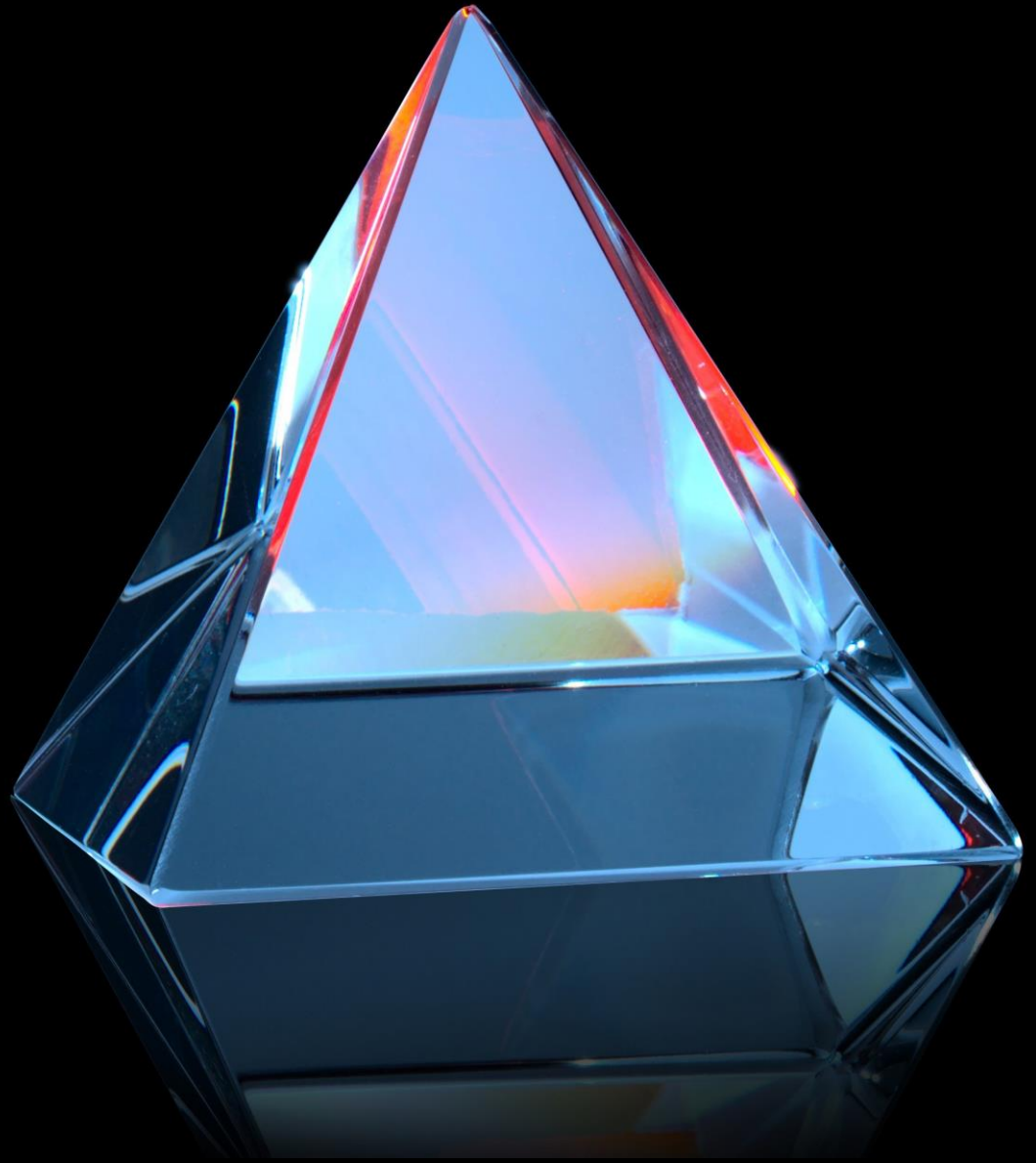


What's driving power bills?

February 2024

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HSBC Asset Management

At HSBC Asset Management (HSBC AM), the Listed Infrastructure Equity team has been closely following the impact of the energy transition on the asset class. An important component of the analysis is the consumer and affordability, which we believe requires a detailed understanding of the wide range of factors that may have contrasting impacts on power bills. However, in recent years the evolutionary impact of the energy transition on power bills has been overshadowed by the shocks from the volatility of commodity and macro-economic variables. Different components of the bill have been impacted in different ways, as determined by market structures and regulatory frameworks in respective jurisdictions.

In this report we discuss how the prices consumers pay for energy are exposed to macroeconomic variables and commodity prices via its different components and how recent developments have had a wide range of impacts on bills depending on the characteristics of the jurisdiction in question. The US presents a fascinating case study given its variety of geographies, natural resources, energy transition policies, market structures and regulatory frameworks across the country. Following a recent research trip to a number of these regions we review the current opportunities and challenges, focusing on a group of diverse regions. As a result of this analysis and considering the views from our previous report on the drivers of the energy transition we see an upwards and more volatile trajectory for customer bills. However, we acknowledge there are a wide range of outcomes and also discuss potential disruptors that could alter this trajectory.



What we focus on at HSBC Asset Management

By number and market capitalisation, utilities comprise the largest share of most definitions of the listed infrastructure equity asset class. However, the types of utilities that meet these definitions can vary from one investor to the next. At HSBC AM our investment philosophy is strictly focussed on a definition of the asset class that generates an appropriate risk-adjusted return for our investors.

Given the monopolistic characteristics of regional or national transmission and distribution networks these companies are almost always regulated and therefore universally accepted within the asset class. We consider owners of regulated generation, usually integrated utilities that also incorporate grids and therefore fully regulated, as only presenting slightly higher risk to grids. Companies owning contracted generation assets, generally, are slightly higher risk again, though still included in our definition of the investable universe. Renewables companies commonly fall within this category. Whilst merchant generation companies, where they still exist, are considered to incur significantly more risk due to the higher volatility of returns making them a less attractive investment opportunity.

The differentiation is important and leads to very different roles that each of the companies play in contributing to the customer's bill and particularly the evolution of bills going forward.

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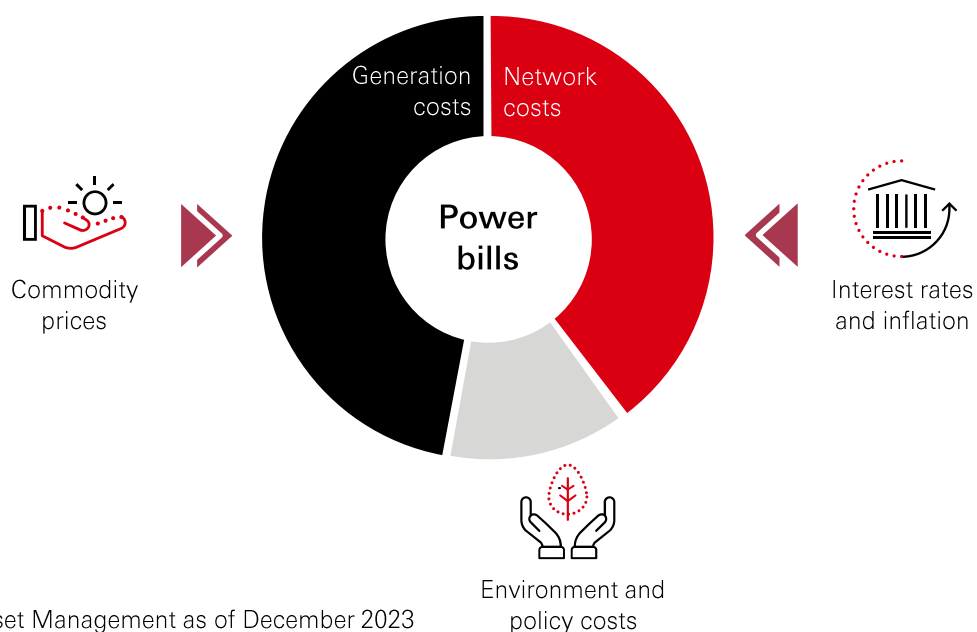
Source: HSBC Asset Management as January 2024 unless otherwise stated.

