is able to demonstrate, with this proactive analytical approach, that the claim related to a 1 in 20 type event. The broker is therefore able to secure an insurance premium that is still within the modelled 'technical premium range' for the new risk financing strategy of this company by including higher retention levels. The risk manager should think that this is good value for money in a hardening insurance market environment.

The insurance manager has been also given a mandate by the CFO to use some of the capital that will be freed up by the higher retention levels into retrofitting the design of key exposed assets against flood and earthquake risks, thereby also demonstrating proactive risk control to both the CFO and the insurance markets.

The risk manager has since been in communication with the organisation's sustainability function, who is trying to identify the impact of climate change to their organisation and has rightly made the connection that the assessment of physical catastrophe and climate risk exposures could be beneficial a first stepping stone for a climate change impact assessment and has managed to play a strategic role in this topic too.



Top 5 benefits for the risk manager of utilizing analytics

Having analysed this case study, what can we conclude are the top five benefits of using analytics from a risk management perspective?

1. You gain an analytically underpinned understanding of your organisation's risk profile and risk tolerance.
2. It puts you on the front foot in renewal conversations with the insurance market.
3. It provides a template for proactive risk management and risk managing & finance planning.
4. It optimizes risk control by comparing the risk mitigation options of retaining or transferring your risk by using the company's overall risk tolerance as a tailored benchmark.
5. It creates an analytically empowered baseline for long term resiliency, including within the context of climate change and physical climate risk.

Conclusion: the next steps

This case study has highlighted that proactive risk management, utilizing analytics and risk engineering, can position an organisation robustly in a hardening market situation. Difficult choices on risk retention can be underpinned and justified by analytics to internal senior stakeholders; ultimately, this can result into more proactive risk control and cost savings, despite the impact of a hardening insurance market.

The next steps for any risk manager reading this article to should therefore be to:

- Review your current risk management and transfer strategy; and, if not done so already:
- Engage with your risk consultants and/or brokers to analyse your organisation's risk tolerance and risk profile to arrive at an analytically optimized risk finance strategy.



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Renewables industry losses: why they still happen, despite good risk management

Introduction: the importance of good decision making

Despite having the best risk management policies and preventative measures in place, the unexpected can still happen in the renewables industry; for the risk manager, this immediately creates a myriad of decisions to be made and questions to ask. The knock-on effect of even a relatively straightforward incident means that many of these decisions need to be made quickly and decisively to bring the business back to pre-loss operating conditions as soon as possible. But at what cost? And, perhaps more importantly, whose cost?

The guiding principle, and one which insurers often communicate early on, is that the Insured should act as if they were a prudent uninsured. However, this can lead to a juxtaposition as to whether the decisions that are made and costs incurred immediately following a loss can ultimately impact the final response from insurers.

Find the root cause early

Both insurers and buyers are looking for an early determination of the root cause of a loss; the insurers require this to analyse the policy coverage to see if they believe there has been indemnifiable loss. For the Insured, it is vital to understand whether the loss is an isolated incident or whether there may be similar systemic or serial issues experienced across their operating assets.

Additional precautionary measures

In the absence of certainty on the definitive cause, the insured, often as a result of other commercial obligations such as Operations & Maintenance/Original Equipment Manufacturers (O&M/OEM) requirements, may be required to put in place a number of additional precautionary measures to inspect other operational assets within the facility, which are not the subject of the claim, as a preventative measure against potential further loss.

Ultimately, the external commercial pressure from shareholders or lenders to take these decisions quickly and carry out pre-emptive actions may lead to wider implications from an insurance response perspective.

Loss minimisation: how good policy wordings work

Most good broker wordings will include a clause which will create a policy response for Loss Minimisation Expenditure and Temporary Repairs. This is normally sub-limited; however, it would create an indemnity for any expenditure reasonably incurred by the Insured, including the cost of effecting temporary repairs following physical damage, to prevent or minimise imminent or further physical damage to the asset and/or to allow work to continue. This would normally also include expenditure incurred by or on behalf of the insured as a result of emergency action taken where:

- Physical damage is imminent, or following physical damage in order to prevent or minimise physical damage to the asset; and/or
- Injury to third parties, or physical damage to their property, is imminent; or following injury to third parties, or physical damage to their property, in order to prevent or minimise injury to third parties or physical damage to their property.

This is generally provided so that where such expenditure is not approved in advance by insurers, the liability of insurers does not exceed the amount of saving that the insurers achieved by such expenditure or the sub-limit agreed in the policy, whichever is the greater.

This does mean that when there is a claims event, the Insured is trying to act in the interest of the business as a prudent uninsured, without the benefit of knowing how the claim will develop. Without prior approval of the loss adjusters appointed by insurers, when physical damage has occurred, there is a fund which can be accessed to avoid or mitigate further losses.

Where this is the case, there is certainly an argument to be made that these types of additional costs should be considered as part of the claim submission, in so much as they represent reasonable and necessary costs incurred as part of loss mitigation. Therefore early dialogue with insurers and their appointed experts is recommended so that clarity is obtained.

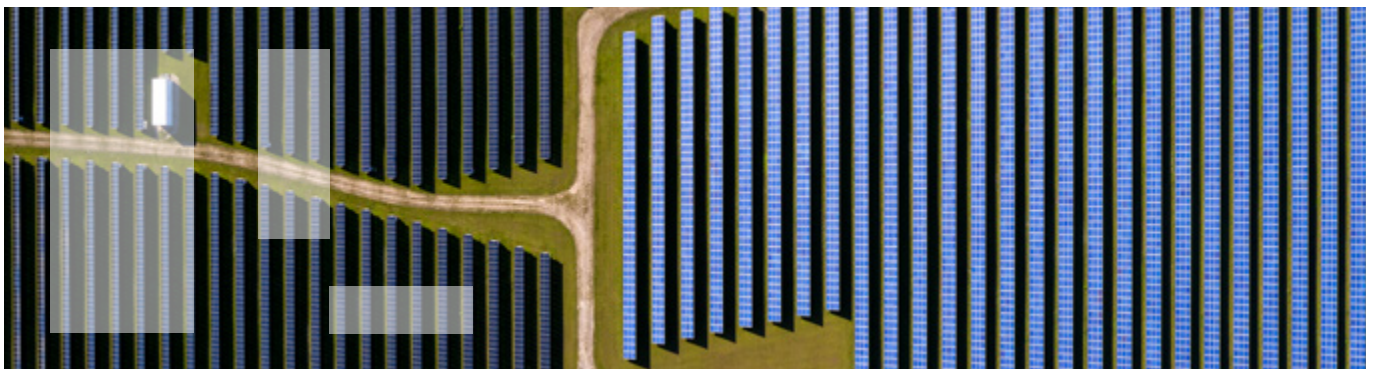
Return to pre-loss condition: the most important priority

For the insured of course, the most important priority following an incident is to plan for a return to a pre-loss condition as soon as possible, particularly when the impact is not only financial in terms of the costs incurred to return an asset to its pre-loss condition but also in terms of loss of revenue on the balance sheet. There are many examples of significant revenue losses that result from a relatively minor physical damage loss; for most policies, the requirement that must be met for these revenue losses to be indemnified by insurers is physical damage coverage for the loss, irrespective of the quantum.

Applying the economic test: when does it make sense for the insurer?

Let's take a simple example. Most Business Interruption policies will give the insured cover for expediting expense and increased costs of working, which enable the policyholder to incur additional costs, primarily to resume operations as soon as possible and as a result reduce any revenue loss. Typically, these costs will be subject to an economic limit consideration; however, this analysis is often done as part of the final adjustment and this can have a significant impact on the final insurance recoverability, which may not have been contemplated at the time decisions were made.

For instance, the decision to air freight a spare part may be more costly than sea or land transportation, but the savings gained in terms of the revenue loss may be significant and therefore will be the right commercial decision to take for the business. If discussions on possible loss mitigation efforts and likely costs versus savings take place early in the process, this can certainly alleviate some difficult discussions later in the life of the claim and help to manage expectations in terms of the insured's ultimate recovery.



Applying the economic test: when does it make sense for the insured?

As we have seen, insurers will generally need to be consulted and their approval secured before it is agreed that there will be a policy response. There are exceptions that minimise losses, such as an emergency fund which can be accessed following physical damage, but this is always subject to a sub-limit.

Mostly, insures will need to see that any agreed loss amounts pass their economic test, spending one dollar to save two on the overall adjustment. However, sometimes the policy will include sub-limits following physical damage for air freight. Alternatively, it will include extra expenses, reasonably and necessarily incurred, to temporarily continue the insured's business as normally as practicable. The decision to have an item air freighted rather than shipped by sea may suit the insured but not be subject to the insurers' economic test. Similarly, such extra expense may not always meet these tests, although it will certainly be sub-limited.

But does the insured always need to consult insurers on every decision made following a loss? In terms of simple obligations, such as retaining damage parts or the selection of repair contractors, this may not always be the case, but certainly where the insured is contemplating committing funds to mitigation efforts it would be prudent to engage in early discussions with insurers to understand the implications of any actions taken.

Conclusion: striking the right balance

As we have mentioned, there is always a balance to be struck between mitigation costs being economic in terms of spend and achieving savings. However, at the time that decisions are made it is not always possible to have the foresight to be able to fully evaluate any insurance implications. When the final adjustment of a claim is completed, this is generally with the benefit of hindsight.

Indeed, these decisions often come under more scrutiny from insurers when insurance is taken out for physical damage cover only, thereby removing the insurance implications for agreeing an economic spend to ultimately mitigate any revenue loss.

Swift actions and decisions still need to be taken from a commercial point of view. Furthermore, although not directly impacted, it is still certainly worth engaging with interested parties so that a fuller appreciation of the business drivers can be appreciated.



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My asset values are falling: so why isn't my insurance premium?

Introduction: the downward trend in asset price

Increased demand, improved technology, economies of scale¹, supply chain competitiveness and the growing experience of manufacturers and developers have all had a major impact on the renewable industry. This has driven a steady decline in asset price for photovoltaic solar (82%), onshore wind (39%) and offshore wind (29%) since 2010². Why, then are renewable energy insurance premiums increasing?

The hard insurance market and the importance of correct values

The primary reason for this is that the Renewables insurance sector is currently experiencing a hard market, impacted by the decline in premium income with several insurers having pulled out of underwriting Renewables business. The market has been unprofitable due to the high frequency and severity of claims, together with tightened reinsurance rates.

With insurance rates still widely predicted to rise again during 2021, it is important to ensure that the values declared to insurers for the application of what is probably an increased rate remains appropriate and correct.

While the insured values will not be the only consideration as insurers assess an appropriate risk rate in a hard insurance market, they are the next most important factor (together with the applied rate) in determining the ultimate premium which must be paid. While insurance buyers and their brokers spend considerable time negotiating to achieve an appropriate rate for the risk, shouldn't there be similar attention paid to ensuring that the correct values are utilised?

However, while insurers will take any decrease in asset values presented into consideration as part of their overall assessment when fixing their rate, cover, terms and capacity for a given asset, it is still only one factor in a much broader spectrum of considerations which must be analysed.

¹ <https://www.windpowermonthly.com/article/1660525/windeconomics-us-costs-fall-turbine-ratings-increase>

² <https://www.pv-magazine.com/2020/06/03/solar-costs-have-fallen-82-since-2010/>



Insurer EML models

When considering the level of impact a reduced reinstatement value and sum insured will have on the ultimate pricing, insurers will pay particular attention to the Estimated Maximum Loss/Probable Maximum Loss (EML/PML) model on any one asset or site. With a renewable energy project often spread out over a wide geographic location, insurers accept that it is unlikely that a loss incident will result in a complete 100% loss to the project. As such, insurers model what they believe to be their estimated maximum loss on a worst-case scenario, based on the material project risk information submitted and the location of the risk, blended with their modelled projections and industry knowledge. Their given project rate will be geared to their assessment of the PML; while they are likely to purchase reinsurance protection for the difference between their modelled PML and the total insured value, the premium applicable to this delta will not be of the same magnitude as that which is applied to the value at risk below the PML. Accordingly, if the overall total sum insured value is reduced by 20% following a devaluation and assessment of correct insured values, there will not be a proportionate reduction in the overall premium until the revaluation impacts the insurers' assessment of their exposure on a PML basis.

Impact of reduced total sum insureds on insurers' technical rates

If the overall project insured value has reduced by 20%, insurers will also consider that, statistically, they now have a higher frequency exposure to a partial rather than a total loss. As such, they remain equally as exposed to the first 80% of the value at risk, even after a 20% reduction in the full value.

As an example, Company ABC owns an Onshore Windfarm with total reinstatement values of US\$100 million:

- With good risk measures in place, insurers assess their PML scenario to be 40% of the total insured value.
- As a result, insurers calculate a technical rate of 0.30%, based on the premise that their likely maximum loss will not exceed US\$40 million in total.
- If Company ABC revalued their assets, resulting in a 20% reduction in values, this may not in itself substantially impact the overall premium. This is because insurers would still believe that their primary risk exposure is still US\$40 million.
- However, the rate will now be applied to the lower total sum insured, producing an overall premium benefit to Company ABC.

With projects that are more heavily exposed to Natural Catastrophe (Nat Cat) losses, there will be an increased reduction relative to the insurers' assessment of costs to protect against a full value loss. So from a premium perspective, the impact of having the true reinstatement value is more important for programmes with higher Nat Cat-exposed locations.

Importance of current valuations on proportional programmes

Having discussed the impact of reduced total sum insureds on the insurers' technical rates, we must also look at the importance of ensuring that values are accurate and up to date. When initially assessing the risk, insurers need to be confident that the sum insured adequately represents the true reinstatement cost in order to accurately determine a correct PML, to which their deployed capacity will be aligned.

This is especially important in a quota share market where insurers work on a proportional basis, taking an agreed percentage of the overall total insured risk. Insurers must also consider if they are increasing their exposure to higher frequency losses by not charging enough premium, due to a disproportionately low total insured value.

Project financing and Average

Most renewable energy projects are subject to project financing which, broadly, does not permit the application of the insurance concept of "Average", being the proportional reduction in any claim to the degree of under-insurance. As such, insurers are very sensitive to projects where overall dollar per MW represents a lower ratio than would commonly be seen in the market.

Conclusion: best practice to track fluctuation in asset values at each renewal period

Like many other aspects of insuring a renewable energy project, the declaration of correct sums insured after valuation, as well as careful internal diligence, is considered material to the overall risk assessment for which clients have a duty to disclose, inclusive of any changes in valuations. As outlined at the beginning of this article, with the developments in technology within the renewables industry and the cost of such technology reducing, it is important that clients accurately track any fluctuation in asset values at each renewal period. This to ensure that their duty of disclosure is fulfilled, and they do not overpay their insurance costs.



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Ensuring a smooth insurance handover: what risk managers need to know

Introduction: from construction to operation

The transition from the construction to the operational phase can be a rocky road for renewable energy developers, contractors, insurers and lenders. Beyond the technical challenges that exist – which are increasing as projects grow larger in size, complexity and overall construction time - the project development teams must manage the transfer of risk through various contractual agreements, set against the differing interests and motivation of the parties involved. The recent market hardening is adding to this challenge, with the emergence of a stricter and more disciplined insurance market.

It is on this basis that in this article we will explore:

1. What is happening to insurance during the handover of a renewables project
2. The insurance issues that may arise during this process
3. What brokers and insurers are seeking to understand to ensure a smooth insurance risk transfer

Insurance during handover

While the interests of the various parties may differ, the common goal is to ensure a seamless transition of risk to the parties that are best positioned to manage it. No one project is the same, but there are several common activities that occur which a project risk manager must factor into its development.

Firstly, **the timing of the various insurance policies**. As the construction policies reach their natural expiry, they must be sufficiently aligned to expire on the correct date of handover. However, while they may expire on a general basis, they are in fact extended through their respective maintenance period to cover the contractor(s) making good any defects onsite. The maintenance period should be set to the longest defect notification period from when the construction cover ends, generally 12 or 24 months in the renewable energy industry. In parallel, the operational policies must then be ready to incept on this handover date to avoid a gap in cover.

Next, projects need to recognise that **the construction and operational policies may be provided by different insurance companies**, in some cases entirely different markets. This is a challenge for the larger, more unique projects, whereby there may be many different insurers being managed to ensure a smooth process. However, a useful development is that several specialist insurers have the capability to write insurances on a seamless construction to first operational basis; these policy structures streamline matters significantly for all involved.

Further, the parties must be aware that **the operation of the insurance policies will differ from construction to operational**. One prime example is for loss of revenue indemnity; the deductible (waiting period) for delay in start-up is measured as an aggregate figure, while the waiting period for Business Interruption is generally on an each and every occurrence basis. This is because for Delay in Start-Up, there is one date on which the loss of revenue can trigger, which is the commercial operations date.

Finally, the above three key issues are being complicated by changes in the industry; due to the increased size of projects, it is now quite common practice for there to be phased handovers (also known as sectional completion) and even periods of early operation before the formal handover.

The issues that risk managers may face

With general complexity growing, **COVID-19** has added to project woes. For instance, and this has been very apparent during 2020, projects are now often facing unexpected delays. Projects may find themselves at 95% complete for several weeks pending relevant approvals; during this time, the project insurances must be extended, and operational insurers kept ready should the situation change quickly to ensure cover attaches correctly. If an ever-changing insurance market is also taken into account, this becomes a challenge to keep terms open, unless for instance a client can pre-bind the cover or have a seamless construction to operational policy in place.

The timing issue is recently being exacerbated where in some instances, **insurers have been reluctant to extend cover at existing terms**, especially those long-term projects which have not felt the changes in the insurance market during the last 18-24 months. This generally does take the form of a premium rate increase over and above a pro-rata basis, and this becomes a greater change if other terms and conditions must be amended.

The different types of handover are further challenging the way in which policies need to respond. If the system is brought into early operation (outside of testing and commissioning) then the construction policy section sometimes will respond, however this is not always the case, particularly for Machinery Breakdown. If the wording does not respond, an extension is required to accommodate the temporary Machinery Breakdown risk within the construction phase. With Solar, the additional export risk is minimal; broadly, for relatively short periods, an additional cost would not be anticipated; however, for Wind the additional risk is sufficiently material to warrant an additional premium. The early operations Business Interruption is another extension of a construction policy that again requires careful drafting to ensure the correct policy response.

Finally, **when a project does not benefit from the same insurers** underwriting both the construction and operational phases, there may be instances of claim disputes where they do not agree on the root cause or the timeline of the loss.



Towards a better understanding of your risk

One of the most straightforward means of simplifying this process is to put in place a seamless construction to operational placement; however, this is not always going to be possible, certainly for the larger and more complex renewable energy projects. The following areas generally consist of what the market would seek to understand to best address this handover challenge¹:

- Full picture of the project at risk
- Identification and understanding of the risks to be transferred
- The period when the property should be insured; clearly and accurately defining the end of construction insurances and inception of operational
- Process of acceptance and scope of handover; the timeline of risk and responsibility
- Scope and timelines of the relevant warranties (supply, installation, or turnkey) and how this interacts with, for instance, the extended maintenance cover of the construction
- The Maintenance Schedule and whether early operations are expected
- Detail on critical items, spare parts, and the punch/snagging list (including responsibility for these)

Conclusion: engage early!

In the face of a challenging insurance market and at a crucial time for any project, risk managers should work with an advisor that understands both the construction and operational insurances. Then they should engage with this advisor at the earliest opportunity, so that they can adequately understand the situation and the risk manager's issues. Only then can they develop a solution with the market that best fits individual risk manager needs.



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¹ IMIA Working Group Paper 115 (19), Construction to Operational Insurance <https://www.imia.com/wp-content/uploads/2020/02/IMIA-WGP-115-19-Construction-to-Operational-Insurance.pdf>



Lost in transmission: the threat to Australia's renewable energy industry

Introduction: the connection quandary

The future growth of Australia's renewable energy industry is in question, with a lack of available transmission lines, grid bottlenecks and uncertainty affecting the sector. These issues are likely to directly impact the financial viability of many large-scale developments.

Over 4.5 GW of renewable energy projects are now positioned to be deployed into Australia's power grid, with many more 'in the pipeline' being actively considered. Our view is that renewable energy developers will almost certainly experience connection delays; this risk factor is certainly important, as many utility scale projects might be abandoned before a shovel hits the ground.

The chicken and the egg...

It's a classic case of the "chicken and the egg" - which came first? With many existing interconnection points being allocated, there are many developers speculating on where and how quickly the grid will be extended to absorb newly-generated power.

The crux of the problem is a lack of connection infrastructure in Australia, resulting from its long and skinny transmission network. While coal power stations and the Snowy hydro scheme are well-served by existing transmission lines, it's a very different story for the increasingly active Australian renewable energy sector, with many new solar and windfarms springing up all over the country. While developers are focused on achieving development in areas featuring good resources, strong radiation levels for solar projects and strong, consistent winds for windfarms are needed to deliver efficient and predictable revenues. To date, there has been a more limited focus, either on the available existing or the planned new interconnections to the grid.

The situation is particularly acute for new projects in north-west Victoria, far west and central New South Wales and Northern Queensland; no solar plant, wind farm or other form of renewable energy, in an area of Australia where the transmission lines are not sufficient to carry the load, can run at 100% of capacity.



Implications for new projects

So what does this mean for projects which have practically completed construction and have conducted the required internal stress and commissioning tests to ensure the generation system performs as designed and intended? Many power generators are finding that they are unable to complete the essential final testing and commissioning tests which are required, following interconnection to the grid by the Australian Electricity Market Operator (AEMO). This is because AEMO is required to approve all final checks which are required for full certification before 1) developers will accept transfer of risk of loss from their contractor parties and 2) before licensed export is permitted.

This means that many renewable energy projects which are essentially fully constructed and practically completed and should contractually move into full commercial operations still remain in limbo. The lack of an available export transmission network means that the projects are physically and commercially frustrated, pending the deployment of the grid.

Illustrating the problem

Let's use a drainage pipe analogy; only so much water can pass through a pipe of a particular size before something has to give. The lack of transmission options means AEMO is curtailing the amount of power that many renewable projects can feed into the grid.

For example, a large asset may be able to generate 400 megawatts, but AEMO is placing export controls on power generators, limiting the level of output that they are allowed to achieve. The projected revenue of a power facility is

obviously inextricably linked to the available output; in addition to creating uncertainty around the scheduled date of generation output, the limitation of permitted level of permitted output is creating challenges with generators' financial modelling and contractual commitments. There is also a lack of uniformity or transparency in setting the caps which is making project delivery increasingly uncertain.

Insurance issues

Until a project is tested at full capacity and certified as meeting all requirements to enter full commercial operations, its status for insurance is impacted. Without being able to undertake full performance testing due to Marginal Loss Factors (MLF) curtailment, they are unable to have their facilities signed-off by AEMO as the regulated grid operator.

While this clearly creates significant challenges for predicting revenue generation, it also means that construction project risks often require insurance extensions resulting from the delayed testing, handover and transition to commercial operations. Construction insurers are often reluctant to agree to extend policies (for a premium) as they see their rates and covers being aligned to the physical works activities and not completed risk, albeit that the project is not operational.

A further consideration is how the Defects Liability Period (DLP), which would normally commence after the project goes operational, is affected by a delay in the issuance of the final taking over certificate. Construction insurers often have limitations on the overall construction period they may cover, including defects periods commonly up to 24 months; a long additional delay to the issuance of the Taking Over Certificate can cause them to breach their



internal guidelines for maximum construction periods. They are also likely to feel strongly that the initial construction rate is not appropriate for completed facilities, where contractor parties have often all but left the facility having completed their work.

This is leading to a stand-off between developers/owners and contractors as to who will solve the impasse. Adding to the difficulties is that not all construction insurers also provide competitively-priced operational phase policies.

When new projects are being developed, contractors are seeking to ensure that any financial delays due to AEMO curtailment liabilities are being considered as Force Majeure events by the contractors, leaving owners to take the full risk in the event of a delay over which they have no control.

Conclusion: the current state of play

There are several examples which demonstrate the problems with the current system. For instance, power giant AGL currently has a project in Queensland generating at 25% of its capacity during the day and 50% at night because of constraints on the grid.¹ This is costing the company \$100 million in issues around Price Purchasing Agreements – other companies have contracted them to supply power from this plant and where that isn't being met, financial penalties abound.

It's a classic case of technology and business moving faster than infrastructure. Developers, particularly those entering into contractual obligations, need to know how to plan ahead for this eventuality. In the framing and negotiation of contracts, they need to be aware of how the issues might play out and consider wisely in their forecasting and contingent modelling.



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¹ <https://www.afr.com/policy/energy-and-climate/wind-farm-nobbled-by-clean-energy-boom-20190415-p51e73>



Wildfire risks and vegetation management: why you need a plan!

Introduction: a world on fire!

It's not only in California; at the end of 2020, it seems as if the whole world's on fire. Also referred to as brushfires, wildfire events across the world have made the news on an almost daily basis. The western US, particularly California, has been especially hard hit during 2019 and 2020. But with the changing climate warming the planet, it seems that no continent has been spared, as Siberia, Indonesia, Brazil, Greece and Australia are all suffering from some of the most damaging wildfires in recent memory¹.

Although not mentioned often in the news media, which has focused on the loss of lives, homes, and towns, wildfires have caused losses to the renewable energy sector, damaging geothermal plants and solar photovoltaic farms caught in their path. Although wildfire damages in California in 2020 are estimated in the billions of dollars, it has been difficult to determine the true extent of the damage to the renewable energy sector. The risk threat of wildfires to existing and new renewable energy projects is now a key discussion point for plant owners and their insurers.

Fig 1: A 2020 on-site vegetation fire, under a California solar array; this fire spread from two acres when reported to six acres before controlled by the local fire department.



