

Key takeaways

- Economic disruption and declining energy demand could temporarily slow renewable energy development, but we see no signs of the long-term energy transition abating anytime soon.
- Renewables are the only energy source expected to grow in 2020¹ as renewable generation continues to mark new historic milestones like surpassing generation from coal in both the US and UK.²
- Short-term uncertainty remains, but the transition to zero- and low-carbon energy sources, including renewable energy, continues to present potential long-term opportunities for companies and investors alike.
- We believe the pandemic could be a pivotal moment for the energy transition as companies and policymakers look to renewable energy to play a central role in post-pandemic recovery.

In part three of this six-part series, we expand on earlier discussion of the [energy transition](#) and [energy efficiency](#) to explore the most high-profile piece of the energy transition: renewables.

Catalysts for change

Enabled by emerging technologies and rapidly declining costs, the transition from fossil to net-zero carbon energy is transforming the global energy sector and reshaping the economy. This energy transition is poised to revolutionize the way we source, store and consume energy, while providing opportunities for investors to align and benefit from the shift to a net-zero carbon world.

Renewable energy, a cornerstone of the energy transition, is all about converting natural heat, light and movement into useful energy like electricity and heat. There is great diversity in natural sources and their corresponding conversion technology:



Solar: Harnessing the sun's rays to generate electrical energy via thin semiconductors, known as solar photovoltaic (PV) systems, or thermal energy via heat exchanger. Solar technology is ideal for sunny locations - though it still works on grey, cloudy days, albeit not as well.³ Due to their modular nature, solar panels are well suited for small or distributed applications like rooftops but can easily be assembled to take advantage of economies of scale.



Wind: Using the natural motion of wind to turn a generator. Modern wind turbines are an evolution of technology that has been used for centuries to pump water, mill grains or cut wood. Size is important where bigger turbines are generally more efficient and cost effective. They can be installed anywhere the wind blows, but there is great potential offshore where it is generally windier and there is less concern about interference.



Geothermal: Capturing heat from the earth's core, where a transfer fluid such as water or steam is used to directly to provide thermal energy or to turn a turbine to generate electricity.



Hydro: The most common form of renewable energy which uses flowing water, often captured in a dam or a river, to generate electricity.



Biomass: Use of organic materials such as wood, straw and dedicated energy crops that can be re-grown within human lifetimes as fuel. The solid nature of many forms of biomass make them an easy substitute for coal. Biomass can also be processed into liquid or gaseous fuels (e.g. ethanol from corn or renewable natural gas from organic waste).

¹International Energy Agency "Global Energy Review 2020" (April 2020) <https://www.iea.org/news/global-energy-demand-to-plunge-this-year-as-a-result-of-the-biggest-shock-since-the-second-world-war>

²Institute for Energy Economics and Financial Analysis (IEEFA) "IEEFA update: Renewables surpass coal in U.S. power generation throughout the month of April 2020" (May 2020) <https://ieefa.org/ieefa-update-renewables-surpass-coal-in-u-s-power-generation-throughout-the-month-of-april-2020/> and "U.K. electricity goes coal-free for a month—a first in 138 years" (May 2020) <https://ieefa.org/u-k-electricity-goes-coal-free-for-a-month-a-first-in-138-years/>

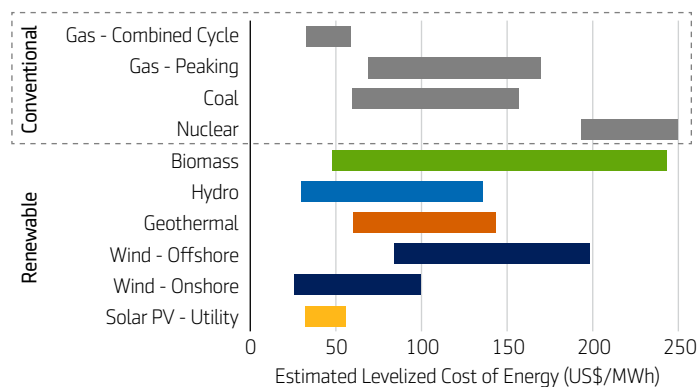
³Richardson, Luke "How do solar panels work at night and on cloudy days?" EnergySage (October 2018) <https://news.energysage.com/solar-panels-work-night-cloudy-day/>

Environmental and economic implications

The ability to generate usable energy without greenhouse gas emissions has the potential to radically transform the global energy system and break the link between increasing amounts of energy and increasing levels of environmental pollution. The energy potential of renewable, natural sources is astounding: for example, the sun delivers more energy to the Earth in an hour than we use in an entire year.⁴ Although this untapped potential is compelling, technology development and innovation remains critical to capturing renewable energy at scale.

