Renewable energy – bold ambitions, exciting innovations, and hope for a sustainable future

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The damaging effects of climate change are already upon us. So far this year, locals and tourists have been forced to flee raging wildfires in the beautiful islands of Greece. In Madagascar, more than a million people are suffering from hunger and malnutrition due to the worst drought in 40 years1. Flash floods in Sudan have displaced large populations and damaged infrastructure and crops. In China, wild weather swings have brought torrential rains in some parts, while other regions bake in scorching heat.

That is anything but an exhaustive list. And so, we must act now to stop human induced climate change. Fortunately, the world has awakened to this realisation. The gap between global investment in clean energy versus that in fossil fuels is starting to widen (see Figure 1 below).

Source: IEA, Global energy investment in clean energy and in fossil fuels, 2015-2023, IEA, Paris https://www.iea.org/data-and-statistics/charts/global-energy-investment-in-clean-energy-and-in-fossil-fuels-2015-2023, IEA. Licence: CC BY 4.0. Historical performance is not an indication of future performance and any investments may go down in value.

This blog outlines some of the biggest renewable energy mega projects happening around the world which show that, when bold ambition meets innovation, there is hope for a more sustainable future.

Energy Island, Denmark
Denmark is building an artificial island capable of powering the entire country in what the Danish government claims is a ‘gigantic green quantum leap’. The island will be built 60 kilometres (km) offshore to benefit from stronger winds, be the size of 18 football pitches, and could house up to 600 giant wind turbines. Denmark plans to complete the project by 2030 with the aim of supplying 3-4 gigawatts (GW) of energy and ultimately expanding to almost 10GW. This future expansion will allow Denmark to export energy generated from the island2.

Denmark constructed the world’s first offshore wind farm in 19913 and has, since then, had a strong focus on generating renewable energy from the strong winds in the North Sea. This project will be a monumental culmination of that policy focus. In addition to wind power generation, the island will also have battery storage and an electrolysis plant to produce green hydrogen.

This trio of technologies that will be situated on the island neatly illustrates their interconnectedness. Battery storage is essential to make wind a dependable source of energy, by enabling it to be deployed as and when required, particularly over shorter durations of time. The production of green hydrogen requires a current of renewable energy to be passed through water to separate hydrogen from oxygen. That hydrogen can then serve as a store of energy for long periods of time, like days or weeks, and can be converted back into electrical energy through fuel cells. Scaling up all three together is a smart course of action.

Gansu Wind Farm, China

The Gansu Wind Farm in China's first phase was completed in 2010 with a 5.16GW capacity and has since held the spot as the world's largest wind farm. The project continues to expand and, in 2021, its capacity reached 10GW. When finished, it will comprise 7000 wind turbines and reach a capacity of 20GW4.

The Gansu Wind Farm sits on the outskirts of the Gobi Desert in northern China, considered an extremely remote and hostile area. To get electricity from the wind farm, China has built a 2,383 km transmission line5.

The Gansu Wind Farm highlights how, with enough willpower, onshore wind (turbines on land) can be deployed at scale. Onshore wind projects often face their own set of challenges when land is at a premium. There is often an opportunity cost of building large onshore wind farms if space must be taken away from agriculture or housing, or if there are ecological risks. By contrast, the Gansu Wind Farm resides in an uninhabitable part of the world with very windy conditions making it a highly fruitful endeavour for harnessing onshore wind, albeit one requiring a bit more effort to build and maintain.

Bhadla Solar Park, India

What else is abundant in a desert? Sunshine. The Bhadla Solar Park in India's desert state of Rajasthan is the largest solar farm in the world, spanning over an area of 14,000 acres. The farm was commissioned in 2017, has a capacity of 2.25GW, and contains over 10 million solar panels6.

One of the challenges faced by solar power projects situated in deserts is that sand can form a layer over the modules restricting the amount of sunlight that goes through. To overcome this challenge, the facility uses robotic cleaners that employ microfibre rollers to clean the panels7.

For a country like India where there is plenty of sunlight, solar power makes a lot of sense. Again, deserts may be hostile environments for installing and maintaining such projects, but these projects minimise the opportunity cost of using land for creating solar power. For an emerging economy with a large population and substantial energy needs, such projects also reduce the country's dependence on fossil fuel imports, a great outcome for both the environment as well as the economy.

Dezhou Dingzhuang Floating Solar Farm, China

The Dezhou Dingzhuang Floating Solar Farm in Dezhou, China is the largest floating solar farm in the world. The solar panels float on a reservoir in Shandong – an eastern province of China on the Yellow Sea. The total capacity of this project is 320 megawatts (MW). It is also connected with 8 megawatt hours (MWh) of battery storage and a 100 MW wind farm which together make up the Huaneng Dezhou Dingzhuang Integrated Wind and Solar Energy Storage project8.

Floating solar offers numerous benefits, including maximising land use efficiency, conserving water resources by reducing evaporation, improving solar panel efficiency through cooling effects, and enhancing grid stability by being located closer to where the demand is.

A final word

Renewable energy projects are becoming bolder, more innovative, and being built with a greater sense of urgency. This has exciting implications for the renewable energy value chain. For example, more modules need to be manufactured so they can be installed in large solar farms around the world. Wind turbines, which are becoming bigger and bigger, need to be manufactured at scale to establish onshore and offshore wind farms. Hydrogen electrolysers are required to produce green hydrogen and fuel cells are needed to use green hydrogen as a fuel source. Similarly, when wind turbines or solar modules float on water, specific components are needed to make that happen. All of this creates promising opportunities for investors in the renewable energy value chain.

The WisdomTree Renewable Energy UCITS ETF (WRNW) gives investors a way to capture all of the above and more. WRNW is built in partnership with Wood Mackenzie, who bring deep subject matter expertise in identifying the most promising innovations and the most relevant companies to create an exposure that best represents the renewable energy theme. In doing so, the product identifies 32 unique subsectors across raw materials, manufacturing, enablers, application, and emerging technologies. Solar modules, hydrogen electrolysers, wind turbine components, and floating solar are among the subsectors included.

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1 Source: United Nations, July 2023.

2 World Economic Forum, The Danish Energy Agency (part of the Ministry of Climate, Energy and Utilities), 2023.

3 The Danish Energy Agency (part of the Ministry of Climate, Energy and Utilities), 2023. https://ens.dk/en/our-responsibilities/energy-islands/denmarks-energy-islands.

4 Discover Clean Tech, 2023. https://discovercleantech.com/ten-gigantic-wind-farms/.

5 Discovery UK, 2023. https://www.discoveryuk.com/building-big/the-largest-wind-farm-in-the-world/.

6 Ornate Solar, 2023. https://ornatesolar.com/blog/the-5-largest-solar-power-plants-in-the-world.

7 National Geographic India.

8 YSG Solar, 2022.

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