Source: KEYT, KKFY & KCOY (reproduced with kind permission)

¹ <https://www.nytimes.com/2020/09/16/climate/wildfires-globally.html>

In addition to the destruction of physical property, wildfires have caused significant economic damage to renewable projects, including:

- Forced curtailment and consequential loss of production of solar generation, due to utility grid shutdowns to prevent fires
- Reduced output of non-exposed solar assets, as a result of reduced sunlight and soot from wildfires falling on the panels
- Liability of third-party damages for fires originating from an energy generator's physical assets
- Similar liability due to failing IPP-owned transmission lines, resulting in a wildfire that causes economic harm to third parties

The need for a wildfire assessment

Wildfire risks are not new to the power sector, and are common for utility sub-stations, even when they are situated in an urban area where ordinary weed growth can present a risk. While analyzing fire risks and developing a fire protection plan for a power generation facility is standard practice, the need to include a wildfire risk assessment for a renewable energy site with little wildfire history is not; however, it should always be advised for any renewable energy project.

In addition to the possibility of an external wildfire reaching your site, an important consideration is the risk of vegetation igniting from an event within the facility, whether natural or man-made; this can exist at a given location, even if it is not known for wildfire risks. If a risk assessment determines that a wildfire risk exists, effective risk mitigation will require a vegetation management plan.

Developing a vegetation management plan

Developing a vegetation management plan is site specific, and will consider several key elements, including vegetation type, growth rate during the year, combustibility of the vegetation and equipment, local climate, precipitation, defensible space requirements, fuel reduction zones and ignition sources, to name but a few. A fire burning under a solar panel can damage the panel and electrical components, as well as the array supports and tracker components. Fire can cause hidden damage to the panels, including micro-cracking from thermal stress, which requires testing to be detected².



Available resources

There is no universally accepted standard for developing a vegetation management plan; however, there are several publicly available resources to assist in its development. Vegetation control limits will be site specific; one recent example called for a maximum allowable height for vegetation to be six inches (15 cm), with a defensible space in some locations stated at 11 yards (10m) around any solar array.

Basic steps

The basics steps for a risk assessment are:

- assess/identity
- quantify
- mitigate
- reassess

Responsibilities

The vegetation management plan must be written, and tasks should be automated in a computerized maintenance management system. Responsible personnel (more than one in case that individual moves on) need to be assigned to manage the plan, including:

- implementation
- planning
- scheduling
- inspection/monitoring
- verification of completed actions
- conduct of periodic compliance audits
- implementing continuous improvement from feedback from the parties involved

Insurer requirements

For insurers to accept the mitigation plan, it needs to be documented to prove you do indeed have one, that it is being managed and that someone is specifically responsible for it. Insurance companies have been asking for vegetation management plans for sites they are considering insuring and looking for details, including at what height will vegetation be cut, how often it will be monitored and by whom. To put it in direct terms: not having such a plan is a non-starter!

Furthermore, the insured should look for insurance terms that exclude losses due to failure to mow or cut. There are vendors who perform solar farm mowing for utility scale solar farms; a solar farm operator may also choose to utilize vendors who rotate goats or sheep to various locations, or provide mowing, clearing and chemical controls. However, the insurer will still expect the insured to manage, audit and verify the program. despite having a third party provide the service.

² <https://www.solarpowerworldonline.com/2020/08/wildfire-season-is-here-what-to-do-if-your-solar-project-gets-scorched/>



Conclusion: some recent loss examples

From our own 2020 claims data³, we have identified below a number of recent vegetation-related losses which we hope will encourage insureds to consider creating a professional vegetation management plan.

- In May, a recent solar farm loss, estimated at \$25 million, has been attributed both to a cigarette and to COVID-19. A work crew went to the site for maintenance and vegetation control; they did not have the proper code to open the gate and then found that lodging was unavailable due to COVID-19; being unable to stay the night and work the next day, they went home. Prior to their return, vegetation had grown higher and a tossed cigarette led to the fire.
 - Wildfires were occurring near a geothermal plant. For on-site fire water the plant relied on two electrically driven fire water pumps, powered by two independent electric power sources. While the plant was not operating nearby, wildfires damaged the overhead lines supplying grid power to the plant. Once the fire reached the site, there was no electric power available to activate either of the electric fire water pumps.
 - In June a wildfire, reportedly started from a cigarette thrown from a car, resulted in damage to a solar farm, resulting in a loss reserve of \$30 million.
 - Another loss last year was attributed to uncontrolled vegetation height, due to a failure to mow the site, with damages estimated at over \$20 million.
 - One solar farm wildfire loss was attributed to poor vegetation control; a contractor's grazing sheep used to control growth would not eat an invasive plant. Growth went unchecked and the loss occurred.
 - In the fall, construction work was underway on the final phase of a solar project, with earlier phases operational. A contractor doing hot work ignited vegetation, and the fire damaged solar panels staged near the trackers for installation. Grasses in the area were reported to be approximately 18 in/46 cm high.
- One solar farm loss was attributed to a spark from a mower at a very arid site, and another was caused by a contractor's cigarette butt.
 - Finally back in 2015, the California Valley Fire caused damage to several geothermal plants. The damages from the fast-moving wildfire at multiple plants included several cooling towers, power lines, pipe insulation, and communication systems, while the power houses were spared and capacity limited. Initial damage was estimated at approximately \$35 million. A contributing factor to the loss was thought to be unprotected, combustible cooling towers. A critical lesson learned here was that due to the widespread destruction and local recovery operations, getting permits and approvals from local authorities took longer than expected^{4 5}.

Given recent sector wildfire events, the risk threat of wildfires to renewable energy projects is now a key discussion point for plant owners and their insurers. Renewable energy risk managers should give wildfire mitigation measures significant consideration for their risks, and proactively share such measures with their insurance partners, perhaps even including insurers in developing such programs.



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“the risk threat of wildfires to renewable energy projects is now a key discussion point for plant owners and their insurers.”

³ Unless otherwise stated, all statistics quoted in this paragraph are from Willis Towers Watson's own records

⁴ <https://www.kqed.org/news/10701255/wildfire-damage-at-renewable-energy-complex-estimated-at-35-million><https://www.latimes.com/local/lanow/la-me-ln-valley-fire-damages-part-of-huge-geothermal-power-generator-20150914-story.html>

⁵ <https://legacy.pressdemocrat.com/business/4543193-181/calpine-estimates-fire-damage-in>



Wind turbine pitch bearings: why risk managers should take note

Introduction: why pitch bearings cause losses

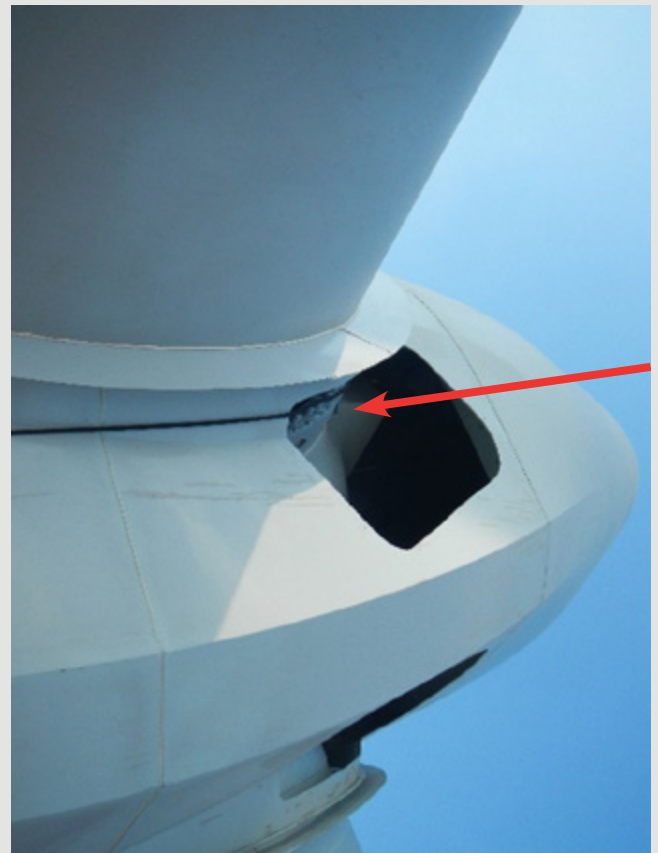
Some models of wind turbines are susceptible to insurance losses from premature component failures, and one issue that has caused serial losses to occur is the blade pitch bearing. The frequency of failure of the bearing is low (0.12 failures/year onshore and 0.14 failures/year offshore¹). Often only certain models from a manufacturer suffer from pitch bearing failure, while other models remain unaffected.

However, once the serial loss occurs it can affect every wind turbine in the wind farm. Assuming the availability of spare parts, specialist crane hire and suitable weather conditions, replacing the pitch bearings on a wind turbine onshore can take four days at a cost of between EUR75,000 to EUR100,000. This article discusses the current industry knowledge around pitch bearing failure and failure mechanisms.

How a pitch bearing operates

The majority of wind turbines use a pitch bearing (Figure 1 to the right shows a red arrow pointing to part of a bearing) to rotate the blades about their central axis, providing a means to optimally adjust the blade angle for wind conditions. During operation a pitch bearing is typically subject to small blade angle oscillations (<5°) and will on start-up and shut down rotate 90° from the brake position (neutral) to the most aggressive active power position. As well as allowing the blade to rotate crucially, the pitch bearing holds the blade on to the hub and prevents the blade being ejected. Even when not rotating at speed, the pitch bearing is still stressed with the natural mass of the blade.

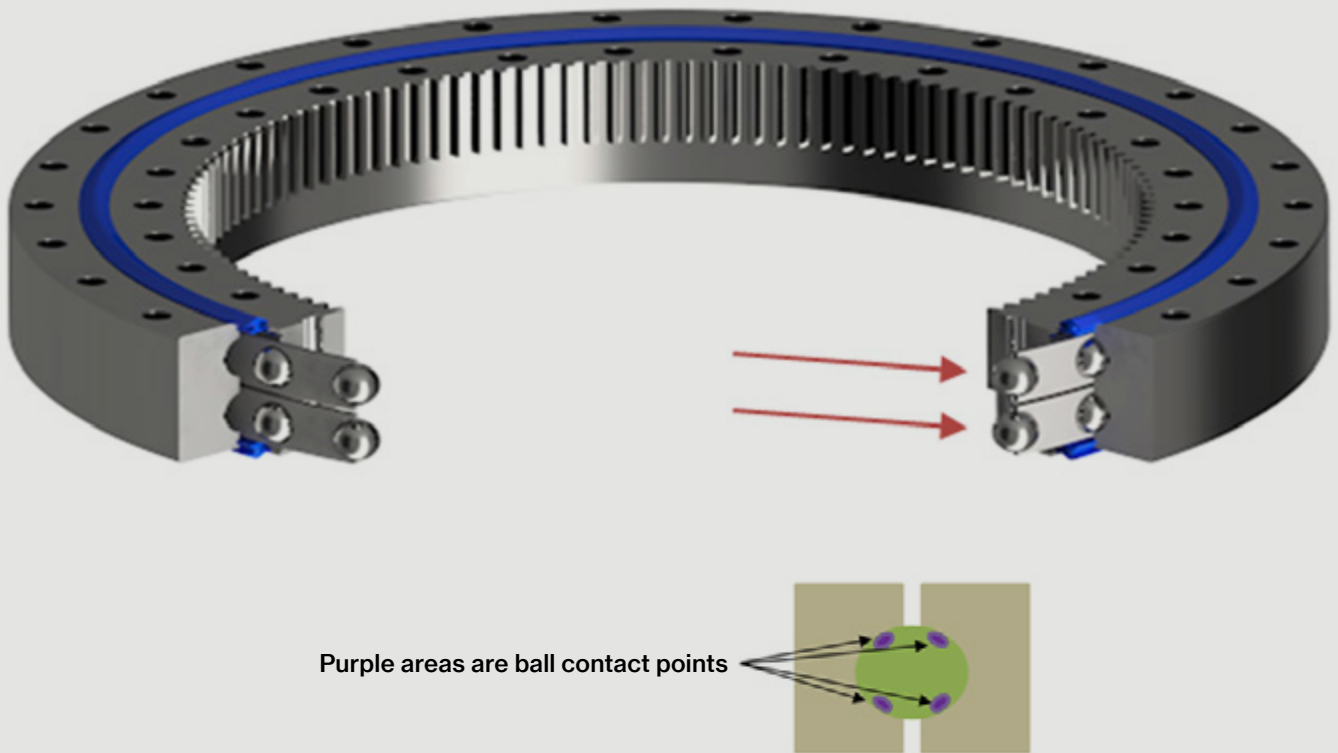
Fig 1: location of the pitch bearing on a wind turbine



Source: Willis Towers Watson

¹ Reliability Analysis of Wind Turbines <http://dx.doi.org/10.5772/intechopen.74859>

Fig 2: Two row ball bearing



Source: Willis Towers Watson

The forces acting on the pitch bearing include:

- Aerodynamic radial force, induced from the blades pitch angle
- Centrifugal force, from the mass of the blade
- Rotational forces, as the blade is rotated
- Vibrational forces, which degrades the pitch bearing lubrication and induces stress into the components of the bearing

High bending moment loads

The combination of these forces result in high bending moment loads on the pitch bearing. These loads create deformations on the blade root, the pitch bearing and the hub; the hub can distort in an elliptical shape under certain load conditions. These oscillating forces require a bearing which can accommodate the variable forces acting on the bearing and the hub to which the bearing is bolted. The traditional choice of bearing for many manufacturers has been the two-row ball bearing as shown in Figure 2 above (balls shown with red arrow):

The spherical ball bearing only has four points of contact, two on the outer race that is fastened to the hub and two on the inner race that is bolted to the blade root as can be seen in Figure 2 above. The ball point contacts with bearing raceways provide multiple points of contact with the balls; this enables the bearing to carry radial, thrust and movement loads simultaneously.

Individual bearing ball surfaces do not see even loading during their lifetime and although each pitch bearing has typically 150 bearing balls, typically 10% are highly loaded and carry the majority of the weight. This is because the bending moment forces are so directional that the bearing distorts and the load on each bearing ball is not equal.

The main failures of blade pitch bearings are:

- Ellipse truncation of the bearing cage
- Cage wear cracking and surface fatigue
- Lubrication issues due to lack of grease brinelling of the raceway
- Poor control of the hardening depth of the raceways
- Outer race cracks originating from stress raisers such as bolt holes and ball fill plug holes



Where the manufacturer has failed to get the design of the bearing and hub stiffness correct, certain models have suffered from hoop stresses in the bearing race that require tensioning cables to be placed around the bearing to increase the capability for minimising elliptical distortion. This situation is rare, and we have witnessed other manufacturers installing arc-shaped strengthening plates which are bolted on to the bearing housing bolts. We have also witnessed premature bearing failure occurring as early as four years into the turbine's life, with extreme failures resulting in blade ejection as the bearing opens up in an egg-shaped manner.

Grease supply

Areas of the ball race which are not a contact point provide a chamber for the grease inside the bearing to lubricate the ball as it traverses around the bearing. However, as the ball bearings are subjected to small blade angle movements, the bearing ball surface does not have a continual process of supplying grease. Therefore, at the areas of the bearing where the radial forces are highest, the bearing can prematurely wear, as the grease film on the bearing is reduced and the balls can impact the race (a process known as Brinelling).

As the bearing race deteriorates, material from the raceway combines with the grease to provide a crude grinding paste. The ball bearing is always a higher hardness than the race as the balls cannot be sacrificial as they are holding the blade on to the hub.

Finite element analysis critical

Wind turbine manufacturers have realised that simply scaling up the size of the bearings which can be over 4m in diameter does not always provide the desired 20-year design life. Manufacturers realised the importance of carrying out finite element analysis of the bearing applying the operational forces to the bearing races. These computer simulations have confirmed that the bearing races and the hollow cast iron hub do distort, especially during high wind, high load conditions. This results in a

twisted ball race for the ball bearing to travel as well as the bearing distorting in an elliptical manner. This elliptical distortion moves the ball contact points near the lip of the bearing, causing distortion leading to pitting.

Elliptical distortion solution

The wind turbine generator (WTG) manufacturers that have twenty years' operational experience now provide a solution to controlling elliptical distortion by modelling the hub and bearing in the design stage. The extra stiffness which can be achieved is a trade-off to the increase in the mass of the bearing and the hub. The WTG manufacturer assesses the different design models of the bearing and hub with a focus to the raceway ball contact stress and edge stress. Once the design has been optimised to achieve a twenty-year life, the bearing can be made by a third-party bearing manufacturer. Once a prototype bearing is available, it can go for physical testing. Manufacturers have a test rig which can simulate the blade loading on the bearing and the bearing is operated in an accelerated life situation. This accelerated life allows the actual life of the bearing to be established. Greasing regimes, either manual or automatic, can also be applied to see the influence on bearing life.

New bearing design: the T bearing

The bearing manufacturers of the duplex raceway bearings have increased the contact area on the balls race to try and improve life of the four-contact bearing design. However, with the evolution of WTGs and the increasing blade length, the bearing designers have had to develop new bearing designs.

The latest design, which has been in service for a few years now, is known as a T bearing. The bearing still uses two rows of balls but the contact area on either side of the ball has been altered from point contact to over 110° on either side of the T. This extra contact area has lowered the stress at the point of contact and therefore reduced the fatigue failures and stress-initiated cracking. To date, this bearing has given good field service, with no reported issues.



Balls replaced by rollers will extend turbine life expectancy

The latest generation of turbines with blades over 100m long will probably have the latest roller bearing design. The bearing will typically have three sets of caged roller bearings, two sets in the blades axial direction and one set controlling radial movement. The roller bearing provides a larger contact area to allow low contact stresses to be achieved between roller and bearing race, ultimately leading to the expected 20-year life.

Conclusion: a paradigm shift

The operational field knowledge and experience, coupled with extensive Finite Element Analysis (FEA) modelling of the hub with the dynamic loads and the use of new bearing designs, are allowing the evolution of the wind turbine as it grows in both stature and output. Without the paradigm shift from the traditional duplex double bearing, the ability to evolve would be restricted.



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Floating Offshore Wind: key considerations

Introduction

It's hard not to be excited by the potential that Floating Offshore Wind holds. Buoyed by the ability to harness stronger, more consistent winds in deeper waters, there is a now large project pipeline, estimated at 6.2GW by 2030 and up to 19GW should cost reduction be accelerated.¹ We at Willis Towers Watson are proud to have been involved in the development, risk advisory and placement of multiple projects to date, including what will be the world's largest operational Floating Offshore Wind farm when it reaches energisation in 2021 utilising MHI-Vestas 9.5MW technology. Based on our experience, we've outlined some points which should be helpful for developers.

Maritime rules and regulations

The nuances associated with maritime rules and regulations are a critical piece of the jigsaw to bear in mind when developing a Floating Offshore Wind project. An example of this is the Nairobi International Convention on the Removal of Wrecks (the Wrecks Convention) which 'requires the registered owner of any seagoing vessel of 300 GT and over to maintain insurance or other financial security to cover the costs of locating, marking and removing of wrecks'².

Fig 1: the Kincardine floating wind project: WGT tow-out



Source: Kincardine Offshore Wind Limited (KOWL) - reproduced with kind permission

¹ <https://www.offshorewind.biz/2020/07/07/gwec-launches-floating-offshore-wind-task-force/>

² https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/440547/MIN_499.pdf

³ <https://safety4sea.com/imo-continues-supporting-the-nairobi-convention/#:~:text=Name%3A,%2C%20Japan%2C%20and%20Saudi%20Arabia>

Let's take an example from the UK. In UK waters, if you do not have approval from the Department of Transport and the associated relevant NRWC certificate, any movement of the floating structure will be vetoed by the Maritime and Coastguard Agency, potentially leading to delays in your project. Additionally, if your project's insurers are not verified by the UK government for wreck removal conventions, then an approval process is necessary before the project can be granted the required certificate to proceed. This approval process focuses both on the insurers' financial standing and on certain requirements as to the level of project specific cover offered.

With the Nairobi Wreck Removal Convention applying across 47 states around the world, including early movers in Floating Offshore Wind, it is an important topic to engage with earlier rather than later in development³.

Weather patterns and associated activities

Careful attention must be given to weather patterns and associated activities. Where possible, long towing routes should be avoided, due to the unpredictability and inability to forward project weather patterns. For example, should a storm descend during a tow, it is important to have prior-identified stopping points which can be used for safe shelter/stand-by while the storm passes. Insurers and their appointed Marine Warranty Surveyors will not allow a tow to commence without their prior certification of the route, so this should be a primary concern.



Auxiliary power

Something which can be overlooked during the tow of the fully erected turbines from port to site is the requirement for auxiliary power on board the semi-submersible structure on which the wind turbine is housed during any tow. Wind turbines in their assembled state during towage operation would not normally have access to a primary power source. As the wind direction can constantly change, turbines need a power source during towing so that they can override their pitch and rotor system and bring the rotor to face into the prevailing wind during towage operations. Without a power supply, there is a very real possibility that the offline turbines will not be facing into the wind, creating additional loads on the structure by subjecting them to physical stresses and levels of vibration for which they are not designed; it can also have an adverse effect on the stability of the whole structure during a tow operation. As a contingency measure, it is therefore recommended to have auxiliary power connected to the system, which is inexpensive and, importantly, will help mitigate the possibility of serious damage to the wind turbine generators (WTGs) during towing.

Interface between semi-submersible and WTGs

When it comes to the selected turbine technology being utilised on Floating Offshore Wind projects, there has been clear desire to go straight for the larger models. These wind farms are being built to take advantage of the world's best wind resources, so using the biggest turbines to harvest more wind and enhance your power production is understandable. Given their size, the interface between the foundations and the WTGs is vital. A collaborative approach to integrated design between the turbine manufacturer and semi-submersible designer and fabricator is essential to allow a suitable length of time to be allocated to load iterations. The overall optimisation of the combined structure (WTG and floating system) should be given priority over the size of the WTG.

Additionally, given the size, scale and innovation associated with this nascent technology (in respect of both the foundations and the WTGs), operational track records are closely scrutinised. Positive operating experiences and classification society approvals are vital to help secure financing and commercially reasonable insurance coverage.

Port infrastructure requirements

The port infrastructure requirements for Floating Offshore Wind are different to those for fixed bottom structures. While much of fixed bottom construction is completed at sea utilising jack-up vessels, for floating projects much of the assembly and construction can be done at a port.

This has the advantage of avoiding costly and dangerous labour at sea but does often require upgrades or amendments to port infrastructure. These might consist of adapting navigation channels and wet storage, particularly if the foundation to be used has a high draft (e.g. spar) rather than semi-submersibles, which are easily towed out thanks to their low draft.

Equally, ports will require substantial yards for laydown and cranes that are suitable both in terms of heavy lift ability but also the height they can lift to, given the size and weight of the turbines being deployed. Should changes to port infrastructure be required, it's important to notify your broker of these works and the associated values to ensure they are built into your coverage and agreed with insurers. Furthermore, there is a high possibility that the works will interact contractually with the rules and regulations of the associated port; early engagement with your broker will help to ensure all contractual and insurance requirements are aligned.

State-sponsored economic support

While there is a substantial pipeline of potential Floating Offshore Wind projects, state sponsored economic support is required to accelerate their development. You only have to look at how state subsidies encouraged the rapid growth and deployment of large scale, fixed-bottom offshore units to understand how important it will be for Floating Offshore Wind. This support will help drive innovation, speed up large scale commercialisation and help drive down the Levelised Cost of Energy (LCOE) in the longer term.

Traditional Delay in Start-Up (DSU) insurance does not cater for the long term impact of lost subsidies, or failure to meet the relevant subsidy allocation rules (which vary but might require energisation or delivery by a specified date). So bearing in mind the potential financial importance of subsidies over the life of the project, the potential for losing them is a serious issue.

Fortunately, there are solutions available to mitigate this risk. Parametric insurance can be used with a single date trigger which pay a fixed amount, which is based on the net present value of the expected subsidy values.

In the complex and evolving risk landscape of Floating Offshore Wind, it is important for developers to consult with their brokers early in the development stage. By doing this, the various risk considerations can be worked through in a methodical manner, helping to contribute to the project's success; indeed, you might be surprised what risks can be insured despite today's challenging insurance market.



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Microcracks: a macro problem?

Microcracks are small cracks in solar cells that are impossible to see with the naked eye but really impact the performance of your solar energy system and investment.

Photovoltaic cells, in their basic form, are relatively thin and can be fragile to any kind of pressure or stress, leading to damage caused by cracking which in turn results from the inherent weakness of the silicon cell material. The integrity of the cells does change with different manufacturers and as a response to different known location requirements. When they occur, micro-cracks can vary from small sections of the cells to the full length of the cells and are not always visible from the naked eye.

The three main microcrack causes are manufacturing, delivery/installation of the panels and the operational lifecycle of the panel, including environmental factors.¹

Manufacturing

Manufacturing defects are usually caused by poor quality materials or process controls, which means the cells become exposed to excessive stress or temperatures as well as poor quality manufacturing and production equipment. These should and can be easily mitigated by the introduction of strict quality assurance checks being put in place. Through greater focus on the manufacturing processes over the last decade there is now a clear understanding of Tier 1 and Tier 2 manufacturers when developers are considering procurement versus cost and quality.

