



SOUTHWEST OFFSHORE WIND FARM, JELLABUK-DO, KOREA, DOOSAN HEAVY INDUSTRY 3 MW WTGS, SOURCE: KOREA OFFSHORE WIND POWER CO., LTD.

KOREA

Having installed 191 MW capacity of wind turbines in 2019 and 160 MW in 2020, the accumulated capacity in Korea reached 1650 MW at the end of 2020. A 60 MW offshore windfarm was constructed in 2020 resulting in 132 MW offshore wind power capacity in Korea.

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In 2017, the renewable energy target was raised to 20% of the electricity generation by 2030. In October 2020, president Moon Jae-in announced

that the Republic of Korea aims to achieve carbon neutrality by 2050. The wind energy sector in Korea, which has shown slower deployment than the photovoltaics, is preparing large-scale installation of wind energy, especially in offshore wind for the energy transition.

TABLE 1. KEY NATIONAL STATISTICS 2020: KOREA

Total (net) installed wind power capacity	1650 MW
Total offshore capacity	132 MW
New wind power capacity installed	160 MW
Decommissioned capacity	0 MW
Total electrical energy output from wind	2.76 TWh
Wind-generated electricity as percent of national electricity demand	0.6%
Average national capacity factor	24.5%
Target	17.7GW by 2030
National wind energy R&D budget	35 mil USD

Market development

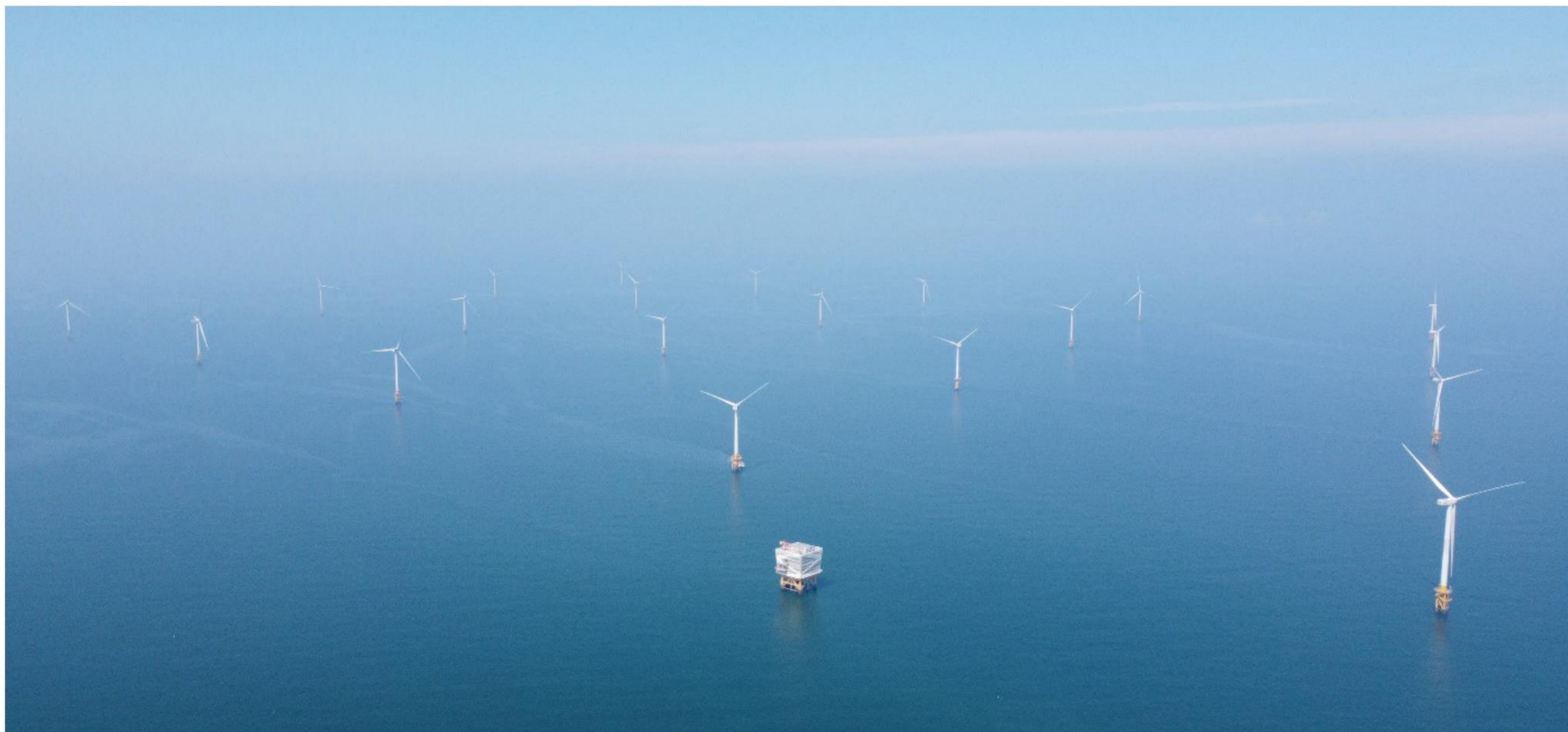
National targets and policies supporting development