Energy as a service is, we believe, fundamental to economic development, capital intensive to maintain to consumers, and despite the in-roads from renewables, still largely reliant on commodities as an input. As such the cost of a service like electricity is closely inter-twined with commodity and capital markets as well as broader economic factors. The recovery of the changes in these costs in electricity or “power” bills in most markets around the world is determined by market structures and frameworks and relatively short-term in nature (within 1-2 years). Longer-term drivers include policies such as those related to decarbonisation and the energy transition have a decades long focus, though determine the extent of the macroeconomic and commodity exposures at a point in time.

In our report on the energy transition in 2022, *Infrastructure: Enabling the energy transition*, we discussed the drivers of the significant change across the economy, a transformation of the energy industry and considerable investments for many sectors of the listed infrastructure equity asset class. These investments are supporting change to the generation mix (eg. renewables replacing fossil fuel), responding to different drivers and patterns of demand (eg. Electric Vehicles and net metering), facilitating different flows of electricity (eg. distributed generation) and at the same time ensuring reliability and resiliency (eg. smart grids). Government policy is generally the catalyst for many of these investments, and indeed they are often incentivised/subsidised, whilst the benefits and impacts will be realised over the long-term. Therefore, whilst there is an initial cost of the investments the potential savings from increased renewables penetration, substituted fuel from EV’s, selling power back to the grid and energy efficiency measures will be realised over time.

The cost of utility investments needs to be balanced with reliability and in the case of the energy transition, decarbonisation policies as well. This has become known as the energy trilemma, specifically: affordability, security of supply and decarbonisation. It is a global dynamic that has become a focus of policymakers, regulators, consumer groups and utility companies, and well-established in determining everything from energy policy to electricity tariffs with their resultant impact on customer bills. As a result, the balance of these factors has determined the speed of the energy transition and nature of investments being undertaken. This feeds into power bills via the recovery of the cost of investments and the extent of the potential benefits being realised. For example, the replacement of fossil fuels with renewables and what that means for other macroeconomic and commodity exposures in the bill.

Figure 1: General components of a power bill and their driving factors



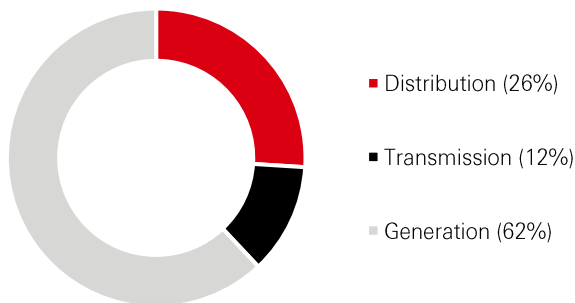
Source: HSBC Asset Management as of December 2023

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To better analyse these exposures, we need to understand the different components of the bill and the degree of exposure to these metrics. Whilst the structure of the electricity industry is often different from one country to the next, generally power bills are comprised of two main components: generation and networks costs. Generation costs are usually the larger component and the more volatile due to the historic dependence on commodities as a fuel for electricity. Despite the penetration of renewables in different markets this remains the case today due to the role (largely by gas) as the marginal price-setter. Network costs are usually more stable though the different components and the variables that determine them have also exhibited periods of elevated volatility. Due to the capital-intensive nature of these operations, not to mention regulatory frameworks in place, we believe interest rates and inflation are key determining factors.