¹ Ed. (2018, October 8). Solar Panel Micro Cracks (Tier-1) Exposed! <https://review.solar/solar-panel-micro-cracks/>

Fig 1: damage due to manufacturing, transportation/installation and the environment



Source: Ed. (2018, October 8). Solar Panel Micro Cracks (Tier-1) Exposed! Retrieved from Solar Review: <https://review.solar/solar-panel-micro-cracks/>

Transportation

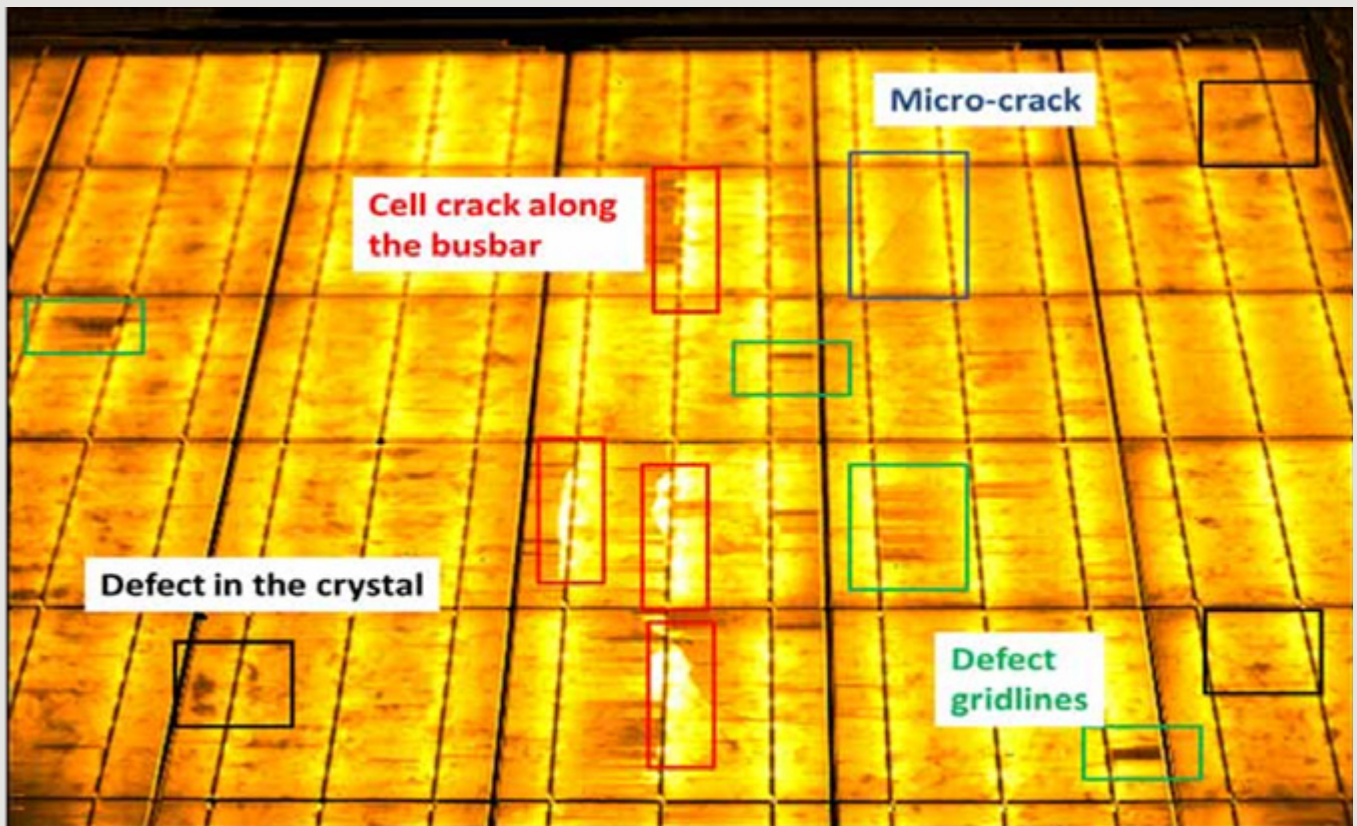
In the delivery stage, damage to the cells is normally incurred as a result of incorrect packaging, unsuitable transportation methods and poor handling techniques. All of these can be mitigated to a large degree by designing packaging with enough protection and padding to ensure that the correct protocols are followed while shipping and storing. While in the installation phase, damage can be caused by improper handling of the modules, accidental bumps and/or drops and excessive force, twisting while installing within the frames and installers walking on panels. It's a common feature with many insurers, who have reported finding that human error (workmanship) resulting from inexperienced construction crews is still often the root cause.

Environment

The most common cause of microcracking is following installation of the panels and during their operational lifetime when they are exposed to external environmental factors. This includes fluctuations of temperature between day and night, constant wind fatigue stresses, heavy snowfall creating weight pressures and, of greatest concern, hailstorms. These can all place the cells under extreme duress, which can lead to microcracks occurring².

² Niclas. (2012, December 25). Solar panel micro cracks explained: <https://sinovoltaics.com/quality-control/solar-panel-quality-an-introduction-to-micro-cracks/>

Fig 2: an EL image reveals defects and microcracks in a PV Module



Source: Sundling, A. (2019, November 2019). PV Evolution Labs (PVEL) – Independent Test Lab. Retrieved from <https://www.pvel.com/field-el-testing-pv-modules-benefits-for-asset-owners/>

However, it must be stressed that the existence of a microcrack does not mean that the PV cells or panels will not function to their designed specification. With operational life expectancy of up to 25 years, it is often difficult to identify the difference between the known or predicted degradation of the panels. However, additional degradation in panel performance (the responsibility of the manufacturer under warranty) or damage that has arisen from sudden external environmental events as identified, would not be the responsibility of the manufacturer. As noted, continual short exposure to external factors, which might normally be considered to be covered by traditional all risks of physical loss or damage policies, may not be identified at the time of occurring; instead, a fatigue stress event is created, which only manifests itself over a longer period. Insurance generally requires a sudden and identifiable event for damage to be considered.

Detection and consequences of microcracking

The Solar Photovoltaic (PV) industry has developed new techniques for crack detection, such as the Resonance Ultrasonic Vibration (RUV) to detect in-line non-destructive cracks that may occur during the manufacturing process³. Additionally, there is the Electro Luminescence (EL) or the Electro Luminescence crack detection (ELCD) which is one of the most applied quality testing imaging methods. The EL method scans the surface of the PV modules in a method which is very similar to something like an X-Ray. Using the EL method, the pictures taken allows us to peer directly into the inner structure of the solar cells of a PV module to reveal any inherent defects and micro-cracks within.

³ Dhimish, M., Holmes, V., Dales, M., & Mehdadi, B. (2017, June). The effect of micro cracks on photovoltaic output power: case study based: <http://eprints.hud.ac.uk/id/eprint/33463/1/Effect%20of%20micro%20cracks%20on%20photovoltaic%20output%20power%20case%20study%20based%20on%20real%20time%20long%20term%20data%20measurements.pdf>

According to Sundling⁴, over the past decade the practice of EL imaging has advanced dramatically and now allows owners or operators of Solar PV systems to identify any modules with cell damage that are likely to underperform against the stated design specification. The evolution of this technology means that it is no longer restricted to highly controlled indoor laboratory environments; it can therefore be used in the field during the daytime without unnecessary cost or effort, making it easier to test these panels on a more regular basis.

When microcracks are present, they cause an electrical separation which in turn causes parts of the cell to remain inactive. Quantifying this to a specific level of power loss is quite challenging, as there are several other factors that play a role. It has been shown that modules that have microcracks can still meet the warranted power over the module's lifetime, so rejecting every module that contains a microcrack is not necessary⁵.

Nonetheless, it is almost impossible to avoid microcracks in the long-run; left undetected, it is estimated that the economic impact of microcracks, including repair/reinstatement costs as well as the cost of loss energy productions, is around €6 per kilowatt per year, meaning that overall annual losses would be well into three-digit millions every year⁶.

Insurer concerns

There is now enough evidence to suggest that microcracks, whilst inevitable, can be mitigated by good risk management. The Renewable Energy insurance market has experienced several high-profile natural catastrophe losses in recent years; this has firmly placed Solar PV projects under insurers' scrutiny for microcracking from external environmental factors. This includes direct and indirect microcracking losses from various issues, such as wind damage resulting from hurricanes and, more recently, large unnamed storms, poor installations resulting from contractor workmanship issues and hailstorm damage. When losses occur with increasing frequency and severity, insurers will seek to respond by reducing cover and increasing prices. Coupled with the hardening of the insurance markets globally, insurers are looking to limit their exposure by the application of microcracking endorsements such as the example reproduced in Figure 3 to the right.

Fig 3: an example of an insurance microcracking clause

- 1. It is hereby understood and agreed that for all purposes of the Policy to which this Endorsement is attached, Microfractures shall not be considered direct physical loss of or damage to Insured Property, regardless of the nature, scope or cause thereof, unless more than 25% of the cells of any individual solar module contain Microfractures.*
- 2. To the extent more than 25% of the cells of any individual solar module contain Microfractures, that individual solar module, and only that individual solar module, shall be considered to have sustained direct physical loss or damage. The availability of coverage for that direct physical loss or damage shall be subject to all terms, conditions, provisions, limitations and exclusions of the Policy to which this Endorsement is attached, including but not limited to the requirement that the direct physical loss or damage be caused by or result from a peril, cause or event not otherwise excluded.*

In addition to the above, the following would need to be evidenced:

- 3. The power output on a per string basis must be demonstrably lower than prior to the loss; and*
- 4. The reduction in power output must be greater than the manufacturer anticipated degradation rates for panels of an equivalent age.*

Microfracture(s): means the manifestation of any microscopic crack or fracture in the panel of a solar photovoltaic module. For the purposes of this exclusion the term Microfracture and Microcracking shall be considered the same and interchangeable.

⁴ Sundling, A. (2019, November 19). PVEL - Independent Test Lab: <https://www.pvel.com/field-el-testing-pv-modules-benefits-for-asset-owners/>

⁵ Köntges, M., Kajari-Schröder, S., Kunze, I., & Jahn, U. (2011, September). Crack statistic of crystalline silicon photovoltaic modules. Retrieved from 26th European Photovoltaic Solar Energy Conference and Exhibition. https://www.researchgate.net/profile/Sarah_Kajari-Schroeder/publication/236152832_Crack-Statistic_of_Crystalline_Silicon_Photovoltaic_Modules/links/00b7d533933214bf10000000/Crack-Statistic-of-Crystalline-Silicon-Photovoltaic-Modules.pdf

⁶ Hutchins, M. (2018, December 26). Filling in the (micro)cracks. <https://www.pv-magazine.com/2018/12/26/filling-in-the-microcracks/>

Consequently, there is increased reliance on securing proof that the panels remain inherently free of microcracks at the appropriate times. This might be after production, upon delivery or during the panel commissioning/ acceptance testing before acceptance by the facility owner. Evidence of the panels being microcrack-free can then be used as a baseline, if it is thought that damage occurs later; or alternatively if the defence is to be that the damage is a pre-existing issue, the evidence can point to which party should take responsibility for rectification.

A key issue is that the damage must have occurred following an insured event - i.e. damage needs to have occurred. There is a need for an agreed methodology to determine the conditions at some point or points in time, through an agreeable test method. Post-event testing costs are still not cheap, even if costs are coming down; as a result, we are seeing the introduction by some insurers of monetary limits for testing costs. We are also seeing the market introduce conditions which stipulate that insurers will only accept that there has been insured damage if there is an identifiable event which results in damage to more than 25% of the exposed panels.

Conclusion: a major concern for the solar industry

This market response highlights that microcracking is a major concern for the solar industry and its relationship with the insurance market. However, with several Tier 1 manufacturers now investing heavily into research and development, we are seeing cells which are much less vulnerable to cell cracking - a welcome development.

Furthermore, the advancement of the EL imaging ability will assist owners and developers to be able to engage with more active monitoring of their sites, identifying early any signs of trouble (which may not be visible to the naked eye) and allowing them to more clearly identify the causation and relevant party for rectification.

Because of both of these factors, we believe that future relationship between the solar industry and the insurance market remains promising.



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Solar trackers: chasing the sun and weathering the storm?

Introduction: a winning combination

While the sun comes up and the sun goes down, wherever in the world you install your solar system you will not be able to achieve optimal harnessing of the available irradiation without tracking the sun's daily movement. In an era where efficiency and output are imperative, solar trackers were always the natural evolution to this challenge and are now widely deployed.

A solar tracker system could increase the energy production of solar farms by between 15-30%¹ and includes the safety feature of travelling to a horizontal position to protect against an oncoming storm. Chasing the sun and weathering the storm - it seems like a winning combination!

But is it too good to be true? In this article we analyse the benefits of tracker systems and the impact they have on a solar project's insurance premium.

Types of racking system

When designing a solar photovoltaic (PV) power plant, developers are faced with a choice of three main types of racking systems:

- Fixed Tilt Systems – modules at a fixed tilt and orientation
- Single Axis Tracker - automatically adjust the positions of the PV array so that the PV modules consistently “track” the sun throughout the day, east to west, rotating on a single point
- Dual Axis Tracker – rotates on both the X and Y axes, making panels track the sun directly

Each has its own distinct advantages and disadvantages, and ultimately the best option for a PV plant will require a full analysis of the site location, conditions, topography and overall project design. These systems initially met with resistance in the early 2000s due to the associated maintenance requirements and higher costs; however, since then these racking systems have steadily grown in popularity amongst developers. The global solar PV tracker market is poised to grow by 102.11 GW during 2020-2024, progressing at a compound annual growth rate of 39% during the forecast period². Single-axis trackers are dominating the solar market and this trend is expected to continue to nearly 90% of ground-mounted shipments in 2021³.

Chasing the sun

Producing more power

It has been observed in recent years that many solar park developers are focusing on the development and construction of lower cost projects in order to sell them under Build Sell Operate (BSO) and other similar financial/profit models. From an economic perspective, whilst the cost of trackers might typically add upfront costs of 5-10%⁴ on large utility scale projects, they are also able to produce more power during peak demand hours as they track the sun throughout the day, resulting in the lowest available levelled cost of electricity. In addition, developers can generally expect an increase in the investment rate of return of the project. The attraction is understandable, especially when measured against the rapidly decreasing rewards of fixed and variable solar PPAs (Power Purchase Agreements) and rapidly increasing costs of insurance. The ability to increase power production becomes critical in assisting project owners and operators to achieve an enhanced Return on Investment.

¹ Compared to fixed tilt arrays of the same size <https://www.kiewit.com/plant-insider/current-issue/fixed-tilt-vs-axis-tracker-solar-panels>

² <https://www.businesswire.com/news/home/20200218005428/en/Global-Solar-PV-Tracker-Market-2020-2024-Evolving-Opportunities-with-Array-Technologies-Inc.-and-Convert-Italia-SpA.-Technavio#:~:text=The%20solar%20%23PVtracker%20market%20is,%23marketresearch%20report%20by%20%40Technavio.>

³ <https://www.solarpowerworldonline.com/2018/02/fixed-tilt-vs-tracker-one-size-fits-approach-can-limit-solar-production/>

⁴ <https://www.greenworldinvestor.com/2017/08/23/tracking-the-sun-all-you-wanted-to-know-about-solar-trackers/>



“One size fits all” a false economy

However, this should not be a ‘one size fits all’ approach. In all circumstances, the design which has been made to operate efficiently in the chosen location should be paramount (for instance, the hurricane version of a tracker which has been designed by the manufacturer to allow fitting in a higher risk location). This is instead of the alternative, which is attempting to install a lower cost version with a design not specific to the potential exposures of the location, leaving any location inappropriate or under design risk with insurers. The last 18 months has shown that such projects are facing substantial challenges in securing a level of insurance cover with a commercially acceptable deductible and premium.

Moving parts risk

Furthermore, from an insurer perspective, trackers bring the risk of moving parts, resulting in greater risk of mechanical and electrical breakdown. When there is a failure of the tracker, tracker arms or lack of power, either during construction prior to energisation or if there is a failure during the operational phase, the inability of the tracker to return to a safe position will create a substantial value/risk exposure. Consequently, the plant will likely suffer from loss of revenue; since trackers tend to have a longer lead time, insurers will argue that they are exposed to higher revenue losses.

Evolving technology

Alongside the developing tracker technology, solar photovoltaic technology is continually evolving. PV string DC voltage are getting close to a thousand volts DC, combined with much smaller string inverters that are more efficient (with less heat loss) having built-in dispatching software, electrical and temperature protection systems.

But what happens when this is combined with poor tracker design? Unfortunately, not all trackers are designed equally. There are known poor tracker designs; in the long term, as the insurance industry suffers from losses from certain just-in-time design and installations, project owners may find that they are unable to procure the required insurance coverages at commercially acceptable premiums and terms. As we have noted in this report, the insurance market is not about to rapidly return to soft trading conditions and limitations on capacity are forcing some projects to retrofit improved design standards at additional cost to maintain a higher level of insurability.

Weathering the storm

Protection from extreme weather

Perhaps a redeeming feature is the protection that trackers claim to offer against extreme weather, particularly windstorm, flood and hail. “It is a fact that wind is the most common cause of damage for photovoltaics systems in general,” says Thorsten Kray, of IFI Aachen⁵. It was generally thought that the safety feature of a tracker travelling to a horizontal position to protect against an oncoming storm was a good idea. The panels would present the minimum aspect to the wind putting the least load on the structure, preventing the panels from being damaged by flying debris.

Coping with windspeed

However, it is being widely argued that trackers are more prone to windstorm damage due to their structure and default storage positions, especially if the mechanism or power supply fails during movement, leaving entire arrays exposed to wind borne damage. The stow safety position might be an angle just off horizontal, in which case the

⁵ <https://www.pv-magazine-australia.com/2019/09/07/long-read-pt-1-tracking-in-the-wind/>



wind attacks from all angles, pushing down on the panels which increases the pressure on the support legs and also from behind, which has the effect of lifting the panel and applying pressure in the opposite direction.

As a result, the tracker structure must be strong enough to maintain control of the panels throughout the storm and high wind speeds. While leading manufacturers in the renewables industry have designed trackers capable of withstanding certain maximum wind speeds, if these potential speeds are higher than those specified, a tracking system is no longer a viable option. While long term site-specific historical data is not always available, design standards to 1 in 20 or 1 in 50 years may be inherently flawed.

Exposure to hail damage

When using the horizontal stow safety position, not only are the panels more exposed to hail damage, but wind will pass over and underneath the structure, causing oscillation in the tracker arms and consequently in the panels, potentially resulting in microcracking (discussed in a separate article in this publication). It might not be obvious at first, but the unseen damage can be extremely costly; in many cases, the cost of testing the capacity of the cells is similar, if not more expensive, than the replacement cost. This has led (amongst other reasons) to many insurers recently imposing a microcracking exclusion to all new and/or renewing policies. Following some recent high-profile hail losses, some insurers are seeking to tighten this exclusion further, with an outright exclusion of microcracking caused by hail.

It is a further concern that while trackers will be returned to a safe position, often automatically following anemometer wind readings, when there is a hailstorm, it frequently occurs with relatively low wind speeds; moving the trackers to a safe position requires a manual override.

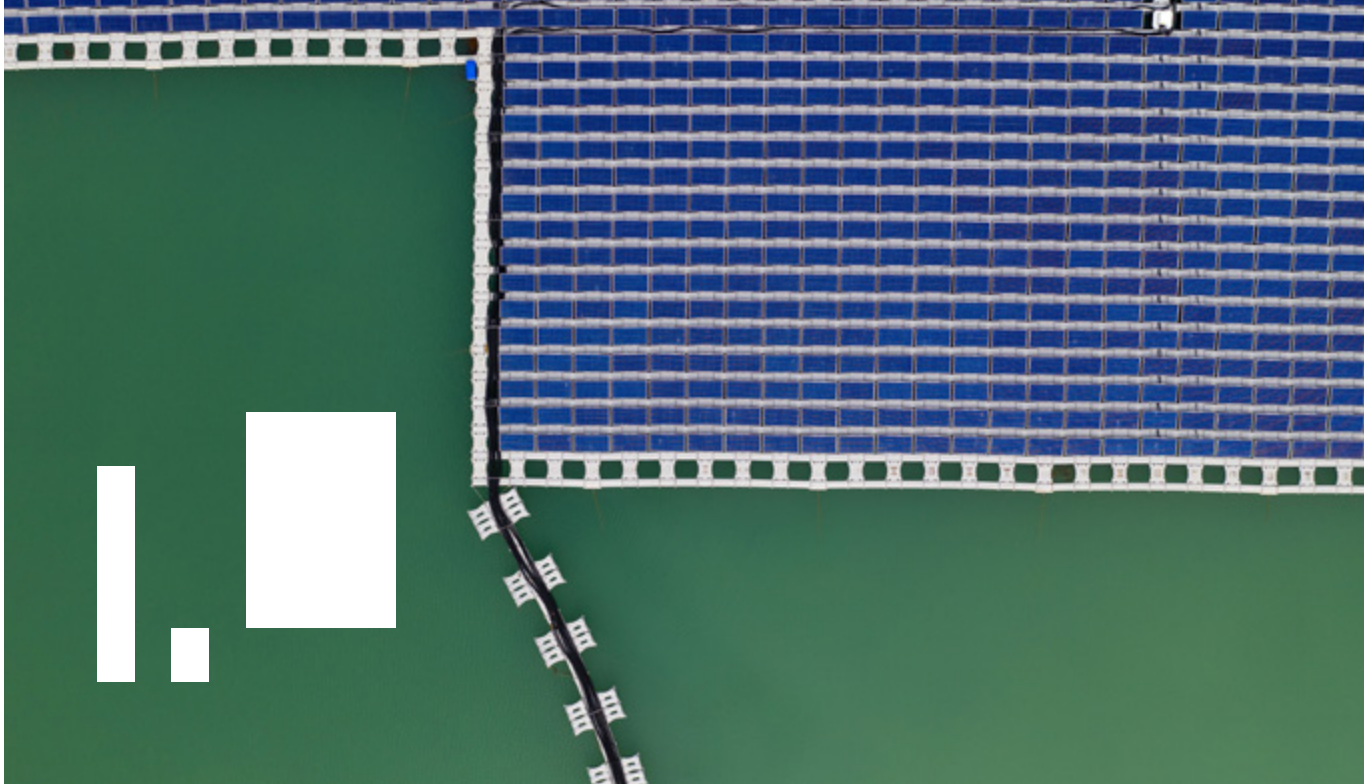
Conclusion: we can follow the sun and weather the storm

In summary, it appears that large scale PV plant operators will always adopt tracking structures, as there is more control and a larger return on desired production; however, the downside is a greater exposure and higher Probable Maximum Loss (PML) through the design criteria and the mechanical tracker systems ability to adapt to protect exposure to Natural Catastrophe (Nat Cat) events. Better metrological prediction software and more positive action tracking systems are coming on stream to help mitigate this risk so that we can keep following the sun but weather the storm better.



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“The tracker structure must be strong enough to maintain control of the panels throughout the storm and high wind speeds. While leading manufacturers in the renewables industry have designed trackers capable of withstanding certain maximum wind speeds, if these potential speeds are higher than those specified, a tracking system is no longer a viable option.”



Reflections in the sun: Floating Solar

Introduction: mixing electrics and water?

For those not involved in the industry, the concept of floating solar photovoltaic (FPV) projects may seem unusual. We are taught from an early age that mixing electrics and water in such proximity is not something we should be doing, and while offshore wind is now an established renewable energy technology, FPV has yet to make the plunge. Much like the transition of wind from onshore to offshore in search of more space and becoming a better, more consistent resource, the time is now ripe for a much wider-scale rollout for FPV.

The sun shines on land and sea alike; if we look a little closer, we can see that there are significant benefits to be gained from moving this technology into a wet environment. Floating Solar is now being harnessed by many developers and is being hailed as the next new revolution in renewable energy, being likened to the Onshore Solar market a decade ago.

A simple concept

The concept is simple. Flotation units are linked together to form a buoyant body, on which traditional panels can be affixed. The whole structure can be built row by row at the water's edge and then launched onto the water surface as each row completes. Once located on the body of water, it is then anchored via mooring lines to the sea (or reservoir) bed. Modules can be combined into 'islands' to suit the needs of a project or the shape of the available water formation. Combiner boxes and inverters are placed alongside, with the project then feeding energy out to the onshore transformer via marine cables.

Evolution not revolution

The reality is that the core technology for these projects is evolutionary rather than revolutionary. Solar photovoltaic systems are technically well understood and deployed globally; the industry has access to a wealth of knowledge gained in the offshore wind industry, which can be used to address some of the challenges which might come with subsea cables and the electrical repatriation of power from a wet generating location being received onshore.

Significant solar suppliers, such as Sungrow and Baywa, are now rolling out their own modular systems and building on the work of earlier innovators in this sector, such as Isigener and Ciel & Terre. Nevertheless, the floating deployment of these technologies is still more expensive. As an example, Structural Balance of System Costs (SBOS), which include the floating structure, mooring and anchoring system, make up about 34% of total project cost, compared to just 8% for a similar ground mounted project¹.

With some locations however - particularly islands - having limited land mass for utility scale, onshore solar sites have strong support from off-takers with preferential PPAs (Power Purchase Agreements). The opportunity landscape for experienced onshore solar developers to take advantage of strong commercial first mover incentives is becoming a reality.

¹ <https://www.woodmac.com/news/editorial/floating-solar-update-2019/>

An answer to land acquisition challenges?

Renewable energy developers will be all too familiar with the challenges of acquiring land with sufficient planning consent when delivering onshore projects. While wide open spaces may be available in some territories, many others with existing transmission and distribution systems to support consumers and local demand will appreciate that development space can often be at an absolute premium. It's no surprise therefore to see a significant amount of FPV development activity in Southeast Asia; countries such as South Korea, where there is limited land mass with a large part being mountainous, are finding alternative ways to fuel their power needs and are looking closely at Floating Solar.

As the cost of land goes up, access to open water starts to look increasingly attractive. 87% of FPV capacity is in the Asia Pacific region², but other countries with high land cost and an availability of inland water bodies, such as the UK, are already home to numerous projects. It's not a well-known fact that the QEII FPV project in Greater London, near Heathrow owned and operated by Lightsource BP at 6.4MW, is one of the largest Floating Solar arrays in Europe and indeed was the largest when it opened in 2016³.