Growth in renewables has been predominately driven by regulations—Renewable Portfolio Standards and other incentives that encourage deployment—aided by dramatic decreases in cost and encouraged by efforts to fight climate change. For example, the global weighted average levelized cost of energy (LCOE)⁵ for solar PV declined by 77% between 2010 and 2018⁶ and is easily cost competitive with conventional fossil fuel generation (Exhibit 1). At the same time, solar has gone from about 0.15% of global electricity generation capacity to 2.25%⁷ and is expected to reach almost 25% by 2050 (Exhibit 2). As for regulatory encouragement, in the US, 37 states had some form of mandatory Renewable Portfolio Standard or renewable generation goal as of June 2019, with eight even targeting 100% clean electricity by 2050.⁸

Exhibit 1: Estimated levelized cost of energy from conventional and renewable sources



Source: Aegon AM, International Renewable Energy Agency (IRENA) and Bloomberg New Energy Finance. As of Q1 2020.

⁴Sandia National Laboratories "Solar FAQs" <https://www.sandia.gov/~jytsao/Solar%20FAQs.pdf>

⁵LCOE is a measure of the net present cost of generation over the assets lifetime and is used to compare different methods of electricity generation on a consistent basis

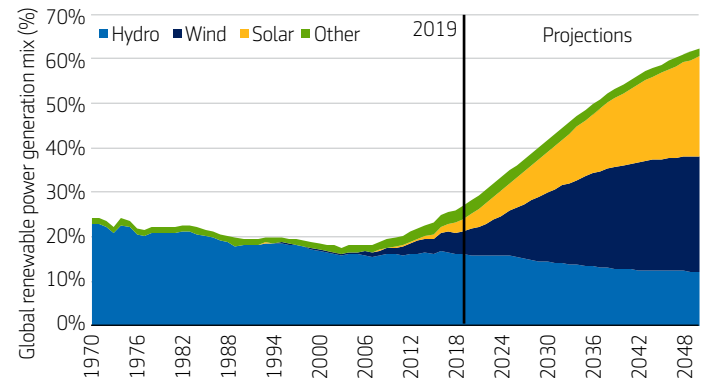
⁶IRENA "Renewable Power Generation Costs" in 2018 (May 2019) <https://www.irena.org/publications/2019/May/Renewable-power-generation-costs-in-2018>

⁷Bloomberg New Energy Finance "New Energy Outlook 2019" (August 2019) <https://about.bnef.com/new-energy-outlook/>

⁸US Energy Information Administration "Renewable energy explained: Portfolio standards" (18 November 2019) <https://www.eia.gov/energyexplained/renewable-sources/portfolio-standards.php>

⁹Roberts, David "The key to tackling climate change: electrify everything" Vox.com (October 2017) <https://www.vox.com/2016/9/19/12938086/electrify-everything>

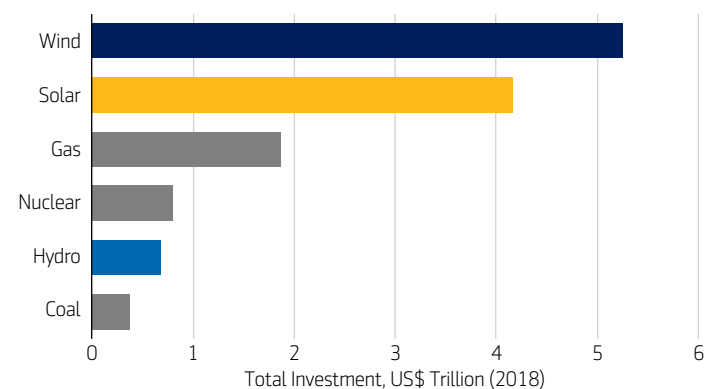
Exhibit 2: Global share of electricity generation from renewables 1970-2050



Source: Bloomberg New Energy Finance. As of 2019.

Looking to the future, research from Bloomberg New Energy Finance estimates that nearly USD 10 trillion will be spent on new wind and solar generation sources between now and 2050 (Exhibit 3). Pairing this investment in renewable generation sources with an electrification push can deliver even greater greenhouse gas reductions. Replacing technologies that are still dependent on fossil fuels like gasoline cars and natural gas heating with alternatives that run on electricity like electric vehicles and heat pumps, coupled with net-zero carbon electricity generation, could result in a truly net-zero energy system.⁹

Exhibit 3: Expected investment in generation by technology 2019-2050



Source: Bloomberg New Energy Finance. As of 2019.

Industry disruption and investment opportunities

Even at our current modest levels of deployment, renewables are causing considerable disruption to the energy industry. Utility business models—traditionally based on the distribution of energy from centralized generation sources to end consumers—are under threat from the growth of renewables. As consumers look to take advantage of the lower bills associated with generating their own energy, utilities may compensate by raising prices to cover the costs of maintaining distribution infrastructure, which further increases the financial benefits for customers to opt out of the grid, and so on in a so-called ‘death spiral’. Fortunately, this is not the base case scenario as many utilities are aggressively taking action to build commercial scale renewable projects themselves—even going so far as to seek out long-term purchase power agreements (PPAs) to lock-in favorable pricing and stable cash flows.¹⁰ At the same time, utilities are increasingly under scrutiny to justify the cost of non-renewable investment. Research from Carbon Tracker has shown that investment in solar and wind is now cheaper than a similar investment in both new and operating coal in major markets across the US, Europe and Asia.¹¹

