June 2023

The case for renewable energy: at the heart of the clean energy transition

WisdomTree®

WisdomTree.eu
+44 (0) 207 448 4330

The case for renewable energy: at the heart of the clean energy transition

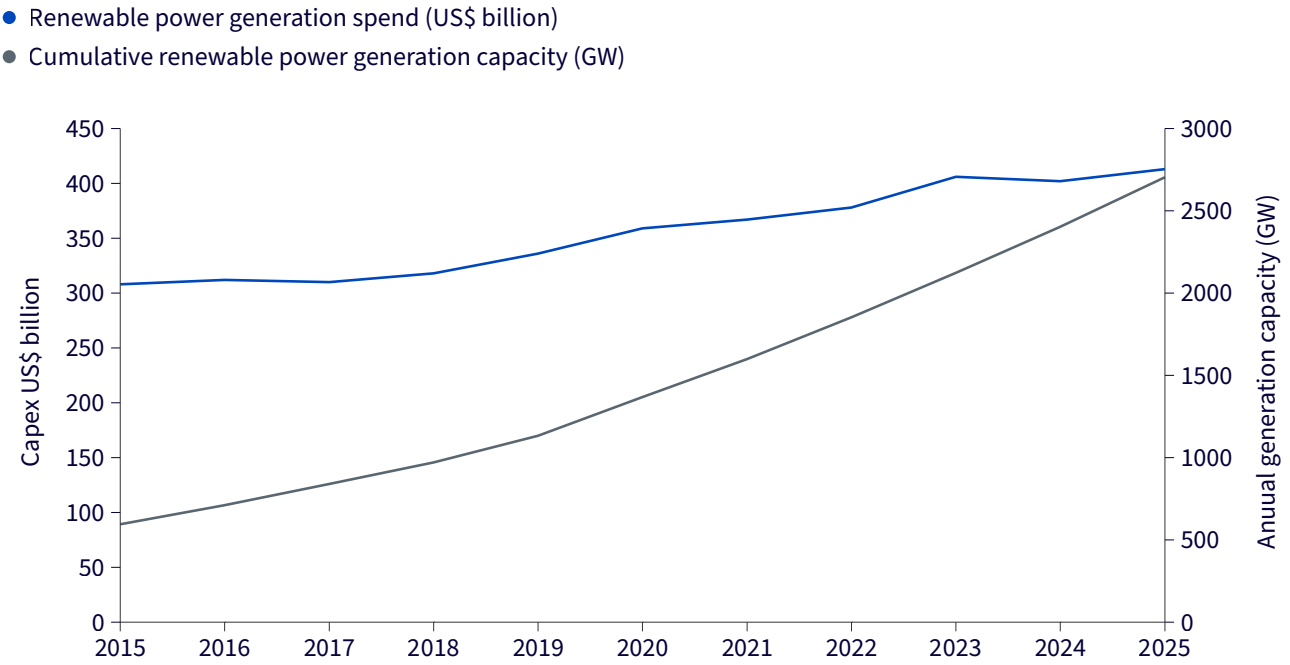
A swift and effective energy transition gives the world hope in its fight against climate change. To ensure this, we must deploy all promising clean energy solutions available and continue to seek new innovations to plug gaps in the energy mix.

Renewable energy sources are at the heart of this endeavour given technologies like wind and solar are mature enough to see significant cost reductions but nascent enough to promise strong growth potential.

In 2015, the world adopted a legally binding international treaty on climate change, termed the Paris Agreement, which aims to limit global warming to well below 2 degrees Celsius above pre-industrial levels, and pursue efforts to limit the temperature increase to 1.5 degrees Celsius. The agreement sets out a framework for countries to cooperate on reducing greenhouse gas emissions and adapt to the impacts of climate change, with each country setting its own emissions reduction targets and regularly reporting on its progress.

Since the 2015 Paris Agreement, renewable power generation has attracted increasing amounts of capital expenditure which has resulted in exponential growth in renewable power generation (see figure below).

Figure 01: Renewable power generation capacity is seeing exponential growth



Source: Wood Mackenzie, International Energy Agency. Renewables includes wind, solar and other renewables (geothermal, etc.). The projection is consistent with a 1.5°C scenario. **Forecasts are not an indicator of future performance and any investments are subject to risks and uncertainties.**

Key drivers, enablers, and growth metrics

The notable tailwinds driving renewable energy production are:

High regulatory ambition: Roughly three quarters of global greenhouse gas emissions are generated by 70 countries. Each of these 70 nations have signed up to net zero goals by 2050 [1]. This is matched by more than 3,000 corporate and financial commitments to net zero. Increased renewable energy supply is at the centre of the drive to realise these ambitions.

