

A smarter way to manage resilience in a volatile world

Power market review

November 2023

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Market capacity figures

The figures quoted in this Review are obtained from individual insurers as part of an annual review conducted in January each year. They are solicited from the insurance markets on the basis of securing their maximum theoretical capacity in US\$ for any one risk. Although of course this capacity is offered to all buyers and their brokers, the individual capacity figures for each insurer provided to us are confidential and remain the intellectual property of WTW.

WTW Energy Loss Database

Loss figures quoted in Part Two of the Review are from our WTW Energy Loss Database as well as additional market sources. We obtain loss figures for this database from a variety of market sources (including a range of loss adjusters), but we are unable to obtain final adjusted claims figures due to client confidentiality. The figures we therefore receive from our sources include both insured and uninsured losses.

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 insurance markets, but otherwise we have used lower case to describe various parts of the power industry itself.

Abbreviations

The following abbreviations are used in this Review:

BI	Business Interruption
Cat/Nat Cat	Catastrophe/natural catastrophe
CCGT	Combined cycle gas turbine
ESG	Environmental Social Governance
MB	Mechanical Breakdown
MWh	Megawatt hour
O&M	Operations and Maintenance
OEM	Original Equipment Manufacturer
PPA	Power Purchase Agreement





Introduction

Welcome to our 2023 Power Market Review. This year's theme, "A smarter way to manage resilience in a volatile world," underscores the urgency of understanding and managing the complex risks shaping the industry. From geopolitical tensions to inflation, climate change and the energy transition — these challenges are redefining the landscape in which power clients and insurers that serve the sector operate. The ongoing Israel — Hamas conflict has further compounded geopolitical challenges and created some additional uncertainty for power generators and insurance markets.

Four primary challenges take centre stage and are explored in depth within our report. Firstly, we consider the enduring Russia-Ukraine conflict, which continues to cast a long shadow over geopolitical stability, energy security, and market dynamics. This geopolitical quagmire disrupts energy supply and increases security risks, and we aim to unravel its implications for the power sector and its insurers.

Global inflation is the second challenge, threatening purchasing power, driving escalating costs, and distorting market dynamics. The power sector, reliant on a balance of resources and investments, is carefully navigating inflation's impact on the global economy. Our report explores the interplay between inflation and the sector, offering insights into resilience strategies.

The third challenge is that of climate change and the shift toward energy transition, pushing power companies to adapt or risk obsolescence. Our examination of the power sector's role in combating climate change highlights how innovative strategies supported by critical investment, will help shape the power market's role in building a sustainable future.

Supply chain and new technologies bring the fourth challenge, introducing complexity and new vulnerabilities. Disruptions in supply chains, whether driven by geopolitical events or technological advancements, affect power generation, distribution,

and ultimately an insurers view of the risk. Our review considers these intricacies, highlighting the power sector's resilience amidst a period of significant supply chain volatility.

We also explore the critical facet of El Niño's impact on the power market, viewed through an insurance lens. This climatic phenomenon can wreak havoc on weather patterns and induce extreme events, significantly affecting the power sector. We analyse insurers' strategies to mitigate El Nino related risks.

As the power sector grapples with these challenges, the insurance industry—its critical partner — faces its own trials. Our review scrutinizes the ripple effect of these challenges on the insurance industry, offering strategies to address underwriter dilemmas and enhance resilience.

Our report has two parts. Part One, revisits the four key challenges for 2023. "The Polycrisis and the Energy Trilemma" explores geopolitical risks. "Optimizing Risk" provides insights into addressing recession. "Climate Change-Induced Drought and Water Supply Risk" discusses vulnerabilities. "The Life Extension Process" explores considerations for power companies, while "The Cyber Insurance Market" dissects evolving risk management. "Application of Parametric Insurance in the Power Market" reviews a promising risk mitigation approach.

Part Two focuses on the state of the power insurance markets in 2023. We examine the challenges faced by power underwriters, the property market, international liability, and the construction sector, and offer a global insurance market round-up.

In conclusion, as we embark on this journey through the 2023 Power Market Review, we do so with purpose and dedication. The symbiotic relationship between the power sector and the insurance market underscores their shared interests. Threats to insurers in terms of risk also endanger power sector customers. This alignment necessitates a reconsideration of risk analysis, risk mitigation and risk transfer strategies.

The challenges ahead are formidable, but they present opportunities to build resilience, innovate, and navigate the path ahead. The power sector's role in shaping a sustainable future is vital, and the insurance industry is a steadfast partner in this endeavour. Together, we ensure resilience remains central to our strategies, empowering power companies to weather change, emerge stronger, and face the challenges of tomorrow.

Having read the Review, I hope you will agree with me that there are a myriad of challenges and complexities for power sector risk managers to negotiate during the next few years. As ever, communication is of the essence and we do encourage you to meet with us as soon as possible so together we can determine the right strategy to absorb, mitigate and transfer your risk in a way that minimises the threats to your organisation.



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Part One: Ensuring resilience in a volatile world





What just happened? Our four key challenges for 2023 revisited

Introduction: Back to 2022

At the time of writing our Power Market Review last year, we highlighted four global challenges that the power sector faced. These included:

- **The Russian — Ukraine conflict:** We discussed the impact on the European generation mix from having to turn down dependence on Russian Gas, the constraints on importing from other sources due to the lack of infrastructure to facilitate this, the inevitable rising cost of gas from other sources and the impact on generation costs and wholesale markets that were expected to remain for some time. We were also faced with the need to reinstate coal generation capacity to make up for lost gas-fired capacity in order to keep the lights on. This was creating concerns among insurers in terms of market volatility and the challenges that they faced in terms of measuring exposures.
- **Global inflation:** Rising energy, commodity and production costs, increased demand for new power generation and transmission infrastructure, together with constrained post-COVID-19 supply chains, were impacting construction and operational costs around the globe. Insurers had significant concerns around the adequacy of insured values, increased claims costs and the need to reflect both in rates and retentions.
- **The energy transition:** The energy transition was driving the shift to new technology development and growth in new sectors such as Battery Storage, CCUS and Green Hydrogen production. Despite the clear narrative around the shift to clean energy, the

question remained as to the rate of movement for the various technologies. The insurance market was under pressure to support the transition but from a position where it did not have the historical performance data from which to underwrite with confidence.

- **Climate change:** The impact on climate change, the world's greatest challenge, was being felt on a number of fronts. The human impact from natural catastrophes on exposed communities is clearly paramount but from a Power sector perspective, generators and utilities were experiencing a range of challenges from increasingly unpredictable and punishing weather conditions. The impact was felt across fuel supply chain disruption, as well as low water levels for hydros and cooling water, low wind levels for wind farms, storm damage to solar and high ambient temperatures reducing gas-fired plant efficiency. All fed market volatility.

The above have been felt throughout the final quarter of 2022 and the first half of 2023 on renewal preparations and terms across all our global customer base. As we warned at the time, strong strategies were required to address the above to:

- demonstrate clearly to the insurance market that the challenge was understood
- identify exposures to each and measures in place to mitigate where possible
- help insurers understand how this impacted their exposures.

What have we seen since?

This year the challenges for the sector are similar, although with some notable changes:

- **The positive:** there has been easing in the gas wholesale markets due to a restructuring of gas supplies away from Russia; global inflation is showing signs of easing as economies respond to higher interest rates; momentum behind the energy transition is clearly growing and the market is showing signs of a more supportive response to risk transfer needs from the sector.
- **Less positive:** the potential for global recession could create further uncertainty for generators and markets if industrial demand reduces; transmission networks will come under pressure from a higher reliance on intermittent power, as re-commissioned coal plants are turned off and output from more expensive gas fired plants is turned down; natural catastrophes from weather and non-weather-related events (mainly earthquake) continue at historically high levels, driving major losses across a wider geographic base — we also have the added uncertainty from the return of the El Nino ENSO this year.

So, whilst the challenges sound familiar, the landscape continues to evolve and change with a level of unpredictability that will continue to focus insurers on risk quality and information, well explained asset and revenue values, clear communication, and the need to ensure that terms reflect the exposure.

In this section we investigate the above in greater detail, assess how this will impact markets and consider the measures that can be taken to deliver the best results in an ever-more demanding insurance market.

Russian — Ukraine conflict

18 months on from the 24 February 2022 and the Ukraine — Russia conflict has no end in sight. Both sides are firmly pursuing their objectives with no political compromise or solution on the table. If anything, the situation seems to be escalating with greater support in terms of military hardware from Western supporters of Ukraine. Against this background we consider the ongoing and future impact of the conflict on the Power sector.

Have the energy strategies implemented between February and December 2022 been successful?

Last year we were in the eye of the energy crisis storm and there seemed to be significant doubt around the European Union's ability to implement effective sanctions against Russia, whilst also delivering:

- affordable and competitive energy to consumers
- enhanced energy security and preparedness for emergencies

¹ https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131

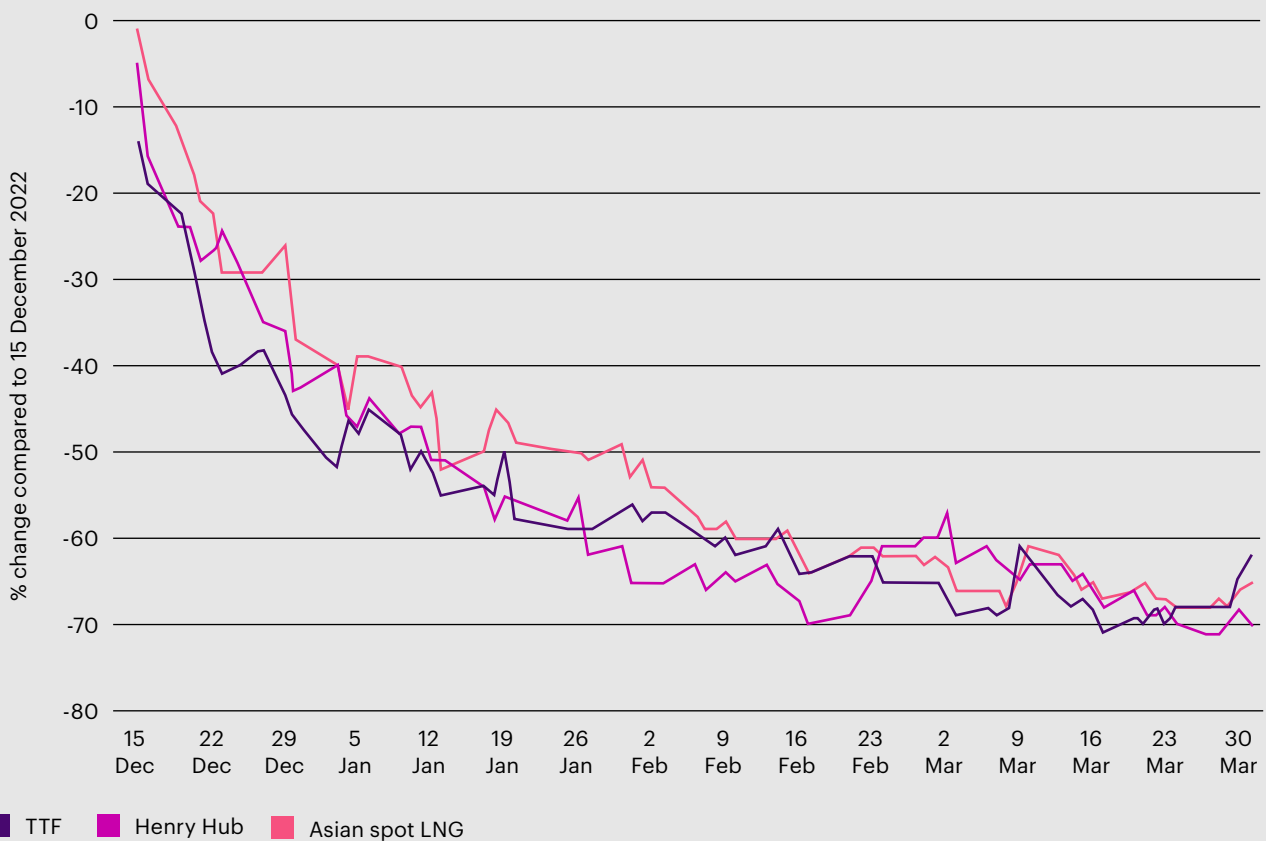
- strengthened EU energy resilience and autonomy

Forecasts suggested that it would take up to five years for power markets to settle, while Russian gas was replaced from alternate sources and the infrastructure needed to accommodate this was put in place. The EU however implemented a highly effective strategy and supporting legislation that enabled it to:

- broaden the EU gas supply base
- prevent excessive Energy company profits and reduce volatility through price/ revenue caps
- reduce demand and market stress by compelling commercial and residential users to reduce electricity use by 5% peak-time and 15% annually — measures now extended to March 2024
- achieve greater leverage on global markets and avoid inter-EU competition by consolidating buying strategies across states
- ensure gas storage facilities were 80% full by November 2022 and 90% full in subsequent winters and require states with gas storage capacity to share this with states that don't
- accelerate the transition to green energy through the "Fit for 55" package that will now reduce greenhouse gas emissions by at least 55% (previously 45%) by 2030
- improve EU TSO interconnection and the free flow of new renewable energy between states.¹



Figure 1: Key regional gas markets percentage change since December 2022



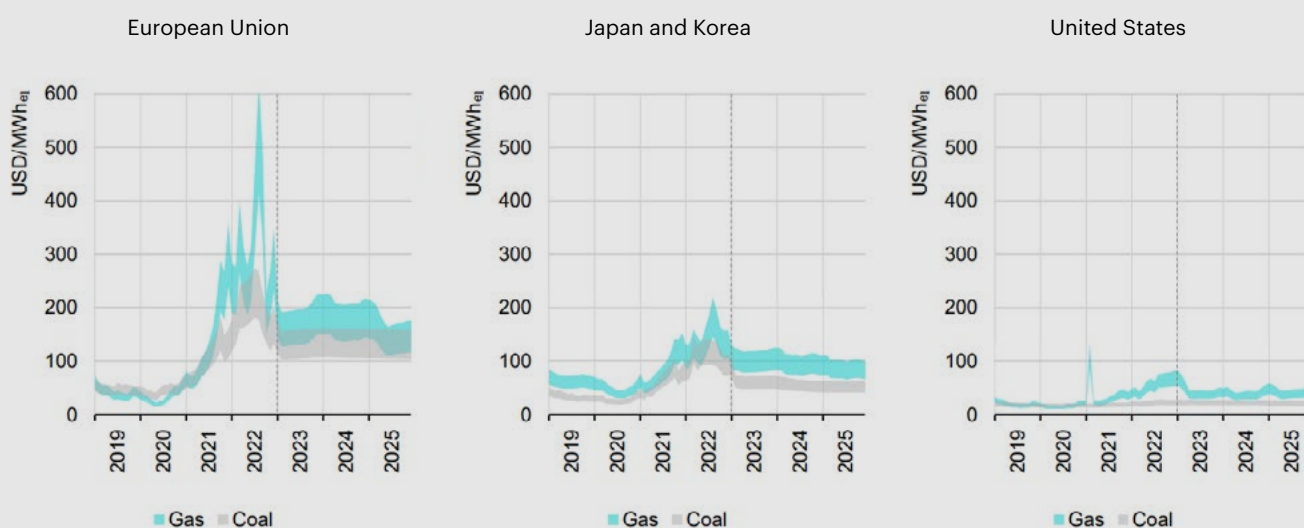
Source: <https://www.iea.org/energy-system/fossil-fuels/natural-gas>

Despite the above initiatives, it is impossible to replace most of the 40% of Europe’s gas supply that came from Russia (there are still reduced imports coming through the Turkstream pipeline and LNG – 10bcm for the first five months of 2023 compared to 62 bcm and 42 bcm respectively for the same periods in 2021 and 2022², without it having a significant medium-term impact on wholesale prices across the world. Therefore, although there has been a 60% fall in European gas prices from the 2022 peak, they remain at historically high levels.

This being the case Figure 2 overleaf shows that as at January 2023, average forward price expectations for electricity from EU fossil fueled generation through to 2025 remain at multiples of historic levels. It can also be seen that whilst other regions are not impacted to the same level, due to gas self-sufficiency in the case of the US and Asia not being dependent on Russian gas, prices across the globe are expected to remain higher than pre-COVID-19 for some time. Importantly however, even though there will always be some volatility regionally from temporary supply constraints or increases in demand, over the longer term, the more acute stress present a year ago will have greatly subsided and the outlook is more stable.

² <https://ecfr.eu/article/own-goal-how-russias-gas-war-has-backfired/#:~:text=In%20the%20first%20five%20months,period%20in%202021%20and%202022>

Figure 2: **Generation costs of coal and gas-fired power plants including emissions costs, 2019-2025**



Large regional differences in thermal generation costs by 2025, with Europe about twice as high as Asia

Source: <https://iea.blob.core.windows.net/assets/255e9cba-da84-4681-8c1f-458ca1a3d9ca/ElectricityMarketReport2023.pdf>

Strategies to avoid future volatility in Europe

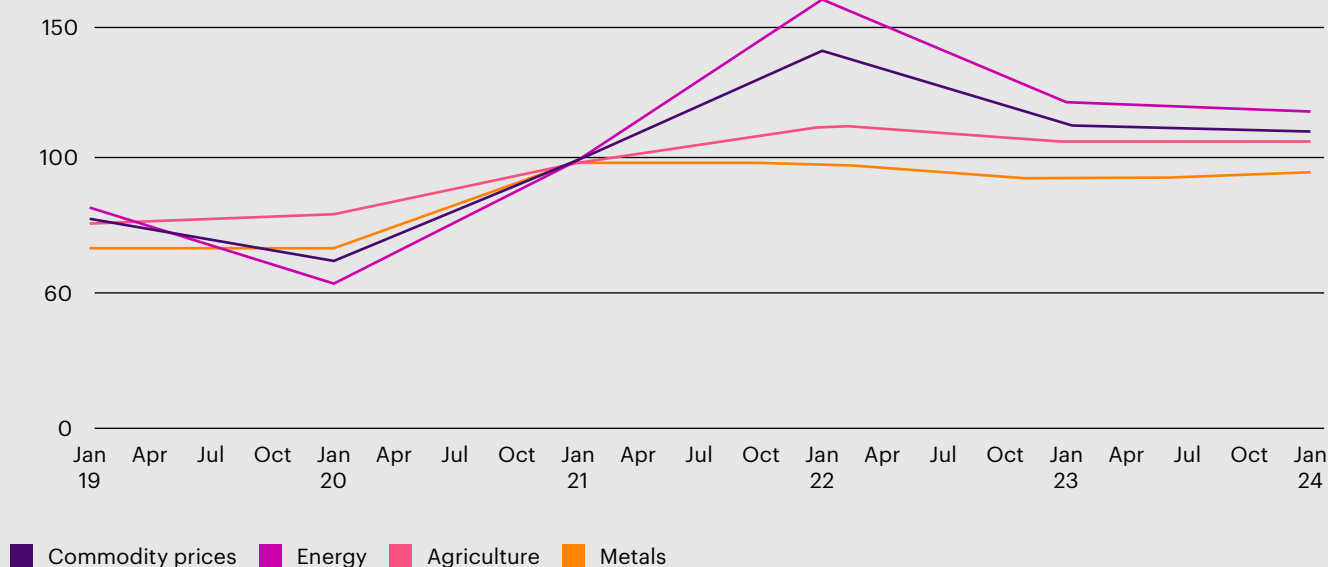
Long-term redesigns of Europe's power market will be necessary to limit future volatility and ensure consumers and producers as well as generators have a more stable environment in which to operate. As well as shorter term fixes, European policy makers and regulators are considering several longer-term EU market reform options:

- **Central buyer model:** Under this model, open market trades are replaced with a single EU or national regulatory agency purchasing electricity from dispatchable sources at fixed prices under long-term contracts. Markets then buy off of the agency at an average price, taking out the volatility of individual trades. Benefits include lack of volatility and consistent and reliable supply of power.
- **Decoupled day-ahead markets:** This involves separate markets for energy resources with zero marginal costs (such as wind and solar) and marginal cost capacity (such as coal). Grid operators would then prioritize the dispatching of renewables, with fossil fuel generation being brought on to meet the residual demand.

- **Capacity remuneration mechanism:** To ensure a steady supply of dispatchable electricity when customers most need it, a grid operator provides subsidies to producers based on the forecast cost of keeping power capacity in the market. This ensures a secure power supply and protects consumers from paying for more capacity than necessary.

This should create a more reliable outlook for insurers that have suffered some unexpectedly high Business Interruption (BI) losses in recent years due to sustained wholesale market shifts and volatility that may have arisen mid-term and not been factored in at renewal. As a result, there has been increased frequency in insurers protecting their positions through the imposition of \$/MW price caps on BI cover for risks exposed to market volatility. Caps are usually applied to monthly projected gross margin, with an allowance of around 15% – 20% to allow for some foreseeable market fluctuation. Insurers are also demanding much greater detail regarding Business Interruption exposures, including splits of revenue by month, availability of critical spares, relationships and loss responses arrangements with OEMs, and projected indemnity periods. Whilst even in a more benign electricity wholesale market these requirements are unlikely to soften now, the reduced uncertainty should help power book profitability and help lead to a more stable rating environment.

Figure 3: Commodity price forecasts, Jan 2019 to Jan 2024



Note: 2023-24 are forecasts

Source: <https://blogs.worldbank.org/developmenttalk/commodity-markets-outlook-eight-charts-0#:~:text=Commodity%20prices%20are%20expected%20to,remain%20broadly%20stable%20in%20202>

Global inflation

Following the significant upward pressure on inflation globally that began during 2021 and accelerated during 2022, we are now beginning to see a reduction in rates across the globe as the contributing factors begin to subside. 2021 saw significant inflation due to reductions in supply chain output during lockdown that did not respond swiftly enough to meet the significant increase in demand across most sectors as COVID-19 restrictions were lifted. 2022 only saw the position deteriorate further due to the substantial increase in energy costs from the Russia — Ukraine conflict in February 2022³.

The downturn in Energy/ Power costs that we have seen during 2023 has however, eased pressure on production costs. Commodity prices have also seen a reduction since their historic peak in June 2022 and by the end of March 2023 were 30% lower. Commodity prices are expected to drop 21% in total during 2023 and to be generally stable during 2024⁴.

Together with the delayed impact of higher interest rates, reduced credit growth and the resultant economic slowdown (Global GDP growth slowing from 3.3% in 2022 to 2.7% 2023 forecast) G20 inflation is expected to come down from 7.8% in 2022 to 6.1% by the end of 2023⁵.

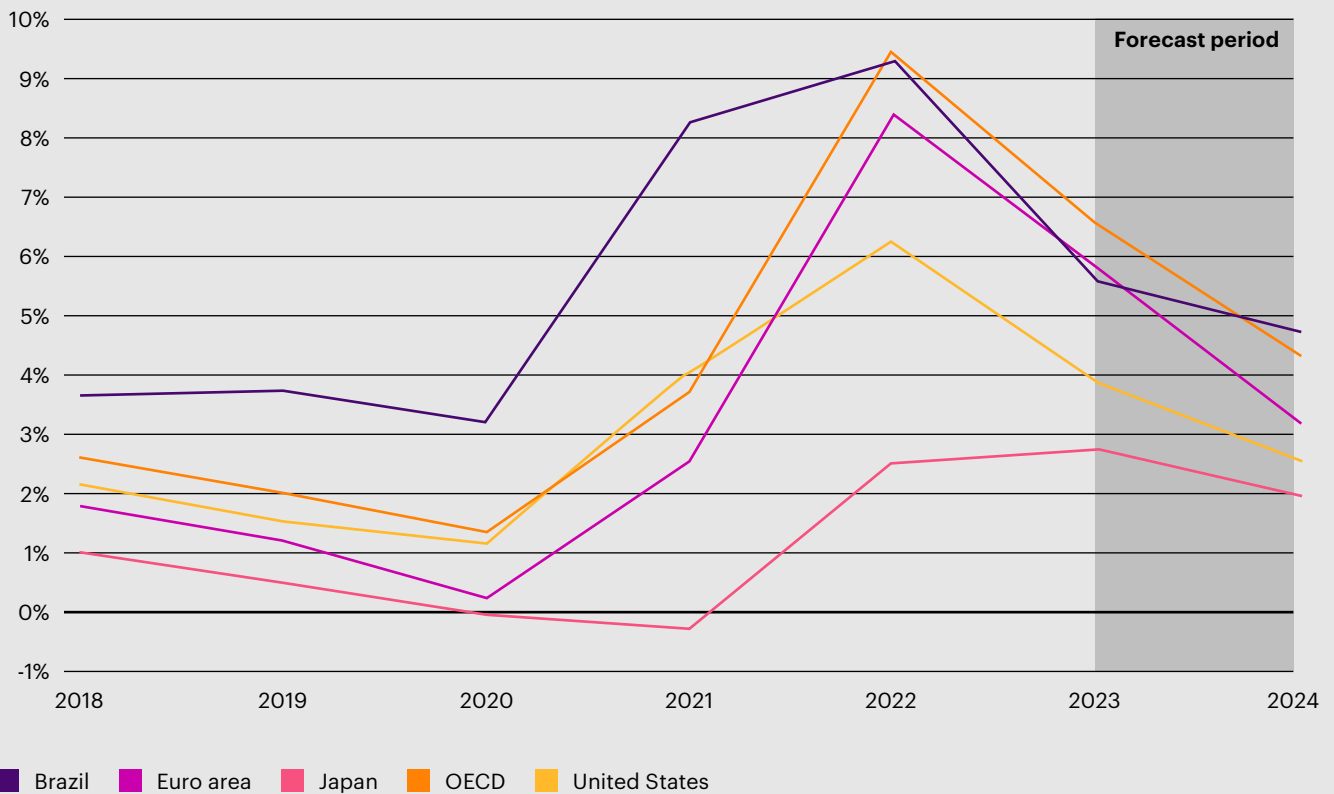
However, this is headline inflation, and the Power sector has issues of its own that are still very evident and bring additional pressure. This is mainly driven by a supply chain with a full global order book from ageing plants requiring upgrades and lifetime extensions, or new generation plants required to meet new dispatchable power needs following retirement of old units, the transition from coal or global electricity demands growth. The same can be said for other major items such as main transformers, the standard waiting time for which is now 24 months. This has not only required a review of values resulting from increased inflation but also a review of Estimated Maximum Loss scenarios as indemnity periods and expediting costs have grown.

³ https://www.oecd-ilibrary.org/sites/ce188438-en/1/3/1/index.html?itemId=/content/publication/ce188438-en&csp_ =f8e326092da6d8bbef8fbfa1b8ad3d52&itemIGO=oecd&itemContentType=book

⁴ <https://blogs.worldbank.org/developmenttalk/commodity-markets-outlook-eight-charts-0#:~:text=Commodity%20prices%20are%20expected%20to,remain%20broadly%20stable%20in%202024>.

⁵ <https://www.oecd.org/economic-outlook/june-2023/>

Figure 4: **Headline inflation has started to fall, but core remains persistent**



Source: <https://www.oecd.org/economic-outlook/june-2023/>

In term of Property values, increases of 8 – 10% have therefore been regarded as a minimum by many insurers this year, even where revaluations have been carried out in recent years. Certain classes of assets, particularly transmission infrastructure and hydro stations with substantial civil values, that had professional revaluations this year following several years of minor inflationary adjustments, saw increases of more than 40%. Whilst this is exceptional, it highlights the need for more regular reviews.

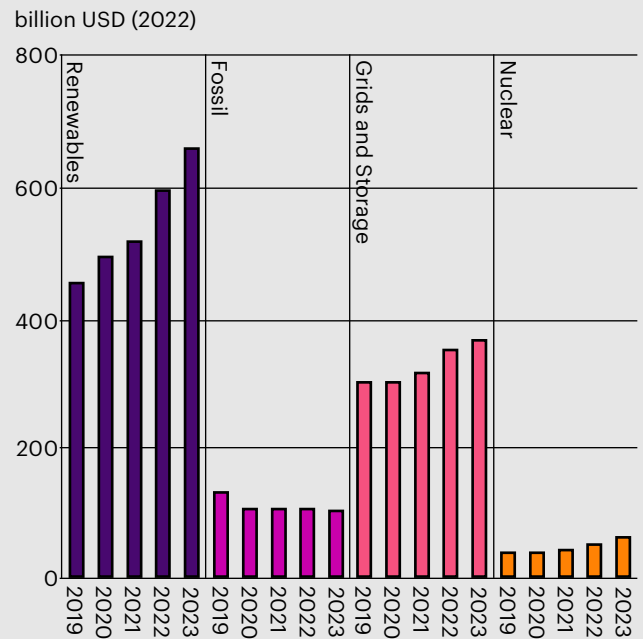
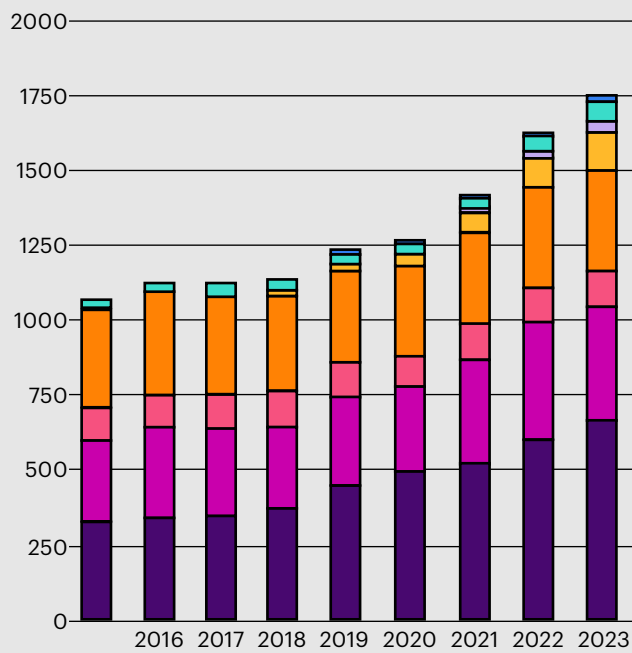
This is particularly the case given that, whilst there may be a case for the above generally more positive outlook for inflation, there remains uncertainty around the global economy. Inflation may be more resilient than hoped and further monetary policy hardening may yet be required to bring inflation under control. There also remains uncertainty around further impact from geopolitical tensions and trade restrictions, including the Russia

– Ukraine conflict, that could yet have further impact on raw materials and the energy market (Russia still supplies approximately 20% of European gas), stronger than expected recovery in China’s industrial sector and adverse weather events⁶.

It is understandably a difficult step to take when considering the potential impact on already high insurance premium costs but ensuring that sums insured, Estimated Maximum Loss values and Limits are all correct is essential for an insurance programme to provide the peace of mind and protection it is there for.