Figure 2: Major components of select country electricity bills

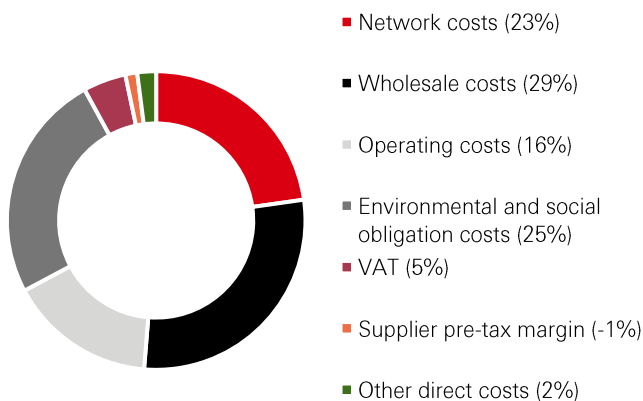
United States



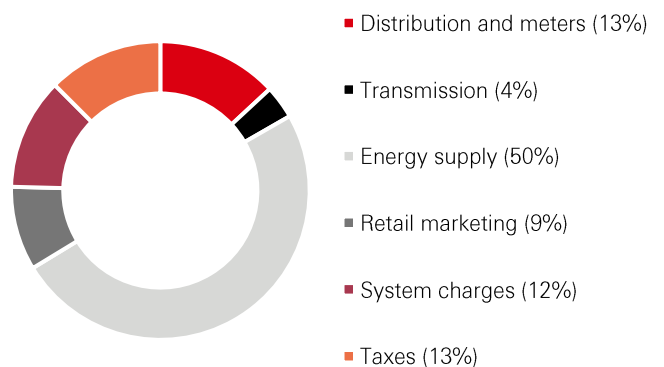
Australia



United Kingdom



Italy



Source: EIA, ACCC, OFGEM, ARERA, December 2023

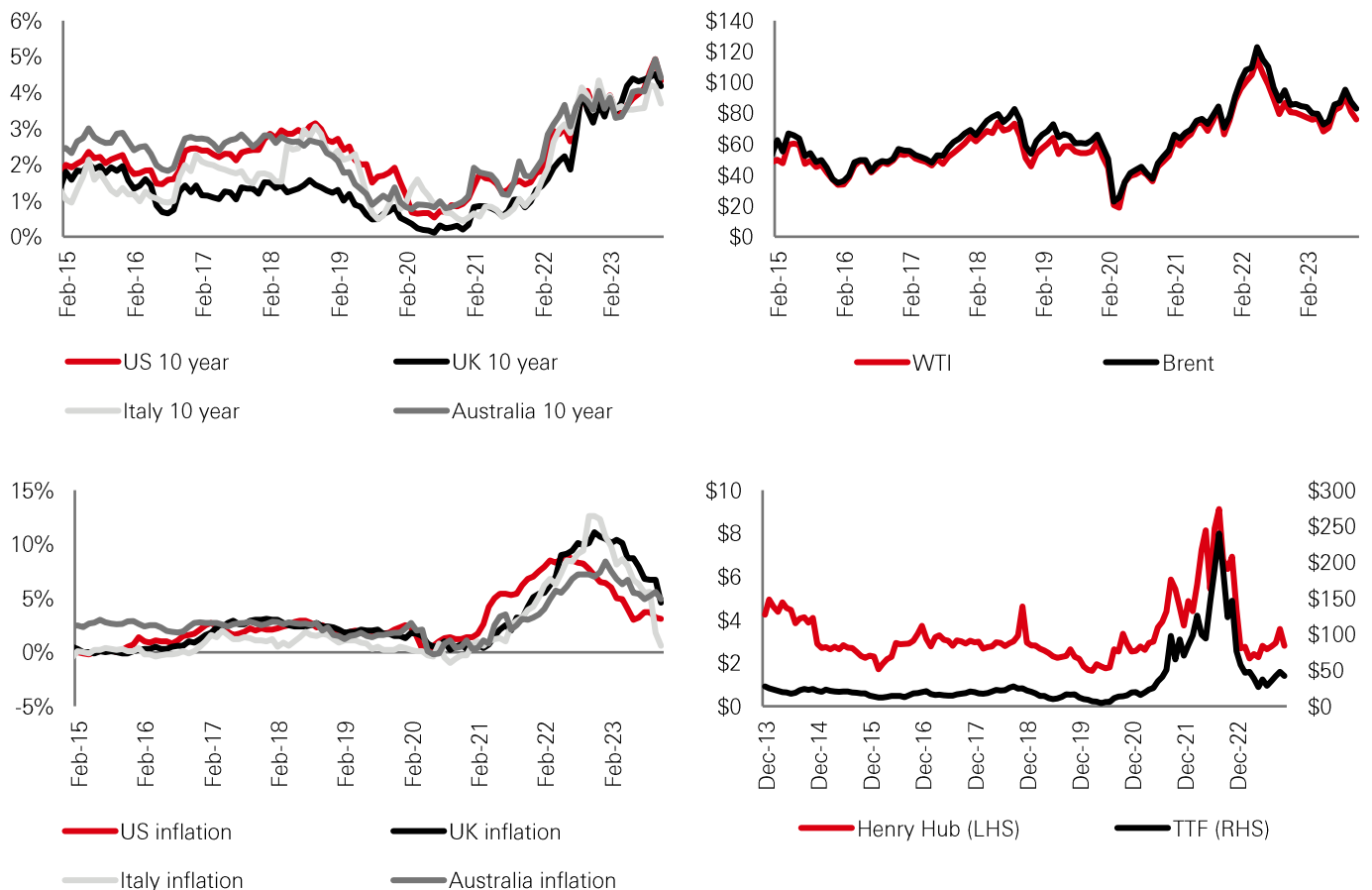
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The latter half of the 2010's was a period of relative stability in the macroeconomic environment and somewhat benign commodities prices providing utilities with favourable operating conditions. The combination of inflation and interest rates remained at manageable levels and increasing decarbonisation efforts, whether from legislation or other stakeholder actions, saw utility companies steadily increasing investments without untoward increases to the customer bill and affordability. The effects of the energy transition on the listed infrastructure equity asset class were gathering momentum.

This period of accommodative macroeconomic variables and commodity prices was brought to an end by the considerable volatility that has been witnessed in recent years.

The beginning of the pandemic and the effects of entering related lockdowns caused less disruption to the utilities operating paradigm than the combination of economies re-opening, unprepared supply chains and the Russian invasion of Ukraine. The associated shocks from commodities and related inflation, followed shortly afterwards by interest rates, would have severe impacts on customer bills. Those countries who were heavy importers of commodities and especially commodities from Russia that were now sanctioned were acutely impacted. Even the US with its large domestic resources incurred material price spikes as their local markets, particularly gas, had become increasingly exposed to global forces.

Figure 3: Recent evolution of macroeconomic indicators (interest rates and inflation) and energy commodities (oil and gas)



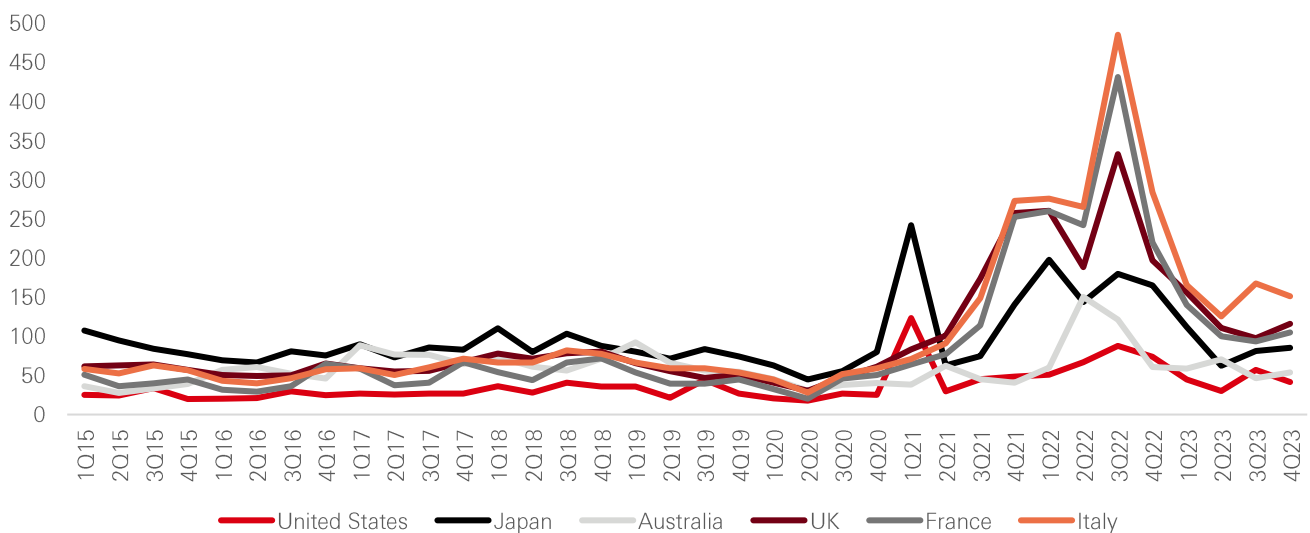
Source: Bloomberg, January 2023

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The contrasting developments drove different reactions from stakeholders in different jurisdictions across the world, subject to, or as a result of, the market or regulated frameworks in place.

Decarbonisation objectives and the ongoing evolution of the energy transition was also, we believe, a contributing factor. Utility companies were forced to balance those (often) competing forces and where possible deployed measures to help mitigate bill impacts and support more vulnerable customers. Meanwhile consumers, faced with higher bills, reduced consumption where they could and/or took actions to increasingly manage their consumption through energy efficiency or demand response programmes.

Figure 4: Average wholesale electricity prices in select countries (US\$/MWh)



Source: EIA, December 2023

The initial impact to customer bills therefore came via the generation component, as extreme increases in commodities – at multiples of their prior levels – impacted the fuel component and/or wholesale power prices. Governments undertook a range of measures to mitigate the impact on the consumer and refocus on alternative and renewable sources of electricity. These involved a combination of actions, both temporary to ease the pain on the consumer, and longer term via an acceleration of, and increase in, renewables targets and incentives. Despite the short-term measures the impact on bills was still significant, however. At least to date, the commodity price shock has proved to be somewhat temporary and wholesale power prices have subsided.