- At the end of 2017, Ministry of Trade, Industry and Energy (MOTIE) announced the 'Renewable Energy 2030 Implementation Plan' which states the national renewable energy targets and its implementation plans towards 2030. The national objective is 20% renewable energy generation of the national electricity demand by 2030 [1].
- According to that plan, 63.8 GW renewable capacity is required by 2030 [1]. Among various renewable energy sources, PV and wind will lead the capacity. PV accounts for 36.5 GW (57%) and wind for 17.7 GW (28%) capacity by 2030 [1].
- The Renewable energy Portfolio Standards (RPS) is the main policy to support wind energy development, which is basically a technology-neutral, market-based system. In the RPS system, there are multiplying factors to adjust the amount of renewable electricity generated from each technology, which varies from 0.25 to 3.8 (excluding ESS applications) [2]. For onshore wind, the factor is from 1.0 to 1.3 depending on the type of projects (e.g., how many local communities were involved in the project). Among various renewable energy sources, offshore wind has the biggest factors, from 2.0 to 3.8, which means that the government strongly drives the deployment of offshore wind within the country [2]. It is expected that the country is going to deploy about 12 GW of new offshore wind capacity by 2030 [3].

- In October 2020, president Moon Jae-in announced that Republic of Korea aims to achieve carbon neutrality by 2050. Under the Green New Deal, president Moon pledged to replace coal-fired power generation with renewable energy over the next decades.

Progress and operational details

- 160 MW wind turbine capacity was installed in 2020 – 16% less than the amount newly installed in the previous year [4]. Five wind farms were commissioned in 2020, one of them was an offshore wind farm and the other four were land-based [4]. The offshore wind farm 'Seonamhae', which means southwest sea offshore wind farm, is a demonstrative project with the size of 60MW and further offshore developments are in progress. Land-based projects varied in size from 5 to 12 WTGs [4]. The average capacity of one single WTG installed in 2020 was 2.81 MW, ranging from 1.65 to 4.5 MW for each [4].
- The total installed wind capacity in the country reached 1,650 MW by the end of 2020 – a 11% increase from the previous year [4]. There are 108 wind farms with 741 WTGs in total. Private companies owned 56.2% (921 MW) of total installed capacity, 36.1% by national utilities and 7.7% by others (e.g., research institutes) [4]. In 2019, the electricity generated from wind power was 3.133 TWh (provisional) which accounted for 0.6% of the national electricity demand (515.987 TWh, provisional) [5].
- According to the Electricity Business License (EBL) by Ministry of Trade, Industry and Energy, a total of 4,659 MW offshore wind projects have received the EBL at 33 locations at the end of 2020. [6].



[PHOTO 1] SOUTHWEST OFFSHORE WIND FARM: BIRD'S-EYE VIEW, JELLABUK-DO, KOREA, DOOSAN HEAVY INDUSTRY 3 MW WTGS, SOURCE: KOREA OFFSHORE WIND POWER CO., LTD.

Matters affecting growth and work to remove barriers

- On 17 July 2020 the Ministry of Trade, Industry and Energy (the “MOTIE”), the Ministry of Oceans and Fisheries (the “MOF”) and the Ministry of Environment (the “MOE”) jointly issued a “Plan for Offshore Wind Power Generation in Collaboration with Local Residents and the Fishing Industry”. The Collaboration Plan sets out specific measures to encourage the speedy development of large-scale offshore wind farms and trickle-down benefits to local stakeholders [7].
- Two objectives of the ‘Offshore Wind Power Collaboration Plan’ are as follows. First, to install 12GW of offshore wind power, creating 87,000 new jobs annually, by 2030 to become one of the world’s five largest offshore wind power generating countries. Second, to share the economic benefits of offshore wind development with local residents and the fishing industry [7].
- Three collaborative initiatives: 1. Government-led Siting and Streamlined Permitting 2. Encouraging Stakeholder Acceptance 3. Leveraging Large-Scale Projects to Enhance Industrial Competitiveness [7].