⁶ <https://ecfr.eu/article/own-goal-how-russias-gas-war-has-backfired/#:~:text=In%20the%20first%20five%20months,period%20in%202021%20and%202022>

Figure 5 and 6: Annual clean Energy Investment 2015 – 2023 and Power Investment 2019- 2023



Source: <https://www.iea.org/reports/world-energy-investment-2023/overview-and-key-findings>

Energy Transition

The push for supremacy of Renewables over fossil fueled generation continues at pace with the IEA's expectations of annual clean energy investment having risen much faster than expected in 2021⁷. Annual investment growth in renewables now sits at 24%, compared to 15% for fossil fuels, driven substantially by the energy crisis and a desire to reduce exposures to geopolitical factors, the growing concerns around climate change and increasing focus by investors on ESG.

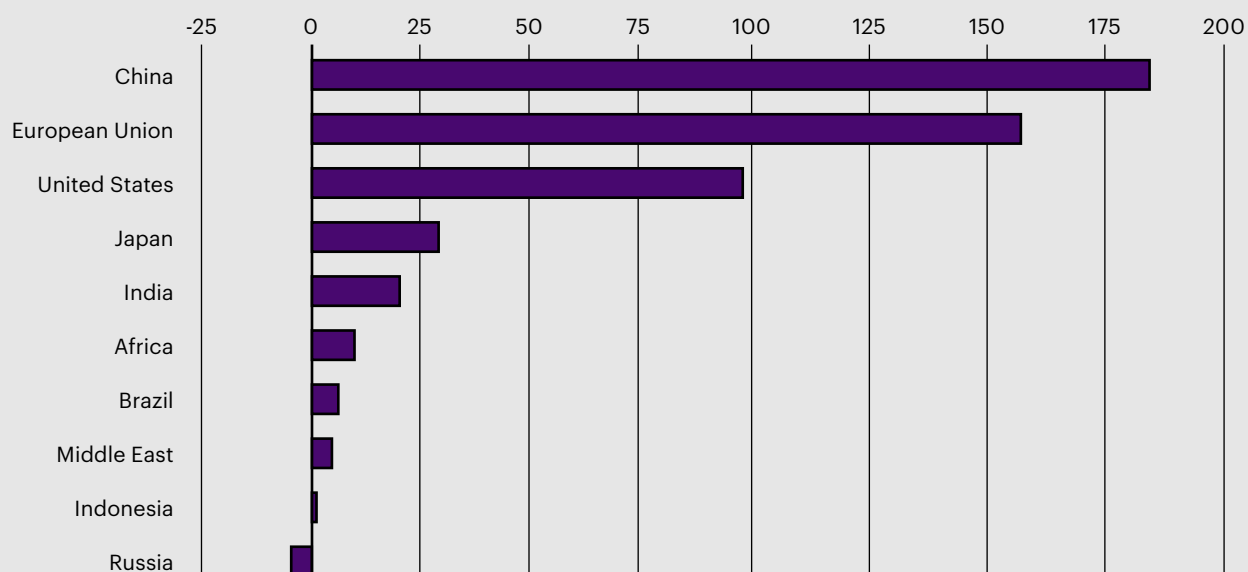
As a result, of the US\$2.8 trillion the IEA estimate will be invested in energy in 2023, they believe more than US\$1.7 trillion will go to clean energy (renewables, nuclear, grid enhancement, storage, low emissions fuels, efficiency improvements and end-use renewables and electrification) and US\$1 trillion will go to unabated fossil fuel supply and power generation. Only five years ago the ratio was 1:1. In terms of investment purely in new power generation the contrast is even more stark, with approximately 90% of all investment in 2023 expected to be in low emissions power, Solar being the stand-out technology, attracting over US\$1 billion of investment daily or US\$380 million over the year.

However, there will be discrepancies; although for some countries a big part of the route to energy security will be through renewables, for others, including China, a part of the answer still lies in coal⁸. China suffered painful electricity market constraints in 2021 due to heatwave and drought that drove electricity demand to record levels (a 26.8% jump in residential use) and low rainfall leading to historically low water levels in key hydro reservoirs and lakes fed by the Yangtze River, the levels of which are expected to continue to shrink. Coal supply therefore is expected to see an increase in investment during 2023 of 10%, putting it well above pre-pandemic levels. Overall, the trend for new coal generation is still on the decline but 2023 has seen the largest number of new coal-fired plant approvals since 2016 with 40GW in total, almost all of which will be in China with ten new plants.

⁷ <https://www.iea.org/reports/world-energy-investment-2023/overview-and-key-findings>

⁸ <https://www.scmp.com/economy/china-economy/article/3190313/chinas-power-crisis-why-it-happening-and-what-does-it-mean>

Figure 7: largest investors in renewable energy, 2023



Source: <https://www.iea.org/energy-system/fossil-fuels/natural-gas>

However, for 2023 China still remains the largest investor in renewable energy by some margin, with China's National Energy Administration expecting the percentage of non-fossil fuel power generation to rise to 51.9% from 49.6% in 2022.

This is illustrated in Figure 7 above, which also highlights the glaring reality of the divide in investment between advanced and developing economies, or what can also be regarded as a north-south divide in terms of the geographies where the investment is taking place. There are some possible exceptions to the rule, such as the substantial growth in solar in India, and rising investment in Brazil and the Middle East but many countries are still lagging behind and so the growth alone over existing annual levels of investment in China, Europe and the US since 2021 outstrips the total investment by all other nations put together.

Transition headwinds

A number of countries are being held back by high interest rates and cost of capital, financially challenged utilities, uncertainty around policy framework and electricity market design.

The situation is complex and the regional discrepancies from country to country around the rates at which the energy transition is being rolled out depend on numerous factors, which are often inter-related, including:

- Policy and regulation and the extent to which they incentivize and facilitate transition roll out.

⁹ <https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/renewable-energy-development-in-a-net-zero-world-disrupted-supply-chains>

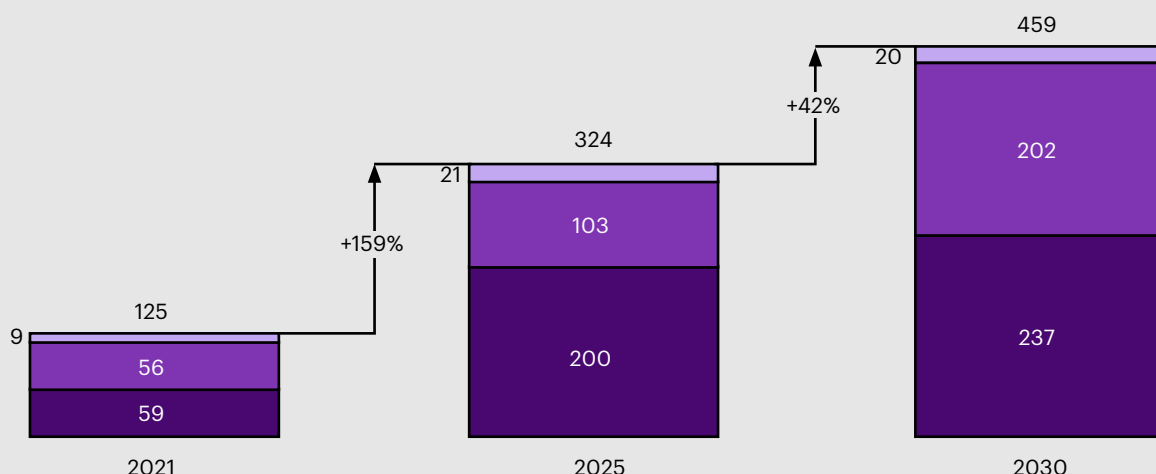
- Accessibility of finance.
- Levels of investment in supporting networks/ infrastructure and their ability to support the roll out.
- Popular opinion in different countries around the energy transition and how it impacts consumers.
- Geopolitics and energy security and how each country sees it can most effectively protect itself against this.

The presence of regulatory support and financial incentives is a key differentiator. For example, while the benefits of the investment incentives and regulatory support provided by the US Inflation Reduction Act and EU's Green Industrial Deal (target of 55% power production from renewables by 2030) are evident, many countries do not have the same supportive frameworks that provide the longer-term security needed to support investment decisions:

- **Japan:** Offshore wind market is on hold while rules for offshore auctioning of permits are reconsidered and Vestas plans for a Nagasaki-based turbine manufacturing facility were cancelled when orders from previous winners did not materialize⁹.

Figure 8: Wind and solar capacity addition by year of FID, GW

■ Solar PV² ■ Onshore wind ■ Offshore wind



Note: Figures may not sum, because of rounding.

Estimated annual final investment decisions for projects demonstrate dramatic activity in renewables markets globally

Source: <https://www.mckinsey.com/industries/oil-and-gas/our-insights/global-energy-perspective-2022>

- **Mexico:** Regulatory and financial uncertainty arose during the current administration that put the support packages on hold and frozen investment in new solar by cancelling planned auctions and no longer issues permits for new sites. This follows a period from 2017 to 2022 when the total percentage of wind and solar energy in Mexico quadrupled from 3% to 12% following investment of over US\$10bn during 2017 and 2018¹⁰.

This regulatory inertia can in turn arise from various important factors that cannot be ignored or swept aside in an ideological target of change required to save the planet. Beyond the environmental challenges there are social and political hurdles that for many countries will remain insurmountable for many years to come. These hurdles include financial constraints for developing countries that are still reeling from the financial impact on public finances of COVID-19, or others that, like China, have unpredictable, changing climates that can heavily impact future wind and water levels that have an abundance of cheap coal or gas. Regional politics and popular opinion also play a major part, with some developing countries feeling that it is the advanced nations that have caused the climate change and that they have no right to dictate energy policy to those that are struggling with the challenges of having to rapidly expand generation output to meet or help drive rising living standards. This will inevitably mean that for those countries, that are home for up to 80% of the world's population and that are having to work hard to deliver

the conditions for economic growth and improving living standards, fossil fuels will remain the cheapest and most practical solution to affordable and reliable energy.

As if this was not enough to put some off, there are other more serious practical factors that make hesitance to commit heavily to energy reform understandable even for advanced nations.

Supply chain challenges

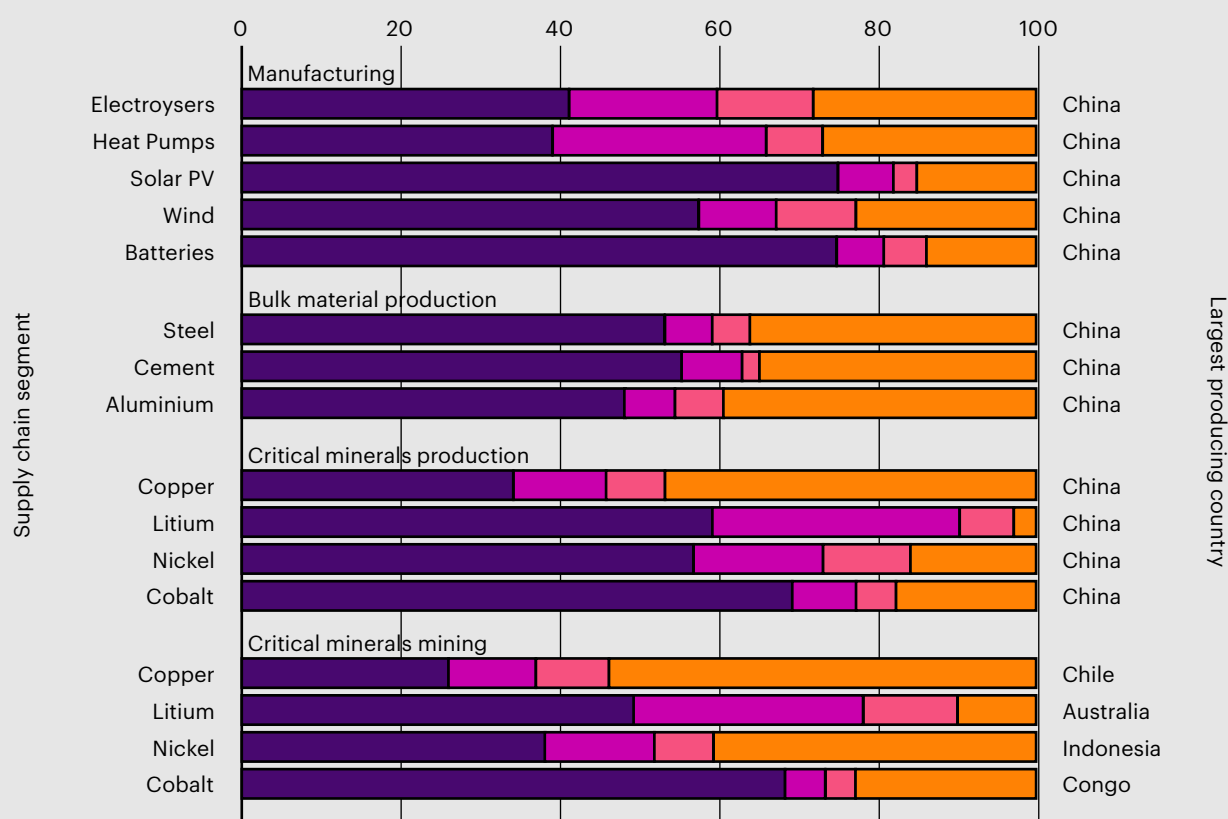
Simply put, demand across the whole range of transition initiatives, from the generation of clean energy to the infrastructure enhancements needed to build smart grids that can deal with intermittent power supplies to the electrification of vehicles, is going to continue to outstrip supply for some time.

McKinsey, in their 2023 Renewable Energy Supply Chain report¹¹, believe that planned investment between now and 2030 will lead power generation from committed solar and on and offshore wind projects to triple from 125 GW to 459 GW. Growth of this magnitude in a sector with substantial investment demands requires clarity of and the pinning down of project costs to prove viability. To achieve this, stability and reliability in supply chains is essential; however, this has been lacking in recent years, with fluctuations in pricing of raw materials and exchange rates (including currency devaluations) that manufacturers and contractors will seek to pass on to customers.

¹⁰ <https://www.forbes.com/sites/nathanielparishflannery/2023/05/23/why-is-mexicos-president-so-hostile-to-solar-energy-investment/?sh=5b3a67bf1813>

¹¹ <https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/renewable-energy-development-in-a-net-zero-world-disrupted-supply-chains>

Figure 9: **Geographic concentration by supply chain segment, 2021**



Source: <https://www.iea.org/data-and-statistics/charts/geographic-concentration-by-supply-chain-segment-2021>

Concerns will also exist with much of the key elements of the supply chain, both in terms of manufacturing base for Solar PV and turbines concentrated in China, that some will see as a significant potential threat to security of supply, given the tensions around Taiwan. In addition, the supply of many of the raw materials required for a range of transition technologies including wind, solar and battery storage arises from a number of less developed nations whose production bases have not been mechanized and will be challenged to meet the inevitable growth in demand that will arise from the current pipeline of projects.

To counter this, strategies are being put in place by Europe and the US to expand, diversify and improve the efficiency of the supply base but this will take a number of years to put in place and that will not be up and running in time to satisfy current timetables. In the meantime the supply chain constraints will drive inflation and greater volatility around project costs that is already being seen with renewables costs having risen for the first time over the past two years for the first time in many years.

Technology challenges

Whilst the transition and options have been in discussion for a number of years, there are still a number of the technologies on which the transition depends that are at a relatively early stage of development. The ramping up of scale to meet the size of the investment pipeline and projects is also going to put even greater demands on suppliers as they seek to not only develop new, more efficient and larger-scale technology but to do so from an already stressed manufacturing base. This has not scaled up in line with the order book and also suffers from the lack of experienced workforce to both manufacture and build the projects.

There are many good examples, most recently in the challenges in gas and larger wind turbines, where the pressure to constantly evolve technology has resulted in lack of reliability and significant losses both during construction and operational phases. This together with warranties generally limited in value and to the replacement cost of replacing the defective parts (not including downstream damage or consequential loss) can be a significant barrier for insurers approached to provide cover. This still applies to key transition technologies including Battery Storage¹², Green Hydrogen and CCUS¹³.

¹² <https://www.epo.org/news-events/in-focus/green-tech/energy-transition-technologies.html>

¹³ <https://wiki.energytransition.org/the-book/challenges/technological-challenges-of-the-energiwende/>

Climate change

El Niño is here...

Climate change is the key driver of energy policy around the globe. The drive towards Net Zero and the meeting of 2030 and 2050 Paris Agreement targets needs to be the focus of huge investment as economies move to keep global warming well below 2 degrees Celsius above pre-industrial levels and below 1.5 degrees Celsius, if possible, by the end of the century.

However, the World Meteorological Organisation (WMO), believes a shift from La Niña to El Niño weather patterns during 2023 has raised the probability that over the next five years there will be at least one year in which the annual average near-surface global temperature exceeds 1.5 degrees Celsius above pre-industrial averages to 66%¹⁴. La Niña conditions have helped reduce global warming trends over the past three years but this is now set to change following the end of La Niña and arrival of El Niño in June 2023.

Key findings of the report included:

- La Niña conditions have helped reduce the development of global warming trends over the past three years but this is now set to change following the end of La Niña in March 2023.
- El Niño warming effects tend to be felt a year after it commences, so that will be 2024 in this case.
- Annual mean near-surface temperatures are predicted to be between 1.1 and 1.8 degrees higher than the pre-industrial average for the next five years.
- There is a 98% chance that the hottest year on record, set in 2016 during the last exceptionally strong El Niño, will be exceeded over the next five years.
- There is a 98% chance that the forthcoming five-year mean will be higher than for the last five years.
- Arctic warming is expected to be disproportionately high.
- May to September average rainfall for 2023-27 compared to 1991 to 2020 is expected to be higher in regions such as Sahel, northern Europe, Alaska and northern Siberia and lower in regions such as the Amazon and parts of Australia.

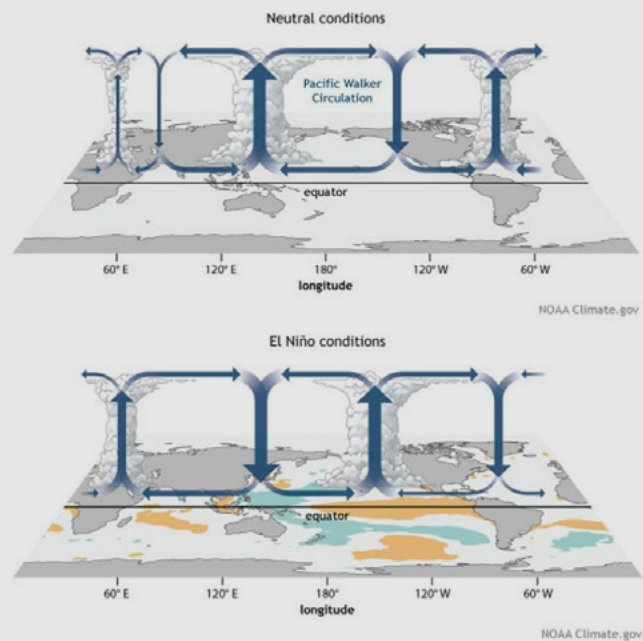
El Niño explained

El Niño and La Niña, arising in the Pacific Ocean, are the single most important causes of changes in weather across the planet.

As can be seen from Figure 10 above, La Niña is characterized by more neutral conditions, with trade winds blowing west across the equator, pushing warm water away from South America towards Indonesia and Papua New Guinea. Since 2020 this pattern of sea and air currents has been clear with strong winds and hotter water in the west. This has set weather patterns for the past three years.

¹⁴ <https://public.wmo.int/en/media/press-release/wmo-update-prepare-el-ni%C3%B1o>

Figure 10: La Niña versus El Niño conditions

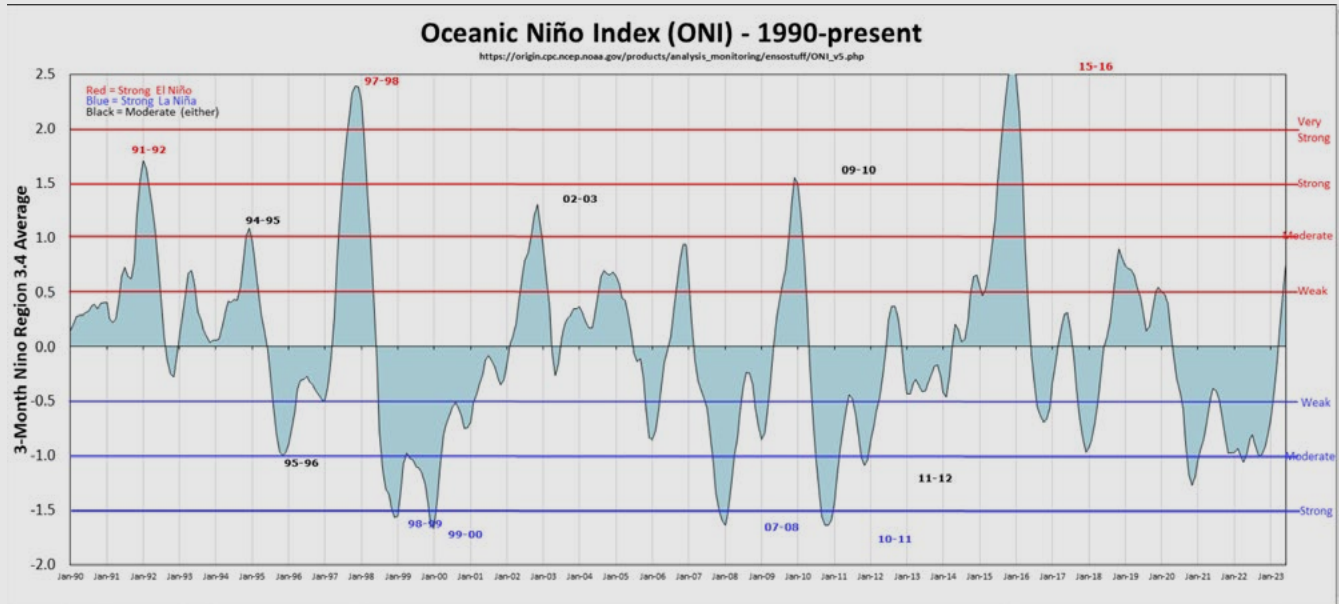


Source: <https://www.climate.gov/>

During El Niño the trade winds pushing warm water to the west reduce and the massive pool of warm water sitting in the west flows back eastwards to the central Pacific. The slower than usual trade winds also allow water temperature to heat up more. Typically, the atmosphere above the Pacific has a single loop formed by air rising in the west that then rises and is channeled back to the east, where it comes back down off the coast of South America, rejoining the trade winds. However, the conditions of El Niño split that single loop into two, with a single central convection column rising from the middle of the Pacific (rather than the west) pushing air both east and west. The impact of this column rising from the central Pacific is so significant and its effects are felt so far afield due to the enormous size of the Pacific and the heat it holds. The atmosphere absorbs more heat and the oceans less, with the effect that two to three months into the new pattern global surface temperatures start to rise. The currents also affect the trajectory of jet streams over continents and with them, their storm systems.

Whilst El Niños may be similar in structure, they are known to have their own characteristics. Patterns that tend to repeat though include drought to Indonesia, Australia, Central America and northern South America and heavy rains to the southern United States, Southern South America, the Horn of Africa and Asia.

Figure 11: ONI index, 1990-present



Source: TBC

Will it be a strong El Niño?

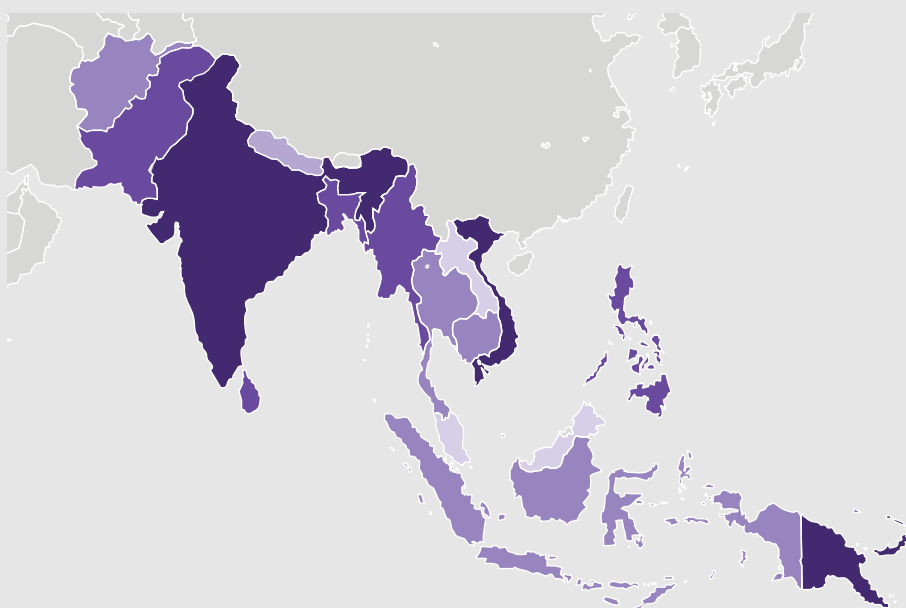
Whilst rising global temperatures after two to three months are referenced earlier in this article, and the WMO suggests that the true impact won't usually be felt for up to a year, there are already signs that it's kicking in.

In August 2023, several publications attributed the tropical storm Hillary that impacted California to a dangerous mix of global warming and El Niño that resulted in water 3.5-5 degrees Celsius hotter than usual

in the area below Baja California and west of Mexico. It was the first hurricane or tropical storm to make landfall in California since 1939, with record rainfall in San Diego and Los Angeles and Death Valley receiving annual rain levels in a single day.

The warmer temperatures that created the conditions for the event also ran deep, which is significant as higher subsurface temperatures are usually a sign of a stronger El Niño.

Figure 12: Impact of last El Niño on South East Asia



Countries in South-East Asia, South Asia and the Pacific affected by flooding, landslides, drought and tropical cyclones, and the severity of the impact based on the number of deaths, the number of people affected and total economic damage.



Note: Data unavailable for countries not coloured.

In emerging Asia, India and Vietnam were among the biggest victims of the last strong El Niño event in 2015-16

Source: TBC

What will be the impact and who will feel it most?

As mentioned earlier, the reality is that El Niño events are not all the same in terms of their impact and their arrival doesn't mean the same impact on everyone. For example, some regions will have droughts and others record rainfall, some (not necessarily much more frequent but heavier) storms and others less wind than usual. It is also notable that of the five worst years for climate related catastrophes in the US (see table later in the section), none occurred during an El Niño year. This is not to say that it is an indicator that this will be a more positive period for the US or that bad losses won't happen, but it is statistically significant.

On the same basis, if we look to the areas most affected by the last strong El Niño in 2015, it was South-East Asia, South Asia and the Pacific who saw substantial destruction to coastal and agricultural communities from flooding, tropical cyclones and drought.

Global natural catastrophes in 2023

In August 2023 Swiss Re issued an update of insured global natural catastrophe losses for the first half of 2023¹⁵.

Its key findings were that:

- Losses were up from US\$48 billion in 2022 to US\$50 billion, the second highest year since 2011.
- US severe convective storms (SCS) accounted for 68% of global insured losses, highlighting the increasing impact of secondary perils.
- There were ten US SCS events with losses in excess of US\$1 billion each, well above the ten-year six-month average of six such events — total insured losses were US\$34 billion.
- Exposure to secondary perils was also highlighted by events in and around Auckland, New Zealand that generated insured weather-related losses of US\$2.3 billion, the worst since 1970.
- The Turkey/Syria earthquake was the single most costly disaster both in terms of economic (US\$34 billion) and insured loss (US\$5.3 billion).
- The average annual growth trend for insured natural catastrophe losses is 5–7%, which owes much to the warming climate and greater concentrations of higher values in urbanized areas.

Figure 13: **Economic and insured losses, H1 2023**

	H1 2023	H1 2022	H1 previous 10-y avg	% change vs 10-y avg
Economic losses	125	129	89	41%
Natural catastrophes	120	123	82	46%
Man-made catastrophes	5	6	/	-23%
Insured losses	54	52	38	42%
natural catastrophies	50	48	32	54%
Man-made catastrophies	4	5	6	28%

Catastrophe versus man-made and insured versus uninsured losses

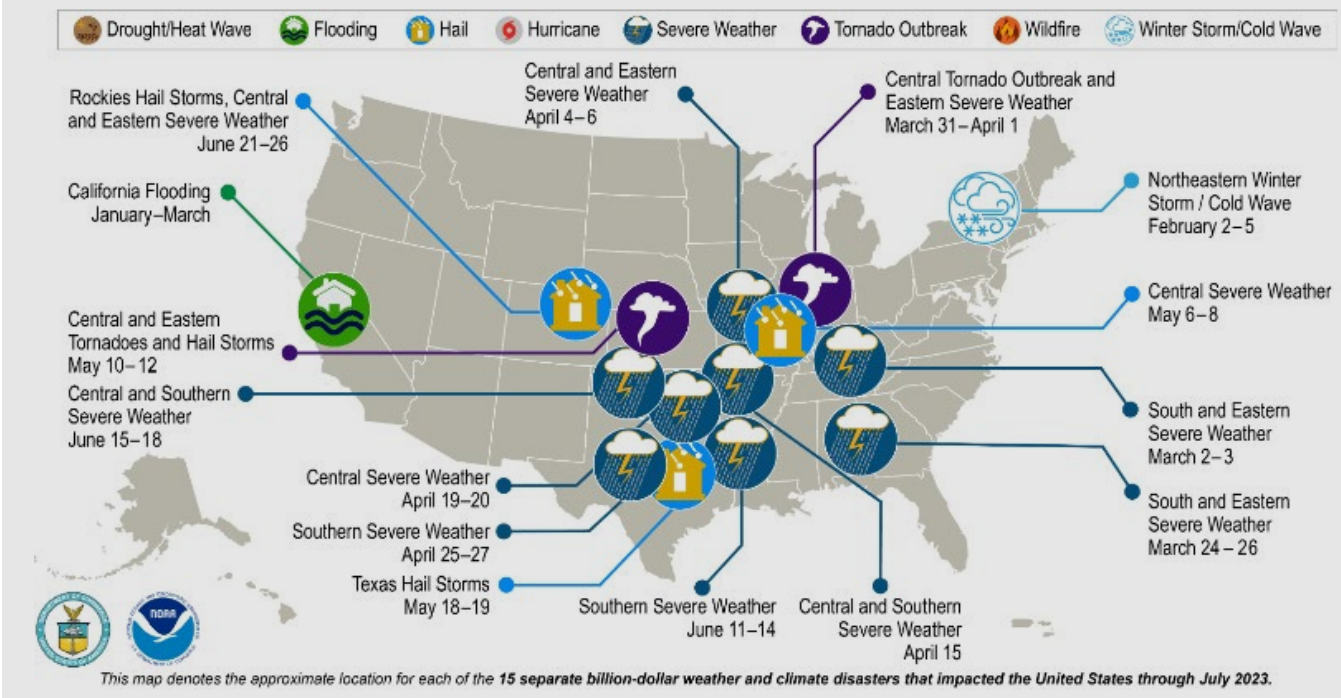
The H1 estimated picture for all global losses is as per Figure 13 above. The numbers are for H1 2023 and H1 2022, as well as the ten-year H1 average. The numbers have also been split between Economic and Insured losses and Nat Cat and man-made.