The flow-through of higher commodity prices to inflation had a lagged impact, both on metrics published (and therefore used for indexation purposes) and actually experienced by utilities. Therefore, as the generation component of the bill was falling the network component began to see more moderate increases. As we saw, interest rates followed suit and provided another upwards pressure on bill math. Inflation has since come down from its peak though remains at elevated levels and whilst monetary policy remains above targeted levels by central banks in most developed nations and interest rates remain elevated as compared to recent history. Therefore, higher costs continue to impact the network component of the bill.

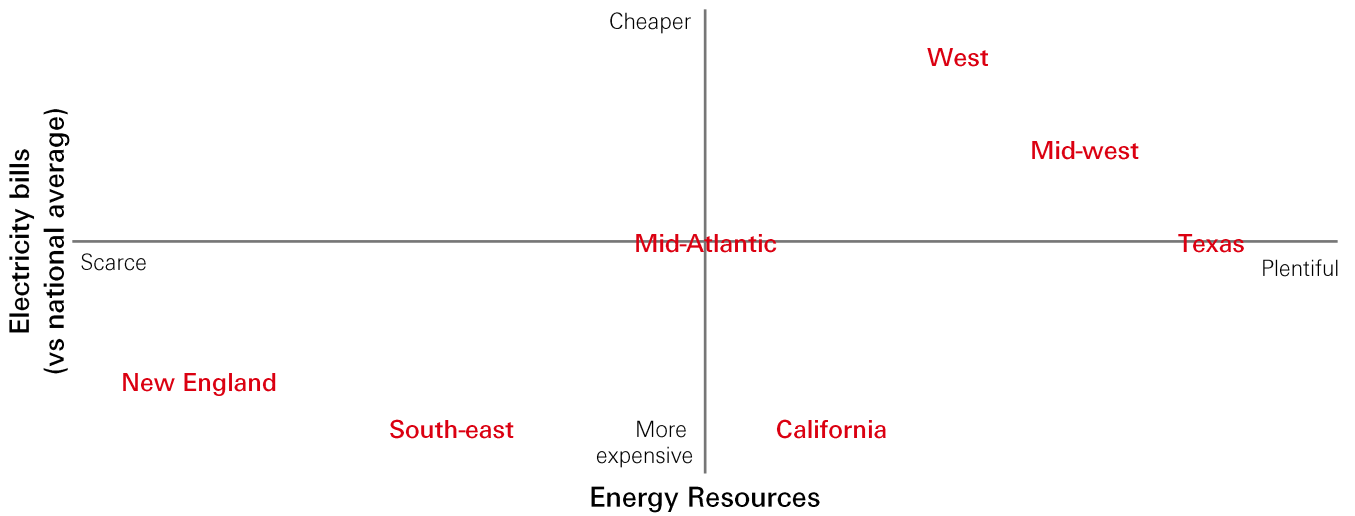
For utilities this presents a dilemma where without these factors subsiding and even reversing, continuing to pursue the same investments to support the energy transition previously envisaged would result in much higher bill increases. How the trajectory evolves from here with respect to macroeconomic factors, commodity prices, and investment spending will be critical for customer affordability, in our view.

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Source: HSBC Asset Management as of December 2023

It was in this environment that I recently travelled to the US to discuss the affordability challenges, growth opportunities and the third leg of the energy trilemma, energy security, with companies across the utility and energy industries. Given the scale and diversity of the US, it is never short of varying opportunities and challenges. This is true of the electric utilities industry and evident in the wide range of bills paid by consumers across the country. Local and regional characteristics have created the wide divergences, whilst, as we have covered, there is a wide range of factors driving the rate of change. We discussed these dynamics with companies from across the country and discuss below four regions with their own distinctive opportunities and challenges.

Figure 5: US regions by average electricity bills and energy resources



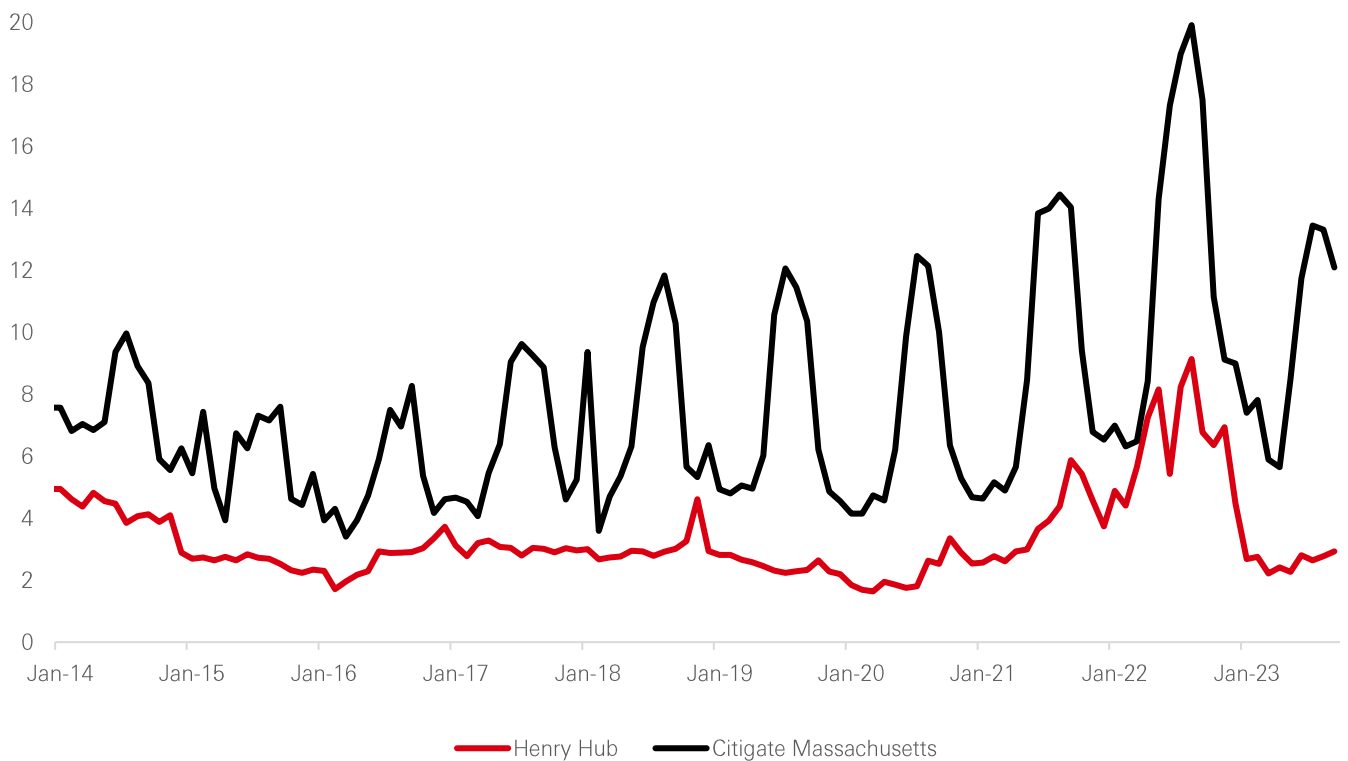
Source: HSBC Asset Management, January 2023