“Licenses for electricity business offshore totalled 4.7GW wind projects at 33 locations end of 2020 and increasing amount of new applications are seen—to deliver the ambitious offshore target of 12 GW in 2030.

R,D&D activities

National R,D&D priorities and budget

- In Korea, one of the R,D&D priorities has been the development of wind turbine generators and its major components for the value chain of wind industry. Also, the development of smart O&M strategies and technologies for the reduction of LCOE was important—especially in the offshore sector.
- Recently the topics of social acceptance and safety issues are being emphasised. Also R,D&D activities about the deployment of wind farms and the reduction of LCOE will be continued.

National Research Initiatives and results

- A project titled ‘Development of 8MW High Capacity Offshore Wind Turbine’ is in progress. Also a project titled ‘Development of floating offshore wind turbine pilot plant (MW class) in finite water depth’ was launched in 2020.
- Another project ‘Development of a condition monitoring and diagnosis for wind turbine generation system’ is also finalised and expected to contribute to better operation and maintenance of WTG.
- Other important R,D&D projects include ‘Development of a 13,000-ton wind turbine installation ship’ (‘18~’21), ‘Development on Installation System of XL Monopile for Offshore Wind Turbines in Korea’ (‘18~’21), and ‘Development of



[PHOTO 2] GYEONG-JU WIND FARM, GYEONGSANGNAM-DO, KOREA, UNISON 2.3MW WTG, SOURCE: UNISON CO., LTD.

Repowering Total Technology to Improve Availability of Old Wind Farm' ('18~'21).

Test facilities and demonstration projects

- A blade test laboratory 'Korea Institute of Materials Science (KIMS - WTRC)' was recognised as one of the RE Testing Laboratories of IECRE in 2019. The KIMS-WTRC can accommodate and test 8MW blades as the dimension of the blade test building is large enough and equipped with static and fatigue test equipment for blades.

Collaborative research

- Currently, Korea is participating IEA Wind TCP Task 11, Task 30, Task 32 and Task 41. As the wind industry expands in Korea, more participation to IEA wind tasks from the industry is expected.

Impact of wind energy

Environmental impact

- The electricity generated from wind power covers only about 0.6% of the national electricity demand which is a very low percentage. However, in Korea, the increase of renewable energy (photovoltaics and wind) and curtailed operation of coal-power resulted in the reduction of 5,090 tons CO₂ in 2020 compared to the previous year. The deployment of large-scale offshore wind energy is an essential measure for the carbon neutral strategy in Korea.

Economic benefits and industry development

- Regarding the domestic wind manufacturing industry, the amount of economic benefits and the level of industry development in 2020 was at the

same level than in 2019, when turnover of 1,461 billion KRW (1,292 million USD) was recorded and the number of people employed reached 1,545 [8].

- As an indicator of the domestic capability of the wind manufacturing industry, roughly half of the installed capacity was covered by domestic WTGs in recent years [4]. The statistics had shown that national utilities had more preferences in domestic WTGs than those by the private companies as a developer or an owner [4]. In 2020, 94.3 MW of domestic wind turbine and 65.7 MW of foreign wind turbines were newly installed [4,6]. Domestic WTGs accounted for 46.4% (762 MW) of the total installed capacity by the end of 2020 [4]. VESTAS had the largest market share, 35%, followed by Unison, Doosan Heavy Industry and Siemens-Gamesa, based on accumulated wind turbine capacity by the end of 2020 [4].
- The development of offshore wind farms is a key component of the Korean Green New Deal which would invest KRW 73.4 trillion to create 659,000 jobs in new and renewable energy sectors.

Total installed wind capacity reached 1,650 MW in 2020—a 11% increase from the previous year

Next term

Not only a strong governmental policy on renewable energy and energy transition, but also the support from the national assembly is expected during the next several years in the wind energy sector due to

the pledge of carbon neutral strategy by 2050. On the basis of the newly determined REC (Renewable Energy Certificate) multiplying factor for offshore wind energy in 2018, greater involvement of local governments and communities and increased feasibility study cases[9] will act as further positive drivers for large-scale offshore wind development. The grid enforcement plan and the basic design of collector bus for offshore wind farms are in progress. Also, some FEED studies for offshore projects and the increased number of cases for EBL(Electricity Business License) applications are indicators of the current status of offshore wind development in Korea.

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[PHOTO 3] PYEONG-CHANG WIND FARM, GANGWON-DO, KOREA, HYOSUNG 2MW AND HYUNDAI HEAVY INDUSTRY 2MW WTGS, SOURCE: KOREA SOUTHERN POWER CO., LTD.