Overall enhanced power efficiency

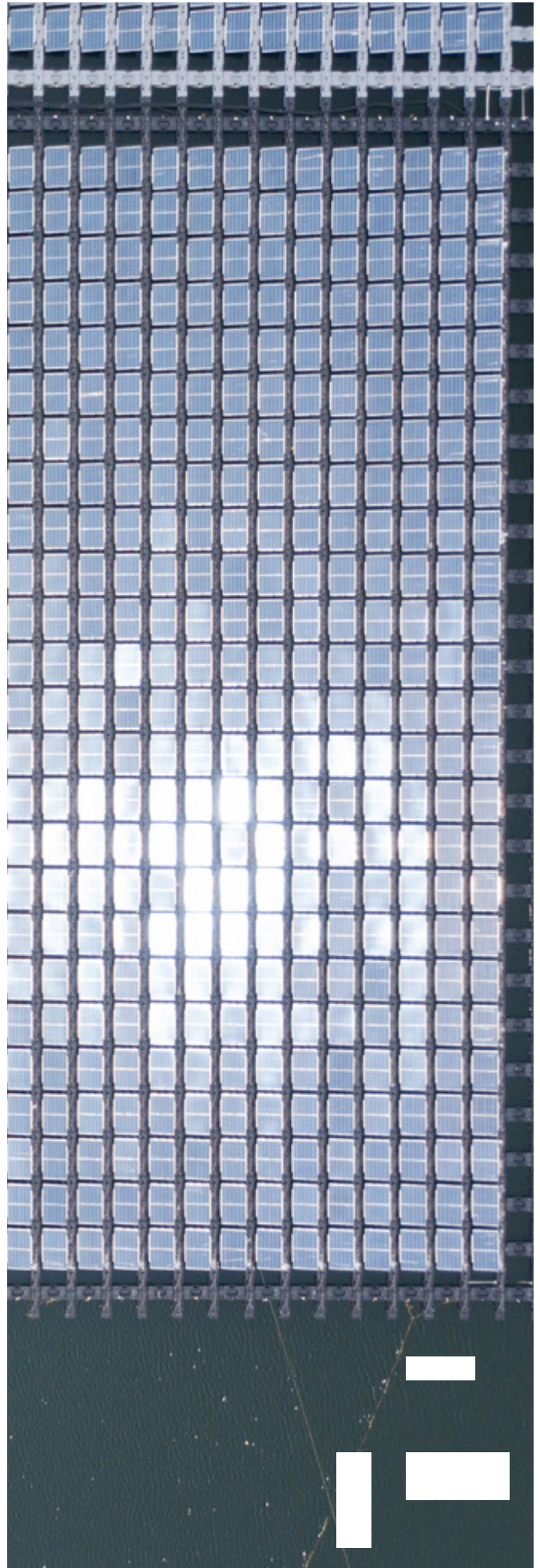
Another key advantage FPV offers is an overall enhanced power efficiency. As systems heat, they become less efficient; this results in a meaningful reduction in power output and consequently project efficiency and profitability. Proximity to water has a cooling effect, reducing the temperature of the operating system and benefitting the site with a greater power output than a comparable land-based site. This lower operating temperature is also expected to slow module degradation.

Other advantages

Moreover, there are further advantages to FPV. Covering a large surface area of the water reduces water evaporation; given the mounting water conservation challenges faced by some parts of the world, the prospect of keeping water in reservoirs is appealing. In addition to this, it has been posited that this shaded area helps to reduce the growth of harmful bacteria and algae which are unwelcome in water supplies. For these reasons, a large number of existing and developing floating solar projects are located on dam and reservoir systems.

² <https://www.saipem.com/en/blog/new-frontiers-renewables-floating-solar>

³ <https://www.rechargenews.com/transition/fire-hits-bp-ventures-flagship-floating-solar-plant-in-uk/2-1-877293>



Hybrid with hydroelectric installations

One key identified application for FPV is as part of a hybrid system with existing hydroelectric installations. Hydroelectric plants rely on a body of water, meaning land costs are significantly reduced. In addition to this, there is existing interconnection infrastructure, further reducing costs and streamlining development. Excess energy during low demand periods can be utilized to pump water back up to the reservoir, creating energy storage. The anti-evaporative effects of the islands are again a welcome benefit. Finally, such systems could form a natural 'buffer zone' for recreational water users.

FPV challenges

Nevertheless, FPV does come with fresh challenges which are still in the process of being met. A typical onshore solar project is expected to last for at least 25 years, with panel manufacturers offering warranties for this period. Floating systems need to be able to withstand long term life, as widescale replacement could require the dismantling and reconstruction of the facility. In an industry known for driving down cost, this is one area that needs to be given a priority in the budgeting phase, as well as being carefully monitored during the project's operational lifetime.

Environmental impact

We are also yet to understand the long-term implications of FPV covering the surface area of larger bodies of water. The environmental impact is of paramount importance, particularly if we are to consider a significant global rollout of the technology as is expected during the next wave in the energy transition. What impact will it have on aquatic habitats, or birds? Will a project face opposition due to preventing leisure usage of the area, or impacting the image of a site? We are already seeing the effect that sentimentality has had on existing renewable energy sites, so understanding these issues and having an educated dialogue on them is key.

Saltwater deployment

The next real frontier for the industry is saltwater deployment. Offshore installation brings with it a host of its own unique challenges in addition to those already facing freshwater deployment. Systems will need to be durable enough to deal with salinity, while the continuous buffeting effect of waves will test anchoring systems, as well as the island's overall integrity. Developers will also face stronger weather systems, putting greater strain on modules; together, these challenges will need to be solved in order for a wider saltwater rollout to occur.



Conclusion: insurers' current FPV apprehension

It seems clear that FPV will have an increasingly important role in the energy transition; it's also clear that Renewable Energy developers who are considering moving from a dry to a wet operating environment will face many risk challenges, particularly as the size of system increases, depending on location, whether it be inland reservoir, lake or the open seas.

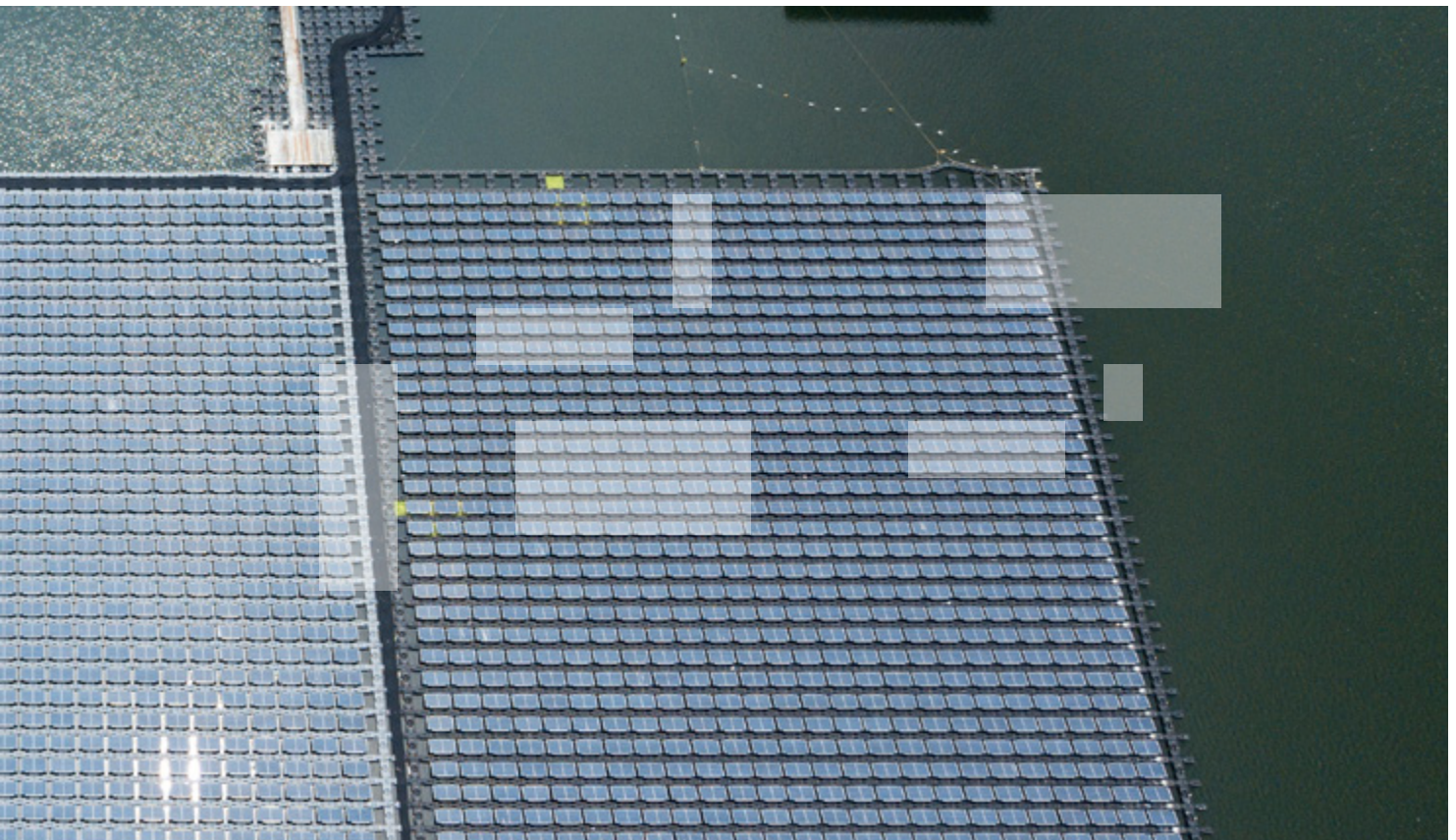
However, insurers are currently not actively targeting this generation technology; their limited experience suggests that any cover offered is likely to be as an accommodation to a broader client relationship. We should be mindful that moving from an onshore to offshore environment can often significantly increase the perceived risk of a project (depending on location), and this would be reflected in the rates, deductibles and terms available in this hesitant, capacity-strapped market. We would therefore encourage an early involvement with risk and insurance advisors so that good cost modelling and risk expectations can be built into the development.



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Part Three - the Renewable Energy insurance markets in 2021



The Renewable Energy insurance market in 2021: current threats and challenges

Introduction: a challenging relationship

The relationship between the Renewable Energy insurance market and developers, owners, operators and investors in assets producing green, clean or low carbon power is becoming increasingly challenging. This challenge is resulting from the rapid deployment of new technology and projects installed in new locations, coupled with the maturity of other projects. This is set against a backdrop of the hard insurance market, capacity limitations, sector losses and a desire by insurers to carefully select their risks and clients, reflecting a change of approach away from seeking premium growth and instead towards a focus on quality and good claims performance.

A cautious market

As we articulate later in this part of the Review, insurers are keen to keep pace with the accepted trajectory of the global energy transition; however, this does not come without its due diligence. While capacity providers may publicly announce their ability to write business, pointing to their lack of treaty restrictions and their commitment to the sector, it's unlikely that the floodgates will open to all technologies, insurance product lines and generating assets.

A circumspect market

The interest shown in this sector by fresh underwriting capacity is certainly having an impact, softening the blow for 2021 compared to conditions in the conventional Power and broader Downstream market. However, it is an underwriter's job to complete accurate diligence on the material risks to assess, and then set a rate commensurate with the risk. Whilst there is undoubtedly an increase in interest globally in the level of new project opportunities, we can expect insurers to remain very circumspect about the relationships they engage in and the price of their product.

So if there are to be these limitations, what does this mean for insurance buyers? Outlined below are some of the key challenges that the industry will face in terms of procuring insurance cover in 2021 and beyond.

Challenge number one: aged assets

While there has been a renewable energy renaissance over the last few years, it's worth pointing out that renewable energy projects have been widely deployed for the last few decades - just not at today's frequency and scale. There is now a substantial generation base consisting of assets in excess of five years of age with proven, consistent operating experience and revenue streams, which are likely to be attractive investments for private equity or established operators wishing to expand their portfolios.

Insurer apprehension

However, insurers are likely to find these older assets to be less desirable from an insurance portfolio perspective; indeed, the technology manufacturer, operating platform, client and project experience will come under intense scrutiny. It is likely that most of these assets no longer benefit from the original equipment manufacturer warranty; without a commercial extension, insurers would consider this to represent a substantial increase in risk exposure to their underwriting account. When insurance buyers are projecting insurance costs in their financial models, in addition to the hard market adjustment discussed in this Review, they should also anticipate up to 20% increase in Property insurance premium costs on expiry of the original equipment manufacturer warranty; this is rarely taken into consideration in premium modelling projections. Similarly, the likely reduced premium cost for securing an extended warranty is rarely taken into consideration as a cost mitigant when considering whether to buy a warranty extension.

Challenge number two - operation, maintenance and spares

Redundant technology

With renewable energy technology rapidly advancing, newer and more efficient models with enhanced material and manufacturing processes are routinely introduced. These significant advances create a real opportunity for the sector to reduce costs and challenge the Levelized Cost of Energy (LCOE). Unfortunately, as factories systems and processes are aligned to deliver the latest operating platforms, this can create pressures on the availability of spares for the previous years' technology, which are now out of production. In today's world, we are familiar with redundant technology; most of us would hardly entertain the idea keeping and maintaining our phone model for 20 years!

Trend towards in-house responsibility

There are many operators who, after years of continuous operation of their assets, feel comfortable with taking responsibility for operations and maintenance on an in-house basis. Insurers will naturally defer to the comfort of known dependency of OEM full-service availability contracts, with guaranteed or proprietary calling on the available spare's pool. With the level of deployed assets globally, there is an increased movement towards taking responsibility in-house, which can produce economic benefits for the operator.

However, until the insurance buyer can demonstrate that their organisational culture, internal controls, experience of their workforce, availability of maintenance and capital spares are effective, insurers are likely to take a pessimistic view. But if the buyer can prove their position by ownership or asset-sharing of critical spares, they are likely to benefit from preferential terms with their carriers.

Challenge number three - natural catastrophe risk

Natural catastrophe (Nat Cat) risk is probably the single greatest challenge to renewable energy community assets around the world; it's also ironic that the deployment of low carbon technology is such a significant part of the fight to address climate change.

Having said that, by historical standards this most recent review period has been relatively good from a Nat Cat perspective for insurers (even when considering wildfires). The historical exposure and losses sustained to renewable energy installations has made insurers reassess their understanding of maximum potential loss, the level of risk to which they wish to be exposed, their capacity deployment and their pricing.



Nat Cat exposure drives PML calculations

However, the changes in the climate, its predictability, volatility and impact on the industry are being widely felt from earthquake, flood, wind, hailstorm and wildfire. Perhaps five years ago insurers would have assessed that their Probable Maximum Loss (PML) - the risk to which they are most greatly exposed - would be geared to the electrical equipment, considering that the wide footprint of their system should greatly reduce the potential exposure to a loss which is close to their Total Insured Value (TIV).

Today, their exposures to Nat Cat are being assessed as key risk factors, with heavy modelling, more limited capacity and higher deductibles; this change in focus is also resulting in the broad imposition of sub-limits of cover for losses arising from these risk scenarios. Insurers consider that they are also increasingly exposed to weather events which are in themselves not considered to be Nat Cat events due to their size or because they fall outside accepted seasons. As a result, we are expecting the market to harden further in respect of weather and Nat Cat cover during 2021 and price and cover for Nat Cat remains a key challenge.

According to Fraser Mclachlan, CEO at G-Cube¹, since 2010, Nat Cat claims for onshore wind projects have become more frequent, steadily rising to more than 5 a year from 2015 until 2019 (the last full underwriting year at time of going to press). These losses were also increasingly severe, reaching nearly \$80 million in 2016 after a series of devastating losses caused by Hurricanes Harvey, Irma and Maria, as well as tornadoes and ice storms.



The most frequent Nat Cat losses during the period 2010-2019 period resulted from named windstorms and floods. Named windstorms have caused consistent losses throughout the past decade, with a usual rate of one major claim per year – however, as hurricanes and typhoons become more frequent and severe, and their paths less predictable, the number of projects affected dramatically increased in 2018.

Conversely losses due to flooding, while less frequent than named windstorm losses, can be much more severe financially due to the prolonged periods of the event, exacerbating the extensive Business Interruption while resolving the claim. Flood claims are also growing, as weather patterns around the planet become less and less predictable - while the average claims due to flooding were approximately \$2 million in 2015, flood claims in 2019 averaged \$14 million.

Extreme cold can also result in significant damage; hailstorm losses average \$18 million due to widespread asset damage.

For insurers involved in the market for the last 10 years, it would be fair to conclude that there has been a slow maturing of claims knowledge as real volume loss data has become available. According to Nigel Spencer – Global Development Manager, RSA.:

“Whilst it is well known that poor experience has plagued the market for a number of years, we are now getting much more knowledgeable about which characteristics of a risk drive this poor experience, leading to recent cover revisions and appetite changes across the London Market.”

Interestingly, Solar and Wind technologies demonstrate different behaviours when it comes to loss patterns; Solar is much more susceptible to natural perils, particularly windstorm and its cousin sandstorm. Combined with the much rarer but costly hailstorm, wildfire and flood events, these account for between 40-50% of identifiable claims costs.

On the other hand, Wind seems less prone to catastrophe events, the bulk of notified losses staying stubbornly in the mechanical arena, whether caused by accident or design. That said, the key driver for poor loss experience is the Fire claim, where irregular but high cost losses of individual turbines account for over 30% of losses.”

¹ All data reproduced below in the next four paragraphs is courtesy of G-Cube's own underwriting information and is reproduced with their kind permission.



Which sub-limit?

Determining the correct sub-limit relative to the overall risk is very subjective; this is driving an increased focus on the risk location, the data assessed and its qualitative application relative to local or international design considerations. Insurers are concluding that the overall risk exposure to their account of a substantial loss incident to a full insured value is not worth the relative premium to their account.

Vegetation management

During 2020, insurers became more aware and focused on the increased risk presented by vegetation management, specifically by Solar PV Projects but also more broadly by recent market wildlife losses in Australia and California (please see Jamie Markos' article earlier in this Review). These have demonstrated insurers' substantial exposure to hot, dry locations, where the grass underneath and the surrounding the sites become extremely dry and overgrown if not maintained correctly; this in turn leads to fire spreading easily though a site if the vegetation is ignited. Submitting a vegetation management plan at the time of securing terms, or having conditions attached to adherence, is likely to be a common feature in 2021.

Challenge number four - contractor experience

Probably the second greatest challenge for developers and operators – and for consideration by insurers – is the experience of the contractor parties. To support senior debt requirements in project financing and many owner operators' preferred procurement strategies, frequently project insurance covers are put in place on assets by the owner, which include the benefit of covers to all parties connected with the project on a co-insured basis.

Right owners, wrong contractors

In the last few years, there has been an increased concern that highly experienced and respected developer, owner and operator parties are contracting with parties whose failures have resulted in substantial losses. While insurers spend considerable time assessing their exposure to external perils and influences, the frequency of incident causes which may be put down to contractor negligence will undoubtedly drive insurers to greater diligence around the assessment of the contractor's reputation, performance and conduct during any claim's settlement process.

Most developers will have pre-qualified suppliers who will competitively bid to deliver the projects. Insurers' opinions regarding the technology provider, the technology or the ability of the workforce to act professionally and safely to perform their contracted works, will impact premiums going forward. While proof of sole negligence on behalf of one party is very subjective and difficult to prove, we can expect insurers to have a greater focus on recovering from the negligent party.

Increase in deductibles

The losses sustained are no doubt a factor in the substantial increase in deductible levels seen over the last review period during the construction phase. Most Physical Damage deductibles are passed through by the owner/ developer to the contractor on a back-to-back basis. An increase is seen as a direct response to making contractor parties more accountable for their own failures, either in the equipment supplied or the actions of their workforce. Developers should expect to have increasingly challenging discussions with their contractor parties over retained risk.

Dual insurance?

During 2021 it is likely that we will see greater challenges to the very wide waivers of rights of subrogation which have historically been achieved. Moving to permit insurers to maintain recourse against contractor parties, should it be possible to substantiate that losses, originates from the lack of due care and attention – effectively contractor negligence. This is likely to drive increased insurance costs for what will effectively be dual insurance; primary covers being affected by the employer responding on prima facie property damage, contractors will be obliged to maintain their own secondary (contingent) covers and employers' insurers will make recoveries where they believe the root cause is sufficiently strong (or not disclosed) to support recourse against the contractors. This could effectively add contractor's negligence to the definition of a vitiating act under an owner-arranged insurance programme.

Insurers have voiced their concerns around the widely reported use of contractors engaging transient, inexperienced backpackers in Australia to assist with solar PV installations. Furthermore, the market has suffered from a number of wind turbine technology losses resulting from the failure to remove a rotor lock pin before energisation, another example of a workmanship issue.



Challenge number five - lender obligations

Whilst re-financing is common, the original debt term is often 20-25 years, which represents long-term financing against the anticipated revenues expected to be generated by an asset. These long-term financing agreements make several stipulations around minimum mandated covers, maximum deductible levels or permitted exclusions.

Current Lenders' agreements reflect soft market conditions

With the increased deployment of renewable energy assets globally over the last five years, many financing term sheets were executed in a soft insurance market. While it's common to achieve a level of flexibility relative to what is "commercially available" in the insurance market, many agreements contain minimum insurance schedules which are reflective only of the softer market terms available exclusively at the time of execution. The challenges presented by the hard insurance market are being acutely felt by many financed projects; they either have to pay substantial increases to achieve the mandated level of risk transfer and deductible positioning or to embark on a process of seeking technical waivers from their lending parties.

While newer financings will at least recognise prevailing market conditions, older agreements where assets are still operating have substantial pressures to balance what they can (or are prepared to) pay for a level of cover which is considered appropriate by their lending parties with their own low risk tolerance. This is particularly felt by renewable energy assets located in high Nat Cat locations where, as discussed earlier, increased deductibles, often ranging into several million dollars, have to be supported by the Special Purpose Vehicle balance sheet.

"The challenges presented by the hard insurance market are being acutely felt by many financed projects."

Challenge number six – escalation of technology

The rapid escalation in technology in terms of size, complexity, logistics, proven experience and location of deployment continues to be a challenge. Insurers gain comfort from having a historical technological base from which to predict future performance.

Insurers wary of taking on new risks

For each new operating platform, technological development or assertion of deep investment to research and development and testing, there will only be a handful of insurers sufficiently confident to take a technical engineering lead. Most will prefer to deploy their capacity after a few years of successful operating performance. It is rare that new technology or operating systems enter the market without requiring some level of adjustment and technical bulletins are regularly released by the leading OEMs.

Greater transparency needed

As capacity becomes more risk averse, requiring a deeper understanding of the manufacturers' assessment of their technology, in 2021 it is reasonable to expect that greater transparency will be sought between leading insurers and OEMs, with insurers demanding confidential but transparent sharing of root cause analysis for loss issues. Lack in transparency is likely to result in more onerous terms being made available and greater pressure to have recourse to the contractor parties.

The renewables industry is in a constant state of development, with the advent of commercialisation and the broad deployment of Floating Offshore Wind, 6MW onshore wind turbines, 13MW offshore wind turbines, commercial battery energy storage systems and hydrogen technology. The insurance market's technical and engineering focus will only continue to grow if it is still able to support the green revolution with evolving technology; close and open partnerships are therefore going to need to be established between the technology providers and the insurers. If this not possible, it will undoubtedly impact both insurability and bankability and will be a key consideration for renewable energy developers during early procurement.

Concluding challenge: COVID-19 and supply chain interruption

The global pandemic has impacted every single person and business, directly or indirectly, and insurers are still determining their level of policy response and the financial impact of that response. There are immediate challenges around delivering timelines amidst continuing long-term uncertainty.

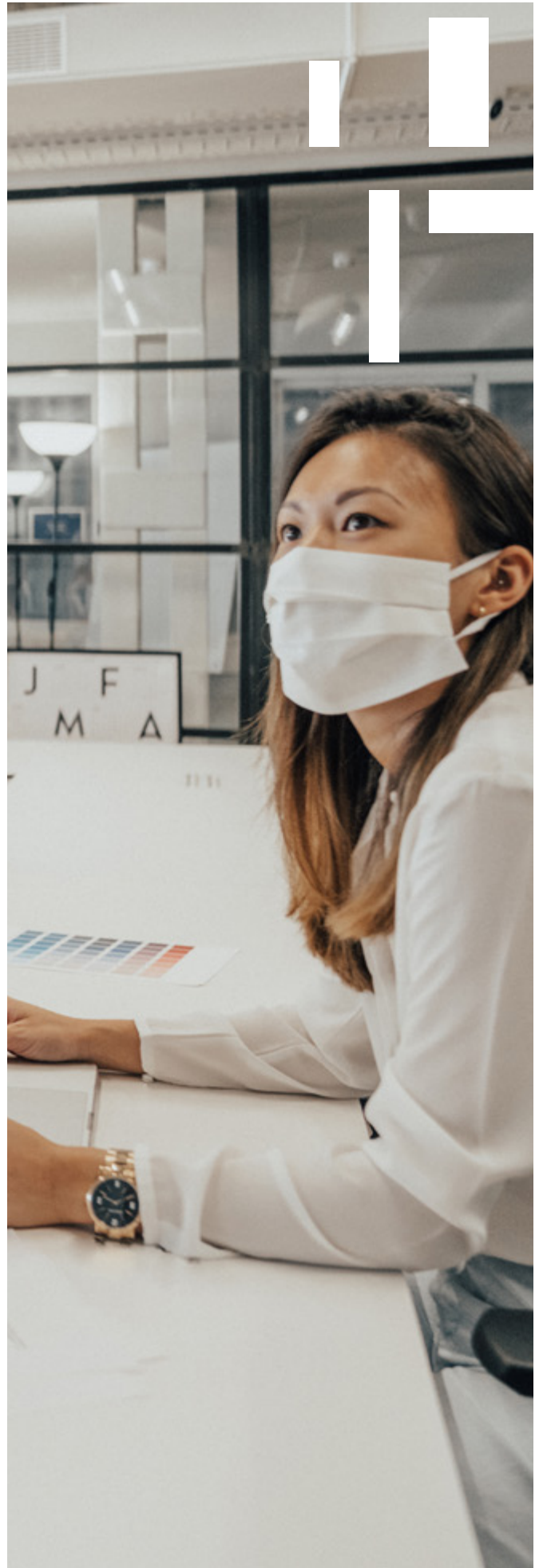
It is widely accepted that insurers will be applying exclusion clauses in the future, and the extent, type and impact of such clauses are the subject of a separate article in this publication. Will all clauses remain bankable? Will the developing position of the market lead to progressively tougher limitations? Or will the market be open to negotiate a softer overall stance?