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New England: the states in the region are not blessed with an abundance of natural energy resources nor great connectivity to neighbouring regions who do possess plentiful, cheap, and green resources. This relatively densely populated region therefore has been faced with security of supply challenges with gas shortages and price spikes in the winter not uncommon. As a result, states in New England like Connecticut and Massachusetts have some of the highest bills in the country. Most of the states in the region also have challenging decarbonisation targets, in our opinion; with strong opposition to new onshore electric transmission, offshore wind was viewed as the potential solution. A number of utilities and other energy companies pursued these opportunities with expected returns based on long-term contracted prices. However, the build out of a new industry in the country during a period of rapidly increasing inflation, not to mention acute supply chain constraints, saw cost blow-outs. Some contracts were cancelled, others are seeking to renegotiate terms, either way the end result will be higher bills in the region at least until the offshore wind industry is more developed (or other technologies are delivered).

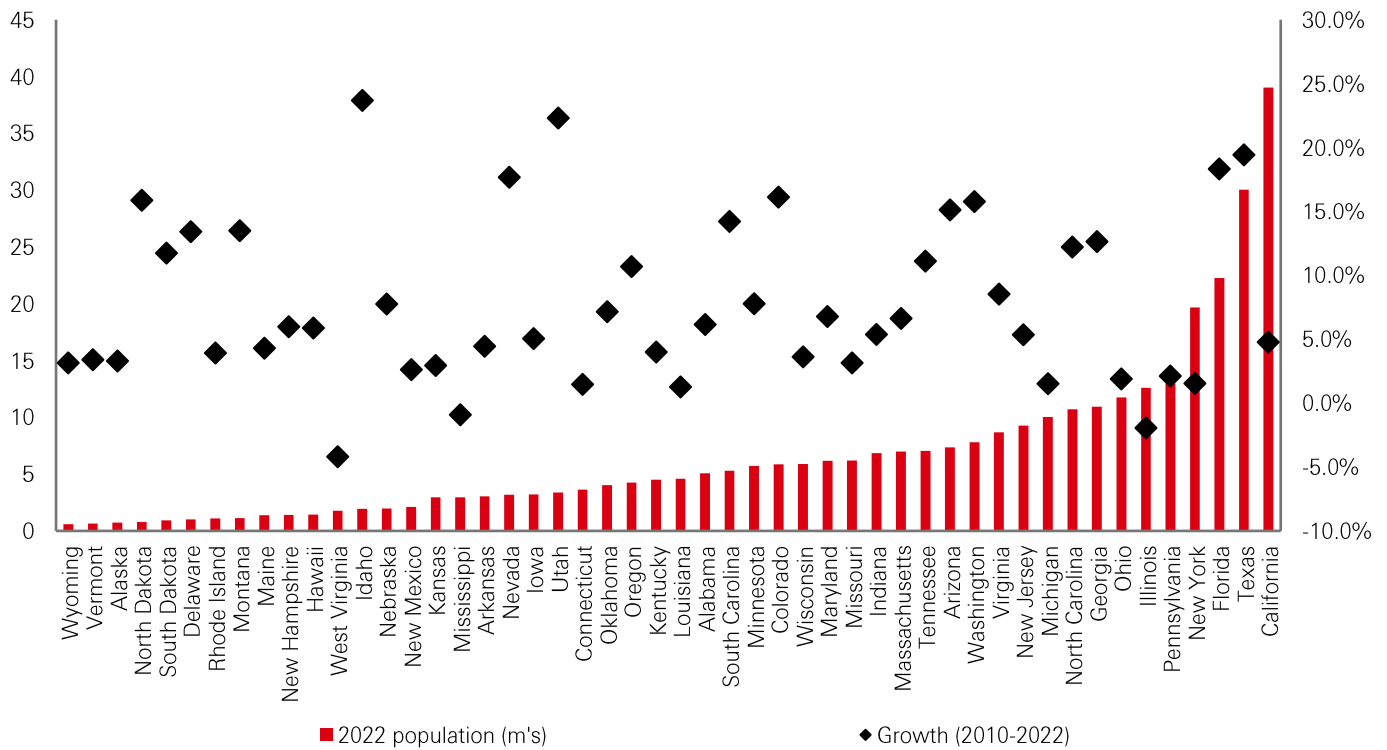
Figure 6: US and New England gas prices (\$/MBtu)



Source: Bloomberg, December 2023

Texas: in contrast to New England, Texas is rich in almost every energy resource as well as possessing an industry proficient at exploiting them. Power bills are relatively low and whilst investments are increasing to support new technologies from the energy transition the population and economy are also growing quickly. Whilst population growth and increased economic activity also create their own investment need, they also mean greater electricity demand over which to share the system costs and as such are usually a deflationary impact on bills. Security of supply has also been an issue in the state with increasingly volatile climate conditions, most notably with the blackouts caused by winter Storm Uri. As a result, the utilities in the state have also been required to step-up investments to improve resiliency. In summary, whilst the road hasn't always been a smooth one, in our opinion Texas appears to be benefitting from strong tailwinds to their energy transition.

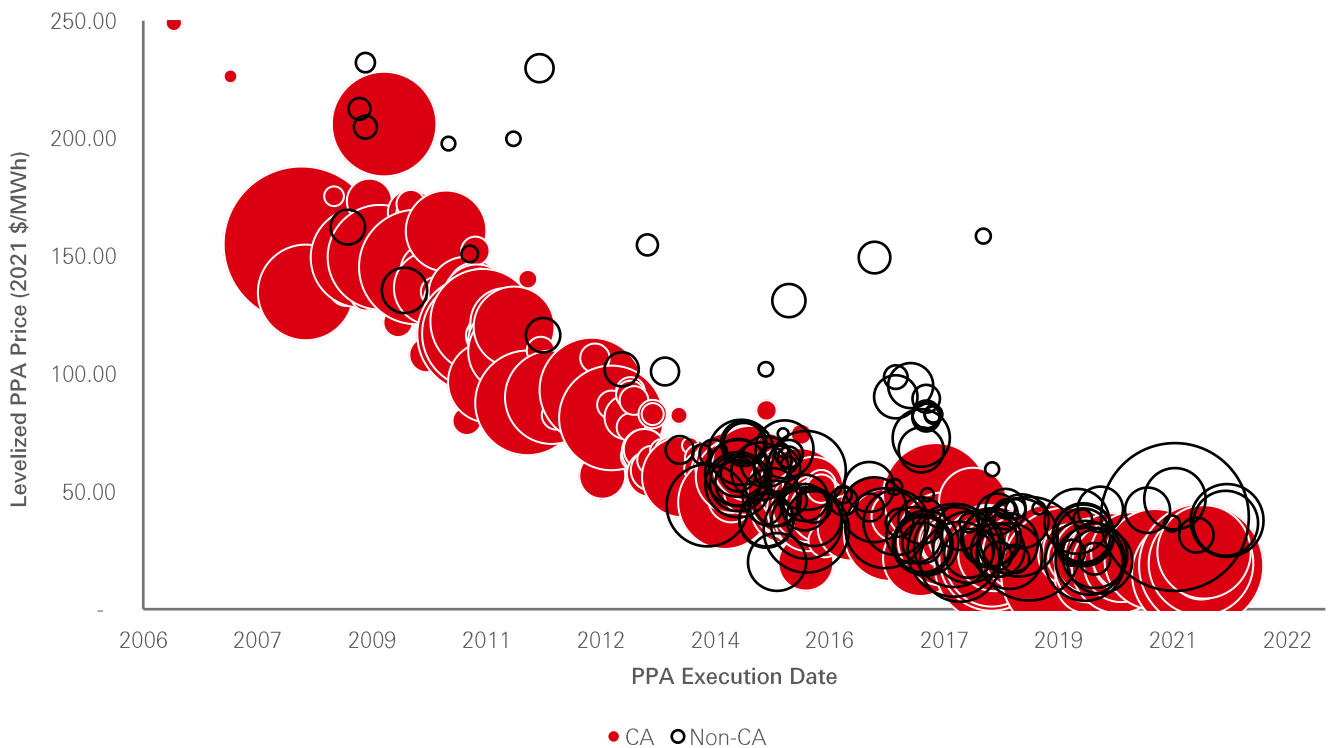
Figure 7: US population and recent growth rate by states