Market dynamics: The war in Ukraine and commodity price volatility have brought low carbon energy security opportunities to the fore as countries seek greater energy security. Efforts to broaden and deepen local supply chains to support domestic renewable energy goals have never been greater. Investment is following those efforts. The offshore wind market alone is expected to see almost US$1 trillion in new investment over the next decade[2].

1 Source: Wood Mackenzie March 2023.

2 Source: Wood Mackenzie March 2023.

Technology cost change: Significant cost reduction is expected in renewable energy sources such as wind and solar.

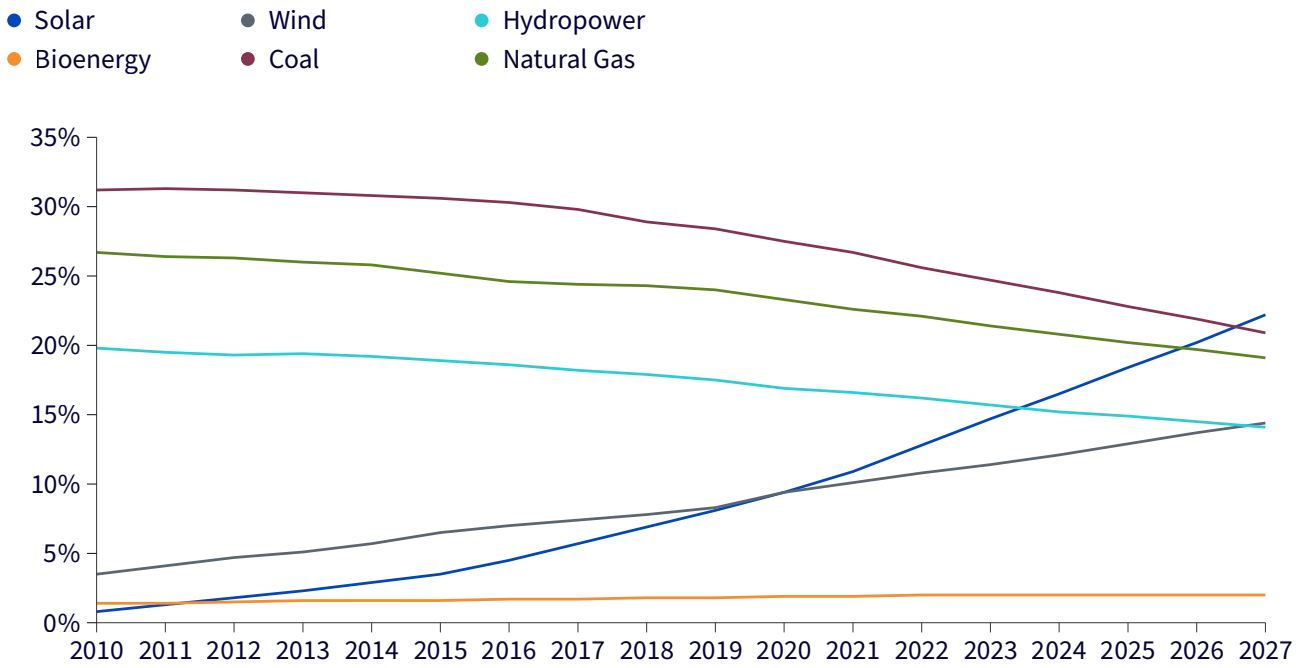
- Onshore wind remains the most cost-competitive technology, with the average cost expected to fall 53% by 2050 relative to 2022 as wind turbine manufacturers continue to deliver scale with turbine ratings growing from 3.7 megawatts (MW) to 8.7MW.
- Average Solar Photovoltaic (PV) costs are expected to drop 62% by 2050 relative to 2022 due to the widespread adoption of bifacial module technologies (which produce solar power from both sides of the panel), larger wafer sizes, and material improvements which will increase energy yields.
- Offshore wind remains comparatively expensive but is expected to lead the cost reduction race, with costs expected to fall 68% by 2050. The scalability of offshore wind farms and turbines makes it one of the most promising renewable energy frontiers with average turbine heights expected to double to 200m by 2050 and turbine ratings growing from 9MW to 25MW[3].

Innovation: Energy storage systems are becoming more efficient with improvements in battery technology promising greater reliability for a grid running on renewable energy. Similarly, emerging technologies like green hydrogen have become technologically viable and will complement wind and solar as they achieve scale.

3 Source: All cost and production capacity forecasts from Wood Mackenzie March 2023. Cost estimates are based on the levelized cost of energy (LCOE) which calculates the present value of the total cost of building and operating a power plant over an assumed lifetime.

