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A new era for Sustainable Energy

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A new era for Sustainable Energy

In a nutshell

- Persistent cost deflation and technology improvements have meant that renewables are becoming more economically viable. While supportive policy is still important, it is no longer crucial for the clean energy outlook as relative economics becomes the key driver of adoption.
- This shift means that we must be much more selective in our investment strategy; we seek (1) producers with a cost or scale advantage, (2) solution providers who enable the next leg of growth and (3) power suppliers who benefit from lower renewable costs.
- Looking ahead, global sustainable energy adoption should be driven by large emerging markets like India and China as they continue to support superior per capita GDP growth with cleaner sources of power.

Sustainable Energy: In numbers

- The average solar module now costs 88% less than it did in 2010.[1]
- The EU carbon allowance price rose to decade highs of €25/t at the end of 2018 up 3x from 2016.[2]
- In 2008, the International Energy Agency estimated that by 2018, c.66 GW of global solar capacity would be installed. The actual figure for 2018 is closer to 456 GW.
- Modern tall wind turbines produce almost twice as much electricity compared to one built just 10 years ago.[3]
- About 5% of electricity is lost during transmission and distribution annually in the US.[4]

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1 Bloomberg
2 FactSet
3 Vestas company data
4 US Energy Information Administration

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The earth in the hot seat

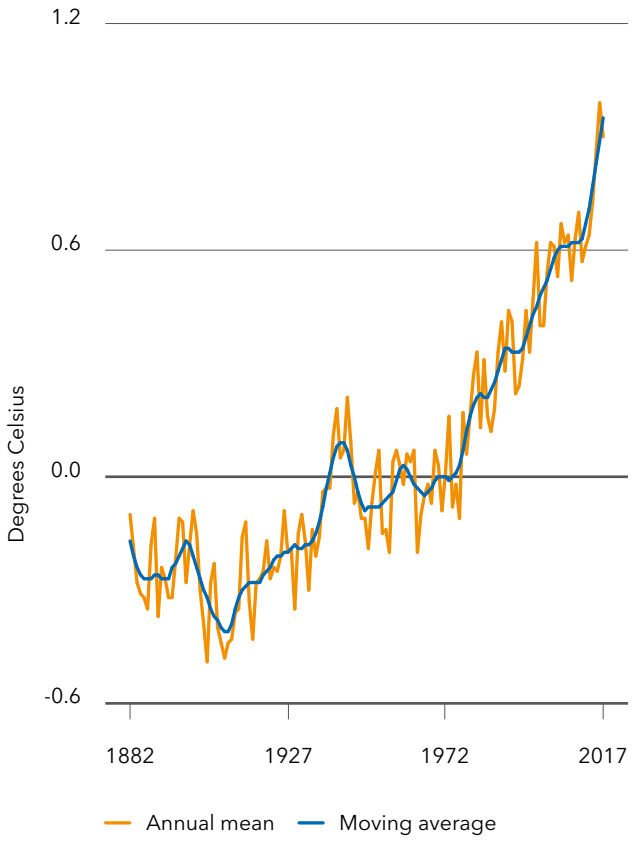
For anyone tracking the debate on climate change, **2015 and 2016 marked an unusually positive deviation** from recent history. Global CO_2 emissions, which have increased steadily since 1970 (except during recessions) failed to grow between 2014-16, sparking renewed optimism in climate policy discussions. Is the much-awaited peak in global emissions here at last?

Unfortunately, no. In 2017, CO_2 emissions roset 1.2% globally reversing the slowdown and projections for 2018 (+2.7% yoy[5]) imply a resumption of annual increases, driven by both stronger economic growth and slower declines in energy and carbon intensity. In turn, global temperatures have continued to rise sharply, with 2018 set to be the fourth warmest year on record, according to the UN. The US National Climate Assessment report recently noted that sea levels are now rising twice as fast as 25 years ago, while re-insurance company Swiss Re estimated recently that global economic losses from natural catastrophes amounted to $146bn in 2018 driven by several extreme weather events including hurricanes in the US, typhoons in Asia and California's wildfires. Several studies show that such extreme or unseasonal weather conditions are becoming the norm. If so, the social and economic consequences of this are likely to be substantial. How can this be reversed?