This highlights the magnitude and challenge of the Nat Cat exposure both for insureds and insurers, with Nat Cat representing 92% of the total estimated losses.



¹⁵ <https://www.swissre.com/press-release/Severe-thunderstorms-account-for-up-to-70-of-all-insured-natural-catastrophe-losses-in-first-half-of-2023-Swiss-Re-Institute-estimates/cea79f3c-6486-41a8-9c6e-09df260efe30>

Figure 14: **US2023 billion-dollar weather and climate disasters**



Source: <https://www.ncei.noaa.gov/access/billions/summary-stats/US/2023>

Focus on the US

In addition to the ten CSC events noted above, NOAA estimates that there were a further five excess of US\$1 billion events in the US in H1, all of which were weather related. The events, illustrated below, include winter storms, thunderstorms, flood, hail and tornados. With 13 storm losses generating a total estimated cost of just under US\$33.4 billion, they represent 87% by frequency and 84% by quantum. The California floods are estimated at US\$4.6 billion and the February “Cold Wave” that impacted the north-east, is estimated at US\$1.8 billion.

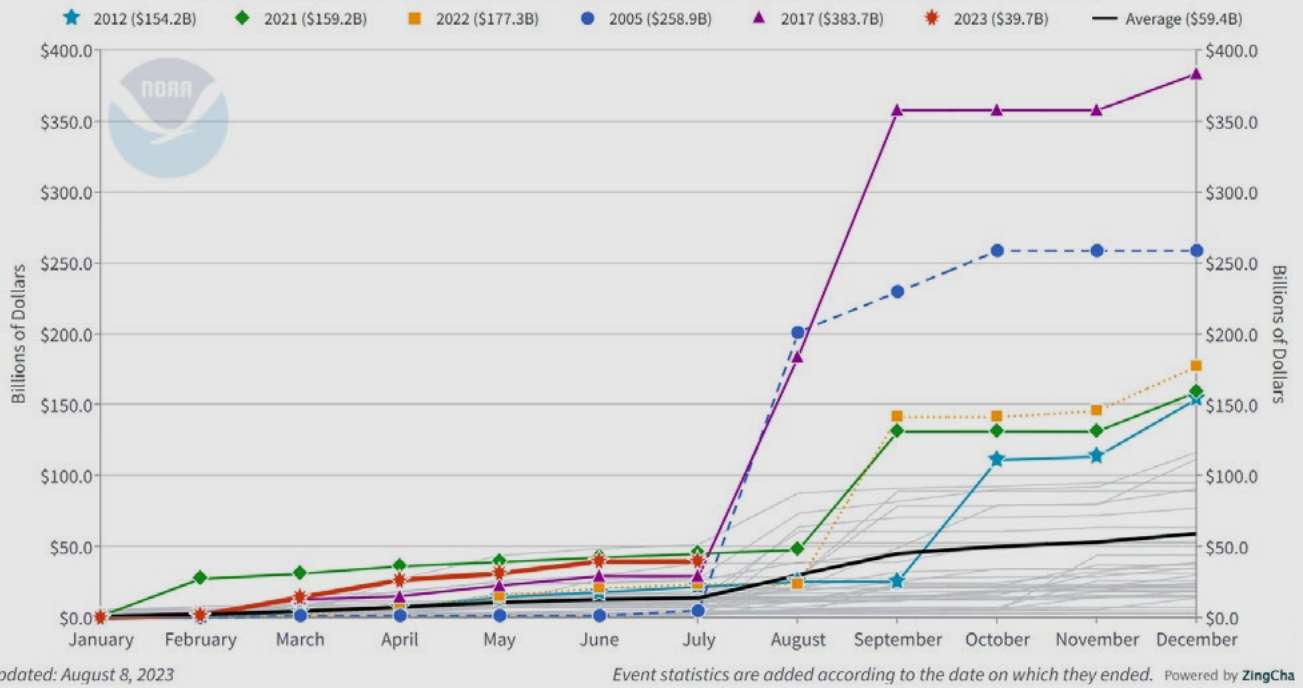
What does the future hold?

Figure 15 overleaf tracks the profile of the development of historic annual Nat Cat losses through the year. The next months as the Atlantic Hurricane Season progresses will likely dictate the outcome for 2023, with the US statistics for H1 showing that, until July, 2023 was keeping pace with the worst five years. Much will no doubt depend on the impact of El Niño.

Impact on the insurance market and strategies for addressing underwriter challenges

The challenges that we have just covered have many implications for our customers and the Power sector globally. Some challenges are here right now and some are still developing but they all have the potential to impact Power market insurers. Generally speaking, whatever is not good for them from a risk perspective is not going to be good for power sector customers. It is therefore becoming increasingly important for risk transfer strategies to be as effective as possible, that consideration of the insurance market and its challenges be at the heart of our and our customer’s strategies.

Figure 15: 1980-2023 United States Billion Dollar Disaster Year to Date Event Cost (CPI adjusted)



Source: <https://www.ncei.noaa.gov/access/billions/summary-stats/US/2023>

We are truly heading into increasingly challenging and uncharted waters — and on a totally global scale. There is nothing that has come before that will be in anyway comparable to the complexity of decision making as the multiple moving parts of geo-politics, regulation, climate change, technology advance, energy transition, changes to business models and power markets (to name but a few) begin to emerge. The sector will need all of the help and support it can get to navigate the perils effectively and when it comes to risk, the wealth of experience and skills of its brokers and insurer partners should be drawn upon deeply to ensure power companies have the right strategy to deliver the optimum solution.

In the extensive table outlined at the end of this article, each challenge is considered against the impact on the market; strategies are identified that should be put in place to address the challenges that the power industry and its insurers face and the possible outcomes, both good and bad, depending on the route taken. The decisions may rest with the power sector but brokers are here to help ensure that companies understand the options and take the right route.

Russia – Ukraine

Impact	Strategy	Market Response
<p>Power market volatility Whilst the impact was felt most noticeably in Europe with MWh prices at multiples of pre-conflict averages, it was still felt beyond, with global energy markets being impacted by increases in prices driven by fossil fuel demand from Europe following the turning down of gas supplies from Russia.</p> <p>Clearly there are measures in play to address volatility and as can be seen from current and futures markets, the positive impact of this is already being felt. This should result in a more stable and predictable environment for all and fewer “nasty surprises for the market”. This is critical as the past years has made it extremely difficult for insurers to understand and rate risks, the insecurity around which has fed through to higher rates.</p>	<ul style="list-style-type: none"> • Clear messaging on type of revenue streams (PPAs/ Spot Market etc.) • Where exposed to wholesale market volatility, explanation of the state of the market and factors that impact local markets. • Where PPAs apply, appreciate that this is a real positive in terms of clarity of exposure for the market and emphasize it. • Provide revenue data broken down monthly to show profile of revenue seasonally and across future years. • Make clear how strong OEM relationships and good spares arrangements will mitigate loss. 	<p>Positive (e.g. MWh caps avoided, lower rate increases, less pressure on deductibles) where:</p> <p>Good revenue data provided and local market dynamics understood; PPAs provide stable and clearly understood revenue stream; Market volatility was considered low.</p> <p>Negative (e.g. rate increases, higher retentions, application of tighter MWh price caps) where:</p> <p>Volatility is unpredictably high; Market dynamics are not well understood; Lack of detail around monthly revenue and split; poor strategic spares and exposure to supply chain challenges.</p>

Global Inflation

Impact	Strategy	Market Response
<p>The market continues to struggle with ongoing inflation and although this is easing there are likely to be many Insureds that are lagging behind.</p> <p>This is made more challenging by a sense in the market that, often, declared values are based on original construction values. However, it is well understood that contract values for plants will often be reduced in return for longer term service commitments which, whilst positive, do mean that the starting value for insurance programmes is below the realistic cost of construction.</p> <p>It is also clear that deductibles for major GTs/STs, Transformers etc. are at the same or similar levels to those that applied over a decade ago, whilst damage repair costs have increased at a steady rate. The inevitability of this is that the value of the deductible to insurers has been eroded over time. This only serves to exacerbate market frustrations with adequacy of values.</p>	<ul style="list-style-type: none"> Engage with insurers to demonstrate an appreciation of the challenges. Provide clarity around how you intend to address this and ensure that your values remain a fair reflection of rebuild costs. Demonstrate how renewal values have been arrived at. Be clear about the details of any LTSA's/ OEM relationships etc. that ensure replacement parts/ repairs at pre-agreed rates. Ensure Limits and EMLs are reviewed ahead of renewal to ensure they keep pace with increasing costs of reinstatement. 	<p>Positive</p> <ul style="list-style-type: none"> Recent valuations, risks whose values benchmark well against trusted peers, regular annual value adjustments): Greater trust in clients and your risks. Less market challenge and more positive base for renewal negotiations. Better sense of partnership from market will deliver the most positive outcome in terms of renewal rating with less pressure on markets to reflect uncertainty in rating. <p>Negative</p> <ul style="list-style-type: none"> Low annual adjustments, no recent valuations, values that stand out as low against peer benchmarks) Lack of confidence in declared values and strained market relationships/ reputational risk/ lack of market appetite Imposition of Average Clause with low trigger Subjectivities for cover to be dependent on valuations within a certain period of renewal Higher increases in rates to reflect probability of higher loss than values suggest.

Energy Transition

Impact	Strategy	Market Response
<p>The market is struggling on several fronts: a wide range of new technologies together with a number of manufacturers/variants trying to achieve similar outcomes in different ways.</p> <p>The sector is moving towards greater focus on larger H class gas turbines with enhancements and larger output and potential for loss.</p> <p>Greater intermittency is straining thermal plants through changing operating regimes.</p> <p>For new technologies, there is a lack of data on plant performance, reliability and potential for loss.</p> <p>There is uncertainty around the impact on risk of strained supply chains that could impact manufacturing and build quality.</p> <p>The risk base is burgeoning, as new plants being built across a wide range of territories; this is expanding demand and also leading to new builds, which are now appearing in less favorable/ riskier Nat Cat exposed locations.</p> <p>There are huge challenges in terms of managing/ underwriting the sheer volume of risks/opportunities, with an underwriter base that is having to draw upon less experienced talent.</p> <p>There is also pressure from senior management and shareholders to be supportive of the energy transition despite the challenges.</p>	<ul style="list-style-type: none"> • Essential to have more frequent/ better market contact. • Have a clear placement plan that allows time for underwriters with an ever-growing volume and complexity of risks to work through. • Identify early and address any market concerns that may exist around new or future investments or changes in the operational risk profile of existing plants. • Ensure good quality Risk Engineering based underwriting information, that provides a fair and detailed assessment of your risks and exposures including positive risk features as well as any areas of concern/ risk recommendations. • Ensure you engage early with your broker to ensure that they are able to put a strategy in place to address the above. • Enable your broker to help with the messaging of these challenges to internal stakeholder, enabling expectations around the impact of new risks on insurers panels, programme structures, risk retention levels and costs. • Collate and clearly present good risk summaries that insurers can work through more efficiently. 	<p>Positive</p> <ul style="list-style-type: none"> • Early and clear visibility by insurers of changes in risk profile, provision of good information, time to consider and review new technologies, Opportunity for discussions around any challenges they may face to enable them to manage): • Market stress avoided, questions can be asked and answers provided in good time. • Allows engagement of client and/ or broker engineers to with insurer engineers where value is added. • Enables considered underwriting of risk and time for underwriters to fight your corner through management referrals where guidelines require. • Best underwriting outcome from a more confident market. <p>Negative</p> <ul style="list-style-type: none"> • Failure of client/ broker to grasp significance of new/ changing risk, Lack of preparation and inadequate risk information, Stressed timelines): • Underwriter has no time to adequately understand or assess the exposure resulting in late questions and challenged timelines. • Technologies that are out of appetite can't be given a fair hearing for existing clients. • Either will result in less attractive terms or declinatures.

Climate Change

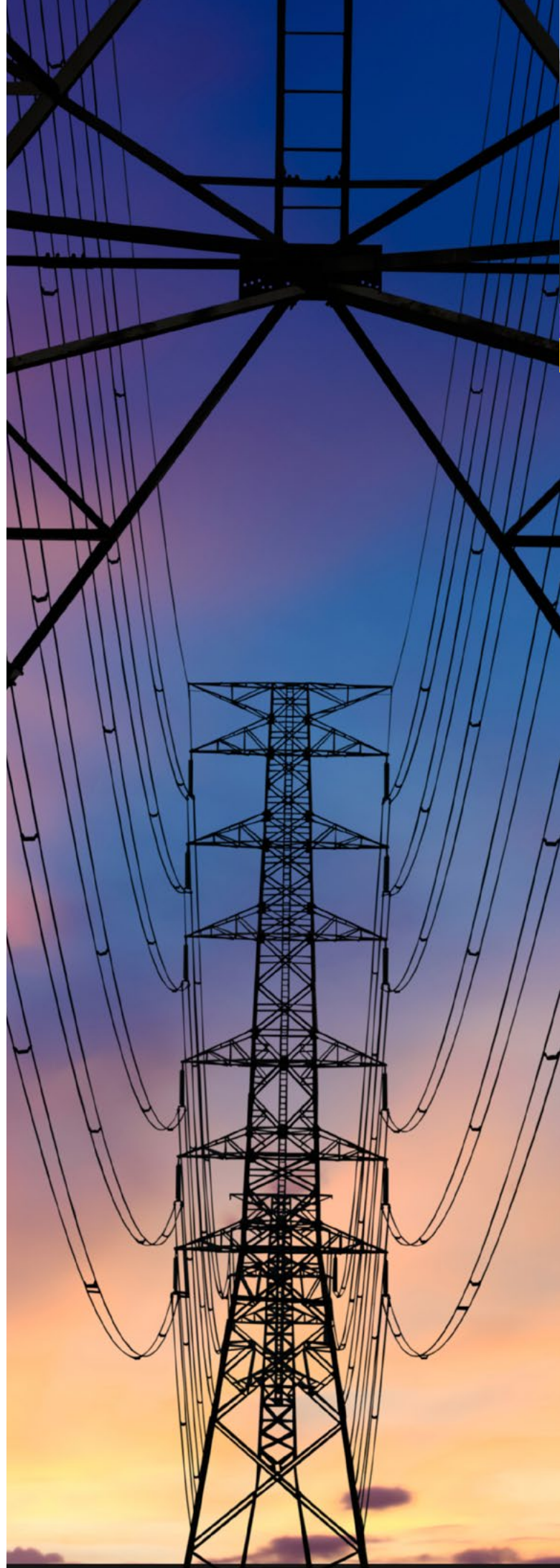
Impact	Strategy	Market Response
<p>Climate change is a key concern for all underwriters as weather losses continue to deteriorate.</p> <p>The frequency and severity of major events are increasing and rates will follow.</p> <p>Locations previously considered less exposed are now being impacted (e.g. California storm and more widespread wild fires).</p> <p>Reinsurance costs are increasing and aggregates reducing, putting pressure on existing cost and cover levels for risks in more exposed territories.</p> <p>Building standards/ protection against major events and risk mitigation plans are under greater scrutiny.</p>	<ul style="list-style-type: none"> • It is increasingly important for Insureds to understand their exposure by spending time assessing and quantifying it. • Where previous losses have occurred ensure that you are able to provide details of the scale of the circumstances surrounding the event and what action has been taken to prevent against future even of similar or greater magnitude. • As costs rise, Cat cover that may have been bought to policy limit or higher than needed sub-limits need to be reviewed — are you paying for or concerned about potential loss of cover that in fact you don't need? • Engage your broker to carry out Cat loss modelling that is available across a range of exposures including storm, flood, quake. This can also be extended to include Cat exposed supply chains. • Ensure accuracy of models are as accurate as possible by ensuring that all assumptions relied on by the modellers are as bespoke to your sites/ risks as possible. Provide risk detail and protections that will be reflected in the loss expectancy. Models can also be used to inform the business case around risk protection/ Cat resilience. • Share findings with internal stakeholders and ensure that the ground is prepared for options to be priced and seriously considered where there is a cost benefit. 	<p>Positive</p> <ul style="list-style-type: none"> • Clear information on risk protection, flood/ storm defences/ plans and quake build standards. • Quality modelling information that provides additional risk insight, preparedness to consider options/ flexibility around limits where appropriate. • Underwriters have the information needed to consider the risk including insight into being able to demonstrate that changing weather has been factored into risk planning as well as past events. • Sound models that can help back up underwriting decisions. • Ability for underwriter to offer best terms and develop options that the risk-informed Insured is in a position to consider. <p>Negative (No qualitative or quantitative information on Cat exposure, no flexibility to propose or consider options, Lack of information on risk mitigations since previous events):</p> <ul style="list-style-type: none"> • Underwriter will not be in a position to do anything other than consider the exposure against the outcome of their Cat model. • Insured is unable to challenge underwriters' perception/ Cat pricing/ aggregate allocations. • Insured is unable to assess the impact or value of any coverage restrictions. • This approach will never deliver the optimum result and the Insured will have no effective strategy to respond.

This concludes the review of the power sector. It is hoped that it has provided some clarity around the key issues that brokers, the market and the power sector face. There may seem a lot to consider and it is very likely that there will always be more along the way, but it is never too early to start preparations for the next renewal. With so much to plan for, we recommend strongly that a well defined plan be put in place as soon as possible each year to ensure success and that your brokers and insurers are at the heart of this.



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The Polycrisis and the Energy Trilemma: The geopolitical risk landscape in 2023

In a world perceived as increasingly:

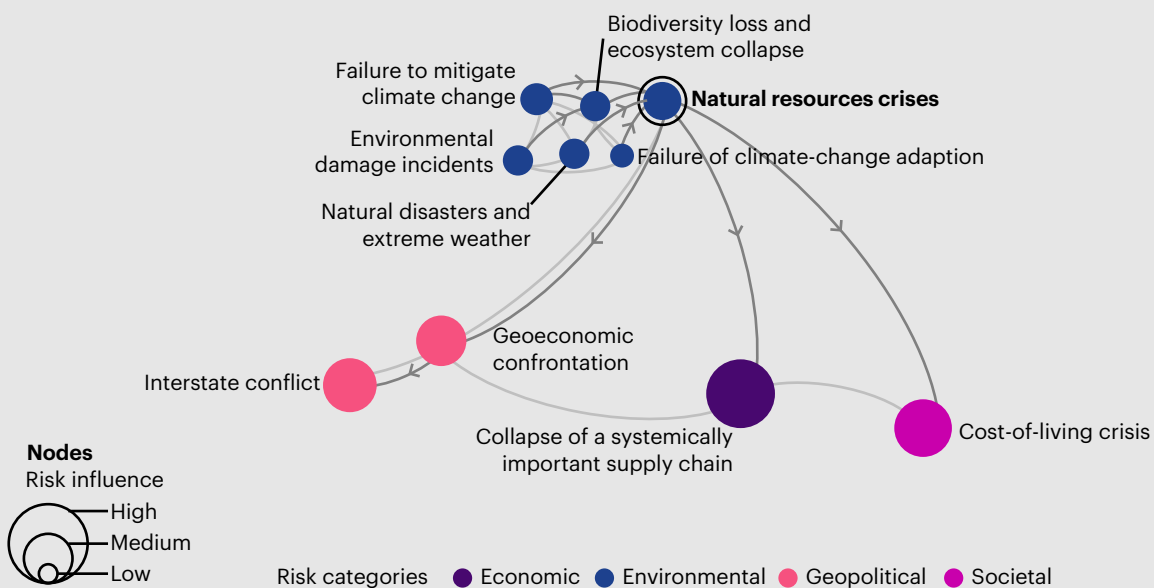
- Volatile;
- Uncertain;
- Complex; and
- Ambiguous,

simple concepts (such as VUCA) can be useful to make sense of the complexity.

“Polycrisis” is one such example, first appearing in the 1990s to mean “interwoven and overlapping crises” facing humanity. Now it has been popularised by the 2023 World Economic Forum Global risk report¹ (see Figure 1 below) to refer to the interrelated environmental, geopolitical and socioeconomic risks to the supply of and demand for natural resources by 2030.

The power market sector finds itself at the confluence of multiple crises: a cluster of environmental challenges, a cost-of-living crisis, supply chain disruption post-COVID-19, and geopolitical tensions.

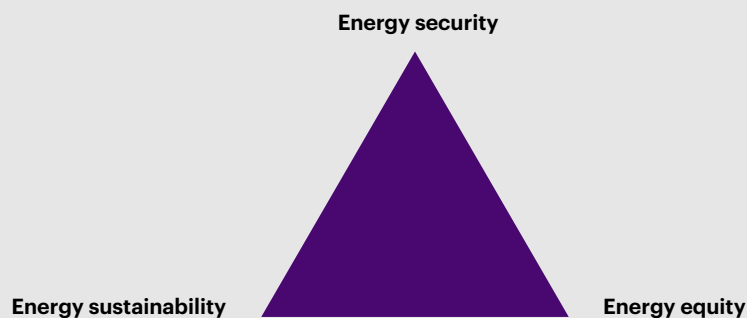
Figure 1: The natural resource polycrisis



Source: Natural Resources Polycrisis — 2023 WEF Global Risk report (page 58)

¹ The Global Risks Report 2023 18th Edition https://www3.weforum.org/docs/WEF_Global_Risks_Report_2023.pdf

Figure 2: **The Energy Trilemma**



Energy Security: the capacity to meet current and future energy demand reliably, withstand and bounce back swiftly from system shocks with minimal disruption to supplies. The dimension covers the effectiveness of management of domestic and external energy sources, as well as the reliability and resilience of energy infrastructure.

Energy Equity: the ability to provide universal access to reliable, affordable, and abundant energy for domestic and commercial use. The dimension captures basic access to electricity and clean cooking fuels and technologies, access to prosperity-enabling levels of energy consumption, and affordability of electricity, gas, and fuel.

Energy Sustainability: the transition of energy system towards mitigating and avoiding potential environmental harm and climate change impacts. The dimension focuses on productivity and efficiency of generation, transmission and distribution, decarbonisation, and air quality.

Source: WTW

Yet when it comes to risk management and strategic decision making, perhaps a more helpful concept is that of the “energy trilemma”, which neatly and timelessly summarises the tensions that this sector is subject to when trying to find a balance between security, affordability, and sustainability.

The last 18 months have shown how this balance can be impacted by geopolitical events, with different countries making different decisions to resolve their energy trilemma.

A reminder that energy and geopolitics are intricately linked was the well-reported presence of Dr Fatih Birol, the director of the International Energy Agency at the last G7 summit in Hiroshima in May 2023. He outlined recommendations for a “clean” energy world, to avoid the same geopolitically driven energy security risks that have become part of the global energy landscape since the 1970s around oil and gas.

Beyond the Russian-Ukraine conflict

Recap of the conflict’s impact on the power sector

While today’s energy crisis shares some parallels with the oil shocks of the 1970s, there are important differences, which make it the first truly global energy crisis: it affects all energy sources (rather than mostly oil) and economies are much more interdependent. It also is likely to last longer, no less due to Russia’s continued

conflict with Ukraine. Russia was until then the primary energy exporter for oil and gas, and a major exporter for coal and uranium.

The impacts of the conflict have been wide-ranging:

- **Trade flows:** Despite sanctions, Russia’s oil exports have held on, with shipments re-routed to Asia in particular. There has been much talk about the “weaponization of energy” by Russia; but if this is the case, the weapon has been pragmatic and ambiguous. The flow of gas and oil towards Europe has been more durable than often assumed. Between February 2022 and February 2023, the EU imports of Russian oil fell by 90%² (but not immediately, and not down to 100%). However, while Russia may have found new customers for its oil and gas, it is facing longer term issues regarding the maintenance of its power operations and infrastructure. As it continues striking Ukraine’s power infrastructure, its own is creaking, due to the reliance of imported equipment and technology.
- **Asset seizures:** foreign-owned utility assets were seized by Russia, in retaliation for asset freezes by European countries (e.g. Germany’s Uniper SE and Finland’s Fortum Oyj³)
- **Investment flows:** after plummeting by 70% in 2020 due to the COVID-19 pandemic, Foreign Direct Investment (FDI) flows to Russia had rebounded by 267% in 2021, reaching

² https://ec.europa.eu/eurostat/databrowser/view/NRG_TI_OILM_custom_6551104/bookmark/line?lang=en&bookmarkId=5c2a870b-6a76-40d8-836a-d8037b6001c2

³ <https://news.yahoo.com/russia-seizes-fortum-uniper-plants-050049445.html>



US\$38.2 billion⁴. Unsurprisingly, an unprecedented range of sanctions has triggered a flight of foreign capital from Russia; according to OECD data, in the first half of 2022 negative FDI flows to Russia reached US\$24.3 billion.

The impact on energy availability and cost has been widely felt. While cost of living crisis protests have been more intense in relatively wealthier countries, developing countries have been particularly vulnerable to the higher costs of energy, given their weaker trade balance.

Higher energy costs have challenged energy companies' social licence to operate. The comments of a European utility company executive reflect this in the 2023 WTW Political risk survey: "Our end customers being citizens means that we operate in a political environment. This means pricing is very sensitive."⁵ With high inflation, the degree of risk from this issue, and the level of government intervention in consumer electricity bills, has become really striking. The consequences for energy companies can range from grassroots movements such as Don't Pay UK encouraging non-payment of energy bills, to more violent protests, such as the 2019 protests in Santiago, Chile, where the offices of an energy company were set on fire⁶.

Has the conflict hindered or accelerated the energy transition?

What does this latest geopolitical crisis mean for the energy trilemma? According to DNV's *Trilemma and Transition*⁷ report, based on a survey of over 1,300 senior energy professionals and in-depth interviews, energy security currently trumps sustainability and affordability. The most interesting insight is that this hides large differences between sectors. Energy security dominates for oil and gas and electrical power, while renewables respondents make clean energy the top priority, and industrial energy consumers prioritize affordability.

Amid the energy crisis following Russia's invasion of Ukraine, Germany revived its use of coal for electricity generation, increasing its coal imports by 8% (including from Russia). It also fast-tracked the construction of a Liquid Natural Gas terminal on the North Sea, in a bid to reduce its dependence on pipelines from Russia.

Does this mean the conflict has hindered the energy transition? The IEA chief is optimistic that in fact the Russia-Ukraine conflict may have accelerated it⁸. Diversification away from fossil fuels is now driven not only by sustainability objectives but also by security objectives.

In 2010, the EU reached a milestone in the energy transition, with more than 50% of its energy coming from renewables (hydro, wind, solar, bioenergy and other renewables) and nuclear⁹. However, investment has been declining, and is dwarfed by the investment in China¹⁰, where innovation has flown. The European approach to "regulate first, innovate later" has resulted in lost ground, and the latest geopolitical crisis may help to boost investment.

However, is there a risk of jumping out of the frying pan into the fire? Are we transitioning from an overreliance on oil and gas, and on Russia, to a greater reliance on renewables and on China?

Looking ahead: Out of the frying pan into the fire?

Looking ahead, strategic choices for power companies will be framed and constrained by the following geopolitical considerations:

- natural resources essential for energy production
- friend/reshoring operations and supply chains
- the growing rift between rich and poor countries (as seen in COP27)

⁴ https://unctad.org/system/files/official-document/wir2022_en.pdf

⁵ <https://www.wtwco.com/en-gb/insights/2023/04/2023-political-risk-survey-report>

⁶ <https://www.ft.com/content/d05a54ac-f24b-11e9-a79c-bc9acae3b654>

⁷ <https://www.dnv.com/power-renewables/energy-industry-insights/trilemma-transition.html>

⁸ <https://edition.cnn.com/2022/10/27/energy/iea-global-outlook-report-2022-climate/index.html#:~:text=In%20its%20annual%20World%20Energy%20Outlook%20report%2C%20published,the%20decade%20%E2%80%94%20up%2050%25%20from%20today%E2%80%99s%20spending>

⁹ <https://ember-climate.org/data/data-tools/data-explorer/>

¹⁰ <https://www.visualcapitalist.com/ranked-the-top-10-countries-by-energy-transition-investment/>



In a multi-energy world, the resulting geopolitics are expected to be different. And in the meantime, the geopolitics of the transition phase could also be complicated.

Let's look at the optimistic view first

The reliance of a fossil-fuelled world on a relatively small number of producers, on pipelines and trade flows, may be giving way to a more decentralised energy system powered by renewables. The shift of focus from external to internal energy supply could support more energy self-sufficiency and less conflict, as it is more difficult to control a decentralized power network, cut the supply or manipulate the price of renewable energy than fossil fuels; this could lead to geopolitical power to be more evenly distributed than before. In a system dominated by renewables, distribution and infrastructure management are more important and technical and regulatory aspects gain weight.

There are also glimmers of hope such as the Just Energy Transition Partnerships (JETPs), which aim to bridge the gap between developed and developing nations in moving towards clean energy, while addressing the social consequences of that transition. South Africa, Indonesia, India, Vietnam, and Senegal will be the first test cases.

Against this hopeful outlook, the arguments in favour of persisting geopolitical tensions stack up:

- The abundance and decentralized nature of renewable energies is tempered by the reliance on raw materials (such as rare earth elements) that are critical for renewable energy generation, distribution, or storage, which are still controlled by a few countries, which makes supply chains vulnerable to trade bans. Indonesia has 22% of the world's nickel reserves, and its ban on nickel ore exports since 2020 has disrupted the supply chains of products such as electric vehicles and rocket engines.

- The mining of critical materials in so far unexplored areas is another reservoir of tensions. The July 2023 meeting in Jamaica of the International Seabed Authority (ISA), an intergovernmental body of 168 member states tasked with regulating deep-sea mining, shows that further geopolitical tensions could arise from interest in the deep ocean seabed. Initial estimates hint that seabed reserves could dwarf those on land: in parts of the Pacific and Indian oceans, manganese nodules can be found, exceptionally rich in 37 metals. Yet deep sea mining is bound to raise environmental concerns in areas of rich and unexplored biodiversity, and the US did not join the Convention on the Law of the Sea because of the controversial provision that some of the profits from commercial mining should be shared with the international community.
- Technology critical to the energy transition is also concentrated in fewer hands. China is the leading global supplier of clean energy technologies today and a net exporter for many of them. It holds at least 60% of the world's manufacturing capacity for most mass-manufactured technologies (e.g. solar PV, wind systems and batteries), and 40% of electrolyser manufacturing.
- The nuclear market renaissance presents its own challenges, with the uranium production predominantly in authoritarian states and zones of influence. Meanwhile, China leads the world in building nuclear power plants (24 units are currently under construction). China is also supporting nuclear capacity in partner countries in its Belt and Road Initiative, for example helping Argentina build the Atucha III, a 1200-megawatt reactor, the country's fourth nuclear power plant.
- Interdependencies between states resulting from electricity interconnectors will remain, even though the International Renewable Energy Agency notes that electricity cut-offs and the use of hegemonic power to cut off transport bottlenecks will be greatly reduced due to increased rerouting possibilities, decentralized power generation and the absence of global electricity connections.