The current market is substantially limiting the cover previously enjoyed by many renewable energy buyers and its current stance will continue to present a challenge during 2021 and onwards. The renewable energy industry continues to be integrated; delays and financial impacts resulting from interruption to the supply chain have been widely felt and are likely to continue to do so for some time. How communicable diseases not classified as a global pandemic are addressed relative to contractual force majeure language will undoubtedly shape the way in which buyers manage or transfer their supply chain risks in the future.



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COVID-19: testing times for the Renewable Energy market?

Introduction

Everyone knows that COVID-19 has changed the way that businesses operate and how we individually work and socialise. The common questions that people ask today – “when will life return to normal?” and “what is the new normal?” - cannot be easily answered. Maybe an easier question to answer is: “what impact has the risk of COVID-19 had on the Renewable Energy sector and how has the insurance market responded?”

All Renewable Energy projects, whether in the process of being built or already commercially operating, have had to adapt and recognise clear COVID-19 protocols. However, given that renewable energy production involves ‘critical workers’ and have therefore generally been allowed to continue operating in most domiciles, there has been arguably less impact on some parts of the Renewable Energy sector than on other industries. This is particularly the case for operational Wind and Solar, as they feature projects which have a high level of remote and autonomous operation.

There is no doubt that some renewable construction projects have become delayed or put on hold. While we have seen major renewable energy projects’ operations & maintenance and asset management continuing, there has certainly been an impact on claims; for example, COVID-19 has caused extended delays due to interrupted production of replacement equipment and/or delays in the supply chain. These delays will have material consequences and possibly impact the anticipated revenue stream for a number of projects.

Are COVID-19 related claims covered in Construction and Operational wordings?

While in recent years the insurance market has been ‘soft’ and wordings have become broader due to market competition and strong broker positioning, insurers’ attitudes have dramatically changed over the last 12 months. Clauses allowing for infectious disease, denial of access or others with non-damage triggers are no longer available; indeed, there is now specific exclusionary language being introduced by most insurers excluding direct or indirect loss arising from communicable disease.

An example of an indirect loss might be the failure of a security guard attending site as scheduled due to COVID-19, which ultimately results in a theft from the site. It is thought that insurers would now be able to exclude the theft loss, which would also mean that there is no indemnifiable trigger for Delay-In-Start-Up (DSU) or Business Interruption (BI), as the trigger for Loss of Revenue would normally require a trigger under the Property Damage (PD) section.

It is the non-damage extensions to Property and BI cover which we are now seeing removed, so that if a project is simply delayed due to workers being off sick or delays in materials due to factories being closed down by COVID-19, then there is no policy response. Extended delays in repair, due to COVID-19 and resupply of equipment following physical damage, becomes a matter for loss adjusters to opine to insurers.

There are examples of lost or damaged transformers, inverters and panels at solar parks that required replacement but the search for replacements has been hampered by COVID-19. The loss of revenue has spiralled as a result of the extended downtime impacting the profitability of the project. Buyers should therefore perhaps consider scenarios of how the prolonged BI could impact the project's profitability - do they have the right indemnity periods? Supply chains for critical components should be reviewed so that should a key supplier fail to deliver, there is always a ready alternative to avoid such extended delays. In the current crisis, this will mean a close watch on main suppliers and how they are dealing with the COVID-19 pandemic.

Bespoke wordings

Most brokers produce bespoke Renewable Energy policy wordings rather than relying on the standard insurance markets wordings on offer. Where possible, brokers seek to include alternative clauses such as the Public Authorities clause that extends cover to include such additional cost of reinstatement of the Property Insured, incurred solely through necessity to comply with regulations of any government (here in the UK, that extends to the requirements of the Health and Safety Executive, which might be enacted due to COVID-19). Denial of Access clauses have also received much attention from insurers and buyers alike. Cessation of Work clauses are also generally available to ensure protection, should work have to be put on hold due to COVID-19 or other communicable diseases. Again, careful consideration of potential scenarios such as having to stop construction activities and what that might mean for the cover, should be considered.

Proactive or reactive insurance market?

How have Renewable Energy insurers responded to the COVID-19 global pandemic? The insurance market has a reputation for adapting to the environment and issues of the day and this time is no different. However, we are witnessing a hardening market across the globe, so insurers have been quick to recognise the danger. They have therefore been reacting quickly to introduce COVID-19 exclusionary language; the urgency in the market has been compounded by natural catastrophe disasters that often batter insurers towards the end of the year, so COVID-19 has added another layer of caution.

The Lloyd's Market Association (LMA) exists at the heart of Lloyd's of London, representing members' interests to Governments, regulators and the Corporation of Lloyd's; it also provides technical expertise including wordings. Coronavirus clauses LMA 5391, 5393, 5394, 5396 and 5397 have been introduced from April 2020 onwards and have been evolving as the pandemic continues. The Joint Rig Committee (JRC) has also created Communicable Disease Endorsements such as the JR2020-16.

Many company insurers have also created their own preferred Communicable Disease Endorsements. Naturally, in the first instance they have sought for these to be utilised, although commonality is now being achieved around the LMA offering. However, differing opinions on clauses and their application are leading to a patchwork approach being used on insurance programmes, which potentially leads to confusion in the event of a claim. The Coronavirus exclusion clauses have been considered controversial due to the 'indirect' causation. For example, reproduced below is LMA 5397, followed by a test case summary.

FCA Business Interruption Test Case - High Court and Supreme Court

Since the beginning of the Coronavirus pandemic, some insurers who provided non-damage business interruption extensions to include notifiable disease, denial of access and loss of attraction wordings have denied claims submitted to them for COVID-19 related incidents under these extensions. However, following expedited proceedings brought by the FCA as a Test case in the High Court, the court rejected many of the causation arguments raised collectively by the insurers but also found in favour of insurers under specific points of their own policy wordings; in particular around denial of access and the vicinity in which COVID-19 existed. Sample wordings had been considered from 8 insurers.

Fig 1: LMA 5397

COMMUNICABLE DISEASE EXCLUSION

(For use on power generation, construction and engineering policies)

1. *Notwithstanding any provision to the contrary within this insurance, this insurance does not insure any loss, damage, claim, cost or expense of whatsoever nature directly or indirectly caused by, contributed to by, resulting from, arising out of, or in connection with a Communicable Disease or the fear or threat (whether actual or perceived) of a Communicable Disease regardless of any other cause or event contributing concurrently or in any other sequence thereto.*
2. *As used herein, a Communicable Disease means any disease which can be transmitted by means of any substance or agent from any organism to another organism where:*
 - 2.1 *the substance or agent includes, but is not limited to, a virus, bacterium, parasite or other organism or any variation thereof, whether deemed living or not, and*
 - 2.2 *the method of transmission, whether direct or indirect, includes but is not limited to, airborne transmission, bodily fluid transmission, transmission from or to any surface or object, solid, liquid or gas or between organisms, and*
 - 2.3 *the disease, substance or agent can cause or threaten bodily injury, illness, damage to human health, human welfare or property.*

Source: LMA5397 29 April 2020

The Test Case judgment handed down by the High Court on 15 September 2020 is very complex and will apply to different wordings, and different policyholder clients in different ways. It is important to note the fact that the Test Case is limited to specific elements of non-damage BI extensions; cover under these extensions is subject to sub-limits. The Test Case does not open up broader coverage for BI losses, so for example if a client's policy has a clear pandemic exclusion, the findings of the case do not mean the client now has cover.

On November 16th 2020, the UK BI insurance test case appeal was heard over four days by the UK Supreme Court with the focus on whether the High Court was correct in its approach to causation, trends clauses and other key details. Judgment is now awaited.

Conclusion: practical steps for Renewable Energy insurance buyers

Going forward, projects and programmes that are seeking renewal terms will face insurer questions around their COVID-19 preparedness. Renewable Energy Developers, Owners and Operators have in the last 12 months typically demonstrated that good protocols are in place to protect their construction and operational activities so these need to be clearly documented and articulated to insurers.

The current state of the global pandemic, together with the hardening insurance market, will likely prevent insurers from providing any meaningful cover for COVID-19 related losses going forward in the short term. Ensuring consistency of the Communicable Disease Exclusion will at least help with clarity of coverage in the event of a claim. Brokers should continue to work closely with insurers to minimise the impact of these exclusionary clauses, as well as welcoming the roll out of global vaccines in 2021 and life returning to some normality.



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London & European Renewable Energy markets: responding to unprofitability

Introduction: the impact of the “technical adjustment”

The Renewable Energy insurance market is complex, fragmented, dynamic, evolving and global; it's also accommodated within many different product lines. This means that it's an opaque market to analyse, albeit that the one thing that everyone is agreed on is that it's moving in line with the broader Property & Casualty (P&C) market. By all accounts, this market seems to have lost money in 2017, 2018 and 2019 and has since been the subject of intense scrutiny, review and technical adjustment throughout 2020 – a process that will continue to some degree in 2021.

Re-evaluating insurance purchase

This adjustment has enabled a re-evaluation of the importance of cost, availability and appropriateness of insurance to many insurance buyers, their corporate boards, lenders and other stakeholders. Often long-held relationships, insurance buying strategies, modelling predictions and mandated minimum levels of cover have been challenged, particularly relating to maximum deductibles. The technical adjustment, which buyers

have had to endure over the past review period, has been unprecedented in the Renewable Energy market, with a desire from buyers to remove volatility and predict forwards market movements that may impact the commercial availability of insurance cover with greater understanding and certainty. This in turn is driving its relevant positioning in boardroom agendas before any normality returns to the market.

A complex market

The Renewable Energy market is complex, as it traverses the fortunes and prevailing appetites in the:

- Renewable Speciality markets, for project lifecycle and portfolio risks
- Power and broader Downstream markets, for operational and portfolio risks
- Construction, Marine and Liability markets, for specific consideration to new build activity and influence on the Renewable Specialty markets with a multi-disciplined approach to renewable energy clients



The situation at the end of 2019

We reported last year that a number of Renewable Energy insurers had closed their speciality functions, for example Pioneer and CNA, while others had exited regional underwriting and brought capacity deployment back to London from some regions, for example RSA exiting underwriting from Continental Europe and AIG drawing authority back to London on a “hub and spoke” basis.

Often insurer managements have refused to continue carrying the weight of portfolio underperformance, electing to deploy hard market underwriting strategies. The forward projection from insurers in 2019 was a movement from a buyers’ to a sellers’ market, with the underwriting climate in 2020/21 being highly influenced by how much of a “delta” it was possible to close between the market’s desired position and that which was commercially supportable in the preceding year. The size of the “delta” was also heavily influenced by both the sector performance and the type of Natural Catastrophe (Nat Cat) season experienced during the review period.

During this period the market was in turmoil, hesitantly trying to understand its own appetite through a forensic lens, reviewing its existing portfolio and creating and deploying technical measures to achieve the desired adjustment. Would their rate increases, limitation of policy terms and the imposition of a COVID-19 limitation clause be sufficient to positively adjust their portfolios without jeopardising their more profitable, attractive client and broker relationships? Or, as the “bad apples” were identified, would it be a case of “throwing the baby out with the bathwater”, leading to a reduced portfolio and insufficient premium income?

In last year’s Review we also discussed capacity shedding, as clients’ “sole capacity” relationships evaporated, given insurers’ increased pressure for portfolio and risk diversification. We gazed into the crystal ball as the ripple effect of the London market’s harsh rhetoric that “enough was enough” resonated through other markets, with the threat of becoming a global reality. With increases of 20-40% widely anticipated towards the end of 2019, the outlook for 2020 was empowering for markets, but bleak for buyers; unfortunately in hindsight these predictions are now the reality.

A fundamental shift is here to stay

Now in January 2021, the burning question in insurance buyers’ minds is this: is the “technical adjustment” complete? Despite the market achieving overall profitability in 2020, unfortunately we must advise that there is still hardship to endure, while the market is becoming less volatile and more predictable as it settles into a rhythm and model in which it believes it is more comfortable. This is why we are not predicting a softening of the market for 2021/22; instead, we recognise that there is a fundamental shift in underwriting philosophies emerging, which is likely to be the single most influential factor in the next few years - a shift which is likely to stay, regardless of future market results.

Now we will consider which predications have come true, where the market is now and the outlook for 2021 and beyond.

2020 - the flight to quality

The degree of underwriting submission data which is required for insurers to complete their review, assessment and acceptance of a programme at buyer-acceptable terms has increased exponentially during this period. It is the underwriter's role to assess and make informed decisions regarding the different risk profiles presented by various buyers and their projects. Insurers are therefore positioning themselves for a longer-term "flight to quality" to sustain a good underwriting performance through increased diligence and assessment.

Buyer with established long-term relationships the least affected

Those buyers who have solid long-term partnerships, as well as performing programmes that offer a good degree of insurer transparency, will experience less of a chill wind in 2021 than those whose strategy remains to visit the market at every opportunity to buy capacity, thereby keeping their market relationships transient. Most insurers are seeing an exponential increase in enquiries, fuelled by disgruntled buyers seeking to acquire and harness any potential programme improvements through broad, unfocused marketing exercises. Those buyers with whom insurers want to work will experience a very different response, perhaps even with a similar risk to those with whom insurers have less traction and understanding of their commercial operations, risk/insurance philosophy and procurement strategy.



The last review period

In general terms, all buyers involved in the Renewable Energy sector over the last review period would have experienced rate increases of between 10-40% (more commonly 10-25%):

- Those with historically well-performing projects or portfolios, lower Nat Cat-exposed assets and close relationships with insurers and brokers, who have communicated well and navigated their challenges with well thought out renewal timelines - often six months in advance - will have fared much better than average.
- In contrast, those buyers who exited a fixed long-term pricing structure in 2020, those used to trading annually in capacity markets for the best premium only deal, those with programmes that are Nat Cat-exposed or that have continuing poor performance, would have experienced moments of panic, with insurance rapidly escalating up the corporate agenda or bankability criteria.

Not all risks are equal

It is also worth acknowledging that technology type and insurer experience continue to play an important factor in influencing appetite and price. The market is still spooked by its historical relationship with Anaerobic Digesters, Energy from Waste and some Biomass programmes. While Battery Energy Storage Systems are rapidly evolving, appetite for such schemes remains mixed, together with any commitment to concentrated solar power and hydro construction schemes.

In contrast, the market is becoming increasingly comfortable with the technological developments associated with the upscaling of wind technology and bi-facial panels on solar systems. This is especially the case where manufacturing defects can still be transferred to original equipment manufacturer warranties, where deductible levels are sufficient and where the current more attractive premium rates continue to prevail.

Capacity adjustments

In 2020, we did not see the same degree of capacity closure that we experienced in 2019. With the advent of more attractive terms following the "technical adjustment", the adjustment level is now being highly influenced by the perceived level of unknown risk or hazard associated with newer, less proven technologies; where that level of unknown risk is lower, there is now a substantially increased interest in the sector.



Utilising intelligence gathered over the last 5-10 years through Managing General Agent (MGA) participation, underwriters are dusting down speculative historical business plans written years ago and presenting them to Chief Underwriting Officers with recommendations for serious consideration. Many underwriters now feel that market dynamics are unlikely to be more attractive than at present; now is the perfect time, they feel, to enter the Renewable Energy market and secure a share of this rapidly developing sector.

However, market positioning is no longer centred around the “vanity” of sector control; instead, it is now more about opportunistically capturing commercially attractive terms following a solid technical understanding, and then about retaining good clients, risks and portfolios.

Attracting capacity - onshore

For the Onshore market in 2019, the “new kids on the block” were Albus & Aviva, who with good timing - and no legacy – should have been able to capitalise on the upwards trend in rates and continue underwriting with strong growth and performance. Unfortunately, Albus has moved into run-off, with no authority for new and renewal risks from 1 January 2021, following a change in appetite from Argenta as a key capacity provider. At the time of writing, some of the Albus team were promisingly rising from the ashes with new MGA opportunities at Castel. Sompo & Markel entered the market in 2020 with dedicated Renewable Energy teams, while Berkshire Hathaway, Risk Point, Travellers (PerSe with new International MGA) and Africa Specialty Risks have all moved to strengthen their focus and positions.

Meanwhile RSA, Axis and GCube, with perhaps over US\$400 million in Gross Written Premium (GWP) and a combined strength in excess of 50 dedicated Renewal Energy underwriters and strong lead capacity, have taken the brunt of the responsibility for understanding, defining and driving the current market adjustment. While they may have the largest legacy, they also have the most to gain by a hardening market. At the same time Munich Re, Swiss Re, AGCS, Scor and AIG, who have been responding to the broader well-documented market position, have also increased their interest in the Renewable Energy sector in many areas.

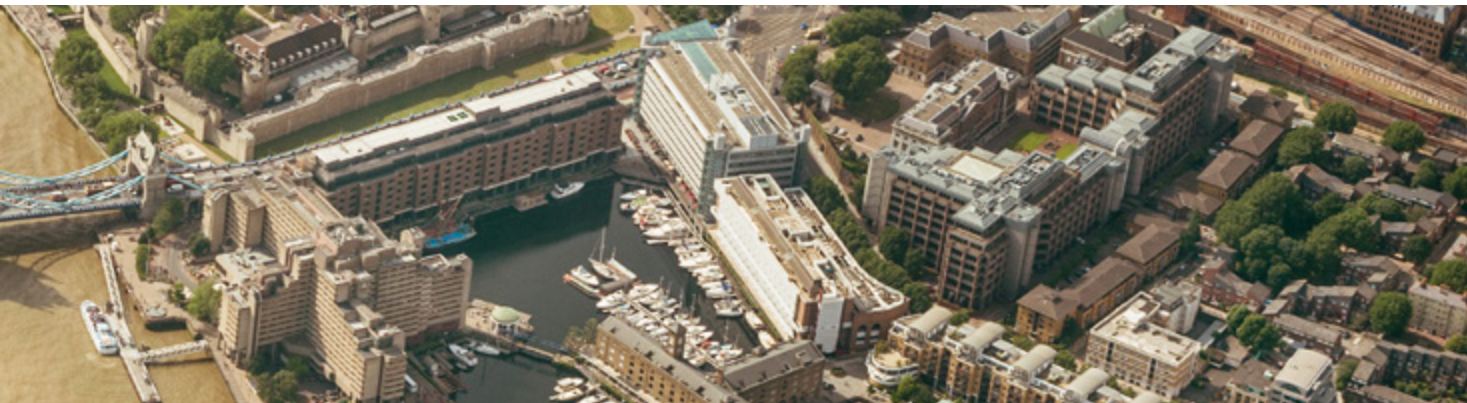
This increased market appetite has resulted from stronger internal ESG directives, a natural decline in the number of conventional power project opportunities and the increased scale, complexity and attractive industry environment of the new, green technology. Added to these factors have been insurers’ more regular achievement of minimum retained premiums, while further interest has also been generated from historical “brown and black” conventional Power market capacity providers.

It is also worth acknowledging that while the concept of a quota share market is not dead, the current market is forcing many placements to be completed on a blended basis, with differing pricing and sub-limits for differing capacity interests. This is a deviation from what we have traditionally seen, with an established, experienced market leader setting terms which are then followed by supporting capacity. The need for supporting markers to set their own terms for their own interests clearly demonstrates the variable appetites and increased time and pressure on achieving whole placements.

Attracting capacity - offshore

The Offshore market in 2020 has perhaps experienced its greatest change for a decade. With the advent of new project opportunities outside the North Sea, the promise of sustained sector growth in Asia, North America (and indeed globally) has attracted much attention. Offshore technology continues to evolve, with 6-9.5 WTG’s deployments being commonplace, with up to 13MW now being a strong consideration in the delivery of larger utility scale schemes designed to reduce costs through upscaling. As a result, the capacity limitations of achieving comfort in higher natural catastrophe exposed locations such as Asia and North America has necessitated access to a much wider pool of supporting capacity.

With many larger Offshore Wind projects, acquiring capacity is now a truly global exercise; this is particularly the case for those projects exposed to Nat Cat risks which command attractive premiums, (regularly in excess of \$10 million) which are required to secure the minimum level of cover demanded by international investors. While new capacity is being attracted by today’s relatively attractive



Renewables rates and substantial slip premiums, this portfolio also provides an opportunity to address internal ESG objectives while at the same time staying close to market developments in this increasingly relevant portfolio.

Limited offshore leadership

There continues to remain a scarcity of leading capacity for offshore projects. Codan and Swiss Re remain the patriarchs of the industry, while Canopus, which previously provided solid industry leading expertise, is now considering its position while its previous underwriting team regroup at their new home at MGA Oilfield Insurance Agencies. Both Allianz and Munich Re have a strong ability to lead, while GCube has the ambition to lead in 2021 with the hire of new talent and change of ownership to Tokio Marine HCC in 2020. AXIS are increasingly considering offshore projects, depending on project attractiveness.

Market strengthening its position

The market is also experiencing a continued strengthening of underwriting expertise. AXIS, GCube, Scor, Travelers, Markel, Gard and the Norwegian Hull Club all now have dedicated Renewables teams, new underwriters or enhanced capacity/market positions. This has increased the pressure on other offshore markets throughout 2020/21, as there is now an opportunity for brokers to access fresh or increased capacity provided by these insurers. Furthermore, we believe that leading insurer technical engineering and claims fees will increasingly become commonplace, as those maintaining a technical resource seek to be recognised for the additional value and technical workload that they provide. This is not only the case with regard to their technical engineering assessment of the risks but often their level of involvement with complex claims as well.

However, while this industry continues to evolve rapidly, developers, owners and operators of these projects will still require the continued support of the established technical leaders. This is essential to support the development to commercialise new technology such as floating offshore wind or the new 13MW wind turbines.

Claims trends

In addition, we have seen the following claims trends materialise during 2020:

- **Contractor negligence:** We are continuing to see a high claims frequency for wind construction policies, due to either contractor negligence or claims being exaggerated by contractors, sometimes without the developer knowing the contractor is claiming under the policy.
- **Weather events:** We are experiencing a year on year increase in weather events, many of which are not considered to be a Nat Cat event due to size/falling outside of the season. As a result, we are expecting the market to harden further in 2021 in respect of weather and Nat Cat cover, as this issue has affected the whole market.
- **Vegetation management:** This is an issue that we have become more and more aware of in 2020, whereby vegetation is not being maintained sufficiently on solar PV projects. This is a huge exposure in hot, dry locations whereby the grass underneath panels and on site becomes extremely dry and overgrown if not maintained correctly, leading to fire spreading easily though a site if the vegetation is ignited.

“We believe that leading insurer technical engineering and claims fees will increasingly become commonplace, as those maintaining a technical resource seek to be recognised for the additional value and technical workload that they provide.”



The outlook for 2021

Traditional oil and gas market: future support for offshore?

As we move into 2021, we would predict that the sector will become increasingly supported by the upstream oil and gas market, as well as the mutual Oil Insurance Limited (OIL) over the next five years, as traditional upstream oil & gas companies become involved in delivering projects within this sector and seek to rely on their usual insurance partners.

However, only insurers that have learned the lessons of the past, that have good memories and that can offer solid technical in-house support with a wide appreciation of the risks involved are likely to survive to reap the benefit of the longer-term opportunities. New nascent market capacity, attracted by the relatively high premium opportunities or under pressure to blindly follow existing clients into a new sector, should be very wary. The market is very sensitive - when rates are high, there is often a good reason for it. Global supporting capacity will therefore be closely watching which leading markets will be able to demonstrate the experience and self-belief to help the market navigate the terms and conditions which take into account the industry's loss record, while at the same time striking the right commercial balance in responding to buyers' demands and needs.

Will there be new opportunities?

The shift in the London and International markets' position and influence has taken 12-18 months to create a new global reality. In 2020 we experienced a substantial increase in global trading activity; this has arisen as a direct consequence of the capacity tightening in the global markets, less attractive rates and more restrictive terms and conditions. This has all resulted in an exponential increase in available deal flow, as buyers and brokers have sought to find more economically acceptable homes for their programmes.

COVID-19 has resulted in global remote working platforms and longer hours online, with the consequent increase in e-mail traffic suggesting opportunities of not-to-be-

missed deals. While insurers have been inundated with this exponential increase in e-traffic, the result has been that the time required to get a deal home has trebled; insurers' conversion rates have therefore reduced proportionately, which naturally has been of some concern for them.

Just a benchmarking exercise?

This increased activity has often justified many lengthy benchmarking results and conclusions; the associated activity and results have been counter-intuitive to delivering what it really takes to satisfy insurers and how to achieve beneficial results in the current seller's market.

The concepts of persuading insurers to understand their clients, to create and maintain key relationships and of supporting their justification of material differentiation regarding professionalism and quality, has been a challenge for all clients and brokers alike. As we enter 2021, we anticipate a more focused technical approach; this can only be achieved by bridging the relationship gap between buyers and insurers, both leading and supporting.

This approach needs to be delivered over a longer lead period to achieve the best possible results for buyers. Initial placement discussions often need to commence at least six months prior to financial close or renewal; only this approach will create the most advantageous environment needed for a true understanding of a buyer's requirements, to show why insurers should differentiate in their favour and why they should form a positive assessment of the buyer's programme in what will continue to be a seller's market.

The growing trend towards self-insurance may reduce insurers' freedom of manoeuvre

Increasingly we are finding that key buyers, especially those with the financial muscle to do so, are considering revised self-insurance versus risk transfer strategies in response to the continuing market hardening. There is no doubt that year on year rating increases, looking back to 10-40% and now forward to potentially 10-20% on existing programmes with clean loss records, will bring insurance spending under renewed scrutiny from buyer management.



