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Offshore wind power takes off in China

China's 14th Five-Year Plan outlines the forthcoming construction of nine major clean energy bases and five offshore wind power industrial bases, with an estimated future installed capacity of 400 GW. The clean energy bases will be mainly composed of wind power and photovoltaic, as well as some solar thermal power.

The nine clean energy bases will be located in the lower reaches of the Yarlung Tsangpo River, the lower reaches of the Jinsha River, the Yalong River basin, the upper reaches of the Yellow River, the Hexi Corridor, the provinces of Xinjiang and Hebei, and the Songliao basin. The five offshore wind power bases will be off the coasts of the provinces of Guangdong, Fujian, Zhejiang, Jiangsu, and Shandong.

The first phase of these projects with an installed capacity of around 100 GW has already started construction. This phase one is largely located in rocky areas and deserts. 40% of the power generated will be used for local consumption while the balance will be transmitted elsewhere using Ultra-High Voltage (UHV) transmission lines.

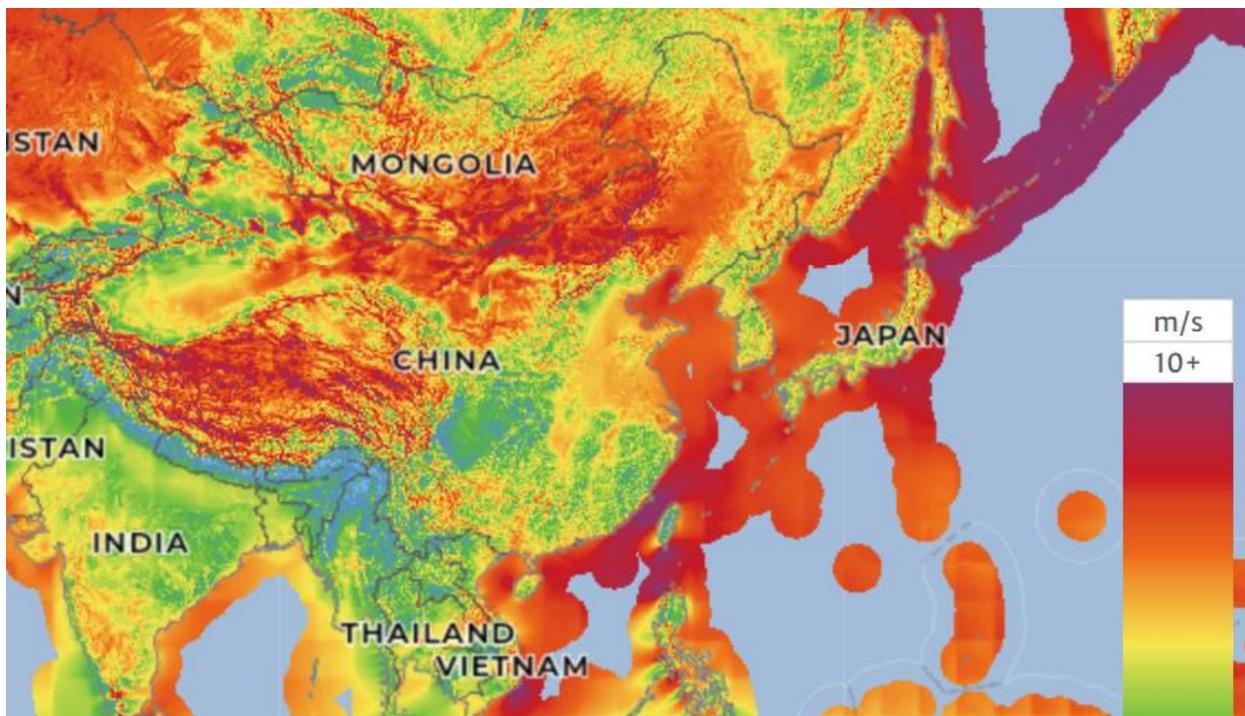
At the end of September 2021, China's total installed power generation capacity was around 2300 GW, among which 55% was thermal power (1,265 GW), 13% was wind power (300 GW) and 12% was solar power (280 GW). With an additional 400 GW, we can see that the new major clean energy bases will play an important role to reach the 1,200 GW solar and wind power installed capacity target that China has scheduled to reach by 2025. As for offshore wind power, China has recently overtaken the United Kingdom by having the world's largest offshore wind power capacity of 11.13 GW versus 10.4 GW of installed capacity for the UK as at the end of 2020.

Recently, Zhangzhou, a city in Fujian province, disclosed the detailed plan of a 50 GW offshore wind power industrial base. The wind farms will be in the shallows off Dongshan Island, covering 8,800 square kilometers and a water depth of 8-30 meters. To put this project in perspective, at present the largest wind farm in the world is the Dogger Bank wind farm located in the UK with a total capacity of 3.6 GW. Although Zhangzhou's wind

power industrial base will consist in several wind farms, the total anticipated capacity is still a staggering number.

Zhangzhou has superior wind power resources with average annual wind speeds of 9m/s and a utilisation time of 4,000 hours per year. The development plan has been submitted to the National Energy Administration and it is expected to be approved by the end of 2022. Once the approval is obtained, Zhangzhou will launch tenders and invite bids to install 5-10 GW every year starting from 2025.

This map shows the wind resources in China



Source: Global Wind Atlas.

After full completion, the annual power generation of the Zhangzhou wind farms will reach 200,000 GWh, which is very close to what had been the entire power consumption of Fujian province in 2020. Fujian Province is 120,000 km², roughly equivalent to Greece. It has 41m people.

According to the published electricity plan by Fujian province, clean energy installed capacity (including the existing solar, wind, hydro, and nuclear power production capacity) will be no less than 80GW by 2030 at which point clean energy will be able to cover the entire province's electricity needs.

China is taking wind energy seriously. Populated coastal provinces, such as Fujian province, consume about 80% of the nation's total electricity whereas a large portion of electricity production is generated in the western part of the country and transmitted to the east using Ultra-High Voltage lines. As western provinces have introduced large-scale energy-intensive industries such as silicon panels and electrolytic aluminum, power shortages are getting worse. The transition towards offshore wind farms along the east coast will allow power generation to be located close to the power usage areas.

In early June, Guangdong province also announced the expansion of its offshore wind power generation capacity to 4 GW by the end of 2021 and a further expansion of 18 GW by 2025. The total installed capacity of offshore wind power mills will reach 45 GW by the end of 2025.

We are therefore seeing rapid changes in the Chinese offshore wind power industry. Just one year ago, as China's offshore wind power projects were heading towards the full removal of subsidies by the end of 2021 to let clean energy compete with coal-fired power generation on an equal footing, investors and wind farm operators appealed to the government to come up with transitional policies, without success.

In the meantime, wind turbine manufacturers keep producing larger and larger prototypes to increase energy capacity, creating economies of scale that drive the cost of energy per megawatt-hour down. In turn, reduced costs could greatly increase the number of offshore potential sites. For instance, Mingyang Smart Energy, a Chinese leading wind turbine maker, has built the largest offshore wind turbine, 242m high and capable of producing 16 MW. These Chinese-based producers are also looking abroad as domestic price competition is fierce. As a sign of what's to come, Italian renewable energy developer Renexia recently bought 10 Mingyang's 3 MW turbines for a project located on Italy's southern coast.

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