Source: US Census Bureau, July 2022

California: it is difficult to talk about the energy transition in the US without mentioning the efforts and aspirations of the state of California. The state has been a decarbonisation policy leader in the US that has brought with it additional costs for consumers as the state has aggressively pursued new technologies. However, investing at the scale needed to make a difference in an economy the size of California's eventually brought with it technological improvements and cost decreases. Now, as those initial renewables contracts start to roll-of, we believe consumers will benefit from replacement capacity at a fraction of those prices previously paid. In our view, this is a timely tailwind given the range of other investments required to remain on track for their net zero by 2045 objective as well as mitigating the increasing effects of climate change. The latter has particularly come to the fore in the state over the last decade with the prevalence of catastrophic wildfires and the utilities now spend billions of dollars a year on fire prevention that also need to be recovered in the bill. We believe electricity tariffs will continue to steadily increase in California, however, given the benefit of a relatively mild climate and therefore lower heating and cooling demand, bills are unlikely to reach the levels of more challenged states.

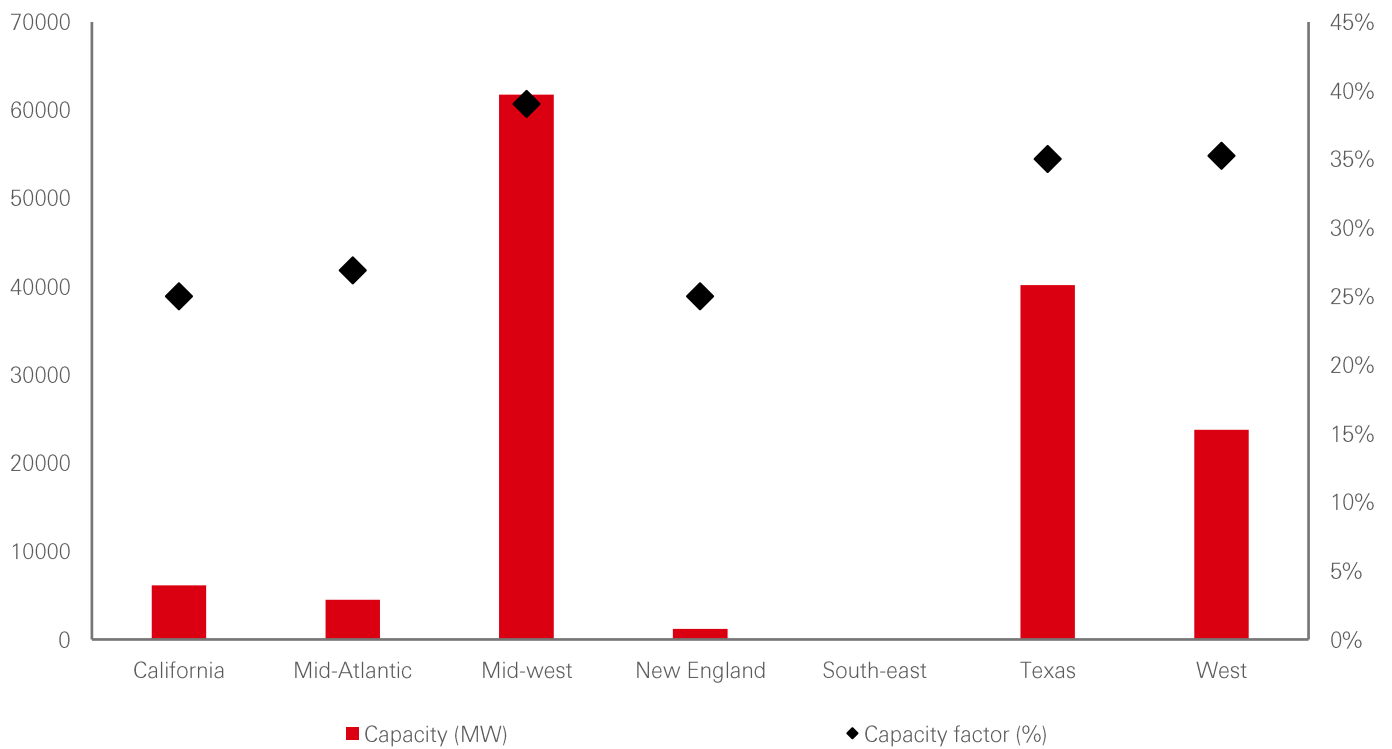
Figure 8: Solar PPA price by US region



Source: Berkeley Lab, September 2022

Midwest: the region has featured prominently in energy transition case studies given the transformation of the generation mix that has been underway for many years and continues at pace. Long reliant on coal-fired generation, the combination of falling costs and improved technology for wind turbines as well as rich wind resource in the region significantly altered the comparative economics. In fact, the economics are such that often the cost of constructing new wind resources would be less than the running costs of the existing coal. The benefits for customer bills are two-fold from both the economics mentioned above but also the improved environmental attributes and reduced commodity price exposure. The growth in new wind capacity has been so significant that a catch-up in investments for the transmission network is now required to cope with the long queue of interconnection requests. These investments will come at a cost and increase in the network component of the bill but, combined with the generation savings, will result in a net benefit for customers in our view.