Increases of this magnitude may prove to be unsustainable from a buyer perspective; many Renewable Energy companies are therefore increasingly likely to revert to analytical tools to determine optimal risk retention levels. This might be achieved through increasing deductible transfer to contractor parties or internal risk transfer purchasing strategies. It is clear that buyers are becoming more confident in their ability to self-insure through aggregate self-insured/loss retention funds.

It seems somewhat ironic that major renewable energy IPP portfolios and power & utility company assets, whose business is frequently the most attractive in the market due to the significant premium income on offer, are now responding to the ever-hardening insurance market conditions by opting to buy less cover. These companies are often highly favoured by insurers; buyers with the confidence, management and conviction to remove less complex high frequency low severity losses increasingly meet with insurers' approval, due to them being comfortable about being more readily positioned to respond to their medium-high severity, low frequency incidents. This understanding of where to position the "efficient frontier" of risk transfer can only be achieved through an analytical review of existing retention levels, claims triangulations and premium spends.

This trend will only be of comfort to Renewable Energy insurers if smaller frequency losses are removed; if not, insurers will be concerned that a programme with increased retentions instigated by buyers might accelerate good business disappearing from their portfolios. They will always be reliant on this business to fund their medium-higher severity less frequent claims; there is no doubt that the threat of further self-insurance measures by key buyers may cause the market to think twice before insisting on further punitive rating increases.

Renewable Energy as part of the wider Downstream market

As reported, appetite and capacity has traditionally resided with dedicated Renewable Energy underwriters being part of specialist, often multi-disciplined teams, benefiting from a focus and understanding of the constantly shifting technology and evolving risk landscape. However, with the advent of renewed interest from Downstream composite insurers, the dynamics shaping the Renewable Energy market are increasingly intertwined with the prevailing conditions in the Downstream Power and Construction markets.

In our Energy Market Review in April¹ and also in our October 2020 Update², we reported that this market had been going through the most challenging period from a buyer perspective for nearly 20 years. The loss record, at least until very recently, has been nothing short of disastrous; realistic capacity levels had declined for the third successive year and buyers have been experiencing significant rating increases, regardless of individual risk profiles and long-term market relationships. In October 2020 we reported that the balance of power in the market still remained firmly in favour of insurers, determined to drive rates upwards to achieve technical levels that will deliver a profitable portfolio in the long term. We reported that in 2020 there had been no further withdrawals from the Downstream market; capacity was stabilising after two years of reductions, with a much-improved loss record and we tentatively considered that the market was making a return to profitability.

If, on adjustment, 2020's current Downstream loss total of just over US\$1 billion is maintained, this would represent the lowest total in 21 years; even if we adopt a conservative approach and add on not only the additional \$300 million that we believe to be outstanding from our market conversations, but also a further amount to cover any further Gulf of Mexico windstorm losses. It is still positioning to be the lowest total for five years; bar the exceptionally benign year of 2015, it would have been the

¹ <https://willistowerswatson.turtl.co/story/energy-market-review-2020/>

² <https://www.willistowerswatson.com/en-GB/Insights/2020/10/energy-market-review-update-october-2020>

lowest for ten years. Downstream insurers have suffered losses in excess of US\$4 billion for three successive years, so buyers still found them to be in a determined mood throughout the January 1 2021 renewal season.

However, the unprecedented growth of renewable and low carbon energy, the increased focus on climate change, the acceleration of the energy transition, increased internal ESG obligations, the noted historical challenges in the balance of the Downstream sector and increased, more attractive terms and conditions for renewable energy are no doubt all having a positive impact on the broader Downstream engagement with the opportunities offered by the renewable energy sector.

Increased reinsurance costs at January 1 2021 and Lloyd's PMD scrutiny/management pressures

Renewable Energy and Downstream insurers will all be keeping a close eye on the level of impact felt post January 1 2021 by their reinsurance treaty renewals; most of these programmes will have just been renewed at the time of publication of this article and the implications will be felt throughout 2021.

A further factor which will ensure that this market will continue to harden is the continuing determination of the Lloyd's Performance Management Directorate (PMD) and overall insurance company management across the globe that 2020's underwriting result will not prove to be a "flash in the pan" and that future rating levels will be able to absorb future losses.

Major insurers may be looking to increase their written line sizes

As we mentioned earlier, this is the first time that many insurers are likely to have recorded an underwriting profit for five years. It therefore seems logical that insurers who had scaled back their lines as the market began to harden are now likely to want to increase written lines on profitable business, thereby increasing overall realistic market capacity.

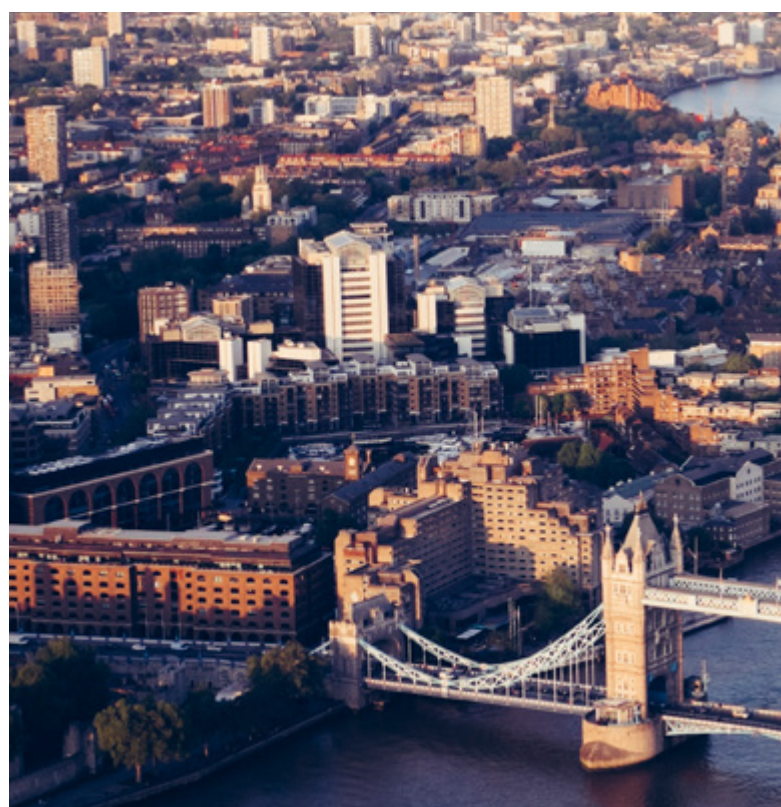
From our conversations in the market, we are already receiving signs from some major insurers that this may be the case in 2021. It should be stressed that this development in itself would not increase "theoretical" market capacity, as increasing their lines to this extent is still possible within the capacity levels insurers can already offer. But should the "fear of missing out" - particularly in the "green revolution" - drive Downstream markets to consider a more significant involvement in the increasingly attractive Renewable Energy market, it would clearly have the effect of increasing the overall "realistic" capacity available to buyers, rather than it being restricted to a few specialty players.

Furthermore, the growing interest of Chinese insurers in taking a larger share of non-Chinese business (albeit on a net retained basis at present) should ultimately provide further competition to the existing market.

Current rating increases set to be maintained for 2021

Despite these more promising results in all parts of the Renewable Energy and Downstream markets, conditions will remain uncomfortable from a buyer perspective and we do not anticipate any immediate softening. Having said that, we do predict a levelling after the 2020 adjustment, especially for the most sought-after business. 2020 has certainly been a hard market, although not to the point where buyers are unable to secure the cover they require to protect their assets properly and provide bankable comfort to attract the essential finance to continue to fuel the growth in this sector. There is still plenty of capital to be accessed, with the potential for more supporting capacity to follow the existing leaders, although as we mentioned earlier these leaders have been scaling back in recent months.

Insurers are therefore still generally insisting on rating increases and, subject to the end of 2020 reinsurance market positioning, we would anticipate increases in the region of 10-15%, while less attractive business or those programmes carrying claims reserves will attract increases considerably in excess of this amount.



Conclusion: mitigating the hard market – six key areas of focus for buyers

To conclude, there are six ways in which buyers can mitigate the worst effects of the current hard market:

- 1. Make sure your risk retention, captive participation and risk transfer strategy is based on sound actuarial principles.** Some of our clients have been pleasantly surprised at how much risk they can actually retain, having bought down their deductibles to successively lower amounts during the previous soft market.
- 2. Make a careful inventory of what should be insured, and what should not.** The market is going to charge their rate increases regardless, so to keep insurance costs down, only insure what you need to. For example, how much of your miscellaneous general asset risk really needs to be transferred? And if so, does it really need to be on a Replacement Cost basis, or will Actual Cost Value suffice?
- 3. Ensure that your values are accurate, up to date and accountable.** Insurers are going to demand to know how they stack up and the basis on which they have been calculated. Not only will this save you time when it comes to the renewal process, it will mean that any price caps that insurers will impose will be less punitive in the event of a loss.

4. Provide a high quality, comprehensive underwriting submission. This will be key to ensuring that the maximum potential capacity can be accessed and that the best possible results are achieved in an environment where risk selection is so prevalent.

5. Engage with your underwriters personally. Even if this is just by video call in this COVID-19 environment rather than face to face, it can make all the difference. Take the time to engage with them to explain your operations and answer any questions.

6. Timing is everything. Work with your broker to ensure that you deliver your underwriting submission to the market at exactly the right time. Know in advance what the insurers will be looking for and so avoid any unwanted surprises.



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Global Liability/Casualty markets: unremitted gloom for buyers as insurers continue to suffer

Introduction

Unlike both the Renewables and Downstream Property markets, we regret to advise that there nothing by way of crumbs of comfort to be had from the global Liability/Casualty markets. While it is true to say that the Property markets are hardening but still not truly hard, our Liability/Casualty markets are indeed just that. If the definition of

a truly hard market is one where capacity above a certain limit is unavailable at any price, then this really is where our markets are as we move towards the beginning of 2021. To understand why we are now experiencing these unprecedented conditions, we should examine current capacity, loss levels, underwriting results and litigation trends before determining how buyers should respond.

Fig 1: Total Theoretical Liability Capacity vs Actual Available Capacity



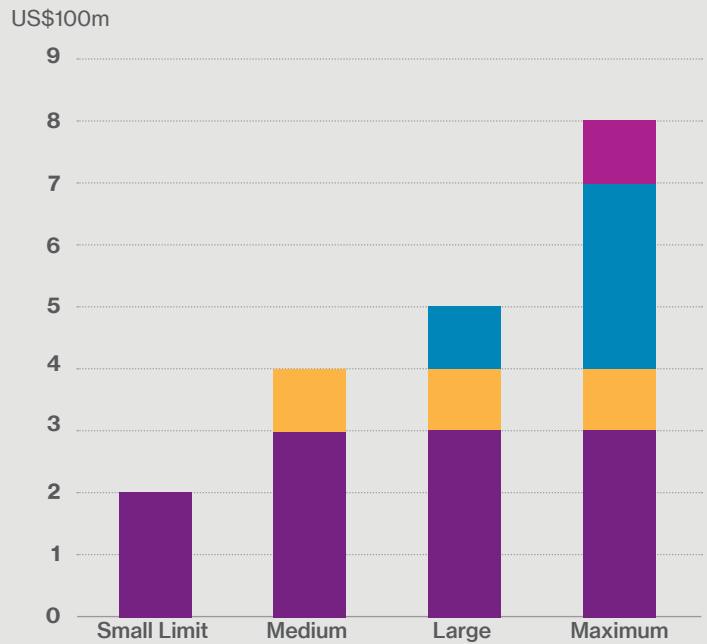
The minor contraction of theoretical Liability capacity in 2020 by no means tells the full story. For some programmes, as little as \$300 million is now realistically available, while the maximum is down to \$800 million

Source: Willis Towers Watson

Fig 2: Liability market pricing dynamics, 2020

4 Key Market Segments:

	<p>Core Existing Markets: Measured and “fair” rate increases</p>
	<p>New Markets: Minimum rates often higher</p>
	<p>Volatile Existing Markets: Erratic. May totally re-rate pricing</p>
	<p>Opportunistic Markets: Highest price they can achieve</p>



The larger the limit, the greater the price volatility

Source: Willis Towers Watson

The capacity crunch

A dramatic reduction in realistically available supply

For the last three years, even theoretical – i.e. the amount that insurers publish themselves – capacity has been gently reducing, from US\$3.2 billion in 2018 to US\$3.0 billion today. However, in this market that is by no means the end of the story. The theoretical amounts on offer from the market bear little if no relation to the amount of capacity available in practice, as Figure 1 on the previous page demonstrates. While in the Property markets the realistic capacity is at least 50% of the theoretical, in our markets it is usually considerably less.

But while in 2019 we were able to access in practice US\$1.2 billion out of a total theoretical capacity of US\$3.2 billion - approximately 33% - now at the tail end of 2020 we can only access in the region of US\$800 million for our clients in the energy sector, just 26% of the total theoretical capacity. This figure reduces still further for onshore/offshore follow form capacity and is also considerably less for certain territories and industry

sectors (this is particularly the case for Natural Resource clients with mining or wildfire exposures, where available capacity is dramatically less). There is of course little doubt that major energy companies often require Liability/Casualty overall programme limits well in excess of this figure, but we must advise that achieving any higher limits is nigh on impossible in this market, without resorting to alternative risk financing solutions.

Furthermore, the withdrawal of some Liability/Casualty markets has been compounded by the restrictions in average line size that have been deployed per risk by many insurers.

An opportunity for the opportunists!

This scarcity of available realistic capacity has enabled some new, volatile and openly opportunistic insurers to target this market to secure increasingly favourable terms from their perspective from buyers keen to secure whatever additional cover they can. This dynamic is reflected in Figure 2 above; it can be seen that the core

Fig 3: Lloyd's H1 underwriting loss by line of business, 2020

	GWP (£mn)	Net earned premium (£mn)	Net incurred claims (£mn)	Net operating expenses (£mn)	Underwriting result (£mn)
Reinsurance	7,759	3,880	(2,756)	(1,380)	(256)
Property	5,104	3,317	(2,885)	(1,434)	(1,002)
Casualty	4,404	3,355	(2,358)	(1,383)	(386)
Marine, aviation and transport	1,585	1,121	(665)	(446)	10
Energy	761	445	(219)	(164)	62
Motor	405	424	(242)	(160)	22
Life	29	27	(16)	(9)	2
Total from syndicate operations	20,047	12,569	(9,141)	(4,976)	(1,548)

Unlike the Energy Property portfolio, Lloyd's Casualty business has made a resounding loss for the first half of this year

Source: Lloyd's

existing markets, with whom buyers share established long-term relationships, can now only offer as little as US\$300 million in total – no more than a minimum working limit for most energy company programmes. Added to these long-term players are some recent entrants to the market, offering another US\$ 100m of capacity. So perhaps a total of US\$400 million can be accessed, bearing in mind that the minimum rates required from these markets are often more stringent than the existing insurers' terms.

However, above this figure buyers are now being forced to access more challenging markets. First of all, they are now forced to approach insurers whom they would have probably been able to avoid during the previous hard market - insurers who are not encumbered by the programme's previous history and whose pricing can, to put it politely, appear somewhat volatile. Unfortunately, from a buyer perspective, the amount of capacity on offer from these volatile insurers will exponentially increase, depending on the required limit. Finally, we have now the true opportunists – those who are now sensing an opportunity to obtain highly preferential terms from those buyers who have no choice but to accept their terms.

Why has it come to this?

Underwriting results

Buyers may be wondering why insurers have adopted an increasingly cautious approach to this part of their portfolio. First of all, let's take a look at recent underwriting results.

Although Lloyd's represents only a part of the overall global Liability/Casualty capacity available, their results do provide a realistic indication of the state of the overall portfolio. Figure 3 above shows that while Energy (Property) has produced a positive overall underwriting result for the first half of 2020, the overall Liability/Casualty result (across all lines of business) has resulted in a £386 million loss; to put this figure in perspective, the corresponding result for H1 2018 was a £40 million profit¹. There can be no doubt that a similar underwriting loss for Liability/Casualty has been experienced in the composite company market.

On top of that, the overall underwriting result from Lloyd's for the first half of 2020 is also a loss of over £1.5 billion.

¹ <https://www.lloyds.com/investor-relations/financial-performance/financial-results/interim-report-2018>

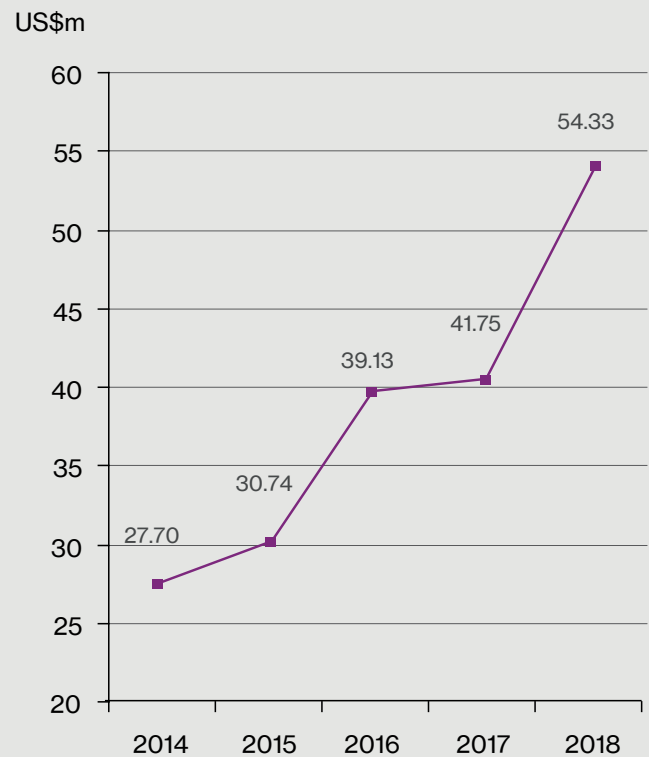
Why social inflation is resulting in larger underwriting losses

There can be no doubt that one of the key reasons for the losses that have impacted this Portfolio is the advance of social inflation, particularly in the US. We believe that the underlying factors responsible for this are fourfold:

- 1. Statute of Limitation reforms.** There is now an improved understanding of trauma, which has led to the realisation that disclosure of abuse may be substantially delayed. Statute of Limitation reforms include reviving expired statutes, extending the time allowed for victims to sue, lengthening the tail of liability and exposes the prior year portfolios to further deterioration.
- 2. Litigation funding is growing.** A popular alternative asset class, the litigation funding industry has grown significantly since 2012 and is now considered a mainstream method to fund litigation. Furthermore, there are an increasing number of cases being pursued to full litigation as financiers' push plaintiffs to trial and not to accept settlement below a set threshold in the quest for an acceptable return. And on top of that, there is now pressure on claims costs due to increased litigation cycle time and defence costs.
- 3. Jury awards are rising** (see Figure 4 to the right). The media is playing a broader role, fuelling concerns over new exposures, shaping perceptions of just awards and making juries increasingly sympathetic to plaintiffs. There is now a common perception that only a stratospheric award will 'send a message' with the belief that the corporation/insurer can 'afford it'. In large cases, the damage awards are also not always based on the facts of the case nor the level of blame assigned to the defendant.
- 4. General costs of repair are increasing.** General claims inflation has resulted in increasing costs of repair for damage, especially to components with embedded technology and to property with aggregation of assets having materially higher valuations.

“There can be no doubt that one of the key reasons for the losses that have impacted this Portfolio is the advance of social inflation, particularly in the US.”

Fig 4: Top 50 US verdicts median average, 2014-18



Source: Shaub, Ahmunt, Citrin & Spratt

As quoted in *Insurance Insider*, October 22 2019:

<https://mvvsp1.5gcdn.net/eac2fddf5b9b403c84c35ebc1bf20320>

Recent losses in the Natural Resources sector

The Natural Resources sector (including Renewables) has by no means been immune from the overall deterioration of the global Liability/Casualty portfolio. In particular, we have seen an increase in both frequency and severity of claims in respect of:

- Midstream/pipeline pollution incidents
- Wildfire
- Tailings dam failures
- Gas pipeline explosions
- Refinery and chemical plant explosions
- Salt caverns
- Product liability losses

Some of the most significant losses have been the aggregate losses following the recent Californian and Australian wildfires, the collapse of certain tailings dams, particularly in Latin America, a gas explosion in the USA, a water utility pipeline rupture in Peru, an oil leak at an offshore platform in Newfoundland and a major oil spill in the Bahamas.

Current market conditions

Rating levels

Faced with such disappointing underwriting results, Liability/Casualty insurers across the globe are now under strict instructions from senior management to secure as steep a rating increase as possible to offset these recent losses. Indeed, we are now witnessing a wholesale recalibration of existing pricing models, with a focus on rate adequacy and risk profile rather than a percentage change on expiring terms.

For non-North American programmes, in very general terms most primary layers are paying increases of between 20-50%, an alarming enough statistic for buyers but significantly compounded by the drastic increases in prices for successive excess layers: low excess layers are seeing increases ranging from 25-100%, with up to 400% - or even more, if minimum rates are deemed insufficient - for mid-top excess layers requiring the participation of the “opportunistic” markets that we alluded to earlier.

In North America, buyers are seeing increases of 25% or more for low/moderate hazard Umbrella Liability programmes, while higher hazard programmes are now paying upwards of 40% on expiring rates. Again, once Excess Liability layers are brought into the equation, buyers are looking at rises in excess of 50% for low/moderate hazard programmes and upwards of 150% if considered high hazard.

An inconsistent and segmented market

However, this simple overview of rating levels disguises some significant variations in an inconsistent and segmented market. The terms offered usually depend on a number of factors, including:

- The perceived rate adequacy of the expiring programme
- The limit required - an obvious issue of supply and demand
- The type of industry – midstream energy is proving particularly challenging
- The quality of information and strength of the buyer's existing market relationships
- The desirability of the risk in question, generally governed by loss record, territory, ESG profile and ownership
- Which markets need to be accessed by geography – local markets tend to be the most competitive, followed by London, Bermuda and other international markets, with business that is referred back to “head office” usually emerging with the most expensive renewal terms

“Faced with such disappointing underwriting results, Liability/Casualty insurers across the globe are now under strict instructions from senior management to secure as steep a rating increase as possible to offset these recent losses.”



Key insurer concerns

In general terms, all markets are reviewing coverage terms & conditions, seeking to restrict “exotic”/peripheral coverages such as Cyber, Charterers Liability, Pandemic and Pure Financial Loss.

As well as ensuring rate adequacy, insurers are taking a deep interest in buyers’ ESG credentials, particularly when reviewing oil & gas programmes. Midstream programmes featuring significant pipeline operations are also coming under particular scrutiny. Both Cyber and Drone coverage are generally excluded or written back at a significant additional premium, while COVID-19 exclusion clauses are now universally applied across all policies; indeed, an Insured’s overall pandemic response and its effect on CAPEX, maintenance and turnarounds are all being studied carefully.

The buyer reaction - reduced cover

No wonder several major clients have chosen to self-insure part of their programme or to reduce the overall programme limit rather than be held as “hostage to fortune”.

Other buyers, for whom the option to self-insure more of their programme is not possible, have had to face the fact that the limit that they would usually buy is either unavailable at any price or to voluntarily buy less limit if they consider the renewal pricing exorbitant and/or uneconomic. Indeed, we have seen at least 10 major programmes forced to accept a reduced insurance programme limit for one reason or another during the last few months.

Conclusion: the outlook for 2021

Given the current market conditions, we must advise buyers to be as fully prepared as possible to meet the current market challenges full on. Until this portfolio returns to profitability - an unlikely scenario in the short term, - buyers should expect more of the same as we move further into 2021. Eventually, like all hard markets, this one will pass as more capital decides to invest in this market, supply and competition increase and in time price rises level off.

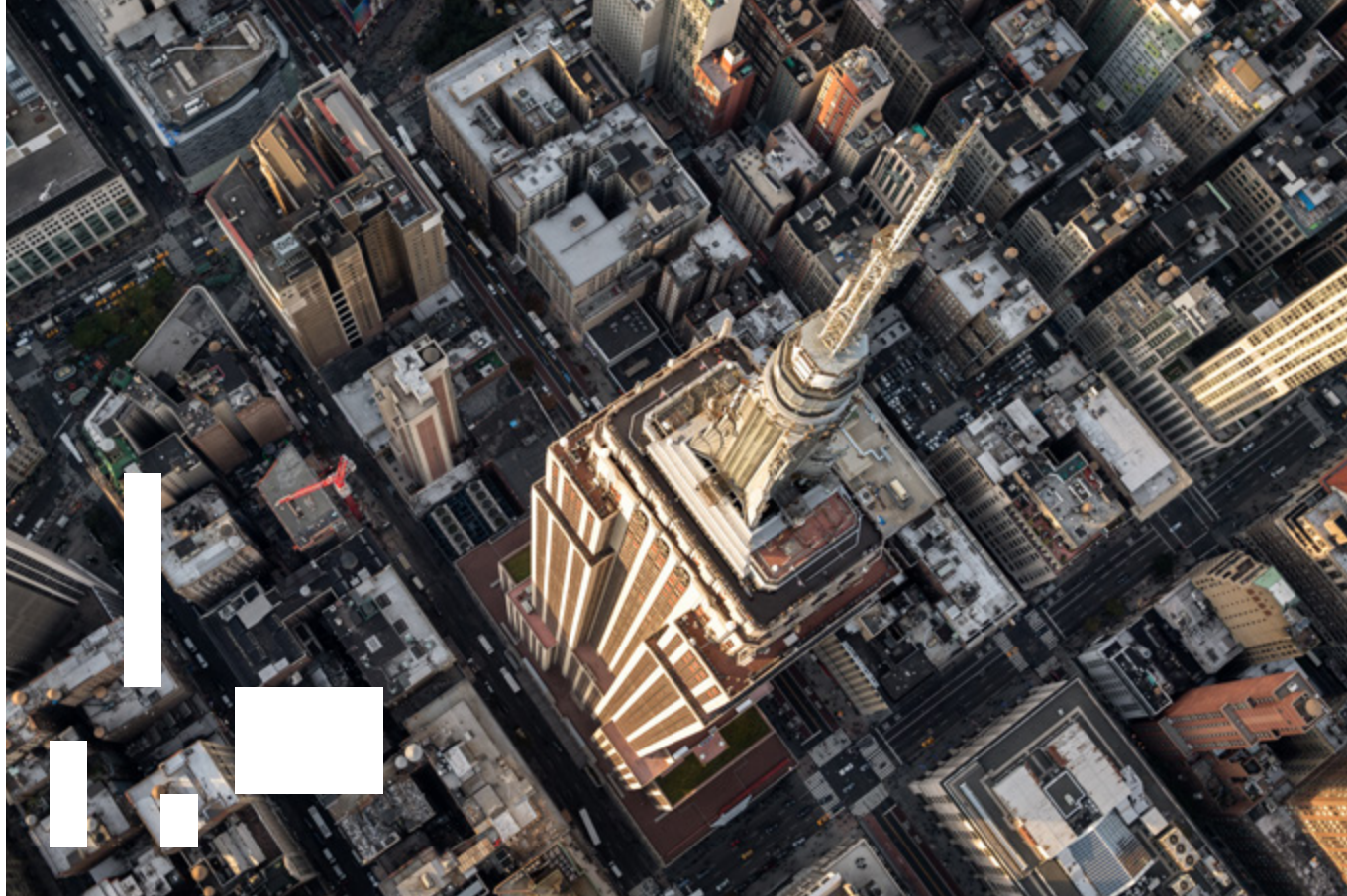
Until then, we will do all we can to prepare our clients for the challenges ahead. We must continue to emphasise that the market positively differentiates those buyers who are long-standing customers, who offer an outstanding risk profile and who understand the level of data required to secure renewal capacity.