Given that global population and per capita GDP are expected to keep growing in the near term, lower CO_2 emissions can only be achieved by reducing both the world's energy intensity (via energy efficiency) and emission intensity (via low carbon energy). Our Sustainable Energy investment strategy has hence always invested in both these solutions. While we aim to address energy efficiency in a separate report, the focus of this paper is renewable energy.

We take stock of the transition to the low carbon economy and argue that regulation has taken a back seat to technology and cost deflation as the key drivers of the theme. This shift changes the rules of investing in this theme, requiring us to be more selective in picking the winners within clean energy sectors and identifying enablers and infrastructure providers who can further improve the economic case for renewable technologies. All this and more in the pages that follow.

Chart 1: Change in global surface temperature relative to 1951-1980 average



Source: NASA's Goddard Institute for Space Studies

5 Global Carbon Project, World Bank

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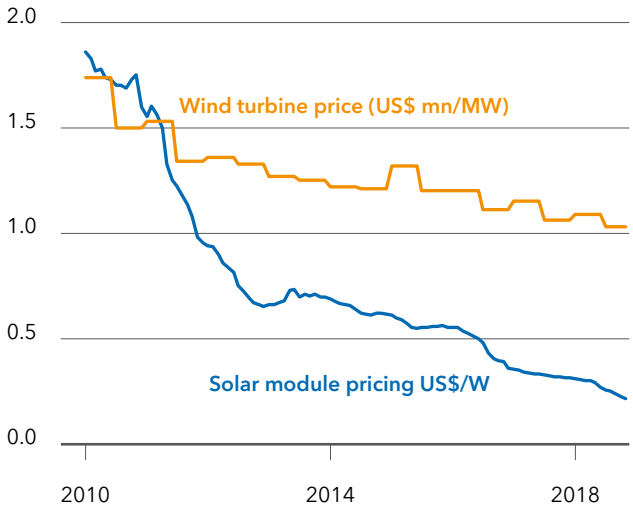
A new era for new energy

Everyday low prices

Clean energy technologies are cheaper today than they have ever been. The average price of a solar module has fallen by 88% since the beginning of the decade, while the unit cost of wind turbines has also declined by over 40% (Chart 2). This means that the economic viability of renewable power is increasingly comparable to (if not better than) conventional power sources.

Chart 2: Clean energy unit costs

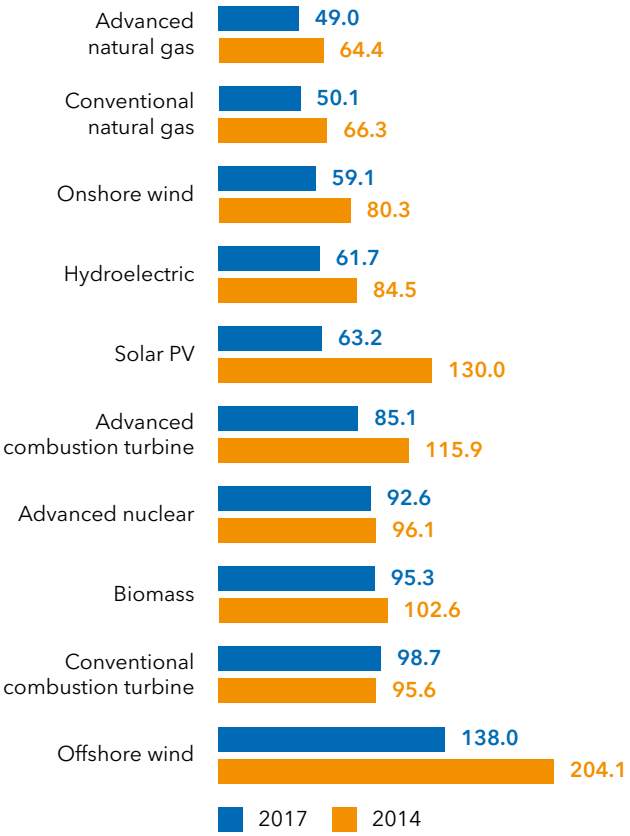


Source: US Energy Information Administration (EIA)