Overall, there is much uncertainty on the future energy geopolitics, both during the transition phase and in its new equilibrium; but it seems naïve to think that there will be fewer tensions.

Whether research can meaningfully reduce our over-reliance on some of those critical materials remains to be seen, but this is an area to watch carefully, as illustrated by these two examples:

- Researchers at Cambridge University¹¹ recently discovered a new method to manufacture high-performance magnets used in wind turbines and electric cars without the need for rare earth elements, almost exclusively sourced from China.
- Geoscientists¹² are looking at whether dormant volcanos can help: magmatic brines, found worldwide beneath dormant volcanoes may provide a more sustainable solution to the global shortage of key metals.

The permacrisis: tips for risk managers

Risk managers may have to get used to a state of permacrisis (the Collins Dictionary's word of the year for 2022), in recognition that most of the crises they face are situations that can only be managed, not resolved. This doesn't mean that they are helpless, but they need to overcome two seemingly unsurmountable challenges:

Myth #1 — you can't manage what you can't measure

With the explosion of open-source data on geopolitical risks, the pace of change and the wide availability of data providers, there is a danger of not being able to distinguish useful signals from the noise. No one has a crystal ball, but the following activities are a good investment:

- **Horizon scanning:** like all man-made risks, geopolitical risk is notoriously difficult to quantify and predict, but regular, structured monitoring of countries relevant to individual company activity can provide essential warning before the situation deteriorates. The twice yearly WTW political risk index¹³ can be a useful guide to decrypt our VUCA world by providing a "risk temperature" for 61 higher risk countries.
- **Scenarios:** considering different versions of the future, and exploring the implications for individual power companies, is a great way to increase the resilience and preparedness of the company's business. There are many energy-specific scenarios around, ready to use; the 2023 Shell scenarios¹⁴ contrast a world driven by a security mindset (Archipelagos) with a world

where climate security takes precedence (Sky 2050). The slightly older scenarios developed by Lloyd's and Cambridge University¹⁵ look at three possible futures: green globalisation, climate anarchy, and green cold war.

Myth #2 — you can't insure against geopolitical risks

Indeed, companies cannot insure against all risks driven by geopolitical tensions, and the corresponding protection gap is difficult to quantify. Yet there is a lot that can be insured, with a wide range of insurance products available, from crisis management, terrorism and sabotage to political violence and war, forced abandonment, confiscation, and currency inconvertibility. And looking at the impact of geopolitical risk too narrowly would miss out other potential risk transfer options, such as reputational risk insurance.

This is a clear case of insurance being only one of the risk mitigation strategies deployed — for example, investment in preparedness¹⁶ through supply chain management, together with a review of business continuity plans and communication strategies will increase the resilience in the face of most crises, geopolitically-driven or not.

The ever-present ESG concerns are often interpreted through the prism of response to climate change, but the successive geopolitical crises have shown the importance of the concurrent pressures from regulator, governments, consumers, finance and media on the S and the G.

Traditionally, geopolitics have been driven by the "great powers" — a set of sovereign states recognized as having the ability and expertise to exert their influence on a global scale. Given its strategic importance in the energy transition, the power sector may also be joining the fray. Whether it turns out to be a pawn or an active player, the advice given to Spiderman ("with great power comes great responsibility") feels very appropriate to our times.



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¹¹ <https://www.cam.ac.uk/research/news/new-approach-to-cosmic-magnet-manufacturing-could-reduce-reliance-on-rare-earths-in-low-carbon>

¹² <https://geoscientist.online/sections/features/mining-the-brine/>

¹³ <https://www.wtwco.com/en-gb/insights/2023/07/political-risk-index-summer-23>

¹⁴ <https://www.shell.com/energy-and-innovation/the-energy-future/scenarios/the-energy-security-scenarios>

¹⁵ <https://www.lloyds.com/news-and-insights/risk-reports/library/shifting-powers-climate-cooperation-chaos-or-competition>

¹⁶ <https://www.wtwco.com/en-gb/insights/2022/09/how-can-i-prepare-my-business-in-light-of-civil-unrest-risk>



Optimising risk: Strategies for a looming recession

Introduction: the era of great volatility

Power companies have been on a rollercoaster the last few years, from demand dipping during the pandemic to record profits reported in 2022. And this volatility looks set to continue, with the very real possibility of a recession during the course of the year which will likely be compounded by the need to navigate tense domestic environments due to the ongoing high inflation. Treasurers and Finance Directors will be unlikely to rest on their laurels and will be keen to ensure that their powder is dry to deal with the economic, geopolitical and climate risks that are on the horizon. Efficiency will be key once more, as budgets are cut or maintained across the organisation. When this happens with risk budgets, the result usually has been a trade-off with risk.

But what if savings could be achieved without increasing the risk?

What's the challenge?

CFOs and Treasurers are happy enough to limit the spend on premiums as a recession looms, but in the event of a loss the focus is always on the cover provided and seldom on the premium paid. In addition, communicating this to a senior audience that is unfamiliar with insurance at renewal time (especially when there hasn't been a large loss) can also pose problems. How do you clearly show this trade-off between cost and risk without becoming embroiled in the detail of individual covers across different businesses and individual countries?

What is needed is an approach that allows insurance managers to fully understand what the key drivers of risk are, how they may be mitigated, and how different strategies balance the need for protection against losses at an affordable cost. Yet at the same time, all this detail needs to be summarised in an easily recognised

format and should connect adequately to the broader environment in which the organisation operates, thereby providing sufficient context and clarity for key stakeholders.

How it works in practice: power company case study

The new insurance manager of a large power company with interests in generation and distribution was concerned about the appropriateness of their insurance programme following years of maintaining the status quo with respect to deductibles and limits. The concern was exacerbated by the recent hard market and high inflation which would almost certainly have changed their risk exposure. Added to the mix was the prospect of a recession with its own diverse effects on the business, which meant that any review of the programme not only needed to allow for the changes to date but also what was likely to happen in the future.

In discussions with them, it became clear that there were three key questions that needed to be addressed:

1. What are the key loss drivers?
2. What is the likely quantum of insurable risk arising from these businesses and how volatile is this risk?
3. How effective is the current insurance programme as well as any alternative programme under different economic circumstances?

Quantifying risk

By combining their company's own data with industry data, detailed and up-to-date knowledge of the available risk transfer markets and modern analytics, we quickly developed a better understanding of the company's risk exposures and their variability under different economic scenarios.

Figure 1: Loss forecasts by line of business (for illustrative purposes)

Forecast Losses in next Policy Year				
Type of Year	PDBI \$m	Public Liability \$m	Employer's Liability \$m	D&O \$m
Good	6	9	0	0
Average	62	22	1	1
Bad	872	250	33	19
Catastrophic	3,100	1,410	260	182

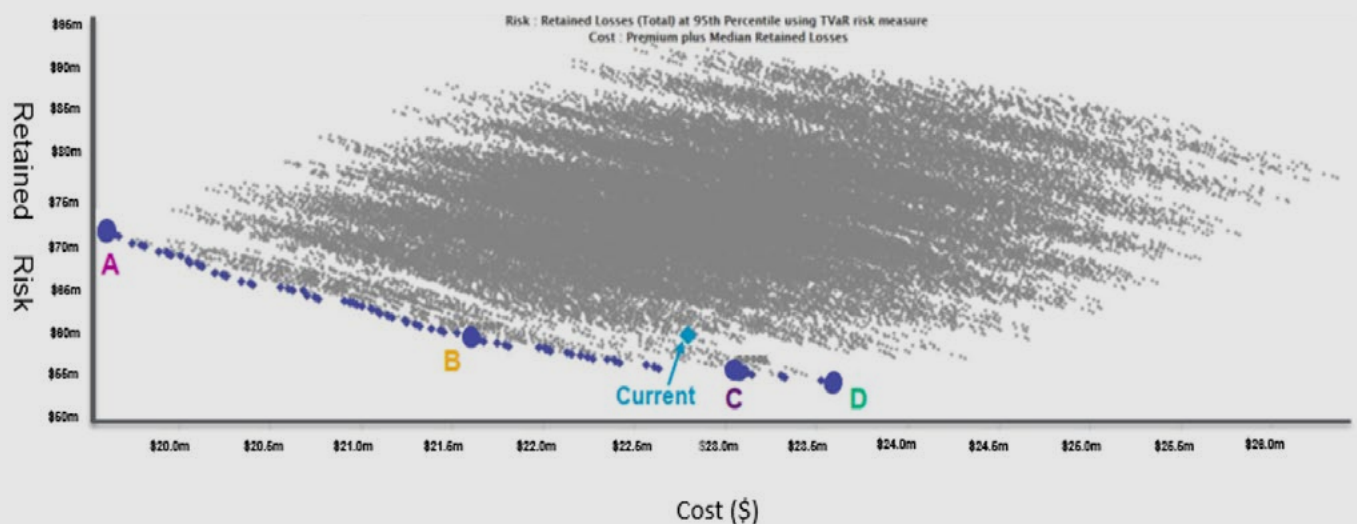
Source: WTW

Figure 1 above shows both the quantum of the company's risks as well as their volatility under an "as is" economic scenario. This helped to ensure the company was buying the optimal insurance cover in relation to the risk exposure within each line.

The same results can also be generated under different forecast economic scenarios where inflation or growth differs from the base scenario.

The final question was addressed with our Connected Risk Intelligence approach, which shows the impact of different insurance strategies on the company's cost budget and risk appetite. By considering all the risks in a single portfolio view, we were able to show how effective the current insurance program was, as well as compare the merits of alternative structures. Figure 2 below shows the range of different insurance strategies (each dot represents a different strategy) that are possible for this company. A different "cloud" of such dots is generated for each economic scenario that the company wants to consider; for example, they could look at the results under a scenario where revenues are down 5% during a recession.

Figure 2: Range of possible efficient insurance structures, with associated retained risks and costs



- The horizontal axis shows the **expected annual cost** of the insurance strategy, which is made up of the premium spend and the cost of the retained losses.
- The vertical axis shows the **amount of retained risk in a 'bad year'**, which here was defined as a 1-in-20-year event.

Source: WTW



The objective was to reduce the amount of retained risk and at the same time reduce the expected annual cost and move to a more efficient programme, closer to the edge of the “cloud” in the above diagram.

The purple dots show the suitable efficient insurance structures — those structures that have the lowest cost for a given level of retained risk. The first conclusion we could draw was that the current structure was inefficient and that there was money left on the table that could be put to better use. Multiple alternative strategies were identified, which were then filtered subsequently depending on criteria such as the company’s acceptable levels of risk tolerance as well as cost of the strategies relative to the risk budget. Option C was selected out of the four efficient strategies that were considered as meeting all the criteria, together with ease of implementation as the approach also provided the step-by-step pathway to implementing the chosen strategy.

The Insurance Manager found this process extremely helpful as it enabled the company to:

- Better understand their risks and their associated volatility — not just at present but also under different future scenarios
- Explain the benefits of insurance easily and clearly to senior management
- Highlight the key differences in risk and cost between the various insurance programmes

The approach was also highly valued by the Treasurer and CFO since they were familiar with risk transfer and risk hedging, but less familiar with insurance — our results provided them with a clear audit trail of objective decision making.



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Climate change induced drought and water supply risk: An overlooked vulnerability

For 2022, almost 80% of electricity in the US was generated at thermoelectric power plants (fossil fuel, biomass, geothermal, concentrating solar, or nuclear)¹. These power plants heat water into steam to turn a turbine generator. Large volumes of water are required for heat removal by condensing the steam back to water in a condenser after it has passed through the steam turbine, which is then heated back into steam again in a continuous closed loop; while the water in the steam cycle is self-contained, the water in the cooling cycle is not.

The impact of fuel shortages at these power plants is understood; however, the risk from insufficient water at these plants (other than hydroelectric where too little or too much water presents risks) is often overlooked. Insufficient water puts electric generation at risk — which makes water just as important as fuel!

Electric power generation accounts for about 40% of the total water withdrawals in the United States, most of which is used for plant cooling needs². While this article focuses on water use for thermoelectric power generation, it should be recognized that water is also critical for fire-fighting and domestic needs, which are not always available from a public supply at these plants. Additionally, coal-fired power plants require water for environmental compliance to operate exhaust gas scrubbers. And while power plants can recycle water

for reuse, and have done much to conserve supply, any prolonged drought may cause plants to compete with the drinking water needs of the population — which at some point may put power generation at risk.

What do the headlines say about the risk of drought for power plants? Three examples demonstrate the extent of the problem:

- S&P Global Market Intelligence: “Climate change poses big water risks for nuclear, fossil-fueled plants”³
- UN Environment Program: “As the climate dries, the American west faces power and water shortages, experts warn”⁴
- NPR: “Drought threatens coal plant operations — and electricity — across the West”⁵

How is water “lost” in power plants

There are several types of cooling water configurations used for these generating plants. For plants with a once-through cooling configuration, the water source is drawn from rivers, reservoirs, lakes, or bays, circulated through the condenser, and returned to the source; these sources are often thought of as endless. However, while once common, newer power plants don’t use this configuration due to concerns about water use having negative effects on the ecosystems of lakes, rivers, and bays.

¹ <https://www.eia.gov/tools/faqs/faq.php?id=427&t=3>

² <https://www.vox.com/23292669/drought-2022-power-energy-grid-lake-mead-climate-heat-hoover-dam>

³ <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/climate-change-poses-big-water-risks-for-nuclear-fossil-fueled-plants-60669992>

⁴ <https://www.unep.org/news-and-stories/story/climate-dries-american-west-faces-power-and-water-shortages-experts-warn>

⁵ <https://www.npr.org/2022/08/26/1118719636/drought-threatens-coal-plant-operations-and-electricity-across-the-west>



About 40% of thermal generating plants in the United States use recirculating cooling systems⁶. For power plants with a recirculating or wet cooling tower system configuration, water for cooling the steam is sourced from the basin of a cooling tower, circulated from the basin through the condenser, and returned to the upper part of the cooling tower open to the atmosphere, falling back to the basin cooled by the air. The water returned to the basin is then reused, but not all the water is returned. The familiar white plume of evaporated water often seen emanating from cooling towers is lost to the atmosphere and must be replaced. This requires tremendous amounts of cooling water to replace what was lost by evaporation. Estimates vary depending on plant type, but a common water loss via evaporation rate is estimated at just under 800 gallons per MWh, which would equal 400,000 gallons per hour for a 500 MW plant.⁷

Newer plants, where water conservation is important — especially combined cycle power plants — often use a closed direct dry cooling tower, which uses air to cool and condense steam so no water is consumed. Water use or drought are not much of a risk to these plants, but efficiencies in hot weather is often lower than with a wet recirculating tower.

According to a Wyoming State Engineer, the federal government has advised that the Jim Bridger coal plant in Wyoming consumes more water than any other coal plant in the West and is at risk of having to shut down if conservation efforts fail to improve its water source piped from the Green River tributary of the rapidly shrinking Colorado River.⁸

While there are exceptions, plants with wet cooling tower systems rely on those previously mentioned water sources, plant owned wells, or occasionally public water to make up the water lost by evaporation in the cooling tower. As climate change and the effects of global warming worsen, those water sources will be stressed, especially by drought. And as drought conditions worsen, plants face the risk of having to operate at reduced loads, or in an extreme case they may have no alternative other than shutting down production. No water threatens electrical generation; power plants in areas affected by drought must therefore begin taking steps to address a potential lack of make-up water. Reduced generating rates and water conservation, might provide some relief; however, water rights and multiple regulatory authorities are likely to have a say as well.

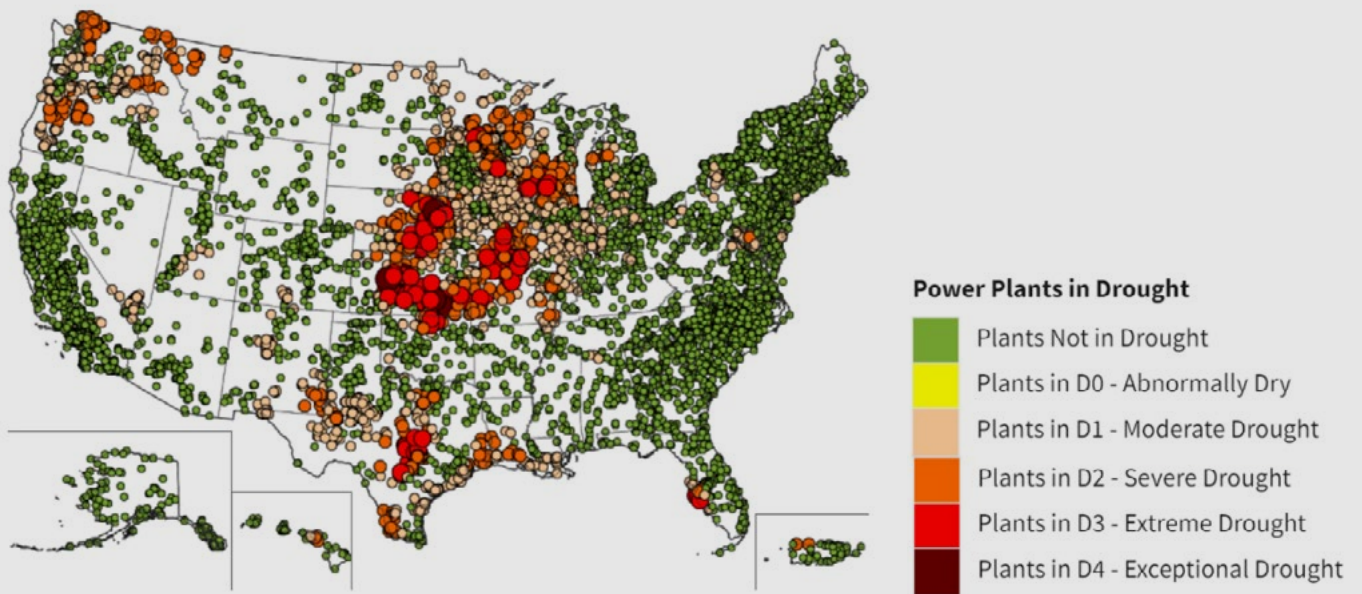
Be warned: this issue is not unique to thermoelectric power plants, as other industries such as refineries, chemical plants, pulp and paper, and steel also rely on large amounts of cooling water to operate and should conduct a drought risk analysis as well as developing a drought response plan when warranted.

⁶ <https://www.eia.gov/todayinenergy/detail.php?id=36773#:~:text=More%20than%2061%25%20of%20the%20thermoelectric%20generating%20capacity,account%20for%2036%25%20of%20U.S.%20thermoelectric%20generating%20capacity.>

⁷ <https://www.powermag.com/how-thermal-power-plants-can-save-80-of-their-water/>

⁸ <https://www.npr.org/2022/08/26/1118719636/drought-threatens-coal-plant-operations-and-electricity-across-the-west>

Figure 1: The big picture: US power plants in drought, 2023



Source: <https://www.drought.gov/sectors/energy>

Conclusion: How to mitigate plant vulnerability to water supply risks and use restrictions

Climate change is occurring faster than civilization can reverse it. When and to what degree drought might affect any given plant is not an exact science, so it is best to begin preparing now to build resilience:

- Conduct a drought vulnerability analysis for the plant to reveal risks to mitigate
- Improve water conservation efforts
- For cooling towers, conduct a thermal performance analysis to ensure the tower is operating properly:
 - Conduct a thorough inspection to ensure the tower fill is performing correctly by minimizing water loss via the tower drift and repair any system leaks in internal tower piping
- While seemingly expensive and hard to justify, for plants with high risk which are expecting to operate for many years, a capital project to convert to a hybrid cooling system should be considered, where a dry closed cooling tower (see Sidebar #1) is added to the existing wet recirculating system with lower water use.
 - (Note: dry closed cooling systems have lower efficiency during hotter weather and higher parasitic loads for the fans in the dry unit.)

- To prepare for restrictions on water use, ensure that equipment can safely operate at reduced loads that meet the water use restrictions while maintaining environmental compliance and contracted supply terms.

While this article focused on how drought risk can affect thermoelectric power generation, as mentioned earlier fuel is just as important for these plants, and water can be a critical risk for fuel transport to plants relying on water transit options. In the fall of 2022, the Mississippi River was reported to be so low that barges were grounded⁹. For plants that rely on marine transport, such as coal and biomass, declining river levels prevent barges and ships from reaching plants. For plants that don't have rail or truck delivery.



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⁹ <https://www.businessinsider.com/photos-dry-mississippi-river-waters-ground-barges-reveal-old-shipwreck-2022-10>



The life extension process: Considerations for power companies

Introduction

The business environment continues to be challenging for power plant operators, whether it be navigating the unlocking of economies in the aftermath of the pandemic, managing feedstock price fluctuations, the recent geopolitical shifts impacting supply chains caused by the ongoing conflict in Ukraine or the pressures the industry is under to evolve into a low-carbon economy.

In particular:

- **On the demand side**, there is an ever-increasing need for electrical power, together with an increased focus by national governments on energy security. This has increased their demand for the availability of generating assets that can provide a reliable power supply, which has made this demand more acute.
- **On the supply side**, existing assets continue to age and operators are increasingly looking more favourably at extension projects to meet this demand gap. There have even been instances where national governments have requested operators to have specific assets continue operating beyond their planned decommissioning dates.

Taken together, these two factors have made future investments in conventional power generating assets extremely uncertain in the near term, CCGT plant construction somewhat mitigates the problem but there has been a general slowdown on new conventional power plants being constructed. In turn, this is putting pressure on operators to extend the life of ageing assets. This increased interest in extending operating assets beyond the original operating life presents several risks that need to be carefully assessed and controlled.

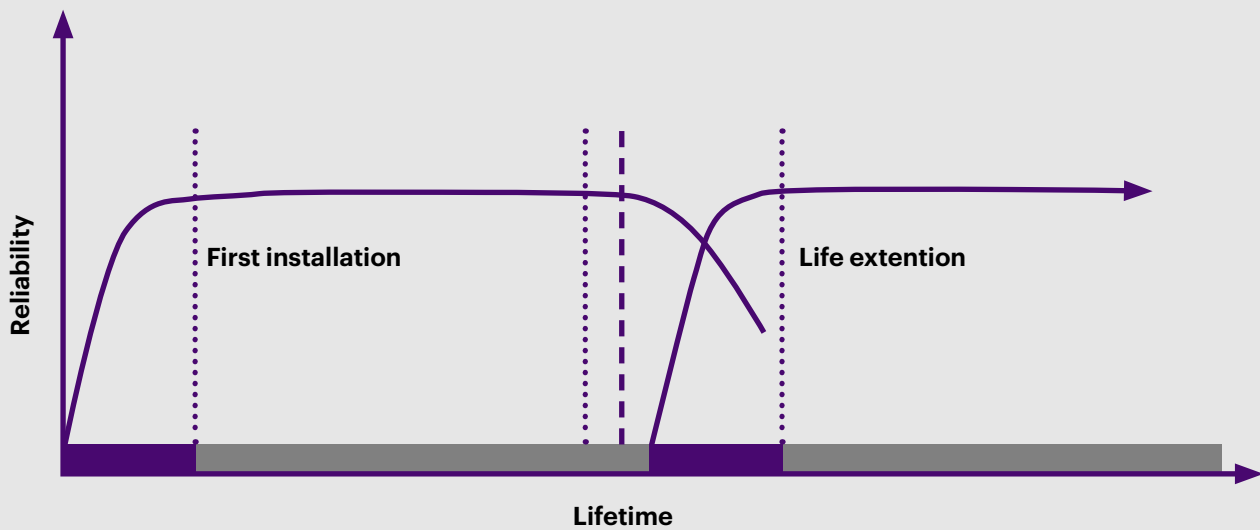
This is why robust life extension processes — and independent analyses of these processes by qualified engineers — need to be undertaken by power companies to ensure that the assets that continue to operate do so in a safe manner and are considered to be “fit for service”. Failing to do so could, and probably will, result in losses that no one wants to experience, either as an operator or insurer. It’s little wonder that insurers are paying closer attention to this issue and will no doubt penalise insurance programmes where assets over a certain age have not undergone this process.

The standard life extension process

The ultimate objective of life extension processes is to determine the duration that assets can operate safely and profitably beyond their specified design lives, and the investment required to secure this outcome. The investment budgets supporting life extension programmes comprise capital funds (Capex) to replace or upgrade equipment, together with estimated future operating expense (Opex), necessary to cover maintenance expenditure and spare parts requirements for the extension period.

The output from this analysis will be a series of different combinations of operating durations versus investment budgets, with operators needing to select the combination range that suits their desired operating period and investment appetite. Typically, operators will seek to maximise the extension period while minimising (or optimising) their total investment, which will bear in mind whether the equipment can continue to operate safely, with accepted levels of reliability and within good industry practice.

Figure 1: Graph showing typical reliability of generator controls vs age, and the 'reset' due to upgrade



Sources: WTW

What does a good life extension process look like?

In particular, companies need to establish whether this objective can be achieved:

- without any component changes and no (or minor) increases in future maintenance/spare parts budgets
- with like-for-like replacements of some components
- with upgraded components, or whole equipment modules that do not change facilities' generating capacities – these upgrades may either improve reliability, future maintenance costs or required investment – or all three
- with upgrades required to address equipment and/or spare parts obsolescence – technology suppliers' support through this period is also important
- with upgraded components or whole equipment modules that upgrade facilities' generating capacities

Using a life extension processes to upgrade facility generating capacity may look appealing, but caution needs to be exercised in order to avoid re-verification of regulatory operating licences which could well introduce significant additional overheads to complete, in terms of costs and time.

Tracking asset ageing

For life extension projects to be successful and economically viable, operators first need to track asset ageing in a comprehensive and consistent manner. This requires the monitoring and collation of many operating parameters and the results of specific equipment inspections that can be used as inputs into various mathematical models that are used to establish plant ageing.

While not an exhaustive list, several key operational factors to be monitored include:

- Maintenance costs and whether or not they are increasing or decreasing over time
- Equipment reliability data obtained from maintenance and overhaul programmes – for example, wear, fatigue and performance degradation
- Programmed overhauls or component replacements which also introduce new equipment
- Availability/equivalent availability factors
- Forced outage/equivalent forced outage rates
- Equipment obsolesce and spare parts availability
- Past upgrades in assets which can increase performance/reliability but also introduces new equipment

Targeted equipment inspections will also provide crucial inputs in determining the extent of degradation, in terms of wear and stress, experienced by equipment components from past operations.

Non-standard life extension processes

Mothballed assets

Another area where life extension projects are being considered are mothballed assets, which may have been taken out of service for a variety of reasons. Here the analysis needs to be more detailed, given the condition of equipment may well be conditional on the mothballing methods employed — meaning that some methods are more effective at preserving asset condition than others. Detailed inspections are therefore normally required to evaluate the mothballing impact, in addition to the operational data outlined above.

Given this additional factor, life extensions on mothballed assets are considered potentially riskier than extension of operating assets. In the rest of this article, considerations will be given to the challenges of and life extensions for electrical generators and associated equipment.

Electrical generator life extensions

The main issues arising from generator stator ageing are:

- Main stator bar insulation degradation, leading to decreased insulation resistance
- Stator end-winding looseness, causing fretting and wear of the main stator bar insulation
- Stator wedge looseness, causing stator bar insulation wear
- Stator cooling water manifold and brazed joints issues, causing hydrogen leaks and insulation problems
- Stator core issues, causing core laminations shorting and overheating

Generally, generator stator bars last anything between 20-30 years, depending on the operating regime, operating excursions, insulation type, maintenance regime (cleaning, testing, wedge tightness etc.), oil ingress, cooling water temperatures, load cycling, specific OEM design pertinent issues and so on. Utilizing new insulation materials, stator life could be extended by another 20+ years, providing the stator core is healthy and in good condition.

Stator life extension projects

Simple life extension of stators often result in like for like rewinds. However, usually stator slot portion analysis is also undertaken to decide whether utilizing modern insulation materials could fit into the cross section, usually involving more copper. This potentially provides generator uprating as a bonus in life extension projects which is only possible if rotors can be uprated, shafts/couplings can take the additional load and boiler-turbine life extension studies establish that upgrades are possible to output additional generating power. Plus, capacity expansion on dispatching equipment.

Generator rotor ageing issues

The main issues arising from generator rotor ageing are:

- Rotor interturn insulation degradation and/or copper shrinking, causing inter-turn shorts
- Rotor end-winding deformation, causing end-winding blocking arrangement migration and inter-turn shorts
- Old type of retaining rings material (i.e. 18% manganese/5% chrome)
- Rotor J-lead (connection lead) brazed joint fatigue
- Slip rings wear
- Rotating rectifier parts obsolesce

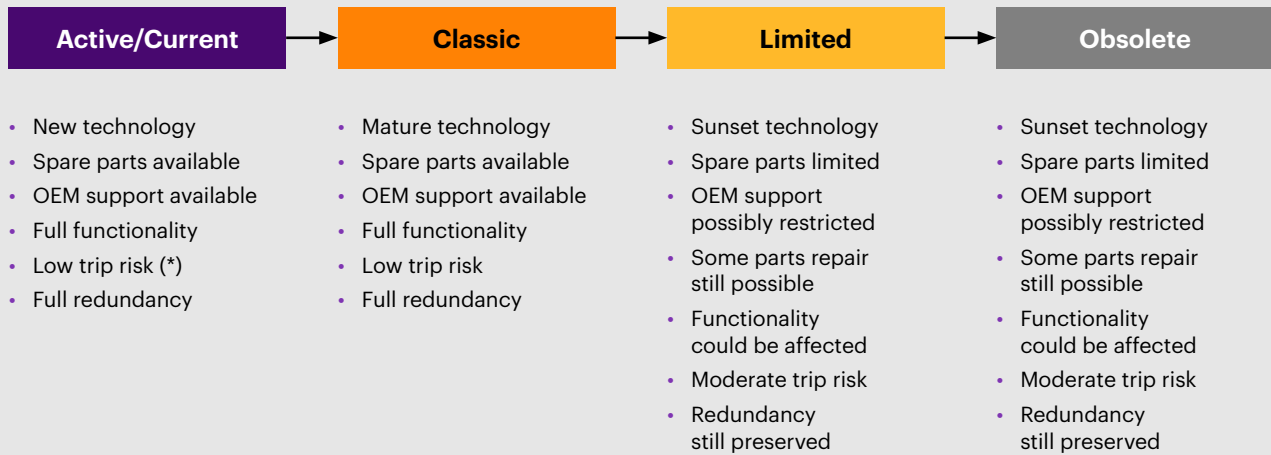
Rotor insulation systems usually last 15-25 years, which will depend on similar conditions outlined for the stator. Life extension projects comprise of a stator life extension study and a rotor life extension study. A testing regime on the generator stator testing with high voltage AC will provide information on the condition of the insulation condition:

- The capacitance, and loss angle of the insulation
- the partial discharge activity on each phase
- the impedance of the winding

A physical inspection of the winding convolute, stator bar supports stator wedges performed to check for loose fitting, dust trails indicating abrasion of insulation, and corona discharge. The stator laminations would be checked with eddy current testing and thermal imaging when magnetised with a test source. From these assessments, it can be estimated how much life the generator has potentially left.