Figure 8: US wind generation capacity and capacity factor by region



Source: American Clean Power Association, SNL, November 2022

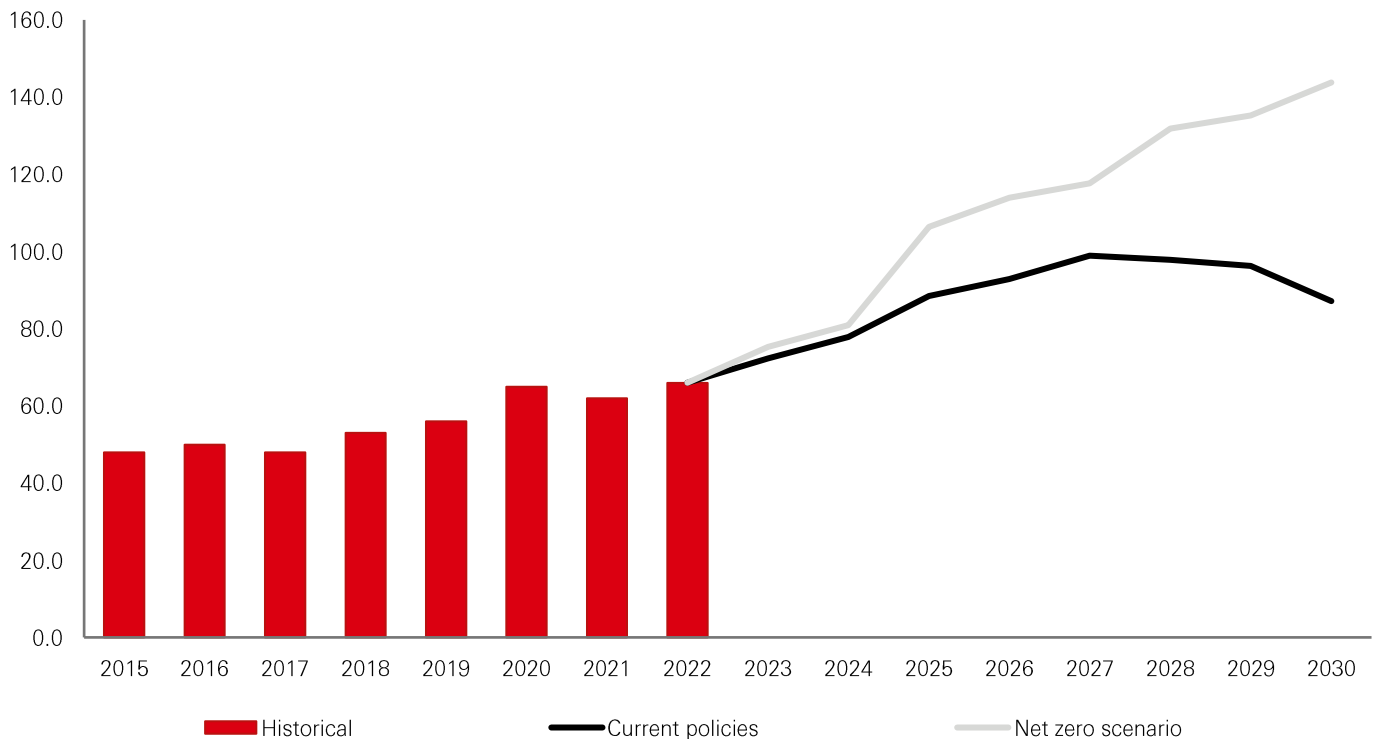
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As we have discussed many factors impact power bills, having short- and long-term effects, on the different components and subject to market structures and frameworks in respective jurisdictions. The evolution of these factors will remain subject to this arrangement with the extent of the short-term commodity and macroeconomic connections at any point determined by the longer-term evolution of trends like the energy transition.

We believe the macroeconomic and commodity picture today may be a new normal where volatility and absolute price levels have receded, at least for the time being, but some remain at elevated levels. Energy commodity markets have adjusted to new flows of supply and demand since the Russian invasion of Ukraine; however, they remain highly susceptible to geopolitical developments. Meanwhile inflation has receded, though remains well above the target ranges of central banks and as a result interest rates are increasingly expected to persist at these more elevated levels to recent history. This environment appears more fragile and susceptible to another “shock” than it was previously but may yet be sustained, in our view.

This current conditions and risks inform the longer-term view. In response to the dislocation from the Russian invasion of Ukraine countries refocused on the alternative sources of energy (security of supply) and particularly renewables (decarbonisation). In just the last year or so developed market countries or regions including the US, Europe, and Canada passed measures to further incentivise a range of technologies from more traditional renewables such as wind and solar to those perhaps less mature in hydrogen and carbon capture to accelerate the energy transition. However, multi-national institutions and agencies have warned that the efforts are still insufficient to achieve net zero targets and mitigate the effects of climate change.

Figure 9: BNEF US annual grid investment scenarios (US\$b)

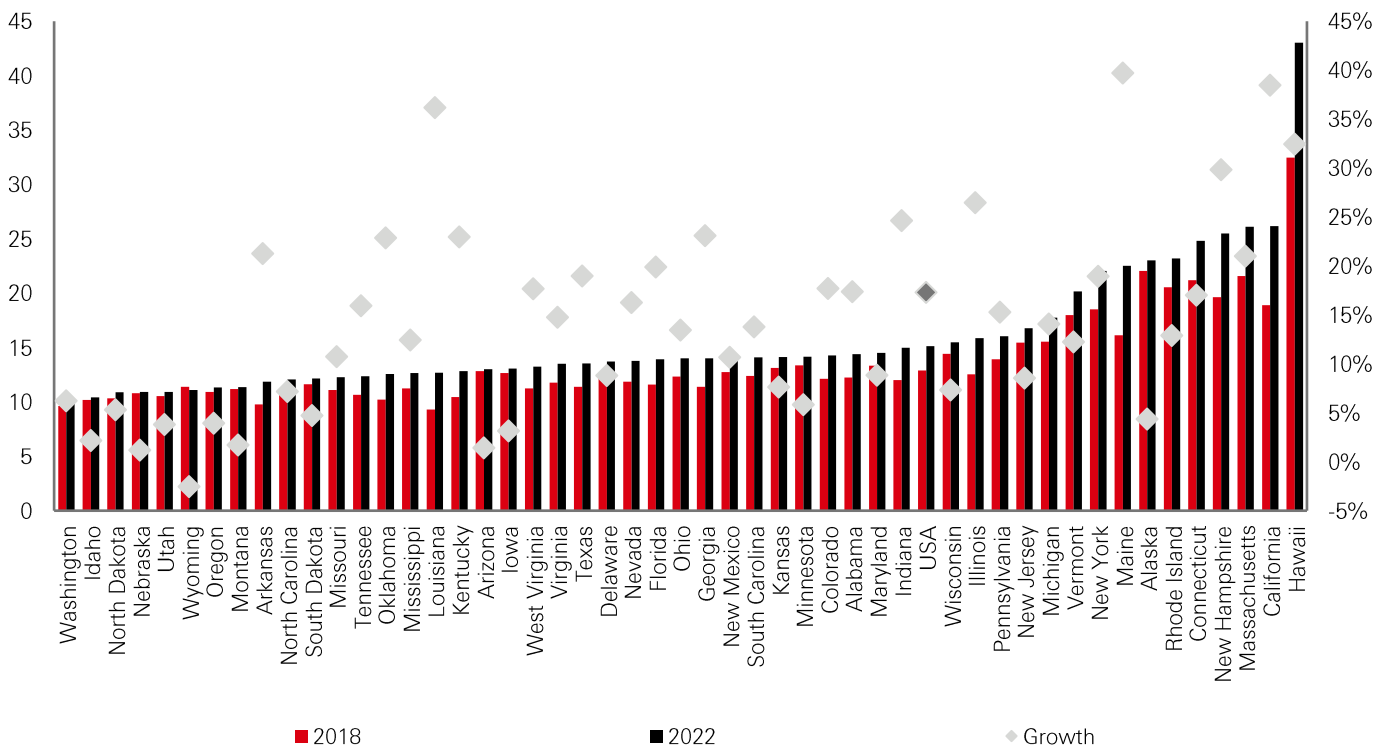


Source: BNEF, FERC, November 2022

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The cost of the energy transition – effectively replicating the existing fossil-fuel dependent utility industry at a larger scale for intermittency and growth – will be highly dependent on technological advancements and the cost of those technologies, in our view. BNEF expects that for the US to achieve net zero by 2050 the installed power capacity would need to almost quadruple from 2022 with the addition of more than 3.4 TW at a cost of US\$7.2 trillion.¹ For just the transmission and distribution grids BNEF expects that the rate of investments will need to double by 2030 to be on course to meet the net zero objective. These are large numbers, however, based on current economic forecasts and also utilising BNEF’s assumptions for demand we equate bill increases of c. 3% p.a. to 2030, not unreasonable compared to long-term inflation expectations. These increases ignore other potential savings but also commodity price increases.