Sufficient preparation, planning and realistic expectation management, combined with a flexible approach to retention levels, captive utilisation and limit purchased will ensure the best possible outcome in a rapidly hardening market environment.



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North American Renewable Energy market: wildfires fuel the hardening process

Introduction: some capacity retrenchment as Renewables portfolio continues to disappoint

In the North American Renewables market, AXIS, GCube and PERse continue to lead this sector, but each has retrenched following significant unforeseen hail and wildfire losses, reducing the offered limits and at higher rates. Most utility-scale programs now are shared, with lead lines typically up to 40-50%. PERse is the exception, continuing to write 100% lines¹.

Changes in personnel

2020 saw many personnel changes in the US Renewables market. After G-Cube was acquired by HCC, their US head left to start up the Renewable Energy wholesale broker NARDAC. Members of AXIS' US team have left to set up AEGIS' renewable energy team. PERse have retained their team and added some new capacity midterm to offset the exit of HCC. The partnership agreement between PERse and AEGIS will terminate at mid-April 2021.

AEGIS will be formidable in the Renewable Energy market in 2021, particularly for member business, with \$250 million of net capacity expected to grow to perhaps \$300 million. AEGIS plans to lead renewable placements on member business and participate mainly as a "follow" market for IPPs at a smaller line size.

More capacity for PV Solar and Onshore Wind

Swiss Re also provides significant capacity, including leading some programs. Other conventional insurers, including HSB, Hartford, StarrTech (and others) remain active, while others (such as Zurich) limit their engagement to participation behind MGAs, GCube and PERse. Albus and others (including some reinsurers backing GCube and PERse) have left the Power market, but market entrants have replaced them, leaving more than ample capacity to write risks in the PV Solar and Onshore Wind markets.

Other risks and creative products

Most Offshore Wind projects are written by carriers in London, though some US carriers have participated. Waste-to-Energy risks (including Landfill Gas, Biomass, Biogas and Biodiesel) continue to be challenging, as many carriers have withdrawn from the market. Insurers still insuring biomass include AIG, PERse, Swiss Re, StarrTech, Chubb, HSB and others, but their appetite varies significantly depending on the fuel source and technology used; insurers' emphasis is on writing only quality risks that engineer well. Many biomass risks have little fire protection and don't meet their requirements.

¹ One noteworthy exception: carriers will offer 100% lines for small community solar projects, or for solar portfolios with good spread of risk. But even for portfolios having single asset sites of \$15-\$20m, these carriers would rather share the risk with others than take them on alone.

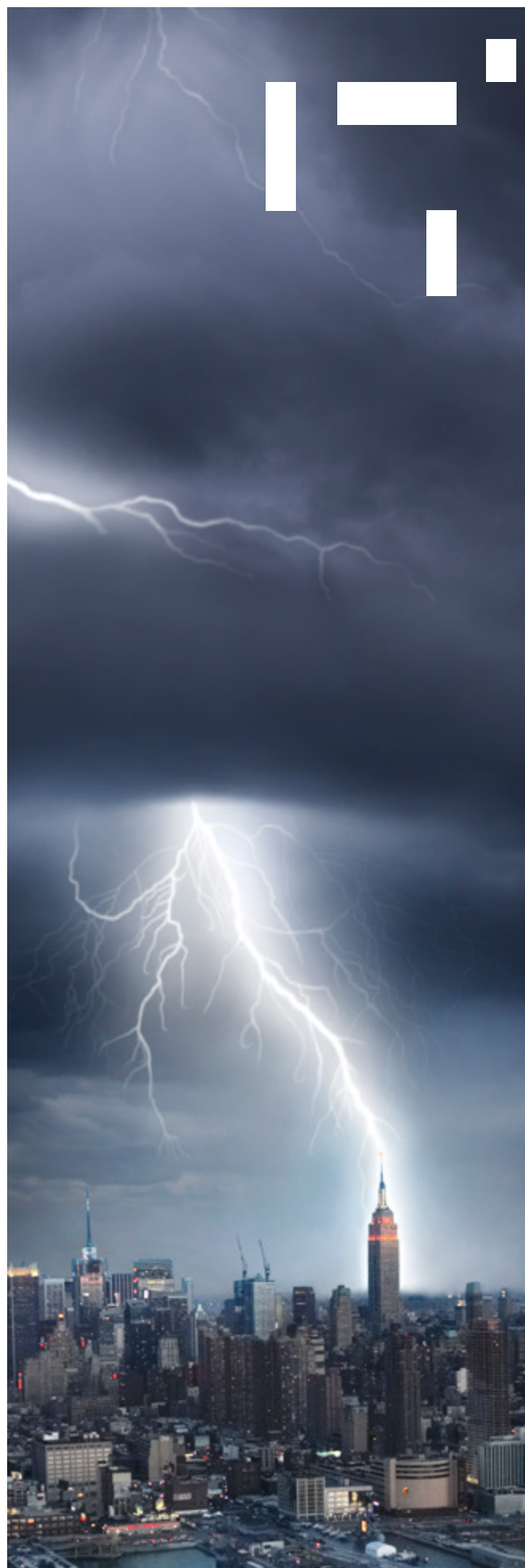
Meanwhile Swiss Re and others have developed parametric products, which become important for projects built in areas susceptible to hail and wind, particularly when clients need to minimize retention levels to meet the counterparty requirements. Hydropower risks explore parametric products tied to lack of rain causing low water levels that supply dams critical to producing electricity. Other creative solutions for renewable projects continue to be developed to meet client needs, as lack of rain causes low water levels which limit generation. Other weather-related products are being developed as needed.

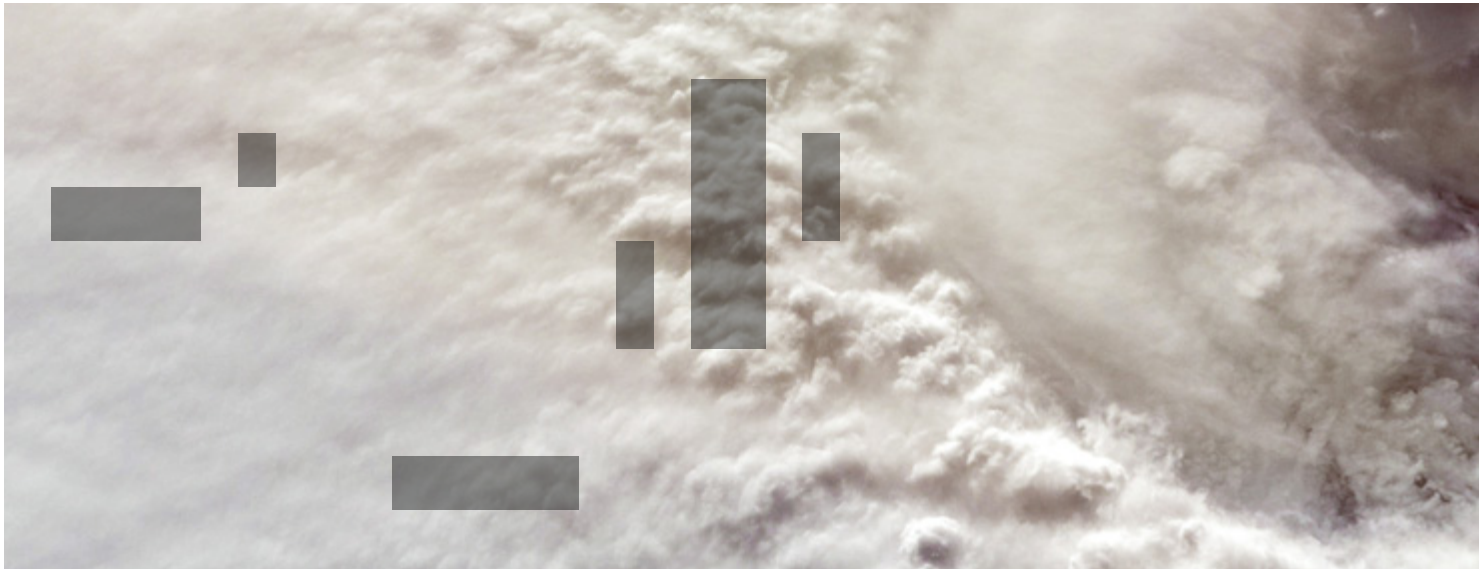
Higher retention levels for construction projects as insurers limit Nat Cat capacity

Renewables insurers now require higher retention levels (\$0.5-1 million for Physical Damage, plus a separate DSU waiting period) for wind construction projects and offer less capacity on such business, given this sector's poor loss history.

More projects are being planned and built in wind and hail exposed areas, where renewable carriers are carefully deploying capacity; this has opened the door for traditional Builders' Risk carriers to underwrite such projects. This is a different approach, as historically most Renewables construction programs have been negotiated to include the first year of operations, and some Builders Risk carriers won't write operational cover. Consequently, separate operational coverage must be negotiated later, phasing in completed assets post-construction. Zurich has led several such Builders Risk projects but is now re-evaluating its position in this sector. Allianz remains in the sector but is scaling back its overall power footprint. StarrTech, Scor, HDI, Swiss RE, Liberty Specialty and Ironshore remain keen to write Builders Risk placements. These carriers' policy forms differ significantly from those issued by renewable carriers, and there are some growing pains in these carriers adapting to each other's forms.

“Renewables insurers now require higher retention levels (\$0.5-1 million for Physical Damage, plus a separate DSU waiting period) for wind construction projects and offer less capacity on such business, given this sector's poor loss history.”





Losses: wildfires and hailstorms skew portfolio significantly

Overview

2020 saw a record 30 named storms in North America, but thankfully damage to renewable energy projects was relatively small. Recent sector losses comprised of hail, wildfire and construction issues, and problematic Wind Turbine Generators (WTGs). Following sizable 2019 PV Solar hail claims, carriers now underwrite hail-prone risks much more carefully. Wildfire losses, already problematic in 2019, were worse in 2020, being more widespread in California and appearing in arid areas in other states not usually considered subject to wildfire risk. Losses range from more frequent \$1-5 million events to some that could be in the \$15-20 million range, and one that might reach \$20-30 million.

Battery storage

Following a 2019 battery storage loss, carriers are now very wary of large battery storage projects. Such installations include a high concentration of lithium batteries under a single roof, without any natural fire breaks, turning a potential thermal runaway event into a large loss. This is a challenging problem being addressed now by battery management systems, but such measures are as yet unproven. Market appetite varies widely by carrier.

Wind

As a consequence of growth and lack of expertise, carriers are seeing more Wind construction losses, with some thought to represent negligence on behalf of the contractor or their subcontractors. Various reputable contractors have been reported to have made outright fraudulent claims, unbeknownst to the owner/named insured. Losses are more by way of property damage than delay or business interruption.

Certain WTG OEMs have experienced more than their fair share of losses, and carriers have taken notice; they now require higher rates and retention levels - while at the same time reducing capacity - for projects involving the troublesome machinery associated with these programs. Carriers report that certain OEMs often take no responsibility for damage involving their equipment, citing contractor error, when more prudent design and better training might make equipment maintenance less troublesome, reducing the potential for losses to occur. OEM issues range from a number of problems, including carbon fiber blades, locking pins, lightning protection, blade delamination and gear boxes. Carriers are placing significant emphasis on getting maintenance work completed before customer warranties expire to minimize the likelihood of post-warranty losses. At the same time, carriers are looking more favorably upon those projects managed either by OEMs or qualified third parties who offer O&M servicing contracts, including unscheduled as well as scheduled maintenance activities.

Tornados and hailstorms are more isolated than named windstorms and earthquakes. However, when tornado losses hit, they can be devastating to a limited area, as winds roar above feasible design levels. In one project, a microburst took down a WTG, shearing it off with incredible torque, resulting in a total turbine collapse. Another convective storm loss involving a wind project under construction, requiring repairable damage to 20-30 turbines, potentially impacting their life cycle (yaw control, etc.). This loss settled for about \$15 million, but some believe other losses like it might cost \$30 million or more.

Solar

In addition to weather events and contractor issues such as those mentioned above, solar losses have included inverter breakdowns. Carriers are wary of microcracking losses as well, as will be noted below.



Rating levels: increases bring portfolio closer to profitability

For the past three years, insurers have focused on correcting their underwriting performance after many loss-making years and these measures have generally succeeded. Renewables rates and deductibles are now healthier than in past years from a carrier perspective, and insurers' portfolios are profitable or close to profitable, despite the unforeseen losses noted above. However, continued pressure on rates and retention levels are expected going forward.

Underwriting more technically focused

As in other sectors, Renewables are now being analysed based on many factors, including equipment used, EPC contractor, project location, loss history, contractual language, retention levels and pricing adequacy. In some ways, this has always been done, but the process is now more technically driven; furthermore, risk engineering during design and operating phases has also become more important from an underwriting perspective.

Rating increases

For 2020, onshore renewable projects saw rate increases of 20-30% on average, with significantly higher increases for risks with poor loss history, significant Nat Cat exposure or under-priced rating. Clean, non-Nat Cat exposed business should expect lower increases in the region of 10-15%, but such risks are now less common. Clients whose programs are coming off multi-year deals at favorable rates might see 80-100% rate increases, even on clean business; however, carriers are focusing more on retention levels and terms/conditions than pricing - they won't write some business at adequate rates without appropriate retention levels in place. The market is trading in a wide band and results vary significantly from month to month.

Rooftop solar is less attractive than ground-mounted and getting rooftop solar deals done has become challenging. Solar rates, formerly as low as \$0.05, are now as high as \$0.25 or more per \$100 of insured value, with Nat Cat loads in addition.

Retention increases

As larger and larger WTGs are deployed, insurers are insisting that retentions need to rise. Buyers need to anticipate this fact in working with lenders, as the previously common retention levels in lenders' agreements are no longer attainable with larger machines. As larger equipment is used, higher deductibles are required, according to carriers; for example, historic wind deductibles of \$100k-250k for smaller machines are inadequate for the larger WTGs (up to 5 MW) being installed today. Adjustments must be made to counterparty agreements to ensure that required deductibles are achievable, preferably before they are signed.

When OEMs uprate existing turbines to achieve higher power output, carriers will view such equipment prototypical until certified/proven, requiring higher deductibles. Carriers look for the OEM to back up this equipment by picking up the difference between the original and revised deductibles. When the OEM won't agree to this, clients will need to find a third-party solution to cover this gap.

Liability

Liability renewal results track close to the Property portfolio, with rate increases also the norm in this market. Wildfire is a big issue for Liability risks and line sizes are dictated by the level of wildfire capacity that the carrier will provide. A number of domestic markets have retracted capacity, putting up lower umbrella limits and layering towers. Battery Storage and residential Solar are tough classes for Liability market; the Rooftop portfolio in general has been challenging following the Tesla (Solar City)/Walmart dispute that was settled in 2019.

Market developments

Location of new projects in Nat Cat zones

Though most areas of construction activity were down due to COVID-19, renewable projects were an exception to that rule. While project locations vary, more and more locations are subject to Nat Cat perils, and/or are located in low lying land subject to flooding (such as Louisiana) and/or feature significant exposure to named windstorm and convective storm. For flood exposure, designers attempt to site projects on the outskirts of identified flood zones; however, insurers now consider such areas as flood exposed and therefore high-risk. Solar farms continue to be built in California and the Pacific Northwest, and carriers are warier now more than ever of wildfire exposure. Creative solutions, including parametric offerings, will be needed to secure coverage needed for many of these risks going forward.

Standard lender agreements default to soft market deductible levels

Tornado, Hail and Lightning perils now require higher deductibles and sub-limits often apply. The vast majority of projects are lender financed; standard lender agreements default to historic deductible levels and policy limits, some of which are no longer commercially available. Lenders advisors have been slow to acknowledge the contracting capacity and hard market, and as such have been pushing clients to secure business on terms that have been provided in the past but are no longer commercially available. Clients are hesitant to renegotiate lender agreements once signed, so it is important to fully review lender requirements for new projects before signing them to ensure that these requirements continue to be attainable. And for existing lender agreements with unattainable requirements, clients will need to either renegotiate these agreements with lenders or purchase expensive complementary coverage (parametrics, deductible buydowns, excess CAT coverage) to meet these requirements.



Wildfires: changes in carrier approach

Carriers are taking steps to better protect themselves from Wildfire losses, including:

- Requiring clients to develop and implement vegetation management programs, sometimes requiring an express warranty that excludes coverage if the client doesn't follow their written program
- Reduced line sizes for wildfire-exposed projects
- Higher deductibles for wildfire exposure
- Wildfire sub-limits
- Wildfire surcharges

These Wildfire subjectivities have not been tested in any actual claims, and we envision possible coverage disagreements. Was the loss Fire or Wildfire? Is it legal for the carrier to sublimit Wildfire coverage in a Fire policy, in California or other states? Does this change if the insurer is admitted or non-admitted? Who determines if the provisions of an express warranty were fulfilled by the client?

Carriers say they simply want their clients to “cut the grass”; this may be their intent, and clearly some clients need to implement better vegetation management programs. However, more work is needed to ensure contract certainty.

Construction changes

For construction business, carriers are concerned with certain EPC contractors and their subcontractors on Wind where they have seen poor loss experience. However, as these are large players in the sector, carriers are mainly addressing this exposure by minimizing their line sizes rather than decline business. Carriers believe some contractors at times are submitting unjustified claims, unbeknownst to the project owner; sub-contractors are frequently improperly trained, leading to more construction losses. Some carriers have “black-listed” certain contractors where they have encountered problems, citing potential negligence and fraudulent claims. Carriers will sometimes manuscript endorsements, passing the onus on claims from the insurer back to the EPC and requiring that claims can only be filed by the first-named Insured, limiting the troublesome contractor's rights under the owners' policy.



PV Solar: microcracking a serious issue

One evolving area of PV Solar losses involves microcracking and degradation of panels (see separate article on microcracking earlier in this Review). Following a hailstorm, owners are concerned that their panels may have been damaged; they also fear that hail contact might impact the future performance of these panels, in which case the owner will want them replaced, as well as requiring continued warranty protection post-event from the OEM.

Sometimes the cost to test the panels can exceed the cost to replace these panels. Carriers are frustrated they have paid multi-million losses to test panels after a hail storm, just to determine whether or not the panels have been damaged. Consequently, carriers now limit what they will pay in testing the panels, while any post-event testing carried out might be required via sampling and subject to a separate sub-limit. The presence of microcracking doesn't prove hail damage, as panels can sustain microcracking damage in transit, during installation or during maintenance, etc. Carriers might support a performance-based test protocol on the panels, testing panel performance before and after a hailstorm, requiring an agreed upon drop in performance (perhaps 25% or more) to trigger coverage.

One panel manufacturer (First Solar) uses thin-film technology that is more resilient to hail events. Some insurers favor these panels, but others are skeptical, and no panel design is 100% hail-proof.

Modeling

Given the prominence of recent hail, tornado and wildfire losses, emphasis has been placed by carriers on understanding a client's exposure to such risks. However, modeling for these perils is not as developed and proven as for windstorm and hurricane, given that hail, tornado and wildfire losses have only recently impacted renewable projects, and little data is available to develop precise modeling. More projects are being built in Nat Cat - exposed zones, putting more and more projects in harm's way. Modeling firms are quickly adapting their offerings, and each version of their models provides more useful results. But in overall terms, carriers are skeptical of tornado and wildfire models and choose to manage their risk through higher retentions and modest line sizes. Carriers are also hiring personnel with modeling experience and having them partner with their risk engineering teams.

Lightning

2020 brought two notable developments with respect to lightning:

- Some 2020 WTG losses were caused by lightning damage, so more emphasis is expected on ensuring satisfactory property design and the maintenance of lightning protection systems. Carriers believe that one OEM had a defect in their lightning protection system, but the OEM has not owned up to this and is making retrofits for their customers sporadically.
- Historically, California does not experience lightning very frequently. One of the reasons for increased 2020 California wildfires was the increased frequency of lightning in the state.



Series Loss Clause

Carriers are striving to reduce the number of events that insurers will pay under the Series Loss Clause, as they feel such losses should be borne by the OEM responsible for the defect that led to the loss.

Risk engineering

Competitively-priced insurance has impacted risk management for renewable projects in that there has been less emphasis on risk engineering, as carriers didn't have the leverage to require clients meet their needs; so often premium levels didn't support engineering visits at all.

This has all changed quickly; carriers require engineering reviews now that they didn't even ask for in previous years, with some hiring their own technical staff and others partnering with expert third parties. Carriers are looking for clients that understand their risk and manage it well; they are doing what they can to educate themselves and their clients on risks as the industry matures, aggregating information for clients, preparing white papers and holding webinars, amongst other initiatives.

Due to COVID-19, much of the risk engineering activity has been conducted virtually rather than in person, but site visits began in some areas during the fall of 2020. In the past, underwriters were interested in engineering for wind projects, but less concerned with PV solar projects; however, they now want engineering for both, with Wind surveys more focused on mechanical/engineering issues and Solar more on Nat Cat and vegetation management programs for wildfire.

Hydrogen

True baseload energy storage is coming in the form of hydrogen, which will provide baseload capacity when solar and wind power are not available. This approach will help reduce supply challenges when electricity demand spikes and intermittent sources are unavailable, for significantly longer than batteries can now. However, green hydrogen² is expensive, and it will take several years for it to be competitive. And to make hydrogen from water requires enormous energy, supplied by renewable energy – this will provide more demand for renewable energy projects. Hydrogen is explosive, and storage and use of hydrogen fuel brings additional risks.

² "Green" hydrogen is a zero-carbon fuel made by electrolysis, using renewable power from wind and solar to split water into hydrogen and oxygen

The outlook for 2021: an increase in target lines

The newly-elected President Biden is known to support renewable energy, so initiatives favoring renewable energy projects are expected in the US during 2021 and beyond.

This year, given an increased comfort level at higher pricing and retention levels, carriers expect to increase their target lines to 60-70% for risks that they favor, subject to upcoming reinsurance and binder renewals. Carriers are looking to find their spots and grow in identified target areas; with healthier terms and conditions, new players are expected to enter the Renewables market. Ultimately, added capacity could again put pressure on reducing retentions and rates as insurers compete for business.

Clients should be prepared to review counterparty agreements (lender requirements, tax equity requirements, etc.) as many of these agreements are based on terms and conditions that are no longer commercially available. Additionally, contractual language regarding wildfire issues, including indemnification and risk of loss issues, also requires attention. As clients often have contractors listed as Additional Insureds on their policies, clients should ensure that these contractors do not have any wildfire exclusions in place on their policies. Meanwhile, coverage limitations for modified technology, microcracking, wildfire and vegetation management will continue to evolve. Clients should again prepare for double-digit rate increases in

2021 but take steps to position themselves in the most positive light with insurers. Such steps should include the following five-point process:

- Conduct risk engineering visits and provide thoughtful responses to any recommendations generated.
- Contemplate retention appetite and limit changes as potential trading chips for rate relief, ensuring that such changes meet counterparty requirements.
- Provide a detailed submission to insurers 30-45 days before quotes are needed.
- Meet with insurers and present an overview of your company, including risk management programs, explanation of values developed, etc. Encourage questions and provide prompt answers. Include information on vegetation management and COVID-19-related measures and experience.
- Wind clients who have invested in Full Services Agreements (FSA) with the OEM should make sure to highlight this, including providing a summary of the coverage they have negotiated as well as a copy of the agreement in the submission.



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International Renewable Energy Markets: updates from Beijing, Dubai, Miami, Singapore and Sydney

Beijing

Introduction: renewable energy industry in China continues to grow in 2020

The renewable energy industry in China shows a steady growth trend. Due to the impact of COVID-19 and the economic slowdown, the growth rate of investment and newly-installed renewable capacity is rather lower than in 2019. We saw a significant stalling of new construction projects during Q1 2020 because of the outbreak of the pandemic, but there has been a general recovery since Q2 2020. The Chinese government has been developing their “New Infrastructure” strategy during 2020 to stimulate the domestic economy; renewable energy is an important part of this new strategy. New investment and application of new technology for renewable energy are therefore attracted and encouraged.

Renewable energy’s proportion of the Chinese energy mix has been increasing in recent years. Renewable energy contributes more than 40% to current structure of national electric capacity in China, including hydropower at 17.73%, wind at 10.45%, solar at 10.18% and nuclear power at 2.42%.