The process of life extension of generators usually considers both the technical assessment, the total cost and duration of the upgrades. A typical stator rewind project is three months (70-90 days breaker to breaker, assuming that the coils have been previously manufactured and are on site). A rotor rewind project is also in a similar time duration. This scenario is assuming that all the rewind materials, tools and accessories are ready at site.

Figure 1: Graph showing typical reliability of generator controls vs age, and the 'reset' due to upgrade



* risk of non-process-related trips due to equipment aging / outdated technology that may require regular calibration because of drifting parameters, which can cause nuisance tripping or even worse prevent proper tripping.

Sources: WTW

Both a stator and rotor life extension project and/or uprating come with substantial cost, typically in a region of 60-70% cost of replacement new equipment. A detailed study of costs is therefore also required from the onset, to decide whether life extension is a better option than the plant replacement.

In the case of old generators, plant replacement would also completely mitigate some of the issues that cannot be alleviated with plant life extension projects. However, a wider design check would also need to consider the new generator design, weight and dynamic forces, the concrete plinth new dynamic load study, the new rotor grid interaction, the inertia of the machine, etc. This would necessitate the approval of the off-taker, together with the Grid Operator whose connection agreements and requirements for generation will have to be met. These regulations will have changed over the life of the generator and will probably be more demanding than at the initial install.

Generator replacement can also reduce the total outage time, presenting a significant saving as the unit could go to grid earlier — for example 30-40 days to completely replace the generator, compared to typically 70-90 days for rewind (i.e. best case: if all the equipment present prior to start and there are well established procedures available).

Excitation life extension system considerations

As part of the plant life extension, the excitation system and Automatic Voltage Regulator (AVR) have to be considered. The electronic control components in the system are ageing and the manufacturers support for a product is limited, resulting in obsolescence.

Electrical components in the excitation system, for example thyristors, capacitors, resistors and electronic components, have limited life and are prone to ageing and performance degradation with possible failure. The OEMs typically discontinue the manufacture of a component after it has been manufactured, for example from 10 to 15 years. The OEMs may not have a direct replacement part, in which case a complete system will need to be replaced and a detailed study produced by the equipment OEM. These studies will have to demonstrate compliance with the country's grid code and will result in proving tests of the new system. The Generator Circuit Breaker (GCB) condition and rating also needs to be checked and considered.

Ultimately, the excitation transformer must also be the part of the life extension study. Typically, excitation transformers — especially if the dry type — have a longer life expectancy if tested regularly and maintained well, and usually have some reserve.

Automatic Voltage Regulator (AVR) life extension considerations

Synchronous machines excitation systems are modelled in such way that they regulate their behaviour — they maintain the generator terminal voltage and enhance the power system performance and reliability. Their model must be suitable for the actual excitation of generators in such manner, that it smooths out the large, severe disturbances as well as the small deviations. Excitation control elements include both excitation regulation, stabilizing functions and protection functions (limiters).

In addition, modern excitation controllers include the Power System Stabiliser (PSS) system, which is used to enhance damping of the national power system oscillations using excitation control.

Protection functions (including excitation limiting functions) entail, for example, the over excitation limiter (OEL)¹, as well as the under excitation limiter (UEL)². Whilst modern AVR systems entail a whole array of excitation regulating, stabilizing, and limiting functions, they are usually either not present or are present in a rudimentary shape in older systems, which may have been compliant to older standards. In such scenarios, modern Grid Code requirements (which are different in every country/region) usually drive the need for upgrades and/or compliance.

During the commissioning and Grid Tests of the upgraded AVR system, the Grid may require further tuning of the AVR/PSS parameters to suit the local Grid needs.

Conclusion: the need for an independent process oversight

The conventional power sector is increasingly embracing opportunities to extend the operational life of many facilities to meet the ongoing demand for electrical power. We have seen that this introduces potential risks which operators and the insurance community need to fully understand and have a clear path for their evaluation and possible mitigation.

Life extension analyses clearly fit this requirement, and from the outline above regarding electrical generators, it should be recognised they are comprehensive and highly technical in nature. They incorporate all the key factors that are pertinent to operate equipment safely and reliably, offering valuable insights into the most appropriate extension periods to meet the needs of power plant operators.



However, it is also clear that with the complex analysis, there is potential for key aspects to be either overlooked or not given the appropriate priority in the assessment process. A degree of oversight of these assessment processes by qualified engineers could therefore help to ensure that all aspects have been considered and are effectively communicated to stakeholders.



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¹ Under excitation limiter (UEL), which prevents the generator from exceeding its core-end heating limit and/or its stability limit, when it is operating at a leading power factor, i.e., absorbing MVar.

² Over excitation limiter (OEL), which prevents the generator from exceeding its field current heating limit, when it is operating at a lagging power factor, i.e., supplying MVar.



The cyber insurance market: Power to the customer

Better news for customers

2023 has seen a much-improved position for Cyber insurance customers and this trend is expected to continue at least until the end of the year. This article will look to rationalise why now may be a great time to press forward with transferring Cyber risk (if not already done) and why power is back in the customer's hands...for the remainder of 2023 at least.

During 2022, numerous reports outlined the factors contributing to the difficult conditions experienced by insurance customers (or companies looking to transfer risk), including the steep financial demands and increased frequency of ransomware incidents as well as the political environment in Europe. Although these concerns have been less acute in 2023, the elements are still present; in other words, the "customer" isn't having it all its own way.

As we move towards Q4 of 2023, it should be noted that First Party losses, be this from Ransomware or cyber-related business disruption events, are continuing to cause problems. Recent high profile human errors in the UK have reinvigorated privacy concerns (such as the recent PSNI breach in Northern Ireland¹); however, customers are still benefiting from a strong negotiating position.

Data and AI challenges

The increased availability and reliance on data to improve efficiencies, including the use of Artificial Intelligence (AI) across sectors such as the power industry, brings with it many advantages; however, it also potentially brings additional risk to the user and the insurer. Although the impact of AI in the power industry has not yet been specifically assessed or specifically

accommodated within Cyber policy language, the impact of its use is something that is being discussed in the background.

Ultimately, as with many digital advances the concerns around the use of AI are growing, as its implementation and adoption increase. A lot of the risk that increasing AI use presents comes from:

- the quality of the data it relies upon
- the specific modelling used to form a decision
- who owns (and is responsible for) the data that is being used
- the intellectual property concerns when employees use party (out of network) solutions

Fortunately for cyber insurance customers, the incorporation of AI in their business process is, as yet not usually differentiated from the language used to describe the use of data or computer systems. However, this should certainly be considered when looking at coverage language where AI use is a going concern.

Current geopolitical tensions

It is also worth noting that the current geopolitical tensions are still perceived as fuelling state-sponsored interference and attacks,² be they direct action or as collateral damage to a more targeted attack. As critical infrastructure is widely accepted as being at the forefront of any state's concern regarding energy security and the climate transition, there is still a need for the power industry to be vigilant and to keep pace with improvements around security and defence, as well as to incorporate cyber insurance into their suite of insurance covers.

¹ <https://www.bbc.co.uk/news/uk-northern-ireland-66448442>

² <https://www.microsoft.com/en-us/security/business/microsoft-digital-defense-report-2022-nation-state-attacks>

New risk transfer opportunities in the Cyber market

So, considering the above, why is now still a great time to consider transferring risk?

Starting with the basics — in the run up to 2023 insurers pushed for rating 'adequacy' during the period of hardening conditions. This concept of adequacy was, in general, consistent across the insurance market and concerned both Cyber controls (or maturity) as well as premium rate adequacy; in other words, how exposed a given risk was and whether insurers were receiving enough premium to warrant the capacity provided.

Increases in the information required by insurers helped customers further understand individual risks; any subsequent requirements laid at the customer's door to improve or explain mitigations have helped insurers pull some organisations' control maturity to acceptable levels. This improved the average control levels of insurer risk portfolios, protecting the market and ultimately reducing the potential for premium rate fluctuations based on insurers' current knowledge of Cyber vulnerabilities. This information need was industry-agnostic and impacted businesses from all geographies. No one escaped, but the result was increased market stability, which tends to lead to renewed interest from insurers.

Premium adequacy is now at a level that has encouraged new providers to enter the Cyber space or existing providers to increase their capacity availability. This in turn has led to more competition and flexibility, which has pushed insurers to start to review and look at reducing premium rates for well managed risks.

When the pressures of challenging budgets are added in to the mix, insurers are increasingly aware that they need to fight and demonstrate flexibility to win the best business. This is especially the case where customers may fall a little short in some of the less critical areas (noting that Multi-Factor Authentication (MFA) use, Privilege Access Management (PAM), training and management of backups are still central to discussions, no matter what the industry).

What does this ultimately mean for the customer? Pricing reductions, innovation in coverage and the ability to 'ask for more'. Now is therefore a great time for customers to work with their broker and to partner with forward thinking insurers to transfer risk and support their growth plans.



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Application of Parametric Insurance in the Power market: a review

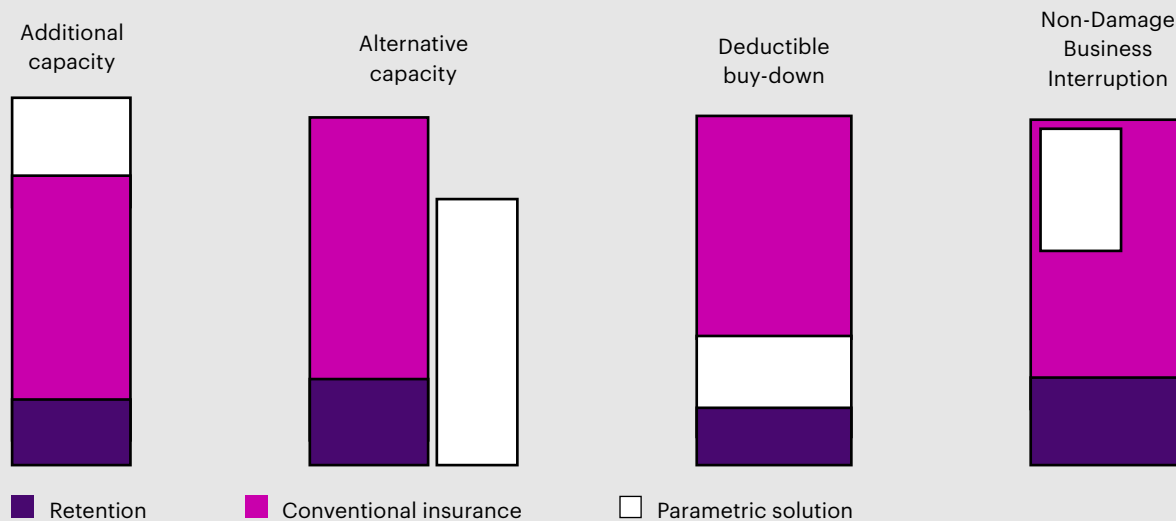
Introduction: a reminder — what are parametric solutions?

Parametric (or index-based) solutions are far from new. Previously, were seldom used, but the concept has been applied as an alternative to insurance for decades. Although not necessarily a derivative, their function is based in the same way that a derivative operates. An index is selected that best represents the risk to be hedged, and if the value of that index moves to a point above (or below) a selected threshold at an agreed point in time, then a payment becomes due according to an agreed pay-out formula. It's as simple as that.

Simplicity is, in fact, probably the greatest benefit of the parametric contract: there is no need for any loss adjustment, and indeed no provision is made for the evaluation of the actual loss in any way. As a result, the speed of contract settlement can be reduced to a practical minimum, usually constrained by the time it takes to report the value of the index, which is almost always tasked to a trusted third-party provider. This may only be a matter of hours in the case of some automated systems or weeks for more manual setups, especially those in which careful verification of potentially anomalous readings are required.

But this very simplicity potentially masks a pitfall: basis risk, which is the risk that the chosen index does not reflect the underlying physical or financial loss very well. Of course, the worst instance of this is when a major loss occurs but little or no payment falls due under the terms of the contract. The reverse is possible and a payment may fall due under the contract, yet little or no loss has actually been incurred. While the latter may seem like a windfall — albeit one for which a premium was properly payable — these mismatches represent an unacceptable lack of precision for the original risk management purpose. Indeed, such insurances in some jurisdictions require an element of proof of loss for these contracts to be recognised as true contracts of insurance. In these cases, 'proof' may often be adequately satisfied by self-certification that 'a' loss has occurred or, perhaps, a loss (financial impact from all sources) that is at least as large as the pay-out. To require a high standard of loss evaluation would undermine the key benefit of a parametric contract.

Figure 1: Examples of parametric solution deployment



Source: WTW

Why use parametric coverage for power risks?

A facetious answer might well be: why not? The idea of a transparent policy and speedy pay-outs is attractive in and of itself. Furthermore, a decision need not be all or nothing, as parametric solutions may be considered not as an alternative to indemnity-based insurance but as a complement, or perhaps as a supplement to the existing conventional insurance programme.

WTW views parametric components as sitting within an existing insurance programme rather than somehow displacing tried-and tested coverages. Such integration may take the form of the examples shown in Figure 1 below.

Indeed, viewing parametric coverage as a means of addressing differing needs from traditional coverage may ultimately offer a broader perspective on risk management than covering the costs of Physical Damage, Business Interruption or Liabilities. In particular, the prospect of rapid liquidity in the immediate period following an event, where funds can be deployed (as is the case with a parametric pay-out) for whatever purpose is most pressing can confer genuine value.

This may especially be the case in the aftermath of a severe natural catastrophe, in which the physical and financial consequences may be quite unpredictable and unexpected. A rapid infusion of cash to respond, mobilise, repair, and assist could literally be a matter of life or death.

When extreme events impact the physical assets of an installation, it may be tempting to consider only the issue of whether sufficient insurance has been taken out to cover the physical and financial consequential losses to the impacted assets. But what about the immediate and subsequent wellbeing of staff and their families? Timely financial support and intervention for members of staff

whose families may have been displaced, or worse, can provide an economic lifeline. Such support is good for individuals and for the company in terms of its resilience and from an ESG perspective.

Insurance where cover may be unavailable

It has been pointed out that parametric insurance solutions may provide effective and flexible enhancements to existing, traditional insurances that are routinely taken out by power and energy businesses — where they can. But what about circumstances in which the existing insurance offerings leave gaps in the risk register?

Parametric solutions may be able to offer protection where none is otherwise available in any conventional form. There's a straightforward reason for this — and it's not that parametric underwriters somehow have special powers that others do not. It comes down to the fact that a parametric policy seeks to convert the intricacies and challenges of an indemnity-style policy into an indexed metric. Underwriting the index is a relatively simpler matter of analytics, whereas underwriting a complex risk — with all its specifics and uncertainties — requires expertise and experience.

An industry example of this might be the circumstance in which traditional natural catastrophe capacity may be all but exhausted, but re-thinking the risk in terms of a parametric structure in the relevant region or catchment may offer a solution.

In catastrophe-exposed areas — say for earthquake or cyclone — it is likely that such events will cause collateral loss, not just to generation assets but also on a wider area basis, including access and associated infrastructure. A well-structured pay-out from a parametric programme may therefore provide a much needed contribution to extra expenses resulting from the event and non-damage business interruption (NDBI).



Similar benefits have been achieved by implementing parametric cyclone cover to protect against the extra expense incurred by the occurrence — or even the threat of the occurrence — of a powerful cyclone. As assets may be located remotely with limited access, the need to take early preventative action to evacuate personnel can become critical and costly. A parametric cyclone contract can cover this obligation in a way that a conventional policy cannot and may help to reduce provisioning costs for the project as a whole.

Protection against low levels natural resource

Insurance solutions against physical loss or damage are well developed for the power industry. Such contracts are highly effective and form the mainstay of traditional insurance protection for the sector. But what about the situation when there is no insurable event — nothing happens — and no power is generated? This eventuality is well illustrated in the renewable sector, where low wind, low solar, and low hydro resource results in low (even no) energy production.

For as much as a parametric may provide valuable coverage in the event of too much of a given element, it is equally applicable in the event of there being too little. The approach and methodology are entirely the same, if turned on its head.

Lack of supply of demand

It is worth harking back to the origins of the parametric market, at least to that early period when the market took off from being a rather small, niche ‘weather derivative’ offering to the more developed place it is today. At that time, at or before the turn of the century, the unsolved challenge was less about a lack of power production but more about demand.

Price hedging was already a sophisticated activity using appropriate financial instruments, but volume was another matter; so the concept of using a temperature index as a proxy for demand found its place. An unusually warm winter, or indeed mild summer, results in a reduction in power and energy consumption; indeed, that relationship can be observed with a high degree of correlation. So, whilst demand per se cannot be hedged, a weather index can be. Temperature data are usually widely and reliably available and these can be associated with demand for key hubs or nodes.

Now the concept of a Heating Degree Day (HDD) or Cooling Degree Day (CDD) Index is widely recognised and can be used by either buyer or seller of power to manage their exposure to low demand.

This cross-over between insurance and derivative methodology was really the starting gun for a new way of thinking which we now refer to as parametrics. Since those early days, the scope of application for such solutions has widened out of all recognition and now include financial exposure to the effects of (in no particular order): precipitation, wind, hail, snow, wildfire, pandemic and footfall, to name but a few.

The ability to deploy parametric solutions has also been greatly facilitated by the expansion and ease the availability of data, which is the currency of any parametric product. In the early days of index-based insurances, there was an almost total reliance on finding a local ground station for rainfall measurement; today, there are alternative sources of data available, including modelled, so-called gridded, data sets, which can provide daily estimates of rainfall at any point on the planet at a resolution of 5km by 5km. This is sufficient precision for use in the power market.

Climate: don't look back!

Parametric solutions are often appropriately associated with solutions for intractable weather and natural catastrophe perils. Climate risks are understood to act over a longer time period and are therefore not per se insurable, whether by parametric or other means. However, the impact of climate change is not an abstract construct of a future which is yet to come; it is with us now and is manifested in the increased frequency and volatility of weather events. Parametric solutions that are available today therefore play an important part in managing these heightened exposures.

For power businesses, as for so many others, the climatology of the past is no longer a reliable indicator of the near future. Now is the time to review — or re-review — how extreme weather events may impact critical assets and operations, as parametric insurance can offer cost-effective and targeted solutions.

Conclusion

Power companies must manage a complex and dynamic set of risks to ensure the long-term sustainability of their operations. This requires a comprehensive risk management strategy that considers the unique risks faced by the company and the industry, as well as the potential impact of these risks on the company's operations and financial performance.

Tried and trusted indemnity-based insurance solutions provide the bedrock of a power risk management strategy; however, there are gaps in coverage and a change in insurance market appetite for some of the more challenging hazards that risk managers face. Here innovative parametric solutions are a valuable additional tool for companies to manage and transfer such risk, offering tailored designs, simplicity of operation and predictability of outcome.

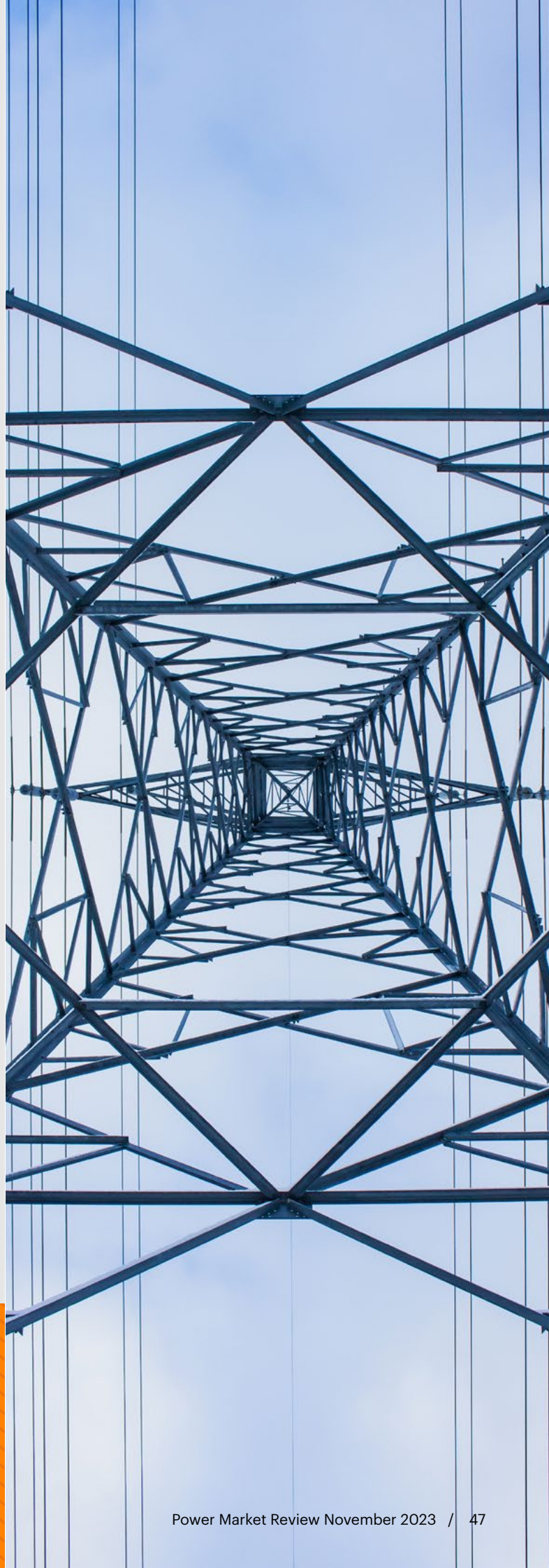


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Part Two: The Power insurance markets in 2023





Still struggling for profitability? A Power underwriter's view of the market

As the loss record for Power risks continues to deteriorate, we asked Rokstone's Ian Green (IG) to speak to us about some of the key drivers that he is seeing in the Power market in the second half of 2023. Ian is Head of Power at Rokstone and is one of the most experienced Power underwriters currently operating in the London market. Asking the questions were Declan Cleary, Broker, Power and Utilities, Natural Resources, WTW London (DC) and Carlos Wilkinson, GB Head of Power & Utilities, Natural Resources, WTW London (CW). The following is an edited transcript of their conversation.

DC: Ian, In general terms, how profitable do you think the Power portfolio now is across the global insurance markets? Have the premium increases imposed over the last few years enabled insurers to attain technical rating adequacy?

IG: Given where we are in the underwriting cycle, a stage which is supposed to be near the top of a market which only recently ended a decade and a half of sliding rate and/or terms, I think profitability has barely been restored. Perhaps it's more apparent in London where smaller more specialist units, particularly Lloyd's syndicates, tend to be assessed more on annual results in a sector that experiences both attrition and severity? I'm not sure other markets see such a wide spread of worldwide risk. Furthermore, local markets write this class into general Property portfolios and do not necessarily have the quantity of risk to be able to spot individual issues or generate sufficient statistics to be able to accurately price and/or term individual risk. It can be a major challenge for technical underwriters writing a portfolio in this class.

DC: So in the London market, can this be seen in the different attitudes between Lloyd's and the company markets?

IG: Smaller company insurers, operating with technical expertise, are exposed to the same issue as Lloyd's syndicates; more focus on annual results and more difficult to spread results across portfolios and time. I would also argue that this is most apparent in the purchase of reinsurance treaty where multi-nationals have significant economies of scale. It is easier in small operations where the whole chain of decision making and authority is shorter and closer "to the sharp end" to see market dynamics and feel results closer to real time.

CW: In terms of those London players who you believe know their books in detail, what do you think their mood is like at the moment?

IG: I would say there is undoubtedly concern at the levels of pricing/terms, particularly because recently the sector has seen a number of additional challenges, some brand new and some returning to prominence. Not necessarily in any order, I would include:

Physical Damage (PD) deductibles: these have not moved with inflation and in many instances a “typical” deductible for a specific item of equipment is largely unchanged in two decades. For example, a “typical” US\$ 1m deductible on an F class turbine was the same \$1m in the early 2000’s. You don’t need me to explain that rates would need to be increased maintain a level return.

Business Interruption (BI) deductibles: these are almost always set as a number of days, so the same dynamic doesn’t apply here. However, there has been huge volatility in certain power markets/grids leading to large increases in sums insured and resulting in a number of disproportionately large claims. The challenge is to keep in tune with the rapid change in dynamics in many different markets using rating models that are not evolved to properly deal with these.

Valuation of assets: this is a constant issue but is certainly a “hot” one at the moment. Perhaps because it has been somewhat neglected in the past few years with more pressing challenges but also because inflation of labour and material has taken off. Insurers are seeing this in many, but not all claims. Most large and or complex equipment is homogeneously priced independent of its operating territory, although this is not always the case with some materials and particularly labour, where there can be very different costs and inflation rates depending on territory

Supply chain issues: this is possibly the biggest short term challenge. All of our insureds are exposed to this to some degree. Many report that delivery times for large items of equipment have doubled. This also extends to repairs, refurbishments, maintenance etc. While in many cases there can be some level of expedition in a loss scenario, this issue increases not only the BI but the PD quantum of a loss. The largest items of equipment tend to have the least opportunity to expedite and, of course have larger BI quantum attached to them. This is a frightening scale of change.

Humans: particularly in territories that are seeing the most rapid transition to less carbon intensive generation and grids, there is a shrinking pool of experienced staff, despite efforts to expedite or create speciality training. Training for a career path to be a senior operator or manager at a large thermal facility has long been an unattractive choice for young and mid-career staff! But with rapid large scale deployment of renewables, particularly wind, there are shortages of qualified technicians and engineers in these areas too.

DC: Do most insurers have a set rule of thumb, such as the BI rate should be a multiplier of the PD rate?

IG: Unlike many general property placements which carry a rate against total sum insured, for many years power underwriters have used BI multipliers to attempt to more accurately price BI coverage, and I think there are some rules of thumb out there. Whether these are entirely accurate is another matter.

DC: Having worked at a number of shops in your career and ones that are quite different in approach you will have seen a number of rating approaches first hand

IG: Yes, without mentioning names I’ve seen some very different approaches to “pricing/rating” models and systems and had the opportunity to see first-hand many different underwriters, including myself, use them in the real world.

I’m experienced enough (just) to have used the Fire Offices’ Committee rating on UK risks, which for many trades (but not power) had a level of data collection and rating sophistication that would surprise many younger underwriters.

As an overview I would say that at first glance rating our class should be relatively easy compared to many including general property because of the high level of homogeneity of the risk types we write: there are only a few styles of plant and very similar equipment steam plants, gas turbines, hydros, etc., all using very similar or identical ancillary equipment and grid systems.

However, a large part of our exposure is machinery breakdown a world where small differences and details can create very different outcomes.

By “pricing/rating” I really mean the whole deal” — i.e. pricing, deductibles, limits and terms.

The basis of any rating model is historic data collection and its statistical analysis. The first challenge for all heavy industry is that for much of it there are barely enough units of insurance to achieve statistical validity. In power I would say that the homogeneity I have mentioned gives us an advantage in this area, but insurers need to be insuring or having oversight of a good portion of the world’s power plants to achieve this.

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Valuation of assets is a constant issue but is certainly a “hot” one at the moment.

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Accurate fine tuning of this becomes more difficult as small variables between ostensibly similar plants and equipment rapidly reduce the applicable pool of statistics. For example, two “identical” size CCGT’s using the same major equipment, or the same age in similar locations can be wildly different underwriting exposures depending on many factors from historical operation regime to, upgrade to turbines, maintenance etc. etc.. a long list. Although there is not much variation on the face of it in our business — when you get down to the detail, there is significant critical variety between different models, operating regimes and so on.

However, a rating engine driven by detailed statistics is not necessarily a panacea to accurate pricing/rating in the real world because we work in a market. Good luck trying to obtain the level of detail needed to populate such a model and write a portfolio of risks, even in a “hard” market, let alone a softer one

Because data is generally less plentiful than desired, there is inevitably greater incorporation of older data, which fortunately brings me to a challenge I omitted earlier.

This, which will continue for the foreseeable future, is the advance of renewable capacity into grid systems causing fundamental changes to the operating regime of older equipment, changes or extremes of change which it was not originally designed to accommodate.

These changes are and will be responsible for losses that would not otherwise occur and while these losses may be foreseeable by type it is less easy to forecast frequency; as they say in the world of investment, past performance is not necessarily a guide to the future.

Some of the renewable generation is evolving so rapidly that there is hardly time to build up an appropriate level of (detailed) data.

So I would say that pricing/rating models around the industry are generally not as sophisticated as perhaps some of our engineering customers imagine.

The current rate of change to factors that have a direct impact on rating/pricing is much greater than I have seen at any point in my career.

CW: So how do you differentiate as an underwriter?

IG: I think experienced class underwriters are particularly useful in all heavy industrial lines and particularly in power, although you would expect me to say that!

We do have a number of advantages in our class:

- many of the companies we insure have strong risk management departments with experienced, longstanding risk managers; the same can be said for their senior engineers. There is a willingness to



engage directly with underwriters and insurance engineers, allowing a deeper understanding of a client and their exposures and to identify those who practice what they preach — observing their actions over many years.

- our industry has long followed the model of using ex-power industry engineers to assist the underwriting process. Experienced underwriters can extract the most value from this work.
- and not forgetting you, I admit there is significant value in our brokers, particularly in London where we can interact directly, with power specific teams. However, this value only exists where broking teams have the appropriate level of knowledge and experience and this has undoubtedly wilted at some houses.

I think it is this knowledge, allied to knowledge of the industry itself, that is necessary to supplement pricing/rating models and allows power underwriters to differentiate much more clinically the very different exposures that clients bring.

DC: To what extent have the treaties of your underlying capacity providers impacted your underwriting guidelines, in terms of pricing and Nat Cat aggregates?

IG: Rokstone being an MGA means I no longer deal directly with treaty reinsurers, but I need to be aware of reinsurers’ current issues and views which are directly impacting who I answer to — our capacity providers. Across Rokstone, we have a crystal focus on quality underwriting to create portfolios that are desirable to our partners and provide an acceptable level of return and my portfolio needs to be tailored to achieve this.

Cat treaties have seen a stiff increase in cost and reductions in cover. These treaties reflect a much wider trend since they are cross-class. As humans put ever more value into areas exposed to Cat perils the cost of losses will continue to climb.