For instance, the the US Energy Information Administration's (EIA) estimates for the levelized cost of energy (LCOE) – which includes capital investments, cost of capital and variable/fuel costs – shows that onshore wind and solar power are both rapidly catching up with conventional natural gas and coal plants in the US. This is true elsewhere in the world too; last year, the first subsidy-free offshore wind farm project was approved in Germany. And in Northwest China which enjoys conducive hot weather and less expensive land, solar farms have also begun to operate without state financial support.

This decline in unit costs has been driven by a variety of factors – oversupply from the manufacturers, aggressive competition for projects, more efficient solar modules, larger wind turbines and improving load factors.

Chart 3: Estimated average levelized costs (US$/Mwh), US (for new generation capacity entering service in 5 years, published in 2014 and in 2017)



Source: US Energy Information Administration (EIA)

The relative economics improve in the favour of wind/solar if we account for any new policies that require gas/coal plants to incorporate carbon capture and sequestration facilities. If we then factor in rising CO_2 emission allowance prices, the outlook looks even tougher for legacy power capacity; EU carbon prices averaged €6.30/t between 2015–17 but rose to €25/t towards the end of 2018. Bloomberg New Energy Finance analysts expect carbon prices to breach €30/t in the next five years in the EU, while they forecast California's carbon price to rise from $12/t currently to $20/t by 2025.[6]

6 Bloomberg New Energy Finance (BNEF)

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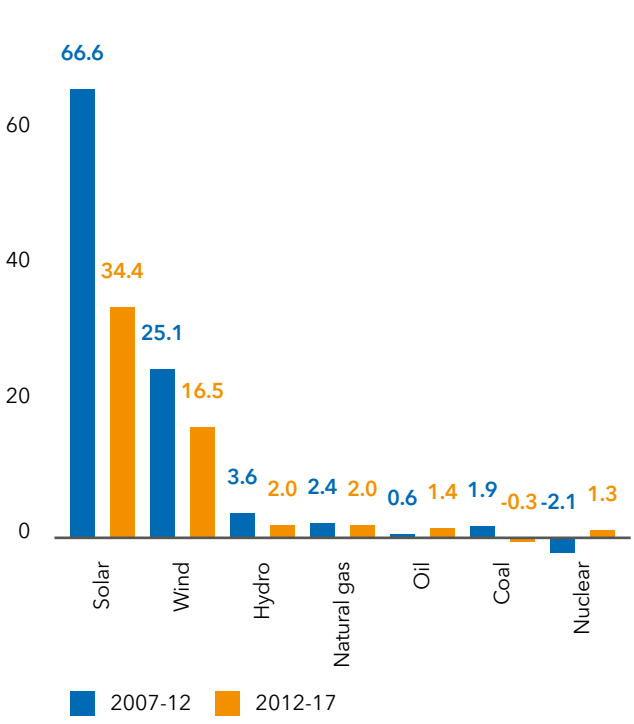
Put simply, **wind and solar economics are increasingly attractive**, both on absolute and relative terms.
It is no surprise then that global clean energy capacity additions have grown rapidly in the last decade, admittedly off a very low base (Chart 4). Solar power has increased at a CAGR of 34% since 2017 and now represents 2% of global capacity, while wind energy (primarily onshore) accounts for 5% of the total after having grown at 21% CAGR in the last decade.
What does the future hold for sustainable energy?