Wind Power

Following the global trend, the Wind Power industry in China has been developing rapidly in the last few years, particularly Offshore Wind. In Q1 and Q2 2020, new wind turbines with a total capacity of 6.32GW have been installed in China, including 5.26GW of new Onshore Wind, and 1.06GW of new Offshore Wind. At the end of June 2020, the total capacity of Wind Power in China was up to 216.75GW, including 209.76GW of Onshore Wind, and of 6.99GW of Offshore Wind. Electric production generated by Wind Power increased by 10.9%, in contrast to the same period in 2019.

Onshore Wind

Wind Power insurance premiums continue to grow in 2020, although the loss ratio for Onshore Wind in the Chinese insurance market is still high (estimated by insurers to be around 100-150%). Most Chinese insurers have suffered an underwriting loss on the operational phase of Onshore Wind, especially after various wind turbines ran out of their maintenance warranty periods. The loss ratio for Onshore Wind’s construction phase was much better than the operational phase. Due to fierce competition in the local market, the premium rates for Onshore Wind power in the Chinese insurance market remain stable compared to 2019.

Offshore Wind

The insurance market prospects for Offshore Wind are much better than for Onshore Wind in China. Most Chinese insurers have made an underwriting profit from Offshore Wind projects, including construction and operational, although the premium rates and deductibles are much lower than in the international markets. The loss ratio of Offshore Wind projects remains at a low level; not many Offshore Wind accidents and losses were reported during 2020's windstorm season.

The premium rates for Offshore Wind projects in China have remained at the same level as in 2019, despite some Chinese insurers' aggression during various Offshore Wind insurance tender processes. However, because of the effect of the global hard insurance market, as well as risk accumulations in certain regions in China, more international reinsurers have withdrawn their capacity or stopped writing Offshore Wind business in China. Chinese insurers will have to use their retentions to cover Offshore Wind risks because of a lack of an appropriate reinsurance treaty. The increased rates would be expected to apply to Offshore Wind projects in the near future. It should also be pointed out that the use of Marine Warranty Surveyors (MWS) is still not standard practice for Offshore Wind projects in China.

Because the current tariff for Offshore Wind imposed by the government will be dramatically reduced at the end of 2021, most power companies and contractors are speeding up the construction of Offshore Wind projects. The price of wind turbines is increasing, due to the inadequate production of wind turbines manufacturers; furthermore, the shortage of offshore installation vessels has also added to the cost and might delay the completion of Offshore Wind projects in China.

Solar

The total power capacity of Solar in China reached 215.82GW by June 2020. However, due to the impact of COVID-19, new installed solar projects fell 24% in Q1 2020, but then picked up from April onwards. As at the end of Q2 2020, 11.52GW of new Solar farms have been installed.

The insurance industry has experienced a difficult time with regard to Solar in 2020, as its loss ratio is getting worse. Due to the severe weather and poor flood season in Southwest China, some insurers suffered substantial Solar losses, particularly with regard to Floating Solar plants. Ping An Insurance has withdrawn from the Solar market since 2019; Huatai Insurance ceased writing Solar with effect from Q3 2020; and other major insurers have begun to reduce capacity or imposed low indemnity limits for natural perils. Solar premium rates are therefore increasing, due to the reduced capacity.

Hydropower

Hydropower is the biggest renewable energy sector in China, contributing more than 17% to the national energy structure. New Hydropower capacity of 8.89GW was installed in 2020, however, because of climate change and reduced rainfall, the electricity generated by Hydropower reduced by about 4.7% in 2020.

The attitude of the Chinese insurance market is polarized between large and small Hydropower plants; underwriters prefer to provide cover for medium and large Hydropower plants, which have better resistance for natural hazards. Similarly to the Solar market in certain areas, some small Hydropower plants in Southeast China were seriously damaged by flood, debris flow and landslide during the summer of 2020. The majority of Chinese insurers have suffered losses on small hydropower plants in that area, so premium rates have been increased by 30-50% for small Hydropower projects featuring high natural hazards or poor loss records. However, rates for larger Hydropower plants remain either stable or slightly increased.

Conclusion: Chinese market still relatively soft

The Chinese domestic insurance market is still relatively soft by international standards. More Chinese domestic insurers with an international rating are willing to offer capacity to the international markets where there are Chinese interests abroad, as they see the harder international market conditions as offering a good opportunity for growth at better returns than in the domestic market. If overseas renewable energy projects have a Chinese interest, the Chinese market can provide significant capacity and competitive rates, terms and conditions for both the construction and operational phases of a given project. Meanwhile, different insurers have various definitions of what constitutes a Chinese interest, as well as various appetites to writing overseas risks.



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Dubai

Centralisation of underwriting authority

While Dubai continues to represent a considerable gateway to insurance company and Dubai International Financial Centre (DIFC) capacity for renewable energy projects in the Middle East and the wider North Africa, its fortunes are often inextricably linked with those of the non-domestic parent company. While the market as a whole has been suffering with detrimental combined loss ratios, a function of a hard market is to draw back capacity to the centre. This reduces support for Managing General Agents (MGAs) either by closing long established satellite offices or reducing their authority levels and drawing back capacity to the more heavily controlled head office.

Change of operating models

More recently, we have seen a number of UK, European and American insurers change their operating model, particularly for Renewable Energy in Dubai:

- RSA have changed their operating model to just look at regional business
- AIG has withdrawn a level of capacity to London, as its model moves to “Hub and Spoke”
- Zurich has had limited opportunities after providing quasi-exclusive capacity to a speciality MGA, but could come back into the market in 2021
- Liberty maintains a strong proposition, but like many is challenged with the deployment of technical diligence and ensuring a flight to quality
- Hannover Re continues to deliver strong support to the sector

A place of innovation

However, Dubai and the DIFC is a place of innovation, a gateway to Middle Eastern (and often Asian) markets which would not otherwise be accessed from other hubs in London and Europe. ADNOC, Africa Re, IGI, Kuwait Re, Oman Re and Trust Re all have strong positions for regional business interests. However, most placements still attract a mixed appetite and will ultimately be completed utilising a broad spread of capacity from the London, Middle Eastern (sometimes African) and Asian markets.

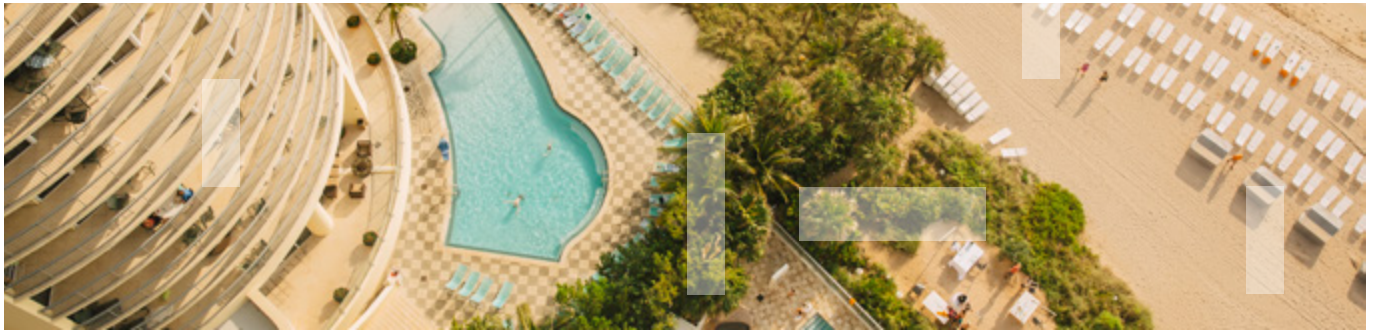
Strong pipeline of projects

The Renewable Energy market in Dubai as a global hub is still developing; to-date, many of the projects developed have been from larger well-established power, utility or other corporations that have their own agenda, relationships and often captives which have driven insurance placement structures. However, there is strong pipeline of projects coming through and it is widely anticipated that there will be a strong desire to ensure the continued involvement of Dubai and DIFC hub offices, even if not technically underwritten in Dubai.



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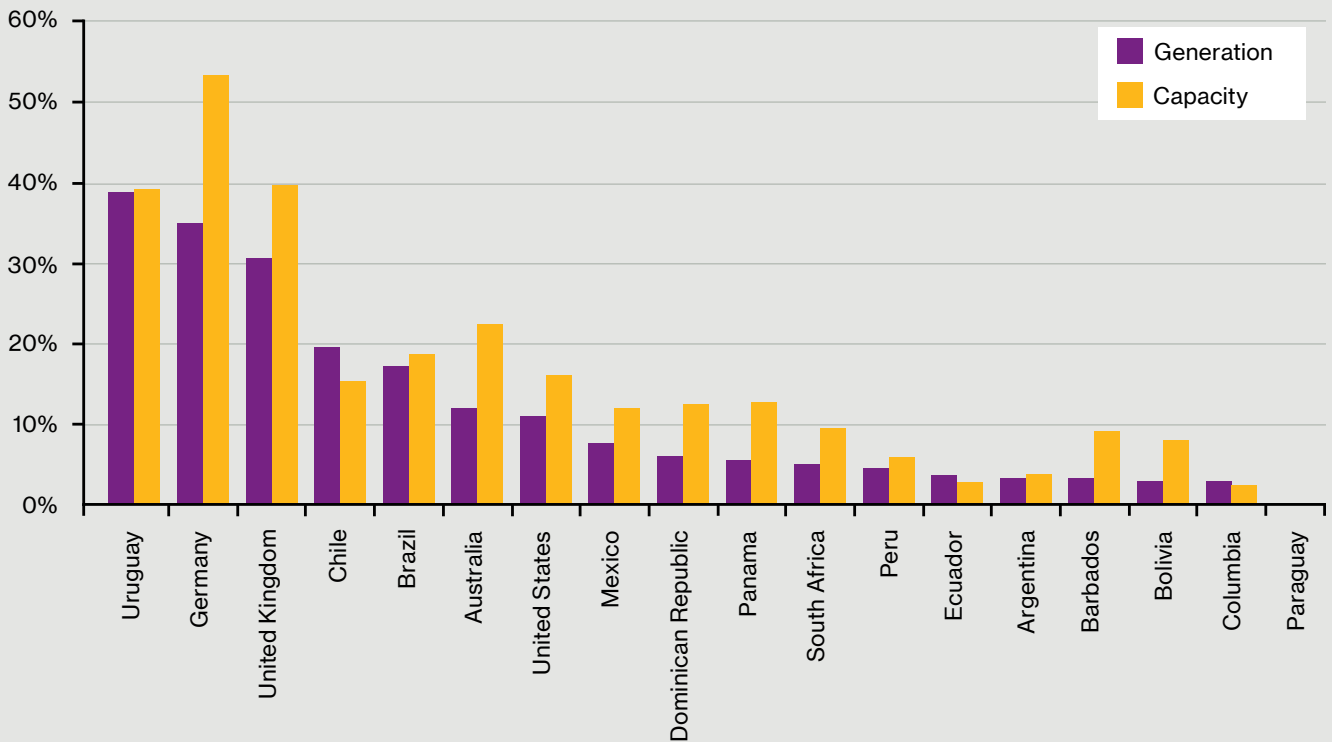
Miami (Latin America)

More than half of Latin America’s power generation comes from renewable sources¹. Hydro generation plays a major part in that; however, Wind and Solar has taken the largest share in renewable investment in recent years and this tendency is expected continue. Latin America has vast potential and abundant resources to grow further in the area of non-hydro renewables: Wind and Solar (especially in Colombia, Brazil, Argentina, Chile and Mexico) as well as geothermal.

Clearly there is room to increase the penetration of non-hydro generation in Latin America. In order to achieve this, it would help if certain governments, who have returned favoring generation on oil & gas instead of renewables, would concentrate again on renewable sources for new investments, to keep a stable contractual environment for the renewable projects already in operation or about to come on line. They also need to ensure that sufficient energy storage is built into the grid and, importantly, that sufficient transmission capacity is built-out to facilitate export from the often-remote location of generation plants.

A recent report from the International Development Bank (IDB)² includes the following graphic:

Fig 1: non-hydro renewable penetration



Source: EY Power and utilities innovation lab

¹ https://www.irena.org/-/media/Files/IRENA/Agency/Regional-Group/Latin-America-and-the-Caribbean/IRENA_LatAm_action_plan_2019_EN.PDF?la=en&hash=12D7D12BF816911D9ED12AFEAOF34E73258B18F2, p1

² <https://publications.iadb.org/en/gap-analysis-and-opportunities-innovation-energy-sector-latin-america-and-caribbean>, p52



Due to the pandemic and decreasing demand, there have been delays in the renewable auctions in several countries. However, for 2021 following auctions are planned; Colombia leads the renewable initiative in Latin America, with the announcement to allocate around 5GW of renewable energy in the upcoming auction in Q1 2021³. It also announced that it is going to collaborate the green hydrogen roadmap for the country in collaboration with Chile⁴. Here, a supply tender for the regulated sector will be held in 2021⁵.

So these are clearly challenging times for renewables in Latin America; however, there are various initiatives on a country or multi Latin level to promote renewable growth in the long term.

Underwriters focus on engineering

In respect of the Latin American insurance market, the key underwriting expertise and capacity continues to be concentrated in Miami, together with the other established underwriting centers for Latin American risks (mainly Brazil and Colombia).

Especially for wind turbines, there is an increased technical scrutiny from insurers on the type/model/age of turbines and on their respective global performance; this is a determinant factor for price, capacity offered, deductibles and scope of cover. Some markets show signs of centralizing their underwriting operations towards their headquarters. Timely preparation, together with solid engineering information, will ensure the best possible outcome for a renewal.

Furthermore, natural catastrophe exposure has become a very challenging area for renewables in Latin America due to the loss record. A revision of the exposure and required limit can help to manage cost increase or capacity issues in that respect.

Despite such market hardening, insurers maintain a long-term interest in renewable energy, as it fits with most large insurance organization mission profiles, moving away from underwriting traditional generation with high carbon dioxide emissions.



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³ <https://www.pv-magazine.com/2020/11/11/colombia-to-hold-5-gw-renewables-auction-in-q1-2021/>

⁴ <https://www.pv-magazine.com/2020/11/11/colombia-to-hold-5-gw-renewables-auction-in-q1-2021/>

⁵ <https://www.cne.cl/wp-content/uploads/2020/11/Resolucio%CC%81n-N%C2%B0422-Aprueba-Bases-de-Licitacio%CC%81n-2021-01.pdf>



Miami Construction market

In the LatAm sector, local Construction/Erection “All Risks” (CAR/EAR) treaties are becoming more restrictive, retaining less and becoming more facultative-driven, even in those countries with traditionally broad local capacity such as Brazil and Mexico.

In respect of the Latin America CAR/EAR reinsurance market, which is concentrated in Miami and with underwriting centres in other Latin American countries like Brazil, Mexico and Colombia, the conditions are undergoing hardening - maybe with a slight delay effect compared to London and other European and International markets.

Rates in the Construction market have been increasing by 35-40% and in some high Nat-Cat and hurricane hit islands in the Caribbean, we are seeing increases of over 50-75%. This follows a number of capacity withdrawals from insurers that have been active in the region over the past 18 months, including AIG, Beazley, Brit, Talbot and most recently Axa, among others. This has also resulted in difficulties agreeing project policy extensions or increases in Sums Insureds where required.

A range of other insurers are undergoing restructuring and reconsidering their appetite for certain risks, including which industries and locations to avoid, as well as imposing stricter conditions. There are fewer lead insurers, particularly for large, complex and high Nat-Cat-driven risks. In particular, insurers are imposing restrictions related to testing and commissioning, LEG Defect/Design, maintenance and Delay in Start Up (DSU) coverages because of concerns about certain types of technologies and work methodologies. We are seeing extremely restrictive appetites and even total refusals to underwrite or support tunnelling works, wet risks, hydros, coal fire, underground mining and tailings dams, beachfronts and prototype equipment, particularly those with LEG 3 and DSU.

The Construction market generally is seeing a lack of infrastructure and mining projects due to financing and economic/social instability, and a slowdown in construction activity due to COVID-19. As a consequence, contractors are struggling, which will decrease premium volumes; so we expect Latin American market reaction to this to result in a further hardening effect on rates.

For Solar and Wind, we are expecting many projects to begin construction activities in 2021, particularly in Chile, Brazil, Central America and in some Caribbean Islands. For all territories (but less so in Brazil) we expect conditions to be more restrictive than 2020; some markets will impose loss limits for Nat Cat and increase in deductibles including DSU. Latam insurers also struggle to offer one-year operational cover and even TPL during Construction cover within the same policy.



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Singapore

Singapore renewable energy landscape relatively stable

Amidst this global pandemic and worrying times, the Singapore renewable energy insurer landscape has remained relatively stable, with little to no significant changes from 2019. Total working capacity from local markets is largely unchanged too, and is currently available up to US\$500 million, with available capacity depending on the type of renewable energy, onshore or offshore, and so on. Major players in the local market include AGCS, Swiss Re Corso, HDI, Axis, Chaucer, Markel, Canopus and MS FCIL.

Little to no movement in overall insurer leadership panel

Given Singapore's relatively small Renewable Energy market, the overall insurer leadership panel remains relatively stable, experiencing little volatility in player movements. Underwriters tend to be conservative in their growth plans, maintaining constant involvement with operators, and are not looking to gain significant market share overnight.

Limited line-sizes and new underwriting guidelines means more stringent processes

While the criteria for assessing risk in the Renewable Energy sector remains unchanged, underwriters have either limited line sizes or have elected to deploy capacity only if it meets minimum premium levels as defined by new underwriting guidelines.

Underwriting guidelines have tightened amidst a hardening market, with insurers conducting a tougher, rigorous, and more selective process when assessing risk, before committing any capacity. In addition, renewal or new applications by energy operators for coverage are likely to be met with stricter scrutiny through underwriter assessments or peer reviews.

Small to medium operations remain unattractive to insurers

Small to medium sized operators with single or multiple sites of total sum insured of less than US\$10 million continue to be unattractive to underwriters. Given the small Renewable Energy market in Singapore, small to medium sized operations - especially single location operations - do not interest underwriters, since premium pools are small; one small loss can easily affect the entire portfolio profitability.

In addition, high acquisition costs in new year participations, associated with onboarding small to medium operations, further downplay the attractiveness of small to medium sized operations as profitable coverages worth the risk exposure for insurers.

Indeed, we have already seen premiums increase by as much as 50% to more than 100% for small-scale solar and onshore wind operations from last year, and the imposition of a minimum premium to apply. Liability limits are generally low, with increases in the range of 10% to 20% from last year. We expect these premium increases to continue into the next year.

The outlook for 2021: Operators need to adequately buffer for increased premiums and stringent checks

Global losses continue to plague major insurers, impacting their bottom lines; this has translated into the development of tighter underwriting guidelines and stricter internal controls to improve profitability across their portfolios. Many insurers are already reexamining their portfolio to reassess their risk exposures in different markets and sectors.

As a result, underwriting processes have become more inflexible, with stringent underwriting guidelines and criteria that must be satisfied before insurers are willing to elect any capacity. On top of this, we foresee a continual rise in premium rates in the renewables sector, with restricted coverage and more exclusions as insurers focus on the bottom-line in this hardening climate.

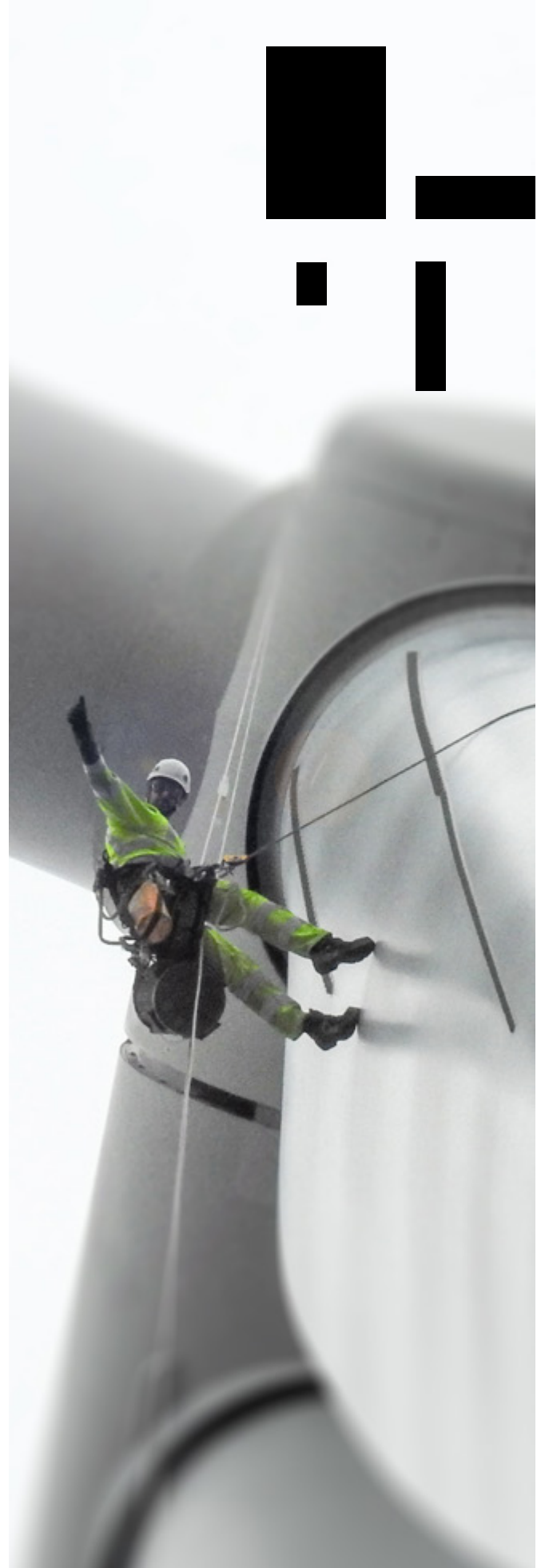
To be adequately prepared for this stricter underwriting process, operators should have technical information about their operations readily available to answer questions from underwriters, engineering teams, or peer review teams to facilitate a smoother renewal or coverage process. Specifically, operators should prepare technical information about the management of safety, security and risk in their operations.

To ensure a smoother process of insurance renewal or coverage seeking, operators should commence the quotation process with insurers earlier (at least 6-8 weeks prior to inception, up from the previous period of 4 weeks). Operators should also be open to share technical information about their operations quickly, and be prepared to accept restrictions in cover, or consider higher retentions.



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Sydney (Construction)

Hardening pressures intensify

The Australian insurance market for Renewables in terms of construction projects has experienced challenges during 2020 following the trends of the general Construction market. Insurers have increased rating levels, tightened terms and conditions and have reduced their capacity for this sector. This has been driven by a combination of ongoing loss trends, a perceived lack of experience by EPC Contractors, the increased exposure to fast moving technological changes and issues around grid connection.

Shortage of leaders

There is still significant available capacity for renewable energy projects, but insurers' line sizes are reducing and available lead capacity has been cut, following the exits of AIG and Zurich in 2018 and 2019 respectively. This has left a smaller number of credible lead markets who are becoming more selective with the projects that they are willing to underwrite. Lead line sizes have reduced to no more than 20-25%, with the average follow lines varying between 10-20%.

Nat Cat driving capacity

Natural Catastrophe and weather exposures are driving capacity in numerous ways. With the growth of regional Green Hubs and a rise in concentration of projects in particular areas, insurers are finding that they are exposed to a number of different projects in a relatively small area and are actively managing their accumulations in the event of a localised rain, hail or bushfire event. Another factor which is having a similar effect is that projects are growing in size and scale, so insurers are offering smaller line sizes to manage their exposures to those same natural catastrophe events.

Losses

The market has experienced regular losses over the past 12-24 months; trends indicate that the majority of losses are coming from a small number of exposures, Natural Catastrophe and weather being significant contributors to loss ratios following recent flood, localised windstorm and bushfires experienced in Australia over the last 12-18 months. Another significant factor is poor workmanship and installation issues causing regular and significant losses to the market, to the point where insurers are requesting individual CVs and experience of both individual project managers and EPC contractors' experience in Australian conditions. The insurers' perception is that this will only get worse, following the exit of many of the experienced EPC contractors from the renewables sector and a number of unknown overseas EPCs entering the market.

Shift in rating increases - particularly for new technology

The rating of renewables projects has experienced a significant and swift shift during 2020, with rates increasing between 50-75% for solar projects and 50-100% for wind projects compared to similar projects beginning construction 12-18 months ago. Similar to other markets, the choice of technology is a big factor for insurers when rating a project, with the increased use of prototypical technology having a large impact. Projects utilising existing and proven technology are experiencing lower rates than those utilising new and prototypical technology.



Coverage restrictions

Insurers are restricting the policy terms and conditions that they are willing to offer. The market will no longer support LEG3 Defects Clauses, and in some cases will only offer LEG1 coverage on prototypical technology. In addition, we are also seeing restrictions being imposed on open trench limits, IP Ratings of componentry, restrictions around grid connections and microcracking. Along with these coverage restrictions policy deductibles are also increasing, with Major Perils and Testing & Commissioning Deductibles now typically starting from \$250,000 per Occurrence.

Outlook for 2021 - more of the same

Moving into further 2021, we expect more of the same market conditions. The current Australian summer experience, with La Niña conditions, is expected to be wetter than normal in some regions and the bushfire season has also commenced earlier in others. The impact of these conditions will be monitored closely by insurers; if they experience another summer with large natural catastrophe losses, we can expect pricing to harden further and policy conditions to continue to tighten.

Our advice

To ensure that a project can achieve the best possible coverage and rates in the market, we would recommend early engagement with insurers; buyers will need to demonstrate to underwriters that they have robust flood and bushfire mitigation processes in place, that they understand the technology that is being used and its suitability for Australian conditions and that the EPC contractors have relevant experience in the sector.



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Apart from the authors already cited in this Review, we would like to thank our colleagues Dick Merbaum and Danny Seagrove, who contributed to Jamie Markos' piece on wildfires.

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