Specific to our sector has been the recent heavy losses to renewables. All these cat related losses suffered in the last few years could not have happened just a decade



prior: the assets didn't exist. There is no let-up in the build and proposed build out of renewable generation into Cat zones. Not surprisingly there is a paucity of historic loss statistics and catastrophe modelling will become more specific and accurate with time and future losses.

Whether at an insurer or an MGA, cat capacity is a limited commodity being fought over internally by different lines of business; each company has to determine how to apportion this valuable resource with rate of return being a foremost consideration.

DC: Have there been any particular type of losses that have impacted your book recently? Is the climate change debate impacting your regional appetite? For example, is the El Niño weather system something you are concerned about from your historical experience?

IG: Our portfolio is not currently subject to any particular loss type but we are certainly seeing losses with greater quantum than would be expected due the factors already outlined. I do feel there is a general uptick in the quantity of losses, but I accept this is a subjective view. I think given some of the issues highlighted one would expect it.

I think the power industry as a whole dealt admirably with the pandemic; however, not everything as performed as optimally as it would have been and this may be giving claims numbers a push.

Power assets are historically minimally impacted by weather and as "critical infrastructure" are generally designed and have the money available to be built to withstand severe/extreme weather.

Regarding El Niño specifically, the changing rainfall patterns it brings do impact certain regions from a Power perspective. For example, certain Latin American countries who have a significant installed hydro capacity, need to run their alternative/back-up thermal plants significantly more in dry years than wet and causing higher electricity pricing; underwriters will consider these running patterns.

DC: Do you see a shift in concern away from traditional MB-related exposures to Nat Cat perils?

IG: Definitely not. Cat losses have traditionally been only a small portion of the total loss in our class. Assets are large, expensive and often Cat-resistant; critical assets tend to get more consideration of cat loss as build than many others.

Historically power assets, particularly generation facilities have performed well against earthquake and hurricane. The notable exceptions are storm surge for assets located "on the beach" and very recently the rise of renewables, particularly solar, which is much more vulnerable to earthquake, wind, wildfire and hail.

This is not to say that cat perils are not considered but MB and operationally related losses will continue to dominate the record.

DC: When considering the renewal of loss-impacted programmes, what tends to be the balance that you strike between declining the business, imposing rating increases and amending the existing coverage?

IG: Losses are where we deliver on our promises to pay but are also a fantastic opportunity to learn more about the exposure that a client brings, whether that be the physical exposures, such as equipment and location or soft exposures such as "clout" with OEMs or attitude and actions. One would hope that most key knowledge is validated rather than learnt, especially with insureds of longer-standing. Any additional knowledge is a consideration for renewal.

Basic principles of insurance include the premiums of the many pay the losses of the few and premiums should equitably reflect the exposure an insured brings to the pool.

In a world of perfect knowledge and underwriting skill, a client suffering a loss would simply see the amended rates/terms applied to all similar clients due to losses changing the pricing/rating model. Back in Lime or Leadenhall Streets underwriters will have learnt more and this will be thrown into the mix of the normal renewal process where many “soft” factors will be added to pricing and rating models. These will include client relationships, broker relationships, the state of the market, competition, availability of reinsurance, overall view of the client, mix of the portfolio, and being entirely frank, in the case of an insured with multiple losses, what your boss (who doesn’t have a clue about the power class) will do to you if the insured has yet another!

DC: Are you seeing evolution of the worldwide gas turbine fleet speed up or slow down? Do you have any concerns around the impact of a strong pipeline of projects on operating exposures?

IG: Gas turbines were beginning to make their presence felt in the generation mix at the start of my career. The evolution during that period has been transformative in terms of output, efficiency, materials and sophistication of design and manufacture. I would say we have seen evolution speed up, driven on one hand by the tools of design and manufacture and the materials that the OEMs have available or developed and on the other by the unchanging demand for improved efficiency and requirements for turbines to serve ever changing needs in grid systems.

We are all gearing up for a world where there are many more much bigger turbines. We have already discussed how many grids are adapting to the changing profile of generation and the impact of must-run renewable assets. Large turbines are seeing an increasing number of start/stop/low generation conditions. How large turbines will fare from an insurance perspective in this new environment is a work in progress, these turbines being a mix of age, size and technology.

CW: Is anything really proven on a test bed?

IG: If you mean “proven” in an insurance sense the answer is no.

OEMs introduced full size test beds some years ago. They were undoubtedly a major advance for everyone involved — OEMs, generators and insurers.

In our day to day lives everything we touch has been tested to the nth degree, because it can be and consumers demand it. Testing a machine outputting hundreds of mega-watts is not so straightforward or relatively cheap, so hours on test beds are not testing like we might think of for an item we use every day.

The next evolution in the 2010s was OEMs putting fleet leaders into generation partners allowing a greater quantity of running hours. This is unquestionably a further advance.

All the OEMs opine to insurers that new models/designations are evolutions and not new. I am sure there are differing views. What can be said with certainty is that the largest turbines from all the OEMs have made huge leaps in physical size, output, efficiency and materials. Consequently, on the largest gas turbines in service today similar losses compared to the largest in service 10 to 15 years past have rocketed in quantum from a property damage perspective. As machines grow in output daily BI numbers obviously follow.

A typical compressor loss on a H technology turbine can easily be double to triple the past quantum of an earlier F unit, even allowing for inflation.

DC: With commodity prices rising across the globe, how has this affected your attitude to asset and BI valuations? Do you see evidence in your loss experience of under-deceleration? What do you want to see in underwriting submissions to ease your concerns?





IG: We have partially covered some of the answer to this question. We have always seen valuations from around the world that do not seem to be in line with those of many other clients even given regional variations, but rising prices have exacerbated this.

One issue I would highlight is new build CCGTs particularly with H technology. These highly sophisticated machines containing patented and proprietary parts can only be serviced by the OEM. They are sold with long duration agreements to provide parts/service maintenance.

I am not disputing the contract value of these projects, for which a healthy pipeline of new builds provide many references for up to date accurate new replacement cost, but from an insurer viewpoint they do not represent the appropriate starting point for premium development when rates used by many insurers are only marginally larger than those used for F units.

Insurers need to bear in mind that most turbine losses involve replacing parts, not purchase of new units and it is parts costs that is the relevant metric.

CW: How do you see the Power insurance market moving forwards? Do you see this current hardening trend continuing, or will the normal market cycle dynamics start to exert themselves with fresh competition entering the market? Or is the market not as volatile as it once was?

IG: I expect the current market environment to remain unchanged in the short term. There is still considerable claims activity impacting both conventional and renewable portfolios.

In the medium term, we would expect from cycle history that rate rises will level out and then reverse; however, given the level of change and therefore uncertainty it might well be that a continued level of increased claims activity will delay this.

A dynamic that does affect Power considerably at times during the market cycle is capacity from general property underwriters, both as reinsurance or in local domestic markets. The power market is only a small corner of general property so it does not need too much to cause change.

CW: Is it a concern to you that so much of the production process and rare earth metals are concentrated in certain regimes which may be challenging from a geopolitical perspective?

IG: From the perspective of insuring operational property, no I do not see this to be a particular problem. A shortage would drive-up equipment prices or in a worst case scenario create unavailability. This may impact a small number of losses but I would see the market moving to price or term this.

There are certainly commentators in general business areas, including the power and mining sectors, expressing views that in the medium term shortage of commodities may impact the attainment of current targets for carbon reduction, although these comments apply to a number of sectors, including transport.

Underwriters will be watching action prompted by the Inflation Reduction Act in the US with interest. The huge incentives may cause effects similar to “demand-surge” and not only in the US. This may extend to commodities/equipment and staff shortages.

It is undeniably interesting having the opportunity to meet many senior managers and engineers from around the world and hearing their views.

DC: Ian, many thanks for your time.



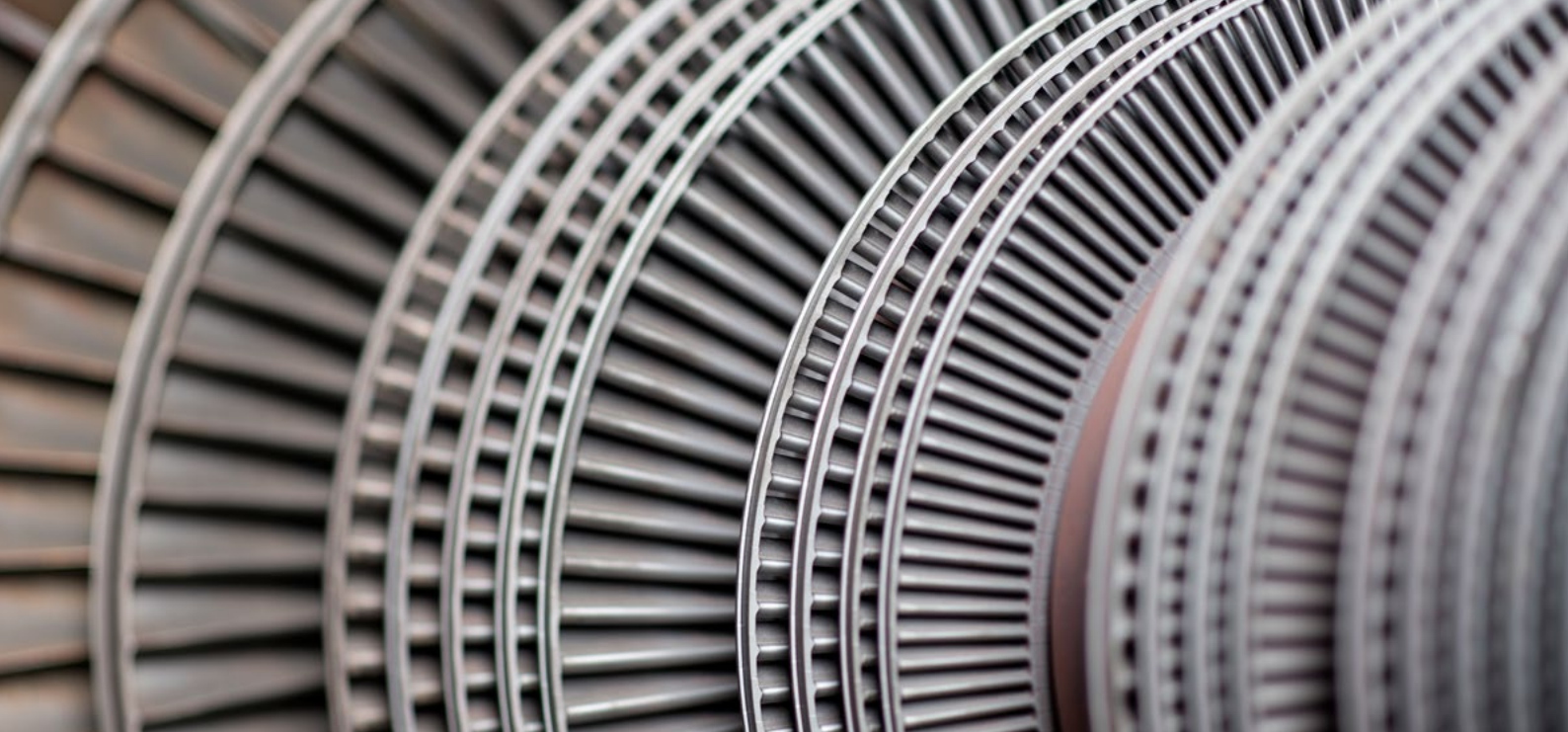
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Property: Lack of competitive pressures continues to drive hard market conditions

Introduction: is the normal market cycle stopped in its tracks?

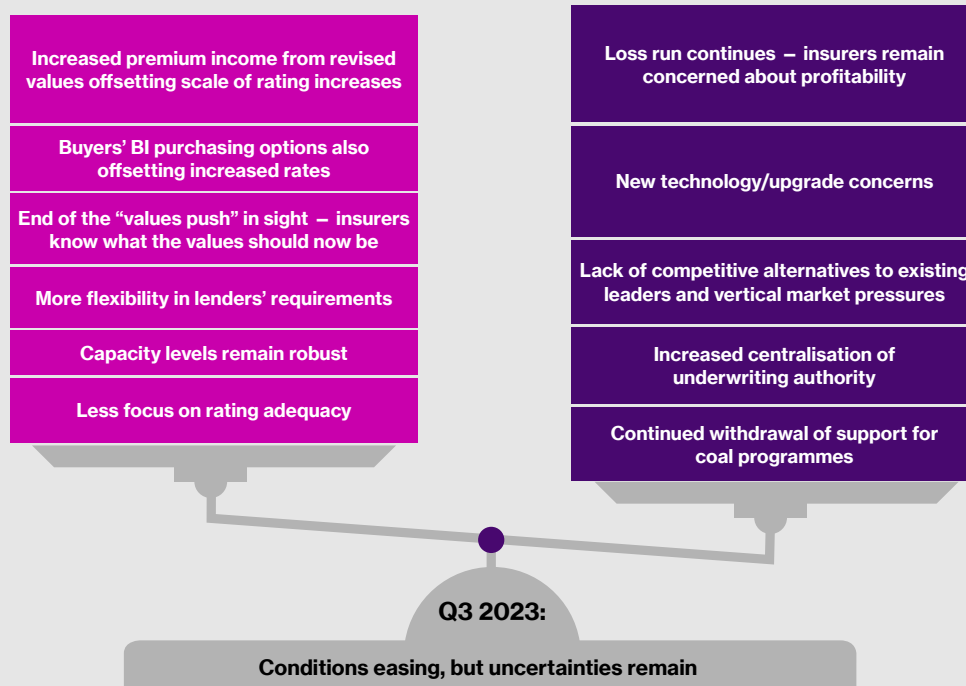
Most readers will be familiar with the concept of the traditional insurance market “cycle”: favourable loss records and extensive competition leads to lower rates and wider, more benign terms and conditions from the insurance market. This then leads to a period of unprofitability, followed by a period of market withdrawals from the sector, leading to reduced capacity and higher pricing; this in turn leads to profitable insurer trading conditions, which then encourages new entrants to the market to provide more competition and rates begin to decline again. Managing this insurance market “cycle” as expediently as possible has been a key risk management driver over the years.

The problem for risk managers in the Power sector is that the traditional Property insurance market cycle seems to have ground to a halt, rather like a fairground cab at the top of a big dipper. For several years now the sector has experienced hardening market conditions; despite this, the prospects for significant fresh competition entering the market to kick start the next phase of the cycle seem to be as remote as ever. Once again this year we have to report rating increases as being the norm in this market, but are there any signs at all that better times are on the horizon for customers?

The Power market has already gone through a phase of hardening and rate correction over the past two years. Towards the end of 2022 there were signs that the Power portfolio was returning to profitability, with flat terms and in some cases actual rate reductions becoming possible. However, deteriorating loss ratios and increased cost-bases (especially reinsurance treaty costs) have put the brakes on any softening; instead, we are seeing a renewed push for rate increases from the market. In particular, insurers’ focus on Nat Cat exposure risks is intensifying, as the frequency and severity of such events around the world and insurers’ own experience continues to deteriorate. For example, Cyclone Gabrielle in New Zealand in February 2023 led to several losses on the New Zealand portfolio, while reinsurance treaty costs have increased significantly, notably again for Nat Cat protection.

There is no doubt that despite the overall gloomy prognosis for customers, there are some positive factors that continue to limit the extent of the hardening market conditions. Let’s take a closer look at both the positive and negative factors affecting this market to determine what customers can expect for the remainder of 2023 and beyond. We have outlined these factors in our “kitchen scales” graphic in Figure 1 overleaf; we will take each of these factors in turn, starting with the positive ones.

Figure 1: The Property insurance market for Power business, Q3 2023



Continuing hard market conditions still being driven by lack of alternatives to existing leaders and poor treaty renewals

Source: WTW

Positive factors

Increased premium income from revised values offsetting extent of rating increases

As we intimated last year, insurers have had the benefit of a stronger premium flow from the significantly increased values being declared this year. While the conflict in Ukraine and the resulting inflationary pressures around the world have certainly contributed to these increased values, there is no doubt that there has been a marked escalation in them over the last 12 months, with some Business Interruption (BI) values in particular showing as much as a 100% increase — well above average inflation rates. It is also important to note that BI values are more heavily weighted by insurers when calculating rates than the corresponding Property values. Indeed, these have been increasing by a much lower average of 10%, a figure much more in line with global inflation rates.

This dynamic has enabled brokers to negotiate more moderate actual rating increases that in recent years, as the increased premium volume from the revised values has enabled brokers to attract more competition for most programmes than at this stage last year. Moreover, following another poor year for the North American Power portfolio, we are seeing more London market insurers seeking to diversify their books and looking to

write more international business. Historically, Lloyd's Power Syndicates have been heavily weighted towards the US, but more are now expressing an interest to review the International portfolio.

Buyers' BI purchasing options also offsetting increased rates

Furthermore, customers have often had the option not to purchase Business Interruption on a gross profit basis; instead many have elected simply to buy debt service only or alternatively on the basis of fixed Operating and Maintenance (O&M) costs only. The strategy has also enabled a number of customers to mitigate the effects of the current hard market conditions.

End of the "values push" in sight

Another good piece of news from a customer perspective is that the end of the prolonged period of insurer insistence on refreshed value calculations is now perhaps in sight — despite the significant increase in values declared over the last 12 months. From our conversations in the market, it seems that the general impression is that the hard work in persuading customers to submit revised value schedules has now been accomplished, and that insurers now have a much better grasp of what the values declared to them should now look like. We therefore believe that the element of uncertainty that has propelled insurers to compensate by

increasing rates still further has now been removed from the equation; although that does not mean that rating levels will start to decline, it does mean that the extent of the increases will now be more moderate. How long this more relaxed state of affairs will last will depend on the extent of any deterioration in the claims record; should the record worsen still further it will prove that this new-found confidence in values accuracy may after all have been misplaced.

More flexibility in lenders' requirements

For several years now it has been generally acknowledged that it has been impossible for customers to seek to amend the terms and conditions of lender requirements; indeed in many instances these requirements have driven the insurance purchasing strategies of a significant number of power companies. However, we have recently found that for those customers exhibiting positive ESG profiles, lenders are now becoming more flexible in what they are demanding; if a good case can be made for modifying these terms, they are becoming more willing to do so. If either:

- the lender's requirements can be proved to be driving too much cost, in terms of either policy limit and/or deductible requirements; or
- customers require greater flexibility in what they buy so that it dovetails with their risk transfer strategy

Lenders are now responding to the more challenging business environment and agreeing to modify their terms which they would not have agreed to before, on the basis that it makes financial sense.

Brokers are now able to help their customers build a case to reduce their lender requirements, improve deductibles, and potentially reduce limits, which can all contribute to reducing the customers overall premium levels.



Capacity levels remain robust

One more good piece of news for customers is that in overall terms capacity remains plentiful. Not only have there been no major withdrawals from the Power market in recent years but the existing capacity has also been augmented by a number of MGAs, particularly in the London market, while China's plan to establish a reinsurance centre in Shanghai may eventually increase Chinese market capacity. Such is the cost of setting up a new bona fide underwriting operation (including reinsurance treaty costs) it is not surprising that there have not been more new entrants and that providers of insurance market capital tend to prefer using MGAs to take advantage of today's market conditions. In this way, the parent company can test the market without committing themselves on a permanent basis. In any event, this development is welcome news for customers as if certain insurers have given their authority to someone else to write on their behalf, that shows some confidence in the current market conditions and this in turn, at least in theory, should ease the upward trend in rating levels.

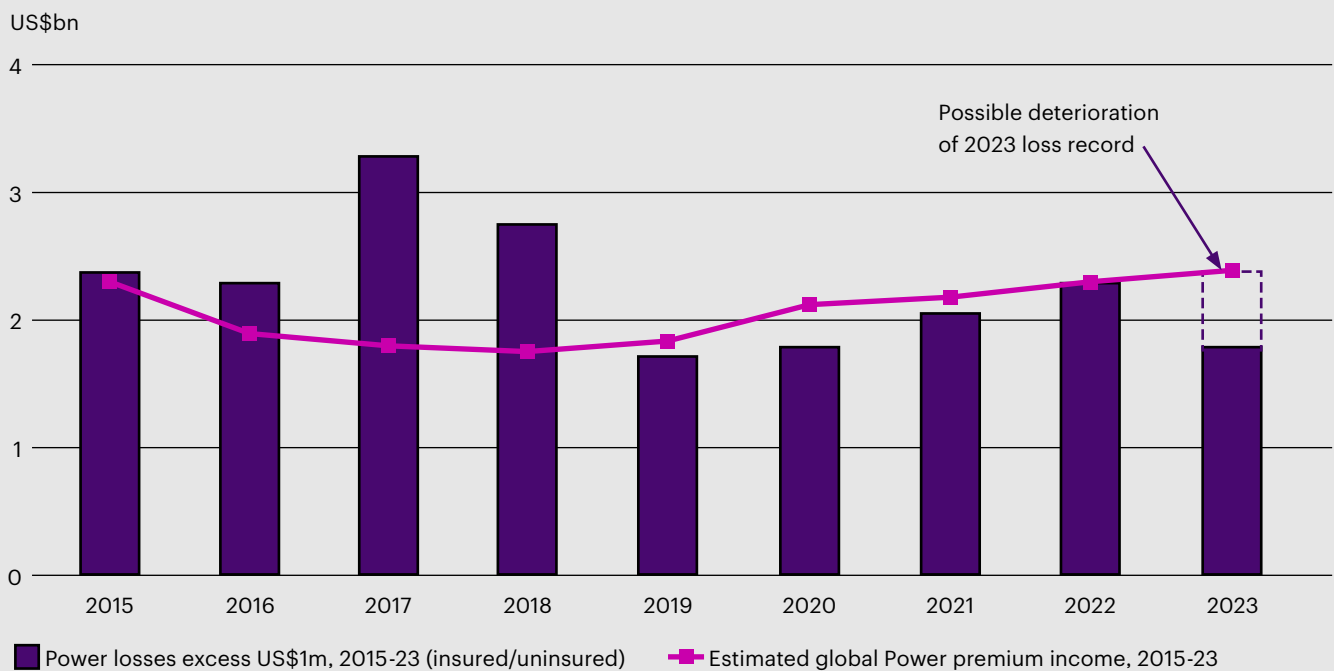
As in 2022, we estimate that overall capacity remains at approximately US\$3.5 billion, with realistically deployable capacity close to the US\$1.5 billion mark. However, in relation to coal assets this amount reduces to a much lower figure of around US\$250 million (coal capacity for new risks entering the London/European markets is significantly lower, and it might pay buyers to differentiate between existing and new business).

Less focus on rating adequacy while deductible levels remain low

While as we have seen insurer pressure to declare revised values has eased for the time being, there is now a genuine debate in the market as to whether underwriters have now achieved technical rating adequacy. Obviously there have been some significant corrections in rate over the last few years, but as we will see later the market is still being hit by significant Power claims. That being said, in our conversations with insurers in London we sense that they don't feel they can permanently maintain true technical rating adequacy, because competitive pressures will always kick in before such rating levels can be achieved. As brokers, we are already finding ourselves in a position where programmes are routinely over-placed and expensive capacity can be discarded.

Moreover, deductibles are now generally at the minimum technical levels, and almost never form part of any increased terms from the market. Most have not tracked with inflation and in some cases have remained static for up to 10 years. Insurers are happy to maintain them at their current levels — despite recent inflationary pressures — because these levels yield the maximum amount of premium income. All this remains good news for the customer, unless increased attritional claims activity produces an excess of "dollar swapping" in the future, in which case the current levels may be a focus for insurers next year.

Figure 2: **Estimated Power losses 2015–2022 (excess of US\$1m) versus estimated global Power premium income**



How many losses below US\$1 million are affecting the portfolio in 2022?

Source: WTW market intelligence/WTW Energy Loss Database as of July 19, 2023 (figures include both insured and uninsured losses)

Negative factors

Loss run continues as insurers remain concerned about profitability

Figure 2 above shows WTW’s best estimate of overall global Power losses excess of US\$1 million compared to estimated global Power market premium income. It can immediately be seen that the loss record in this market continues to deteriorate, with the 2022 total now reaching some

US\$2.3 billion (outstripping 2021’s US\$2.1 billion) and with 2023’s figure forecast to eventually reach US\$2.4 billion. In the meantime, while premium income for this class continues to rise, all the indications seem to suggest that total premium levels will only rise to a similar figure (US\$2.4 billion) by the end of 2023. We do

appreciate that these are only estimates and that the final figures for 2023 may vary from these projections; however, what these estimates do suggest is that overall profitability — and indeed technical rating adequacy — may still be beyond the market’s grasp at present.

Figures 3 and 4 on the next page outline the major losses recorded by the market to date for 2022 and 2023. There is no doubt that increased BI values and supply chain issues, particularly in North America and Europe, have had a major impact on the overall loss totals for both years.

Figure 3: **Power losses excess of US\$20 million, 2022**

Plant type	Cause	Region	Total US\$
Gas	Fire/Explosion/VCE	North America	350,000,000
Gas	ST Generator Short	North America	154,000,000
Coal	Fire/Explosion/VCE	North America	130,000,000
Gas	HRT collapse	South Asia	100,000,000
Gas	HRT collapse	Latin America	90,000,000
T&D	Mechanical Breakdown	Europe	60,000,000
Gas	Compressor damage	Middle East	50,000,000
Hydro	Mechanical Breakdown	Europe	50,000,000
Gas	Mechanical Breakdown	Latin America	50,000,000
T&D	Anchor/jacking/trawl	Asia Pacific	45,000,000
Coal	Fire/Explosion/VCE	North America	40,000,000
Gas	Compressor failure	North America	40,000,000
Gas	Mechanical Breakdown	Europe	35,000,000
Gas	Generating trip	North America	30,000,000

Source: WTW market intelligence/WTW Energy Loss Database as of July 17 2023 (figures include both insured and uninsured losses)

Figure 4: **Power losses excess of US\$20 million, 2023 (to date)**

Plant type	Cause	Region	Total US\$
Gas	Crane tower collapse	Middle East	205,000,000
Waste to Energy	Fire/Explosion/VCE	North America	205,000,000
Gas	Mechanical Breakdown	North America	80,000,000
Gas	Electrical generator short	North America	50,000,000
Gas	Mechanical Breakdown	North America	28,000,000
Gas	Transformer failure	Latin America	25,000,000
Gas	Flood	Latin America	25,000,000

Source: WTW market intelligence/WTW Energy Loss Database as of July 17 2023 (figures include both insured and uninsured losses)

What do these premium and loss statistics mean for the customer? In essence, they demonstrate why, despite several years of hardening market conditions, insurers remain reluctant to offer more preferential terms, and why they remain determined to press ahead with rating increases in an effort to demonstrate to their management that this portfolio remains an attractive one.

New technology/upgrade concerns

In addition to the general concerns that the Power market has regarding its overall profitability, the concerns that we raised in last year's Review regarding the application of new technologies or upgrades. In particular, insurers' focus remains on some specific gas turbines manufactured by well-known OEMs which they believe contribute directly to the current unfavourable loss record. Although some milestones have been reached for some upgrades, with more being reached as this Review went to press during Q4 2023 — which will allow more insurers to underwrite these new technologies than previously — others have found that new concerning issues have recently materialised which has only increased their apprehension in underwriting programmes featuring these technologies.

The deployment of new technologies is an issue that is constantly evolving, with the introduction of new hydrogen burners dual-fuelling and conversions from heavy fuel oil and diesel being good examples. Brokers have responded by using their engineering expertise to demonstrate that these technologies have been sufficiently well managed to ease insurers' concerns regarding LEG 1 issues, so as to prevent the imposition of further coverage restrictions by insurers. One well known OEM, for example, has designed their hydrogen burners to make the flames smaller, which makes them easier to control; however this is generally an expensive avenue for buyers to go down, with only a handful of units worldwide actually deploying these burners. As such, supply chain issues are bound to arise and it must be remembered that to be considered ESG-friendly by insurers, power companies have to produce hydrogen from a clean source.

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The Power market continues to be beset by a high degree of “vertical” pricing, whereby each insurer offers specific pricing for their particular participation in any given programme.

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Moreover, while this strategy has had some success with regard to hydrogen burners, market concerns remain as to any changes to blades, or any further changes relating to the development of hot gas path technologies; here there is a significant underwriter concern, such that some companies deploying these technologies may now be in danger of not securing any meaningful insurance capacity at all.

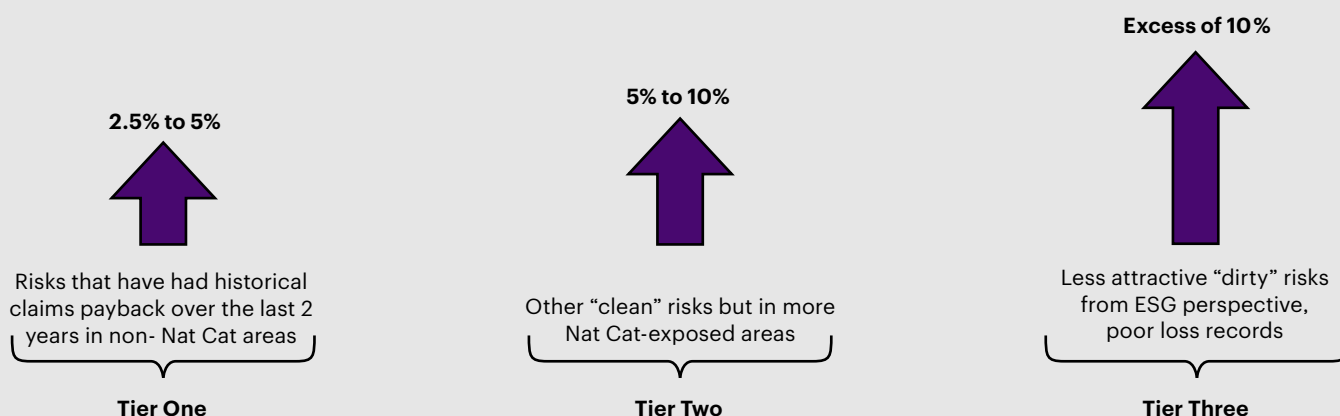
Finally, specialist Power insurers are looking to impose fuel supply quality clauses, making sure the operators of the plant in question are running it properly. We are also seeing a number of new gas-fuelled power plant projects becoming operational in recent years; this development maybe as a reaction to the increase in renewable power, and the potential instability that this might create in economies across the globe.

Lack of competitive alternatives to existing leaders and vertical marketing issues

Another besetting reason for the continuation of the hard market conditions remains the lack of competitive alternatives to existing leaders, as well as the continuing vertical marketing issues throughout the market. With the barriers to entry still relatively high, and with the profitability of the Power portfolio by no means demonstrable in general terms, it is perhaps unsurprising that not only has there been no significant new entrants to this market (other than MGAs as mentioned earlier) but also that none of the existing market has come forward to indicate that they are now prepared to act as leaders to challenge the existing panel. As a result, although the current market leadership panel has generally adopted more moderate stances over the course of the last 12 months, brokers are still finding it challenging to generate competitive alternative marketing strategies involving fresh underwriting thinking.