Combined, these trends are forcing utilities and energy companies alike to change their plans and re-think business models. Innovative companies are charging ahead with the energy transition, with utilities such as Xcel Energy committing to go 100% carbon-free and Vattenfall targeting fossil-free living within one generation, while companies like E.ON have moved to focus on energy networks and customer solutions.^{12,13,14}

Despite opportunities, challenges remain

Even in the face of these strong positive trends, there are barriers which could work to slow the deployment of renewable energy technologies:¹⁵

- **High upfront capital costs:** While increasingly competitive on a levelized basis, renewable energy technologies often require greater upfront investment than mature fossil fuel equivalents;
- **Siting and transmission:** A challenge for any new development and exacerbated by their distributed nature, renewables increasingly run into conflict with existing communities or infrastructure;

- **Integration:** Renewables are generally not dispatchable like traditional fossil fuel sources which, combined with their weather-dependent intermittency, can result in the need for either over-building capacity, increased interconnection and/or storage;
- **Market access:** Ensuring that energy market rules are set-up in such a way as to facilitate the integration of renewables to the existing energy system.

Key themes and investment considerations

The increasing importance of renewables is a potential boon to investors. As a sector with long-term growth expectations and green credentials, it is likely to continue to grow in attractiveness. Global supply chains encompass traditional vertically integrated utilities to local installers and everything in between, leading to a variety of opportunities for investors along with a level of market maturity and accessibility not often found in the energy transition. For example, green bonds are increasingly seen as a source of the large-scale capital required for transition in addition to traditional debt and equity instruments, all of which are available from investor-owned utilities, technology providers and associated service providers.¹⁶ On the other end of the spectrum, there are opportunities for securitization through the pooling of consumer loans and leases, such as those for solar PV systems via solar ABS—a market that surpassed USD 1 billion in 2017.¹⁷

With governments looking at post-Covid-19 stimulus measures and investors looking for safe, long-term places to put their capital, we believe now is the perfect opportunity to accelerate the energy transition. Investments made in the renewables industry may achieve the double objective of economic recovery and environmental improvements. Unlike fossil fuels, the use of renewables does not typically result in air pollution which is increasingly linked to increased mortality.¹⁸ At the same time, investments in renewables have the potential to deliver greater employment, with one study estimating that a USD 1 million expenditure in renewables creates over seven full-time equivalent (FTE) jobs, while a similar investment in traditional fossil fuels would result in less than half that.¹⁹ Governments and investors around the world now have the opportunity to not only combat the problem at hand, but make investments to reduce the potential future environmental damage while accelerating the transition to a net-zero carbon future.

¹⁰S&P Global “European renewables sector faces rising merchant risk, consolidation in 2019” (January 2019) <https://www.spglobal.com/marketintelligence/en/news-insights/trending/rqa--SQo2yIg-XXNQASNhq2>

¹¹Carbon Tracker “How to waste over half a trillion dollars: The economic implications of deflationary renewable energy for coal power investments” (March 2020) <https://carbontracker.org/reports/how-to-waste-over-half-a-trillion-dollars/>

¹²Xcel Energy “Building a Carbon-Free Future” https://www.xcelenergy.com/environment/carbon_reduction_plan

¹³Vattenfall “Our targets” <https://group.vattenfall.com/who-we-are/about-us/our-targets>

¹⁴E.ON Group “Facts & Figures: Edition 2020” <https://www.eon.com/en/investor-relations/financial-publications/annual-report.html>

¹⁵Union of Concerned Scientists “Barriers to Renewable Energy Technologies” (December 2017) <https://www.ucsusa.org/resources/barriers-renewable-energy-technologies>

¹⁶Trabish, Herman K. “New money: Green banks and green bonds are bringing billions to utilities for the energy transition” Utility Dive (November 2019) <https://www.utilitydive.com/news/new-money-green-banks-and-green-bonds-are-bringing-billions-to-utilities-f/567483/>

¹⁷Spector, Julian “It’s Official: Solar Securitizations Pass \$1 Billion in 2017” Greentech Media (October 2017) <https://www.greentechmedia.com/articles/read/solar-securitizations-expected-to-pass-1-billion-in-2017>

¹⁸EURACTIV “Air pollution ‘likely’ to increase mortality from COVID19: experts” (March 2020) <https://www.euractiv.com/section/coronavirus/news/air-pollution-likely-to-increase-mortality-from-covid19-experts/>

¹⁹Garrett-Peltier, Heidi “Green versus brown: Comparing the employment impacts of energy efficiency, renewable energy, and fossil fuels using an input-output model” Economic Modelling Vol 61 (February 2017) <https://www.sciencedirect.com/science/article/abs/pii/S026499931630709X>

Looking ahead

In the next edition of this series we will discuss storage as we continue to explore the opportunities and challenges related to the energy transition.



Energy efficiency

Doing the same with less



Renewables

Generating energy without carbon emissions



Storage

Decoupling energy demand from generation



Low-carbon fuels

Using alternatives to common fossil fuels



Carbon capture

Capturing, storing and using carbon

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