Report 2021

Korea

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Having installed 64 MW capacity of wind turbines in 2021, the accumulated capacity in Korea reached 1713 MW at the end of 2021.

In 2017, the renewable energy target was raised to 20% of the electricity generation by 2030. In October 2020, it was 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 for large-scale installation of wind energy, especially in offshore wind, for the energy transition.

Highlight(s)

- Total installed wind capacity reached 1,713 MW in 2021 – a 3.9% increase from the previous year.
- The number of offshore projects with a Business licence increased to 13.6 GW (54 sites, up from 33 sites in 2020).

Table 1. Key National Statistics 2019: Korea

Total (net) installed wind power capacity	1713 MW
Total offshore capacity	142 MW
New wind power capacity installed	64 MW
Decommissioned capacity (in 2018)	0 MW
Total electrical energy output from wind	2.85TWh
Wind-generated electricity as percent of national electricity demand	0.6%
Average national capacity factor	23.4%
Target	17.7GW by 2030
National wind energy R&D budget	45 mil USD

Market Development

National Targets and Policies Supporting Development

- At the end of 2017, the Ministry of Trade, Industry, and Energy (MOTIE) announced the "Renewable Energy 2030 Implementation Plan," which states the national renewable energy target, 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, a 63.8 GW renewable capacity is required to meet the target of 20% of national electricity demand, 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 project (e.g., how many local communities were involved in the project). Among various renewable energy sources, offshore wind has the biggest factor, 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].

- The new president-elect of the Republic of Korea, Mr. Yoon stated to maintain the policy of carbon neutrality target in 2050, which was established by the former president Moon. He also announced to increase the nuclear power generation, which currently supplies 29% of annual electricity consumption already, in 2021.

- Because carbon neutrality is the promise to the world and the new government said to succeed in it, Korea's renewable energy policies will be and should be continued. In addition, the request from major companies to achieve RE100 is getting stronger in Korea. Moreover, the lowest number of wind share of electricity, 0.6%, even shows the possibility and the room for the growth of wind energy development in Korea.

Progress and Operational Details

- 64 MW wind turbine capacity was installed in 2021—less than half of the amount newly installed in the previous year [4]. Five wind farms with 18 wind turbines will be installed in 2021, and all of them are land-based projects [4]. The average capacity of one single WTG installed in 2021 was 3.53 MW, ranging from 1.65 to 4.5 MW for each [4].

- The total installed wind capacity in the country reached 1,713 MW by the end of 2021—a 3.9% increase from the previous year [4]. There are 109 wind farms with 759 WTGs in total. Private companies owned 56.8% (966 MW) of total installed capacity, 35.8% by national utilities,

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and 7.4% by others (e.g., research institutes) [4]. In 2021, the electricity generated from wind power was 3.163 TWh (provisional) which accounted for 0.6% of the national electricity demand (537.014 TWh, provisional) [5].

- According to the Electricity Business License (EBL) by the Ministry of Trade, Industry, and Energy, a total of 13,595MW offshore wind projects have received the EBL at 54 locations at the end of 2021. This number of sites increased 64% compared to 33 areas of the previous year [6].

Matters Affecting Growth and Work to Remove Barriers

- On July 17, 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].

- 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.

RD&D Activities

National RD&D Priorities and Budget

- In Korea, one of the RD&D priorities has been the development of wind turbine generators and their major components for the value chain of the 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 have been emphasised. Also, RD&D activities regarding the deployment of wind farms and the reduction of LCOE will be continued.

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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 RD&D projects include "Development of a 13,000-ton wind turbine installation ship" ('18~'22), "Development of Repowering Total Technology to Improve Availability of Old Wind Farm" ('18~'21), "Development of power quality control technology for a large capacity wind turbine with modular structure," and "Development and Demonstration of Integrated O&M Service Solution for Digital-Based Offshore Wind Power Plant" ('20~'22).

Test Facilities and Demonstration Projects

- A blade test laboratory 'The 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 in IEA Wind TCP Task 11, Task 30, Task 32, and Task 41. As the wind industry expands in Korea, more participation in 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 50.9Mt 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 industry, it seems that the number of economic benefits and the level of industry development in 2021 did not deviate much from the previous year. In 2020, domestic wind manufacturing industry revenue recorded an overall turnover of 1,920 billion KRW (1,477 million USD) [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 have shown that national utilities had more preferences in domestic WTGs than those by the private companies as a developer or an owner [4].

In 2021, 18MW of domestic wind turbine and 45.6MW of foreign wind turbines were newly installed [4,6]. Domestic WTGs accounted for 45.7% (779 MW) of the total installed capacity by the end of 2021 [4]. VESTAS had the largest market share, 34%, followed by Unison, Doosan Heavy Industry, and Siemens-Gamesa, based on accumulated wind turbine capacity by the end of 2021 [4].

Next Term

Rising energy prices are an opportunity for the expansion of renewable energy generation, and the investment in renewable energy generation is expected to expand in terms of energy security. Based on 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 will act as further positive drivers for large-scale offshore wind development. Grid enforcement plan and the basic design of collector bus for offshore wind farms are in progress. In addition, 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. As the new government places importance on nuclear power generation, there is also concern that the expansion of renewable energy will be relatively limited.

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