Moreover, the Power market continues to be beset by a high degree of “vertical” pricing, whereby each insurer offers specific pricing for their particular participation in any given programme. This means that simply obtaining lead market terms from the existing panel will by no means be the end of the marketing process for the broker; indeed, a significant number of following insurers are now demonstrating firmer underwriting stances than the leaders. So even where leaders are rewarding customers with more generous terms where appropriate, their efforts to reward these companies can often be thwarted by following insurers insisting on maintaining their own harsher underwriting stances. And although we have seen more interest from some followers to participate in the most sought-after programmes, no following market is currently in a position where they are generally obliged to accept most of the business that is offered to them; in most cases that they can hold out for their own individual terms.

Figure 5: **The three- tier market maintained– average rating increase in the Power Property market, Q3 2023**



The Power market continues to experience rating increases almost across the entire portfolio, despite buoyant capacity levels – there is just no challenge to the prevailing market leaders

Source: WTW market intelligence/WTW Energy Loss Database as of July 19, 2023 (figures include both insured and uninsured losses)

Increased centralisation of underwriting authority

One reason for this new found confidence from the following market has been the increasing centralisation of underwriting towards the London market. Whereas in more benign market conditions we have witnessed the expansion of underwriting hubs around the world, in recent months we have seen underwriting authority at several hubs withdrawn, with decision-making returning to London. This has increased the premium flow to London, which may well have served to increase London market income but has also had the effect of blunting global competitive pressures.

Continued withdrawal of support for coal programmes

A final negative factor impacting power industry customers is the continuing lack of insurance capacity for coal-fired power plants, an issue which has become more pertinent in Europe as countries have sought short term alternatives to secure energy supply following the continued conflict in Ukraine. As some previously mothballed plants become reactivated, owners are effectively being given a choice between self-insurance and governments acting as insurers of last resort in order to effect any kind of risk transfer for these assets.

Conclusion – today’s Power market rating environment

Figure 5 above indicates the average percentage rating increases that are now being negotiated in today’s Power insurance market. Readers will notice that very little has changed since our 2022 Review; for example, the best programmes are now showing a +2.5% to +5% rating increase, compared to flat to +5% increase advised last year. This simply indicates that, for now, the negative factors described earlier as just about balancing the positive ones as the hardening dynamic starts to falter a little.

What can customers expect from the rest of the year? Whether or not the hardening dynamic will accelerate again will depend very much on the development of the current 2023 loss record. Should further major losses materialise, customers can expect rates to increase still further; however if the anticipated loss levels depicted in Figure 2 don't materialise, brokers may be provided with the leverage they need to force a halt to the current hardening dynamic.

As ever, forward planning is essential if customers are to mitigate the worst effects of the current market conditions. Those that engage with their brokers early to develop an effective marketing strategy will be best placed to drive improvements to their current terms — or at least limit the rating upswing to the barest minimum.



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International Liability: Reaching the peak or just a mirage?

Introduction

Despite the growing presence of competition in the International Liability market over the past twelve months, rate increases continue to prevail, although now on a more moderate scale. This inflection point follows a multi-year cycle of hard market conditions, most likely sustained beyond its natural lifespan by a series of macroeconomic and geopolitical factors, although it is not yet clear whether this inflection point signals the end of the hard market cycle or not.

However, what is clear is that the cadence of the market is notably different to before and policyholders are benefiting from a much more balanced negotiating table. Following several rounds of compound rate increases, neither the drive — nor the justification — from insurers for ‘remedial’ pricing corrections is as pertinent as it was a few years ago. The reduced determination for rate increases is coupled with an emerging

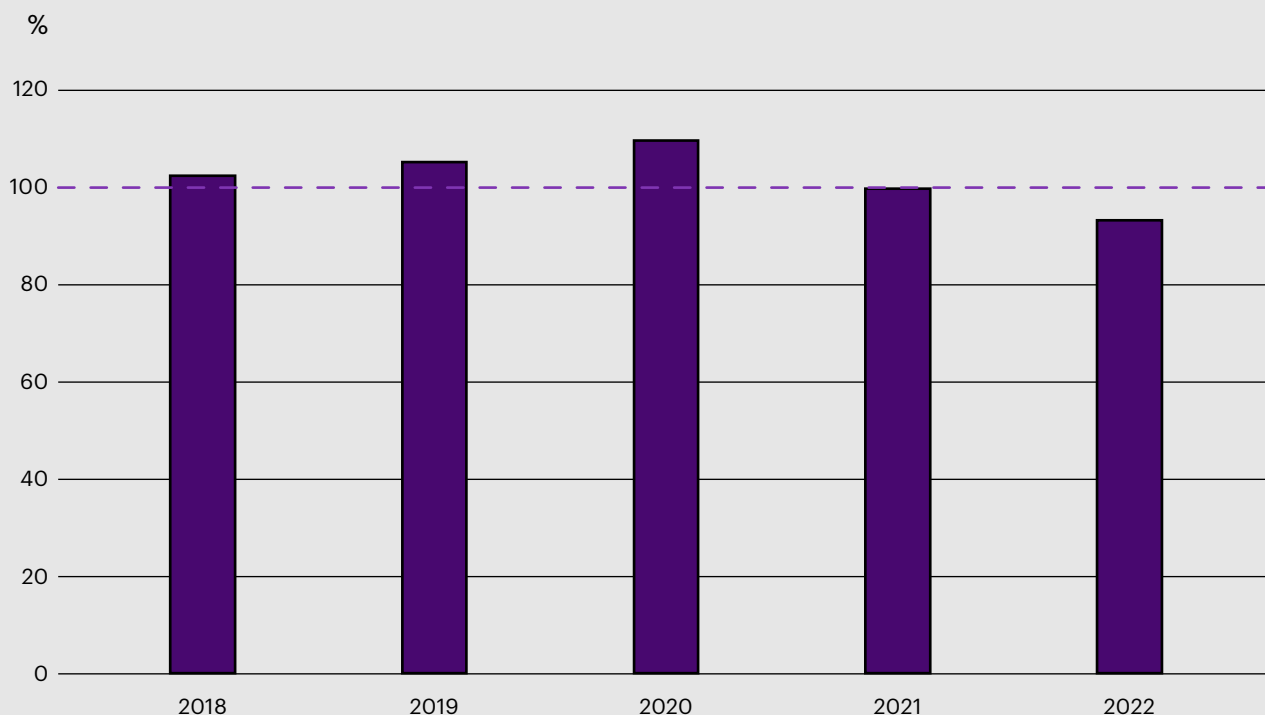
momentum from insurers to write more premium which has served, at least in part, to reset the equilibrium of the market. The good news for customers is that this swing in market forces is in turn enabling customers to differentiate themselves more effectively from their peers in their quest for the most favourable policy terms and conditions.

‘Push’ versus ‘Pull’ factors

Rate remediation

Over the past few years International Liability rates, in keeping with other lines of business, have been subject to multiple years of compound increases. This is largely the product of a drive for rate remediation from Lloyd’s and London company markets to return insurer combined operating ratios to below 100%, a feat which Lloyd’s reported as having been achieved for Casualty within its published results for 2022.

Figure 1: Lloyd's Casualty Combined Ratios, 2018-22



Source: <https://www.lloyds.com/about-lloyds/investor-relations/financial-performance/financial-results/full-year-results-2022> (Page30)

Whilst there are several factors behind the boasted return to profitability, the biggest contribution is unsurprisingly the sustained drive from insurers to increase rates across the board. In general terms, the period of cumulative rate increases now stretches across six years, perhaps signalling a turning point in the recurring insurance market cycle.

Hard market sustainment

The sustainment of rate increases and hard market conditions over the past few years can be put down to several macroeconomic and geopolitical factors which have combined to create a complex and multi-dimensional underwriting environment for the market to operate within:

- 1. Rate adequacy:** As outlined above, a continued focus on rate adequacy, albeit on a less intense scale, persists as a result of previous poor underwriting results and prior-year loss developments continuing to surpass expectations. This is often more pronounced for Excess of Loss layers, which have historically been perceived by underwriters as requiring more rating remediation than often more technically-priced Primary layers. This is particularly the case when layers are required to meet new minimum pricing levels that were not previously applicable.
- 2. COVID-19:** The impact of the pandemic on the insurance market, not only in terms of the (generally

non-Liability) losses that it caused for insurers but also the significant impact it had and continues to have on the way that placements are negotiated in the insurance market. The requirement to work from home during the various lockdowns was conducive to enabling underwriters to push for higher rates and more stringent coverage conditions; it could be argued that the hybrid working environment that has ensued continues to create an environment that makes it easier for underwriters to decline risks or apply rate increases compared to the pre-COVID era.

- 3. Inflation:** The impact that inflation is having on insurers' approach to pricing, both in the form of economic inflation and social inflation, is a further contributor to the prolongation of hard market conditions:
 - **Economic inflation:** Underwriters are having to incorporate increased costs across all key elements of Liability risk into their underwriting models, including but not limited to bodily injury awards, property damage rebuild costs and pollution clean-ups.
 - **Social inflation:** This is compounded further by the effects of social inflation, including the significant increase in both litigation and average jury award costs as well as broader definitions of liability. Even though this is more pertinent in the United States than the rest of the world, the impacts are applicable worldwide.

4. **Reinsurance treaty renewals:** Whilst the most recent rounds of Liability treaty renewals appear to not have been as onerous as Property treaty renewals, increasing treaty costs has nonetheless added further upward pressure on Liability rates. However, the extent of this impact was somewhat reduced by insurers' decision to mitigate increases by electing to retain more risk themselves as part of their treaty terms and conditions, and most probably the conflation of this factor from an underwriting perspective with inflation.
5. **ESG:** This continues to be a factor that influences both risk selection and policy terms and conditions, underlining the importance for policyholders to differentiate their risks from others'. To this end, insurer policies on ESG have become even more embedded within the underwriting process, with some insurers even retaining in-house ESG experts to assess policyholders' ESG credentials in advance of placement negotiations. Where buyers do not meet minimum ESG requirements, there have been instances of capacity being withdrawn by insurers. This said, the impact of a significant focus on ESG does not necessarily create tougher conditions of policyholders, as outlined further below.

Factors pushing in an alternative direction

However, the factors underpinning the sustainment of hard market conditions are to some extent offset by various factors pulling in the other direction:

1. **ESG:** Whilst on the one hand evolving stances on ESG can lend support to increased rates and less insurer choice for policyholders, the impact is not entirely one-sided. 'Greener' sources of energy, including Renewables, Hydropower and emerging power technologies (e.g. Carbon Capture & Storage) are very much seen as target business for insurers. Additionally, whilst some buyers, such as those with thermal coal exposures, will have less scope for overcoming ESG hurdles than others, it is evident that all insurers are motivated to look more favourably upon clients that are armed with strong ESG credentials and a compelling climate transition plan.

Furthermore, whilst ESG requirements often exist in the form of thresholds, they are not necessarily applied in a binary manner, as demonstrated by the consideration that some insurers are willing to lend to the unavoidable delays in the delivery of ESG milestones experienced by some policyholders because of the conflict in Ukraine.

2. **Russia-Ukraine conflict:** The effects of the conflict adds a further dynamic, given its impact on underwriters' premium income. A significant amount of premium exited the London market as a result of the sanctions and regulations that were imposed following the commencement of the conflict, meaning that underwriters are now redirecting their focus, both geographically and in terms of target sectors, when searching for more business. Ultimately, underwriters are increasingly more open to risks in (unsanctioned) regions of the world where they may have previously held less of an interest.
3. **Drive from insurers to write more business:** In the past twelve months there has been a palpable drive from insurers to write more business, as they look to increase Gross Written Premiums, with certain insurers earmarking International Liability for ambitious top-line growth (albeit admittedly cautiously, as insurers remain keen to ensure that such growth is profitable). The impact of this is significant as it serves as a powerful counterbalance to the 'push' factors that have underpinned the continued momentum for rate increases over the past few years. This is particularly the case for power business (with the exception of coal, discussed in more detail below) which very much remains target business for most insurers.

The impact of competition

Risk categories

Notwithstanding the various macroeconomic factors that shape the negotiating landscape for International Liability, the placement outcome for any given programme continues to be significantly impacted by the characteristics of that particular risk. Whereas insurers will be keen to meet new business targets by adding good programmes with credible ESG and Energy Transition credentials to their portfolios, the opposite is the same for those programmes which are not viewed as favourably, with a clear differentiation in policy terms and conditions (including rates) correspondingly applicable.

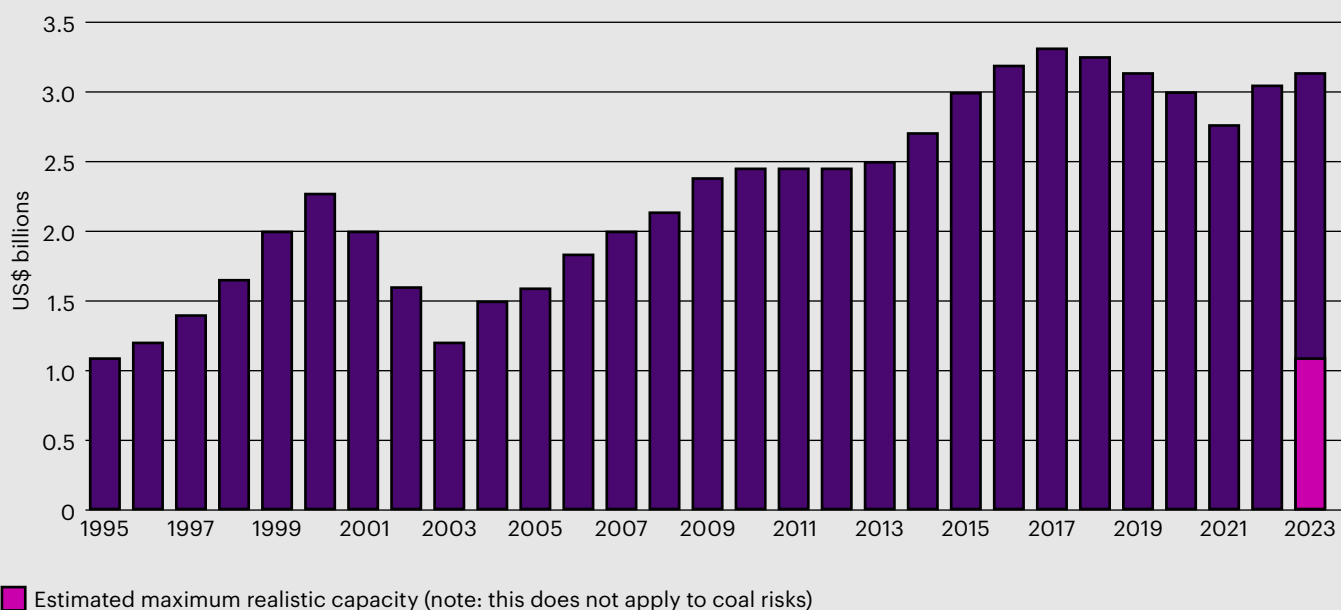
One effective way for customers to positively differentiate themselves to underwriters from their peers is to ensure regular and effective engagement (e.g. in the form of roadshows and site visits), a strategy which has seen increasing redeployment since the start of the year following a period of restricted travel due to COVID-19 regulations.

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It is evident that all insurers are motivated to look more favourably upon clients that are armed with strong ESG credentials and a compelling climate transition plan.

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Figure 2: International Liability market capacities, 1995 – 2023



Source: WTW

Increasing competition

The lack of competition present during the recent hard market cycle (caused largely by a combination of contracted capacity and an unforgiving focus on rate adequacy) is a key reason behind the significant premium increases experienced by many policyholders during the past few years. However, as we have seen in the market more recently, where programme limits can be placed multiple times over, the existence of competition in the form of alternative capacity leads to downwards pressure on rating levels and protects insurance buyers against the threat of opportunistic pricing.

Capacity nudging upwards

The overall limit of capacity available in the Power market remains relatively stable compared to recent years, although the ability and willingness of insurers currently active in the sector to increase individual capacity deployment is gently nudging the total upwards.

Whilst in theory the total Intentional Liability capacity available for Power risks sits in the low billions, in reality the largest limits purchasable are often significantly lower, as a host of underwriting considerations create a delta between insurers' maximum theoretical capacity and their realistically deployable capacity. Notwithstanding this, the largest towers, often purchased by European and North American Hydro and Utilities customers, can still exceed the US\$1 billion mark.

The maximum realistically achievable programme limit is influenced by several factors, including:

- minimum and/or preferred attachment points
- appetite for specific aspects of coverage requirements
- whether the risk is a renewal or new business to the insurer (capacity deployment tends to be higher for renewals)
- the extent (if any) of self-insured retention and/or captive deployment
- whether there is participation from local insurers as well as the London market
- individual insurer risk appetite for the risk exposures
- overall risk quality and loss record

Capacity deployment considerations

In addition to the above, insurers continue to seek ventilation (i.e. ensuring capacity is not deployed on consecutive layers) on larger programmes, particularly where the line size across a programme is towards the upper end of their deployable capacity. Similarly, retention levels continue to be carefully considered as insurers look to ensure that their portfolios are adequately protected from future inflated claims costs.

Other underwriting considerations

Coal

Whilst overall capacity may be gently trending upwards, the capacity available for heavily coal-exposed risks remains limited, particularly for those buyers who have hitherto not purchased significant limits, as previous Lloyd's mandates continue to shape syndicates' approach — and reluctance — to writing new coal risks. In such circumstances, even a strong ESG and/or energy transition story might not be sufficient.

Notwithstanding this, there are several insurers that will consider coal without threshold constraints. Others, however, will only consider coal risks if the exposure falls below certain parameters, for example being below a given percentage of throughput or turnover.

This said, insurer-imposed thresholds on ESG related exposures, such as thermal coal megawattage, are generally becoming increasingly difficult to circumvent, leaving customers with less room to manoeuvre in this domain during the placement process. Where customers are unable to satisfy underwriting criteria, the lack of capacity available can significantly reduce the ability to arbitrage competing quotes, particularly on programmes requiring larger limits.

Bushfire

Another key consideration for underwriters is bushfire exposure, particularly in the US and Australia. Consequently, programmes covering transmission and distribution operations in territories with bushfire exposures are being subject to greater rate increases than other sectors of the power industry. This is in part due to underwriter concerns around ageing networks and perceived underfunding of maintenance, particularly in North America.

As a result of the higher rate increases being applied to T&D programmes, there is a tendency for programmes with bushfire exposures to consist of 'split slips' (where insurers participate on the same layer at different terms and conditions) and less consolidated programme "tower" structures.

Recent extreme weather events in Europe have also called into question the potential impact on transmission and distribution infrastructure and the ability of owners and operators to protect their networks. This is resultantly causing some of the modelling around frequency of extreme weather events to be reassessed.

US

Finally, US exposures generally continue to attract greater scrutiny from insurers, especially US Auto (both at a primary and excess level). Consequently, any programmes with exposure to the US are considered more cautiously by the International Liability market which shares a wide-ranging consensus that jury verdicts in the US continue to accentuate the severity of Liability losses.

Policy terms and conditions

Conditions

Recent renewal cycles have witnessed soft market coverage extensions being removed from policy wordings, as underwriters were able to rely on hard market conditions to limit their portfolio exposures. Whilst this has not yet been totally reversed, the moderation of the hard market cycle has enabled certain coverage extensions to be obtainable again, as and when a valid case can be made around the specifics of a given risk exposure, its risk management and/or its mitigation. That said, insurers remain focused on clarifying the intent of coverage afforded in policy wordings.

Whilst various versions of climate change clauses are in circulation, since the London Market Association (LMA) published its own climate change clause this has tended to be the most commonly used clause by London insurers. However, it is worth noting that the absence of a climate change clause does not necessarily mean the exposure is covered as, depending on the basis of cover, insurers may point to Sudden & Accidental pollution limitations within policy wordings as excluding any coverage for climate change liability.



There has also been an increase in the application of PFAS (Per- and polyfluoroalkyl substances) exclusions, which, while not as commonly applied, have become increasingly prevalent, particularly with certain insurers. Notwithstanding this, where sufficient information can be provided there is sometimes scope to limit its application.

Rates

Whilst regional variations exist for average rate movement, over the past twelve months the London International Liability market has seen a further deceleration of rate increases, with rates stabilising for favoured risks, and average rate increases — not accounting for any risk-specific exposure changes or large losses — dropping to mid-single digits.

Where risk exposures and limit requirements mean that competition for capacity is available, flat renewals — and sometimes even rate reductions — are becoming available again, particularly for non-coal power generation operations. Insurers are also increasingly willing to provide LTA (Long Term Agreement) options for a flat premium, with insurer expectations of future rate increases subsiding. That said, high single-digit to low double-digit rate increases are likely to remain commonplace for programmes that contain bushfire exposures.

Overall, the market appears more focused on rate adequacy than rate movement, with insurers becoming more willing to take a view on programmes that they are keen to continue participating on, regardless of whether the rate is increasing in line with prior rate movement expectations. This represents a shift in focus from rate movement to rate adequacy; however, whether this is really a signal of the end of upward rating pressures remains to be seen.

Conclusion: still challenges but greater opportunity

The International Liability market for Power risks has witnessed a discernible step-change in market dynamics over the past year which, in overall terms, is positively impacting customers compared to the several years of renewals under hard market conditions which has preceded this moment. Where previously many programmes had gaps in cover which provided opportunities for insurers to meet premium growth targets, the combination of fewer programme gaps and higher GWP targets is causing a positive momentum for policyholders and a decelerating effect on rate increases.

That said, whilst the change in market cadence can in part be attributed to insurers' drive for more business, there are multiple forces at play and the direction of travel is not straightforward. Key macroeconomic factors, such as inflation and the conflict in Ukraine, are contributing to a push-pull dynamic which is obscuring the path ahead and making it difficult to predict with certainty quite what might be in store for customers over the coming months.

For many reasons, the landscape remains complex and somewhat challenging for insurance buyers; customers will need to continue to think strategically about how best to approach renewals. In doing so, insurance buyers keen to capitalise on the best possible programme structure and pricing should ensure that they appoint a broker with the technical knowledge, industry experience and market relationships required to execute the optimal placement strategy.

Whilst the marketplace continues to pose challenges, it now also presents opportunities which have not always been available to customers in recent renewal cycles. Whether the market has truly reached a peak in terms of rates, however, remains to be seen.



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Construction: Hardening market dynamic continues

Introduction

The hardening market dynamic continues and the reductions in insurance premiums and broadening coverage experienced over the previous two decades has now solidified into a hard market, with coverage restrictions and increased rates as insurers seek to manage their portfolio exposures. However, there is light at the end of the tunnel, with signs of stabilisation now present.

Power construction projects are exposed to a variety of risks, be they geographical, economic, political, sociological, contractual or technical. As the market dynamic continues on its current trend, insurance buyers are faced with increased challenges, changing the risk transfer landscape. Not only are our industry clients facing increased scrutiny from insurers undertaking risk evaluation, but they are also having to adapt to the development of both new and old risks.

Rating levels

Figure 1 below shows average Construction rating increases for Power business imposed by the market since 2019, representing an uplift of approximately 180% in 5 years:

Contract negotiation

We are finding that project parties, including lenders and state bodies, are not yet fully aligned on the availability of coverage specifics leading to complications during contractual negotiation. As the shift in market position has seen restrictions in coverage, it is imperative that

Figure 1: Average Construction market Power business rating increases, 2019-23

Year	Average Power business rating increase
2019	+15%
2020	+10%
2021	+15%
2022	+15%
2023	+10%

Source: WTW

parties gauge the availability of specific coverage prior to making contractual commitments to procure insurances.

Global inflation impacts felt industry-wide

Within the past 18 months, the global economy has been homogeneously hit by varying degrees of inflation, affecting costs of materials, equipment, and labour. Prices have leapt from a steady annual 15% increase to approximately 110% and more for Power development projects using specialised parts, materials and equipment.



The inflationary impact feeds down into construction projects, with development costs increasing proportionally; developments which are underway also have an increased exposure which project parties may not be aware of. These impacts are often not seen or felt by project owners who have contracted on a lump-sum basis with contractors required to construct the project at a fixed cost. However, given that the contractor maintains insured status, they are able to claim more for damage to property that would have initially been declared, increasing the financial risk to insurers.

For example: a project is contracted on a lump-sum/ fixed costs basis has a gas turbine value declared of US\$30 million out of a total project CAPEX of US\$100 million at the time of project inception. The project owner is protected from price increases by contractual measures; however, if after two years there is a total loss to the turbine requiring full replacement, it is likely that the replacement cost will be more than US\$30 million. So long as the amount of each individual loss does not exceed the total sum insured of US\$100 million, insurers will be required to provide indemnity to replace the turbine at its new cost — higher than initially envisaged.

If project owners/contractors are unable to display measures taken to prevent increased costs, insurers are applying a premium loading to ensure that they are remunerated by this potential exposure.

Most construction insurance policies should contain an automatic provision for growth in sums insured by up to 115% over the lifecycle of the project. Historically, projects would require the utilisation of minor portions of this; however given pricing volatility, this additional provision is now being used more often than not. Insurers are therefore reviewing the amount of capacity which they are willing to deploy on certain risks where project teams cannot show controls are in place to manage inflationary impacts on costs.

Supply chain issues affecting coverage and pricing

Power projects have been some of the worst-affected project types for supply chain issues, due to the complexity of the equipment and its lead times; indeed, it is estimated that 80%¹ of companies have experienced considerable issues in the last 12 months. Following the global slowdown during the COVID-19 pandemic, significantly increased levels of construction activity have begun, with projects which were deferred now commencing alongside projects which were initially in the planning phase. This has put additional pressure on the availability of materials, components and skilled labour as well as creating a bottleneck in the freight industry. The resultant effects cannot just be attributed to COVID-19; for example, the series of earthquakes hitting Turkey in early 2023 has had a dire effect on the steel export industry, with approximately a third of Turkish steel mills halting production.

While traditional insurance products can cover some risks, proactive risk management is a vital tool to identifying problems before they occur and can help alleviate cost pressures on insurance policies. The construction industry has specific risks in their supply chain; most recently, this includes the ever-increasing cost and availability of raw materials. Much of supply of raw material in the construction industry operates on a 'just in time' model, especially regarding Power development operations where there are restraints in terms of secure space on site, meaning that even the smallest issues can have a big impact on the overall project schedule. Power operations are also often carried out in remote geographical locations, requiring complex logistical challenges to be overcome. Lead times for items damaged in transit to the project can therefore be drastically longer than before, due to manufacturer and transit company order books.

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Most construction insurance policies should contain an automatic provision for growth in sums insured by up to 115% over the lifecycle of the project.

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¹ <https://www.swissre.com/press-release/Insured-losses-from-natural-catastrophes-break-through-USD-100-billion-threshold-again-in-2022/e74c6ce7-8914-45d6-a384-df71dbeb87b8#:~:text=Insured%20losses%20from%20natural%20catastrophes%20break%20through%20USD,mai>

These supply chain complexities are having consequential effects on coverage and pricing. Insurers are looking to impose value limitations on off-site storage locations, with strict conditions regarding the protection of property stored. In addition, because of prolonged lead times, insurers are increasing time excesses for Delay in Start-up insurance, requiring increased risk retention for insured parties which can lead to complications with project financiers.

Focus on stricter coverage conditions

With all market cycles, changes in terms are a gradual process. To address adverse claims experience, insurers use three main levers: premiums, deductible levels and coverage. Once the market began to harden, premiums rates rose significantly, deductibles increased (depending upon type of risk) and coverage was restricted — especially with regard to those which insurers felt left them more vulnerable in the event of a claim.

Insurers continue to impose stricter coverage conditions, more aligned with those seen as “standard” for many years. Each risk is being considered on its own merits and pricing is influenced by project type and geography, with political risk perhaps a more recent influencing emerging factor. Changes in regulation and legislation, including trade wars and sanctions, gave rise to concern arising from the period that large construction projects can take, sometimes being five to ten years to complete and involving contractors and suppliers from around the world, making them more vulnerable to trade disputes and sanctions.

Conclusion: insurers’ focus is not just on Nat Cat losses

It is estimated that Nat Cat losses breached the 10 year average by approximately 40% in 2022² and this is having significant impacts on the availability of insurance cover for operational mines in exposed regions. This impact is similarly felt within the construction phase of these projects, with insured property arguably more exposed. Specific increased deductibles and inner limits for Wildfire are becoming commonplace in Australia, as are they for Cyclone and Flood, pushing risk retention

back to the insured parties in comparison to prior years which had seen limitations imposed solely on underground and wet works.

In addition to Nat Cat exposures, insurers have also turned their focus to non-natural exposures. Defective design, workmanship, plan and materials have been high on the agenda for insurers for many years; however, there is now an emphasis on taking a far stricter approach. The technical nature of Power projects, the complexity of the equipment and machinery installed and the consequential losses of these going wrong have all led to a change in stance. In 2018, it would not have been uncommon to see insurers providing the widest form of cover (LEG3 or DE5), covering not only the consequential damage arising out defects, but also the costs of access and replacement of defective property (excluding any improvement costs). In today’s market, it is rare to see this level of cover afforded and insurers are prone to limiting coverage to damage arising as a consequence of defective property (excluding accessing and replacing the defective property, as per LEG 2).