Chart 4: Growth in energy consumption, by source, global 2007-17, average growth rate



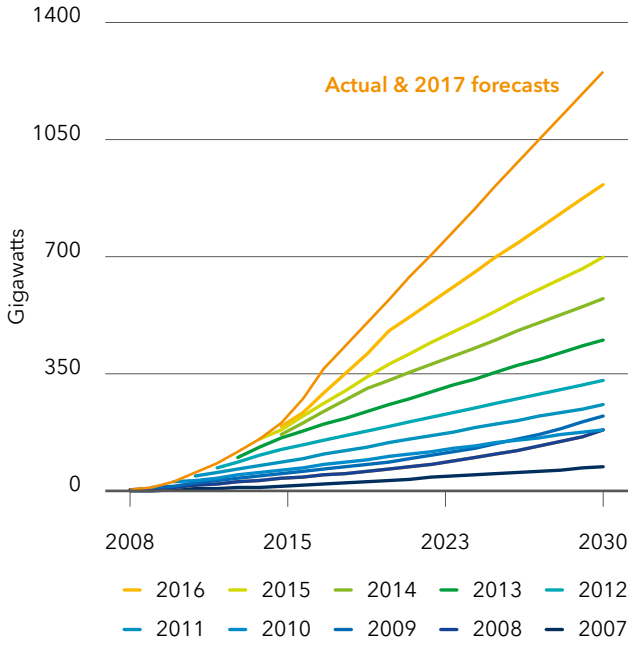
Source: BP Energy Outlook

The grass is always greener than estimated

It is worth noting here that renewable energy adoption has been persistently underestimated in the past. Take solar for instance; 10-year forward forecasts for 2017 underestimated actual adoption by over 10x as Chart 5 shows.

Note that during the same period (since 2008), global LCOE for solar PV declined by over 70%.[7] This is in line with initial expectations for most disruptive innovations – their impact is overestimated in the short-term (often leading to very high valuations), but more importantly for long-term investors, they are significantly underestimated in the long run.

Chart 5: IEA annual projections of global solar capacity



Source: IEA, IRENA, Bloomberg, Goldman Sachs Global Investment Research

We expect the pace of renewable adoption to be sustained at least in the medium term, driven primarily by capacity additions in large emerging markets, particularly India and China (e.g. the IEA expects China alone to be responsible for 30% of solar installations between 2018-30E).
Why? Three uniquely EM factors to keep in mind:

1. **It's about demand, not just clean supply:** Energy consumption is still growing from very low levels; per capita electric power consumption in India for instance is 11% of Germany. Clean energy will be part of a broader solution as industrialisation and urbanisation boost the need for power in emerging markets.

7 IEA, IRENA, Bloomberg

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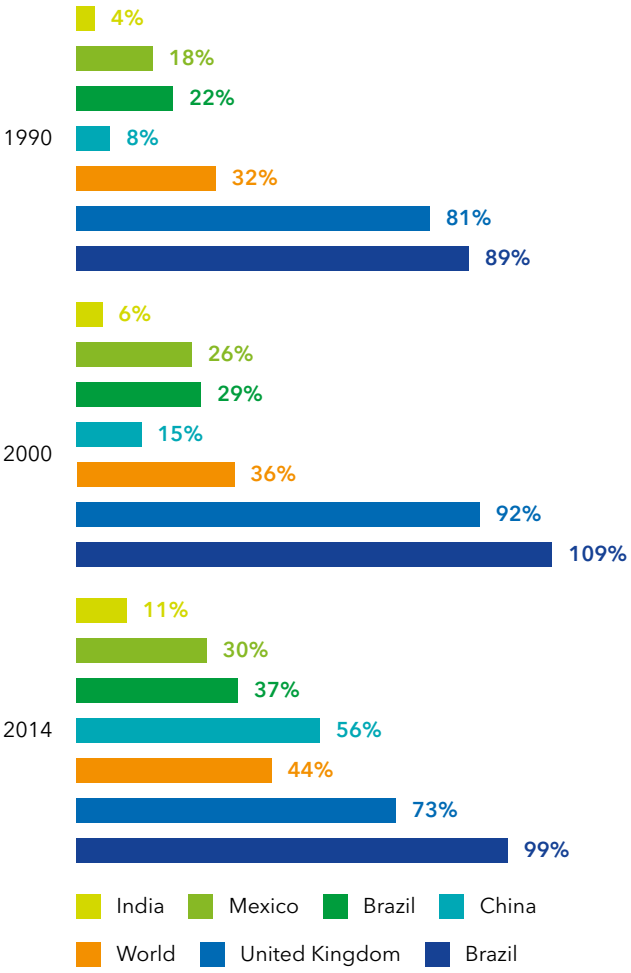
2. **It's about pollution, not just climate change:** High growth emerging markets face a more immediate need to adopt low carbon technologies as they seek to manage pollution in dense urban areas. China and India are home to 18 of the 20 most polluted cities in the world.[8]
3. **It's about energy independence, not just innovation:** Despite having the fifth largest coal reserves in the world, India is the third largest importer of the commodity. China's industrial policies such as 'Manufacturing 2025' are also aimed towards achieving self-reliance in a host of industries (like semiconductors and clean energy).