As a result of these tailwinds, renewable energy is expected to become more economically viable and displace fossil fuels. For example, installed capacity for solar power is expected to outgrow natural gas by 2026 and coal by 2027:

Figure 02: Share of cumulative power capacity by technology



Source: IEA, Share of cumulative power capacity by technology, 2010-2027, IEA, Paris https://www.iea.org/data-and-statistics/charts/share-of-cumulative-power-capacity-by-technology-2010-2027, IEA. Licence: CC BY 4.0. Last updated 05 December 2022. The above forecast is based on current policies and market developments. **Forecasts are not an indicator of future performance and any investments are subject to risks and uncertainties.**

The renewable energy value chain

Gaining exposure to the renewable energy value chain is a diversified way to access the promising opportunity in this space. The value chain is as follows:

Raw Materials: Raw materials are the building blocks of the value chain, and each input has its own unique place. For example, copper's strong electrical conductivity helps reduce CO2 emissions in renewable energy systems, which can often use 6 times more of the metal than fossil-based energy systems[4]. Other materials like steel and aluminium are indispensable in building solar panels and wind turbines.

Manufacturing: The manufacturing of numerous components required for renewable energy is an integral component of the value chain. This includes production components like polysilicon for solar and turbine blades for wind, as well as distribution and transmission equipment like high voltage cables.

Enablers: Effectively operating a network on renewable energy requires the support of various enablers. These include energy storage systems which help stabilise the energy supply for times when production is low. They include network operators who deliver the energy to the end users. And it also includes sectors like recycling which must be scaled up for renewable energy to grow sustainably.

Application: Application refers to companies that build and manage renewable energy facilities. From securing planning permission to their construction and maintenance, renewable energy projects like offshore wind farms require time, capital, and expertise.

Emerging technologies: This refers to the cutting-edge in the renewable energy value chain. Emerging technologies include floating wind which can be easier to install and potentially deliver higher production capacity as floating turbines can be taken farther offshore to access windier conditions. Floating solar, solid-state batteries, and green hydrogen production are among other examples of emerging technologies which highlight the exciting innovation happening in the renewable energy value chain.

4 According to the International Copper Association, 2023.

Important Information

Marketing communications issued in the European Economic Area ("EEA"): This document has been issued and approved by WisdomTree Ireland Limited, which is authorised and regulated by the Central Bank of Ireland.

Marketing communications issued in jurisdictions outside of the EEA: This document has been issued and approved by WisdomTree UK Limited, which is authorised and regulated by the United Kingdom Financial Conduct Authority.

WisdomTree Ireland Limited and WisdomTree UK Limited are each referred to as "WisdomTree" (as applicable). Our Conflicts of Interest Policy and Inventory are available on request.

For professional clients only. Past performance is not a reliable indicator of future performance. Any historical performance included in this document may be based on back testing. Back testing is the process of evaluating an investment strategy by applying it to historical data to simulate what the performance of such strategy would have been. Back tested performance is purely hypothetical and is provided in this document solely for informational purposes. Back tested data does not represent actual performance and should not be interpreted as an indication of actual or future performance. The value of any investment may be affected by exchange rate movements. Any decision to invest should be based on the information contained in the appropriate prospectus and after seeking independent investment, tax and legal advice. These products may not be available in your market or suitable for you. The content of this document does not constitute investment advice nor an offer for sale nor a solicitation of an offer to buy any product or make any investment.

An investment in exchange-traded products ("ETPs") is dependent on the performance of the underlying index, less costs, but it is not expected to match that performance precisely. ETPs involve numerous risks including among others, general market risks relating to the relevant underlying index, credit risks on the provider of index swaps utilised in the ETP, exchange rate risks, interest rate risks, inflationary risks, liquidity risks and legal and regulatory risks.

The information contained in this document is not, and under no circumstances is to be construed as, an advertisement or any other step in furtherance of a public offering of shares in the United States or any province or territory thereof, where none of the issuers or their products are authorised or registered for distribution and where no prospectus of any of the issuers has been filed with any securities commission or regulatory authority. No document or information in this document should be taken, transmitted or distributed (directly or indirectly) into the United States. None of the issuers, nor any securities issued by them, have been or will be registered under the United States Securities Act of 1933 or the Investment Company Act of 1940 or qualified under any applicable state securities statutes.

This document may contain independent market commentary prepared by WisdomTree based on publicly available information. Although WisdomTree endeavours to ensure the accuracy of the content in this document, WisdomTree does not warrant or guarantee its accuracy or correctness. Any third party data providers used to source the information in this document make no warranties or representation of any kind relating to such data. Where WisdomTree has expressed its own opinions related to product or market activity, these views may change. Neither WisdomTree, nor any affiliate, nor any of their respective officers, directors, partners, or employees accepts any liability whatsoever for any direct or consequential loss arising from any use of this document or its contents.

This document may contain forward looking statements including statements regarding our belief or current expectations with regards to the performance of certain assets classes and/or sectors. Forward looking statements are subject to certain risks, uncertainties and assumptions. There can be no assurance that such statements will be accurate and actual results could differ materially from those anticipated in such statements. WisdomTree strongly recommends that you do not place undue reliance on these forward-looking statements.