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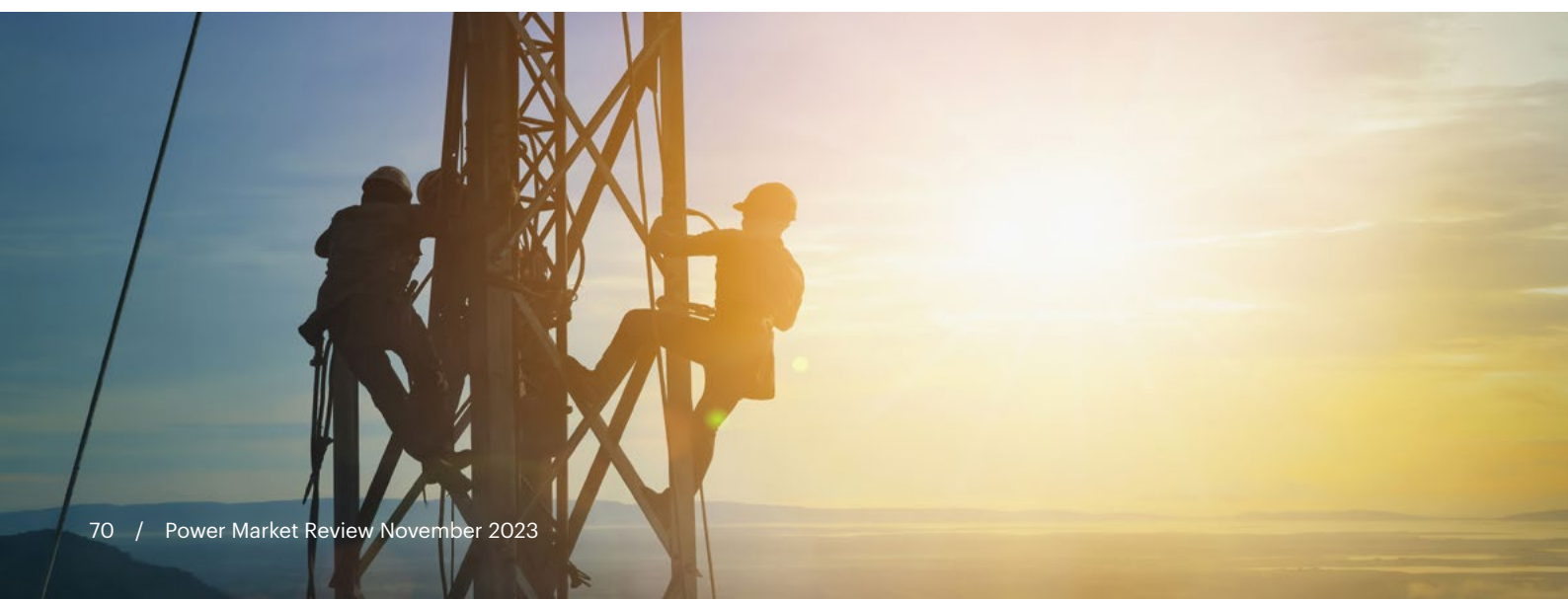
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² Institute for Supply Management





Postcards from around the world: Global insurance market round-up

China

Domestic business

Except for Construction cover, including Delay in Start-Up insurance, capacity for domestic operational Power business remains sufficient for customer requirements. For large-scale state-owned power groups, terms and conditions for renewal are still generally maintained at a competitive level. For Independent Power Plants or some smaller-sized power companies, insurers tend to be focused on profit rather than on premium volume.

Although Business Interruption is still not a common cover for Operational Power Generation business in China, we can increasingly see a tendency for State-Owned Power Groups to pay more attention to risk management and thereby seeking different ways to transfer their risk.

In mid-June 2023, the Chinese government officially stated that the installed capacity of non-fossil fuel energy power generation now accounts for 50.9% of the country's total capacity. Following these encouraging government policies, insurers are also willing to adjust their underwriting guidelines for encouraging non-fossil power projects, except for some that have bad loss records or large Combine Cycle Power Plants which are still excluded by reinsurance treaties.

Overseas business

After a significant capacity reduction during 2022, the Chinese market capacity for overseas power business continues to reduce in 2023.

The reinsurance treaties of most Chinese insurers apply a more restrictive definition of "Chinese interest" than in 2022. For example, for the operational phase of a project, the Chinese ownership needs now to be at least 50%, whereas this requirement was only 40% in 2022.

For Chinese interest overseas business, Chinese insurers are also very cautious, especially for projects in countries with high Nat Cat risk or with high Business Interruption sums insured. Underwriters are also very cautious in providing a high SRCC policy limit.

For non-Chinese interest overseas business, the capacity for quote share/primary programs has almost reduced to zero. Only CPIC is still reviewing these programs but they are proving to be very picky regarding terms and conditions and they can only offer a small line size as a following market. Most Chinese reinsurers that have an international rating would only consider these programs on an excess basis.

Coal-fired power

Although the installed capacity of non-fossil energy power generation in China is over 50% of the total, coal-fired power projects still provide a large premium pool with an overall favourable loss record. Unlike the international market, in China the premium rate for coal fired power plants remains stable and has even slightly reduced for those plants that have a good loss record.

Hydropower

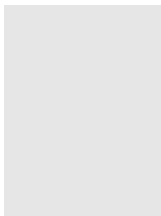
Due to some large losses in the Hydropower sector in 2022, underwriters are now more cautious in continuing to provide competitive terms for this class of business, especially for those projects located in a high-risk Nat Cat country or region.

The loss record for small hydropower projects has been poor for the last few years, so some insurers are now declining to accept small Hydropower risks. But for the small hydro with a good loss record and in a low-risk Nat Cat region, some underwriters still have the capability to review the premium scales and are willing to quote competitive terms.

Combined Cycle Gas Turbine Power Plants (CCPP)

Due to a lack of reinsurance treaty support, Chinese market capacity for large CCPP projects mainly relies on the international market; as a result, premium rates and deductibles are closer to international levels. Following the technical development and some big CCPP loss in 2021 and 2022 in China and abroad, underwriters are more cautious in participating on large CCPP programs; indeed they will always require more information about the technology and operational information.

However, for small CCPP power units (less than 150MW) with mature technical gas turbines, the Chinese market can provide more competitive terms, including lower rates and deductibles. Even for these small CCPP projects which require DSU cover, Chinese capacity can offer 100% of what is required without international reinsurance support.



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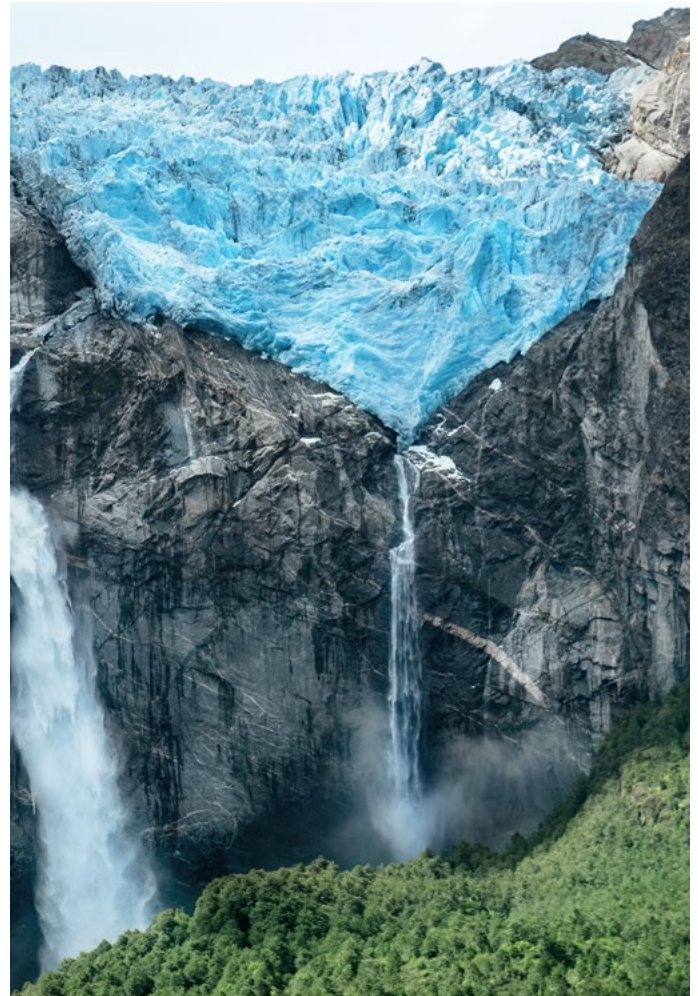
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Latin America

Introduction

After a couple of years of hardening market conditions, in which comprehensive submissions were key for customers to be able to negotiate the best terms and conditions, these conditions have now become the new normal. Underwriters expect to receive these comprehensive submissions for all power risks; these will include not only an underwriting report with updated recommendations, but also an updated corporate presentation with capex details and ESG initiatives as well as a detailed split of values with updated valuations for assets and explanations of Business Interruption value calculations.

Most Latin American economies are in a difficult position at present due to a common political trend affecting most countries; showing power company strength in financial indices within their country's economic context therefore differentiates them from the general impression of instability. Demonstrating plans for maintenance and new investments will attract insurance market interest, as every insurer wants to write what they consider "good risks". ESG is also crucial in this aspect of being perceived as a good risk; in particular, the "E" aspect plays a major role in how insurers underwrite their Power portfolio, while coal companies continue to have to prove themselves still further. There are restrictions in some markets designed to avoid new coal business;



furthermore, as advised in previous Reviews others can no longer not write any coal business at all. So for those that can still underwrite coal generation it is imperative that these risks are presented as part of the bigger program, together with a clear roadmap towards the company's energy transition.

Insurers continue to scrutinize slips and wordings, requiring an explanation as to why extensions need to be provided. Global inflation has put an increased focus on asset values; insurers want to know when the last valuation was performed and who carried it out. Asset valuations are a critical issue and an absolute priority for power companies.

Regarding the BI aspect, most power companies have cycles in the production of their different plants. Revenues and business plans are mostly carried out on an annual basis starting on January 1 but policy inception dates do not often match the start of the calendar year. There is a need to be clear on how the generation cycle matches the insurance policy period and the indemnity period in case of a loss. It is crucial that there is a clear understanding regarding the revenue flow to avoid problems at the moment of the loss. Reviewing the BI volatility clause and the need of updating the BI values therefore remains a crucial part of the renewal process to ensure coverage is suitable and reasonable for the customer's operations and current risk profile.

In general, local market conditions have been tightening, following the reinsurance market trend, especially for Power risks featuring conventional technology (e.g. hydro, diesel engines, coal and combined cycles).

For all technologies it is extremely important to have an analysis of the key technical components. Risk inspections, engineering reports and recommendations play a fundamental role for all generation facilities, whether they are engines, hydro, coal, combined cycle/ renewable power plants or transmission/ distribution facilities.

In line with the above, proper maintenance reports, including vibrations, thermographies, borescopies, oil analysis (dielectric and lubrication) and details of critical spare parts need to be provided for customers and their brokers to be able to negotiate applicable terms and conditions. In the case of equipment that is more than 10 years old, it is very important to detail the major maintenance services (overhaul) received and projected, as we recommend that these be in line with the indications of the respective manufacturer. The detail of critical spare parts for the main equipment, the plan for their replacement and the asset valuation criteria are also relevant information for the insurance market, as is predictive and preventive maintenance as defined by the manufacturer; this because insurers are paying special attention to the revaluation of assets and the application of demerit tables.

On the other hand, issues such as the Energy Transition, ESG and the company's risk matrix are an integral and fundamental part of the renewal process. In general, there is a significant re/insurance market trend of an increasing awareness of the energy transition; insurers have to fulfil their own ESG policies, so customer ESG ratings are becoming a fundamental part of their risk management strategy — and consequently a hot topic when presenting to insurers.

Capacity and access to regional markets

Capacity in the Latin American markets remains essentially unchanged. Global reinsurers underwriting Power risks in Latin America continue to maintain underwriting centers throughout the region, the main ones being Miami, Bogotá and Brazil.

There are local insurance companies that write small Power risks within their treaties but the key players remain the global insurers from their offices in the region. Miami continues to be a hub, not only because

of the international insurer presence but also through Lloyd's deploying capacity through MGAs. As the Latin American giant, the Brazilian market continues to be able to underwrite most business locally, ceding limited shares to the facultative market. In today's market, it is even more important to carefully choose access points to have direct interaction with the leading underwriters of the line of business in question.

Capacity has remained available for Property risks, although insurers are extremely cautious when deciding where to deploy it. Timely preparation of a renewal, combined with excellent quality technical and underwriting information, are therefore keys to success.

Market trends

In general, local market conditions have been tightening, following the reinsurance market trend, especially for Power risks featuring conventional technology (e.g. hydro, diesel engines, coal and combined cycles). In respect of coverage, Contingent Business Interruption coverage requests continue to be heavily scrutinized and customers are therefore receiving restricted limits and higher deductibles. Furthermore there is pressure from insurers to maintain reinsurers standard market wordings, while Cyber exclusions are increasingly clearer and more restrictive.

With the decarbonization process, the energy transition and the Net Zero goals, reinsurers that still underwrite coal risks are reducing their shares in the renewals of coal-fired power plant programs, making the program design for these technologies increasingly complex.

The appetite for pure Transmission & Distribution (T&D) business is very limited, especially where placements are reliant on local market capacities that require a higher proportion of reinsurance. It should be noted that what is related to transmission lines is generally either completely excluded or a sub-limit is imposed to provide at least some coverage, especially to catastrophic risk. Historically there has been a challenge to cover T&D lines away from the 1000mts or 3000 feet outside from the insureds premises at competitive prices; now with renewable projects becoming operational, Latin American countries have identified the need to expanding their network. How will the insurance market support the industry, which needs more T&D lines to deliver the new generated energy from clean sources?

Rating levels

During June 2023, many insurers in the region carried out their treaty renewal processes, which will be valid throughout 2024. The trend we observed at the beginning of 2023 continues, with prices that continue to increase together with more restrictive terms and conditions in both coverage and deductibles.

For the Power market specifically, in countries not exposed to severe Nat Cat risk the range of rate increases varies from 0% to +10% on average, while

in countries not exposed to severe Nat Cat risk the variations are between +5% to +15%, depending on the loss record, size of program and quality of the risk.

These increases have been driven by a combination of factors, including inflation, a reassessment of exposed risk and capacity shortages in some countries.

Conclusion: market discipline continues

Latin American markets continue to show discipline in the underwriting process of their power book. As summary, we see insurers:

- Controlling the capacity deployed — choosing where and when to maximize their capacity
- Scrutiny on information for both Property Damage and Business Interruption values
- Machinery breakage coverage continues to be a key concern, while dams remain a concern for the Latin American market
- As part of their own Net Zero initiatives, insurers are focusing on the ESG actions that their customers are considering
- The tendency for insurers to decrease line sizes and focus on Nat Cat limits continues
- Insurers are looking much more closely at policy conditions, including deductibles, sub-limits and additional coverage, which have been brought about by the slippage of time in competitive market cycles together with rate increases and capacity deployment.
- Renewals for "good" risks are expected to have up to single-digit rate increases; however, portfolios with claims or technical complications are still expected to suffer rate adjustments



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The Middle East: an ever changing risk landscape

Attracting investment

The Middle East continues to attract interest from insurers and brokers alike, driven by significant investment into the region both domestic and from overseas. Saudi Arabia alone has over US\$300 billion of new projects already announced to begin operating within the next three years, together with US\$130 billion of energy and utility industry investment. Despite being an energy hub, the Middle East region has extremely ambitious ESG goals; each country in the Gulf Cooperation Council (GCC) is receiving a huge amount of investment from overseas, with Japan being a key stakeholder for more efficient power generation and renewable energy.

A wider scope of business

The Dubai hub has historically focused on regional Middle East-domiciled risks but it is also a key market for Indian, Pakistani and more recently Israeli business, where natural catastrophes are on the rise and local capacity has for the most part been on the decline, meaning an increasing amount of business is making its way into the Reinsurance market place. With Nat Cat aggregate capacity being scarce and increasing in price, this has given more diversity to underwriting portfolios, has helped to keep the market hard and as such has been a factor in their profitability.

As a result, regional/indigenous capacity is on the increase, with the continued introduction of overseas capital via MGA vehicles; meanwhile the rumour mill is awash with international (re)insurers returning, as underwriting results for most have been positive, despite many headwinds.

Focus on revaluation

Regional leading insurers are now seeing the fruits of their labour after digging in their heels in previous years, with a tightening of underwriting guidelines. Their focus is on revaluation, given challenges arising from cost of raw materials, unproven technology advances, shortage of technical expertise during the travel restrictions of the pandemic and, of course, supply chain disruption. Furthermore, this is a region where the power sector is maturing, as many project finance facilities are coming to an end of their PPA and design life. We have seen a number of complex claims during the last few years; however, with rates that bit closer to technical, insurers have still been able to post positive results.

New investment

The utility sector in the United Arab Emirates continues to be extremely dynamic, with the recent government plan for Clean Aluminium to utilise much of the base load nuclear capacity. This paves the way for new investment, in the form of high efficiency CCGT technology & life extension work on some of the aging asset base. This will bring about more challenges given the predicted changes of plant operating regimes and will result in an increased demand for peaking capacity — all of which will surely have an impact on underwriting methodologies.

Better times for customers

All of this is excellent news for brokers and customers alike. As new capacity is introduced to the market, the basic rules of economics dictate that extra competition is able to be generated. So far in 2023, brokers have been able to negotiate small single-digit rate reductions for “vanilla” renewals of clean and well-risk managed business. However, for customers whose broker can offer a global marketing philosophy, larger rate reductions can generally be negotiated once placements are verticalized, enabling brokers to look further afield to challenge incumbent leaders.



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North America

Market developments

The US Conventional Power market continues to play a critical role in meeting and securing US power industry demands. Increased activity around extreme weather continues to drive pressure across all aspects of power generation, from generating assets to end users. In addition to natural hazards, the industry is dealing with workforce/supply chain concerns, and continued liability “nuclear” verdicts. Successfully navigating these obstacles will position the thermal power industry for continued success.

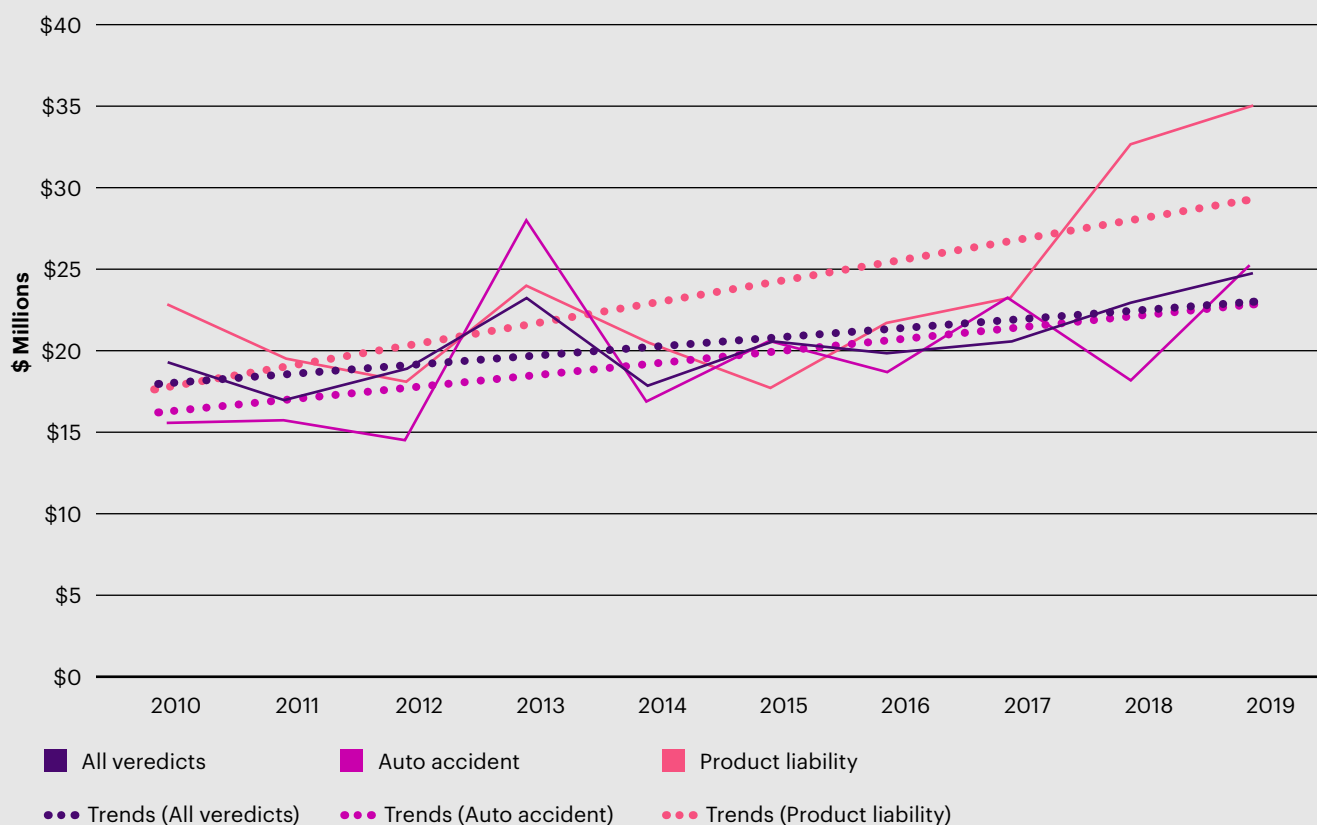
Natural hazards

Natural hazards continue to plague the utility industry as devastating wildfires, heatwaves and freeze events impact both human life and property. The recent Maui wildfires brought to the forefront reminders of the extreme hazards we now continually face and live with. Average temperatures and windspeeds continue to increase, adding pressure to power demands, infrastructure and human life. This was no more apparent than the recent events in Hawaii where a strong pressure gradient funneled winds in excess of 60-80 mph through the west side of Maui. These winds, coupled with dry condition ultimately fueled the devastating fires across Lahaina, HI.

New workforce/supply chain issues

The post-pandemic economic fallout continues to impact the economy and the power sector is not immune to these global issues. Another often forgotten topic is today’s aging workforce, which is impacting both the power industry and insurance industry alike. Within the power industry, we’re seeing increased mistakes by newer, inexperienced operators; these operators lack

Figure 1: Median nuclear verdict & trend line, 2020-2019



Source: <https://www.propertycasualty360.com/2023/07/11/nuclear-verdicts-raise-alarm-preventing-legal-system-abuse/?slreturn=20230724223838>

the decades of knowledge of those leaving the industry at an alarming rate. The “boomer” generation and Generation X are retiring at an accelerated rate since the onset of the pandemic; while the power industry continues address this gap, the insurance industry is also dealing with a knowledge gap; both WTW and insurers are finding an opportunity to both develop talent and bridge the gap.

Another interesting development from the pandemic is the increased cost of construction and the financial feasibility of offshore wind (OSW) projects. Many of these OSW projects are expected to replace carbon intense thermal power plants; however while developers had expected the OSW project cost trend to continue to decline over time, due to a significant cost increases resulting from inflation the New York Power authority has scrapped plans to build a US\$700 million offshore wind farm, while New England developers have backed out of Power Purchase Agreements that did not reflect these increased costs that mitigate some of the tax incentives in this space. These inflationary pressures and lack of financial viability will likely lead to extending

the life of many aging steam turbines, gas turbines, and generators. Extending the life of these units, coupled with experienced plant operators retiring, could maintain current pricing and deductible pressures for the foreseeable future.

Liability verdicts

Third party liability verdicts continue to rise. According to PropertyCasualty360, in 2019 there was a 300% rise in nuclear verdicts, compared to the annual average from 2001 to 2010. The ILR report found that the median verdict grew from \$19.3 million in 2010 to \$24.6 million in 2019 — a 27.5% increase¹.

Wildfires continue to drive these nuclear verdicts, with PacifiCorp being the latest utility held liable for a jury. In this instance, a jury in Oregon found the electric utility liable for punitive damages stemming from Oregon wildfires in 2020. The increased third party awards will continue higher and keep pressure of clients and insurers alike.

¹ <https://www.propertycasualty360.com/2023/07/11/nuclear-verdicts-raise-alarm-preventing-legal-system-abuse/?slreturn=20230724223838>

² <https://www.microsoft.com/en-us/security/business/microsoft-digital-defense-report-2022-nation-state-attacks>

2024 outlook

The outlook for 2024 continues to improve; recent headwinds driven by then pandemic appear to be behind us, while others are still working through the economy. Property pressures are easing as ESG initiatives and inflationary demands are turning utility companies to existing power generation technologies. Property insurance market rate forecasts continue to decelerate from the power generation highs of 2021 and 2022, and we continue to anticipate mid-single digit rate increases in the months ahead. However, non-coal generating assets that can differentiate themselves from their peers will see close to zero rate change.

However, the Casualty market continues to see loss cost trends increase. Auto loss cost trends are increasing nearly 7-10% annually, with no slowdown in sight. General Liability loss costs trends appear adequately priced, but insurers are expected to increase their surplus annually, resulting in an average of 2%-5% annual rate increases. Umbrella and Excess trends are a bit more unfavorable and we continue to believe that these rate pressures will be maintained into 2024. However, the Worker Compensation line of coverage is showing signs of insurer profitability and filed rates are now trending towards the negative.



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Non-Coal programs

Despite the expensive reinsurance treaty renewals and significant cumulative loss activity in the power sector during 2022, we have seen only modest increases in rates compared to the previous 12 months for the non-coal power sector. In part this is because of an abundance of capacity, due to a widely recognised shift in appetite from coal to non-coal power due to the phasing out of underwriting existing coal risks. We have also seen the appearance of new capacity, which has helped to boost greater competition in the market. Even power clients that have substantial exposure to natural catastrophe perils have seen only modest increases in rates. Power clients with renewals during the first half of 2023 enjoyed a pleasant surprise of being offered lower rate increases than those experienced in previous years (5% on average), and it's worth mentioning that some good quality programs with clean loss records and no Nat Cat exposures have actually been enjoying flat renewals.

In addition, renewal credits have been brought back to the customer's table again. Prompt Payment Discounts or No Claims Bonuses disappeared quickly in 2021 and 2022 during the hardening market situation; however, these discounts are now being offered once more and customers are starting to enjoy the benefits of these in their renewals. Long term deals are also being considered for the next renewal policy period, which is an indication that rates are expected to flatten or even reduce.

Deductibles are being maintained and not increasing, but we do see more exclusions in relation to global geopolitical issues such as the Territories Exclusion and Extortion and Ransomware Event Exclusion.

Although there are signs of competition in the market, this does not mean that insurers are letting their underwriting positions slide, as they continue to show plenty of discipline in their underwriting of power business. Customers able to supply recent and/or high-quality information will find that this is still a major factor in a successful placement outcome. While the appearance of the Omicron variant of COVID-19 meant that engineering reviews continued to be conducted virtually until mid-2022, we are now seeing physical surveys fully returning. We are actively working with customers to help them prepare for these inspections, as this could deliver tangible benefits in placing their business.

Coal Programs

In contrast, premium rate increases for coal power business have steadily accelerated upward throughout the year in response to effects of limited coal capacity globally, regardless of the risk quality and loss history. In 2023, stand-alone coal placements are now experiencing extreme challenges, with very little room for negotiation as terms are generally fully dictated by

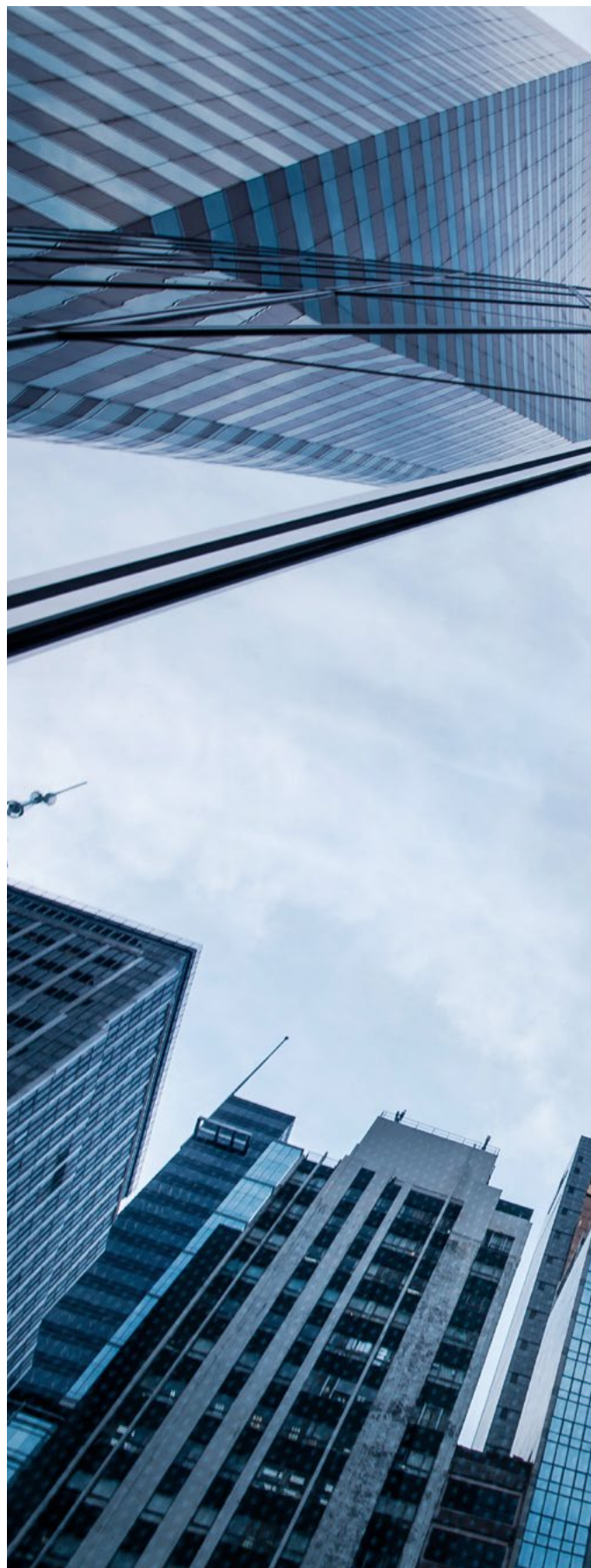
insurers. As a result, on top of the low policy limit and high deductibles, policy sub-limits are also being slashed by half compared to last year. Estimated Maximum Loss (EML) is being widely used to determine the policy limit while deductibles are benchmarked with the market trend.

The market share of insurers with coal exclusions has reached 62% in the reinsurance market and 39% in the primary insurance markets²; further rate increases and deteriorations in terms are expected to persist. In Asia, generally many have chosen not to put any new coal programs on their books, while at the same time gradually lapsing their coal programs from year to year to achieve Net Zero within their target date.

However, there are also insurers who are adopting a policy of accepting new business in cases where a customer can prove that it has a clear approach to working toward an orderly transition to renewable energy. One recent key example is AC Energy, which has successfully utilized the energy transition mechanism (ETM) by acquiring South Luzon Thermal Energy Corp. (SLTEC) and its thermal power plant for an early retirement in 2040, ensuring that it will result in less greenhouse gases than it would have if it was powered through its entire lifespan³. This project has given insurers a high degree of confidence in supporting the client's transition plan; as a result insurers whose ESG approaches are in line with AC Energy have been supporting SLTEC in its insurance renewal. We are watching this change in strategy and its implications for customers looking to future-proof their insurance arrangements very carefully, as ESG considerations continue to become more important.



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² <https://www.businessinsurance.com/article/20221021/NEWS06/912353233/62-of-reinsurers-have-coal-exit-policies,-38-have-oil-&-gas-exclusions>

³ <https://www.bworldonline.com/corporate/2021/10/01/400347/ac-energy-takes-full-control-over-batangas-power-plant/#:~:text=AC%20Energy%20Corp.%20now%20fully%20owns%20South%20Luzon,completed%20the%20acquisition%20of%20Axia%E2%80%99s%20stake%20on%20Thursday>



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