Chart 6: Power consumption per capita relative to Germany (100%)



Source: World Bank

It is in this context that we need to assess India and China's substantial investments in wind and solar power. Europe may have initiated the clean energy revolution 10-15 years ago, but it will be emerging economies that drive adoption in the coming years. The absence of legacy infrastructure can also allow EMs to leapfrog advanced economies. For instance, decentralised rooftop solar systems are likely to grow rapidly in Asian and African economies with plentiful sun and inadequate power networks. In turn, BNEF projects that solar and wind will provide 48% of the world's electricity by 2050.

In short: Rising global demand and patient capital are likely to make wind and solar more economically viable in the coming years via economies of scale and innovation. That marks a distinct shift for anyone investing in renewables – **clean energy sources are attractive not only because they are cleaner than fossil fuels, but also because they are increasingly cheaper**.

The most important implication this shift is this: as technology moves front and centre, **the role of regulatory support becomes less vital** to the sustainability of the theme. While global policy in aggregate has continued to be supportive, the last two years have been marked by pockets of uncertainty (e.g. the US withdrawing from the Paris Climate agreement, Australia's continued investments in new coal assets contradicting its climate commitments). However, this does not make a meaningful dent on the global outlook for wind/solar, in our view. While we remain mindful of policy shifts, our focus is now directed at the evolution of the key technologies in this new era for new energy.

8 WHO, 2015, average PM 2.5 levels

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The rulebook has changed

How does this change the way we assess investment opportunities: winners, enablers, adopters and laggards

Who stands out?

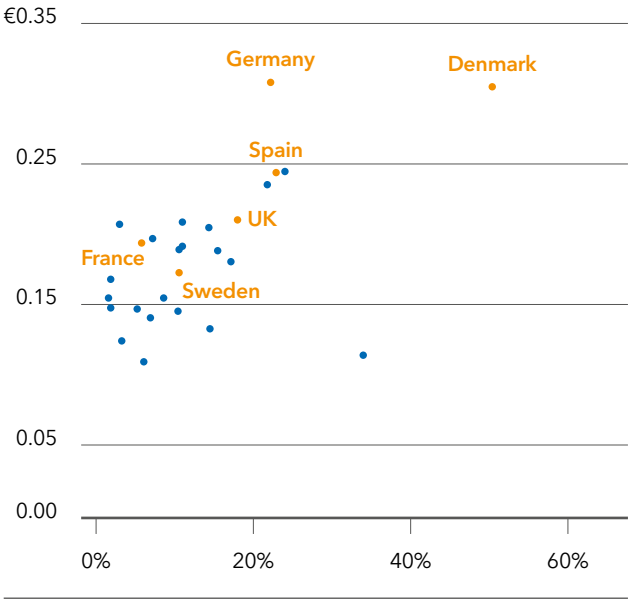
Wind and solar are not new energy sources; after all, we have invested in these technologies for over a decade in our New Energy fund. However, these low carbon technologies are entering a period of growth in which broader adoption is set to be driven by lower unit costs. This phase of disruption – when technologies go from being niche to mainstream – is usually marked by persistent deflation, tougher competition, market share gains by large players and eventual industry consolidation.