Figure 10: US average price of electricity for residential customers by state (cents per KwHr)



Source: EIA, February 2019

Considering all these dynamics, whilst we don’t believe the cost of the step-up in investments for the energy transition to be egregious, a more significant concern might be the potential for greater volatility in the outlook. We believe this is a very real risk in the short term from commodity markets considering geopolitical sensitivities, but also potentially macroeconomic indicators based on the point in the monetary policy cycle. Meanwhile in the long term with the expectation that the energy transition will lead to more reliance on intermittent sources of energy, this could result in extreme levels of demand for non-renewable sources when supply may be insufficient and likely result in surging commodity prices. The development of new technologies, such as long-duration storage, will be key to mitigate this risk, however, these currently remain a long way from being economic. We therefore foresee the potential for steady increases in customer bills with the risk for greater volatility in the short to medium term.

1. Source: BNEF, March 2023

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Bill disruptors

Making long term forecasts that rely on technological advancements and cost decreases clearly presents challenges, let alone those that interact with a wide range of variables including macroeconomics, commodity prices, policy, supply and demand, etc. We have discussed the outlook for some of these factors and here raise other factors that could “disrupt” that trajectory for customer bills and potentially accelerate the energy transition more broadly. We don’t have strong views on the potential of each being realised or the magnitude of the benefit but rather realise the significance for bills and affordability could be very meaningful. With the below we are again drawing on the research presented in our previous energy transition paper, where further details may be found.

- ◆ **Nuclear Small Modular Reactor:** We believe small modular reactors technologies becoming economic would be a significant catalyst that could potentially replace existing fossil baseload power. The impact on bills would be dependent on the extent of the improvement in the economics, particularly relative to existing and comparable baseload power, but the decarbonisation and security of supply benefits would be very apparent. As a result, development of the technology has strong policy support in a number of countries around the world. In addition, compared to existing fossil baseload power there would be less exposure to commodity prices and the volatility that brings.
- ◆ **Long duration storage:** As mentioned in our outlook, we note this has the potential to displace the remaining (fossil) baseload power for those periods when the sun doesn’t shine, and wind doesn’t blow. Current technology is well-established for periods of up to 4 hours and already deployed at utility scale around the world. However, we see the ability to store electricity for longer periods at attractive economics represents a significant catalyst for the transition. Hydrogen could be a potential solution with the ability to create it when power prices are low, store it and then consume it in generation when power prices are higher, subject to the economics. The benefits to customer bills would be the lowering of volatility from commodity prices, not to mention security of supply and decarbonisation.
- ◆ **Distributed generation and net metring:** The technology here is well established, though as with other drivers of the energy transition will continue to benefit from improvements and cost reductions. The potential opportunity is via the scale and increased penetration coupled with net metring technology and increased digitisation. The ability for customers to actively manage their consumption in accordance to price signals could have an increasingly meaningful direct benefits for bills, whilst also indirectly mitigating broader network constraints and additional investments (with networks usually built to accommodate peak loads).
- ◆ **Electric vehicles:** An increasingly well-known technology as well and clearly a continued beneficiary from improvements and cost reductions. The opportunity comes from avoiding oil consumption and the expected longer-term volatility but also the ability to use the asset as a battery for the grid and sending electricity back via bi-directional flows. We believe, at scale, fleets could operate together to transmit back to the grid during peak periods and help mitigate bill volatility.
- ◆ **CCUS:** Carbon Capture, Utilisation and Storage; in the utility industry capturing carbon emitted from fossil fuel generators represents significant potential to mitigate the need for technologies such as long duration storage. In our view, the technology will not be deployed to existing fossil fuel generation at a significant scale in the short-to-medium term but a breakthrough would represent a meaningful opportunity.

Power bills are exposed to a wide range of factors, often inter-related, that have both short- and long-term impacts. This has been particularly noticeable over the last decade or so with the evolving impact of the energy transition contributing to the exposures different components of the bill had to shocks in macroeconomic variables and commodity prices as a result of the pandemic and Russian invasion of Ukraine. Whilst those effects may have subsided, to varying degrees, we view the potential for further volatility as a material risk to customer bills in the short to medium term. This volatility may well contribute to the speed at which the energy transition is pursued and the evolving impact the various drivers might have on the bill. In addition to this focus on decarbonisation and the ongoing affordability considerations, these shocks have also brought greater attention to the third leg of the energy trilemma, security of supply. We believe all three will remain key considerations going forward with respect to the opportunities and challenges for the utility industry, as we observed in the US, and relevant around the world.

For companies we follow within the listed infrastructure asset class, the impacts on the customer bill, and affordability in general, will continue to play a central part to their evolving strategies in our view. Initiatives (such as “bill disruptors”) that mitigate increases have gained in importance as has the support provided to particular groups of customers that may be experiencing bill increases more acutely. Managing this alongside the ongoing energy transition and increased focus on security of supply amongst stakeholders will continue to be a challenge for companies. These dynamics vary widely across the utilities sector, as do market structures, bill components, and the factors that impact upon them. We believe that an in-depth understanding of all these aspects can differentiate between companies and help identify mis-priced opportunities.



Meet the author

Joseph Titmus is based in HSBC AM's Sydney office and is responsible for the analysis of utilities infrastructure companies in North America. Mr Titmus started in the financial industry in 2004 at Cushman & Wakefield Healey & Baker as an analyst covering London City office markets. Following this, he spent 16 years at AMP Capital in Sydney and London, where he was involved in the development of AMP Capital Brookfield's listed infrastructure capability. In March 2022, Mr Titmus joined HSBC Asset Management, alongside the rest of the AMP Capital Global Listed Infrastructure team, to launch its Listed Infrastructure Equity capability. Mr Titmus holds a Bachelor of Economics from the University of Tasmania and a Master of Applied Finance from the Financial Services Institute of Australasia (FINSIA), with whom he is a Senior Associate.

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- ◆ **Emerging Markets Risk:** Emerging markets are less established, and often more volatile, than developed markets and involve higher risks, particularly market, liquidity and currency risks.
- ◆ **Exchange Rate Risk:** Changes in currency exchange rates could reduce or increase investment gains or investment losses, in some cases significantly.
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