In other words, there should be significant differentiation in how the next leg of volume growth will impact various manufacturers. It has hence become more crucial for us to be selective among the OEMs. In turn, we look for producers who stand out versus their peers due to a cost or innovation advantage (e.g. First Solar's Series-6 roll out which offers higher efficiency and lower manufacturing costs[9]).

Where are the bottlenecks?

Clean energy is becoming more affordable, but it is not yet reliable and scalable everywhere. This is primarily due to the intermittent and unpredictable nature of renewable power generation, which means that baseload thermal capacity cannot be retired despite deteriorating economics and lower utilisation. As a result, as the share of solar and wind rises above 10% of total demand in a country, the all-in system costs of electricity rise meaningfully, as can be seen in the next chart. For renewables to cater to 30%-50% of future demand it is vital to resolve this challenge. So, what are the solutions? Smart grids, long-distance interconnections and transmission, energy storage and demand response systems can all help manage uneven supply and demand.

Chart 7: **Residential electricity tariffs, Euro/kwh, Nov 2018 v. Wind+Solar as a % of electricity consumption**



Source: energy.eu, BP Energy Outlook 2018

For instance, ENEL, which is among the world's largest private suppliers of renewables, has committed to spend over €27bn in capex over the next 3 years of which 42% is expected to go into renewables and 40% into network infrastructure (including digitisation), as the share of renewables rises from 45% in 2018 to 55% of 2021 capacity.[10] Large power companies that can invest in new energy infrastructure and benefit from falling costs have the potential to transform themselves into leading developers of renewable projects.For example, NextEra, which has the highest market share in utility scale storage in the US is better positioned to win bids for new renewable projects as the auctions increasingly mandate battery storage.

9 Company data
10 Company data

Its scale and early mover advantage has also translated into lower project costs, giving it a strong competitive advantage, in our view.

Who is getting disrupted?

Does the rise of renewable energy pose a risk to traditional energy? It depends. The IEA estimates that hydrocarbons still account for over 80% of global energy supply decades after nuclear, hydro, geothermal, solar and wind have become mainstream. In the near term, as we noted earlier, it is unlikely that thermal fuels will experience drastic declines in global demand given (1) the need for supporting infrastructure to enable renewable scale and (2) the rising need for energy in large emerging markets.

In advanced economies however, some utilities face the risk of owning stranded assets as new renewable capacity takes direct share. We expect legacy power plants, especially those that rely on coal, to face accelerated decommissioning in the future as renewables become more affordable, reliable and scalable.

Much of the debate in this paper has centred around supply. But the demand outlook (particularly in developed economies) also presents an added risk factor to legacy supply. Improved energy efficiency that steadily shaves 2%-3% demand every year can aggravate the challenges faced by traditional power producers.
This will be the focus of the next whitepaper in this series on New Energy.

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Thematics
by BlackRock

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Our thematic funds aim to invest in long-term secular trends that we believe will have far-reaching implications on global industry profit pools. Our investing process focuses on understanding the key drivers and lifecycle of themes to identify parts of the value chain that are most attractive at any given time. We then look beyond basic end-market exposure metrics to identify stocks for which themes are likely to have a meaningful impact on future earnings and where this is still underappreciated by the market.

For more on why and how we invest thematically, see 'It's time for Thematic Investing' (Dec 2018).

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Equity Risk: The value of equities and equity-related securities can be affected by daily stock market movements. Other influential factors include political, economic news, company earnings and significant corporate events.

Investments in transport securities are subject to environmental concerns, taxes, government regulation, price and supply changes.

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Investments in the technology securities are subject to absence or loss of intellectual property protections, rapid changes in technology, government regulation and competition.

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Investments in the new energy securities are subject to environmental concerns, taxes, government regulation, price and supply fluctuations.

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