



Report on Wind Power Industry 2015, South Korea

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Introduction

The cumulative installed wind power in South Korea was 608.5 MW in 2014, up 8.5% from 561 MW in 2013. Most wind turbine systems were supplied by local turbine manufacturers since 2011. The Korean government has changed its renewable energy policy from Feed in-Tariff (FIT) to Renewable Portfolio Standard (RPS) since 2012. The required rate of the RPS in 2012 was 2% and will increase up to 10% by 2024. A plan for construction of a 2.5 GW offshore wind farm off the west coast was announced in 2010. The first stage of the project with a capacity of 100 MW wind farm was downsized to 60 MW and Doosan Heavy Industries & Construction is on a list of the potential Engineering Procurement Construction (EPC) members. Since 2009, the government has concentrated on local production of components to secure the supply chain for wind projects. Several onshore & offshore wind farm projects are planned by the central & local governments and private companies.

Plan and Progress of South Korea Wind Power Industry

4th basic plan for the new & renewable energies ¹

On September 19, 2014, the Korean government announced the long-term plan for the new & renewable energies (NRE) field. The main issues are as follow:

a. To supply 11.0% of the total primary energy supply (TPES) with the NRE by 2035, with annual growth rate of 6.2% from 2014 to 2035 (annual growth rate of 0.7% for TEPS).

Table 1. Change in supply of new & renewable energies (unit: %)

	2012	2014	2020	2025	2030	2035
Ratio of the total primary energy supply	3.2	3.6	5.0	7.7	9.7	11.0

b. To reduce the relative importance of waste energy, while developing solar and wind power as major alternative energy resources, so that NRE will account for 11.0 % of total energy by 2035. The wind power will play an important role on the long term deployment plan. The onshore & offshore wind farms will supply 18.2 % of total NRE by 2035.

Table 2. New & renewable energy supply composition ratio (unit: %)

	2012	2014	2025	2035	Annual growth rate
Solar-thermal	0.3	0.5	3.7	7.9	21.2
Solar-PV	2.7	4.9	12.9	14.1	11.7

¹Ministry of Trade, Industry and Energy (MOTIE), 9 September 2014

http://www.motie.go.kr/motie/ne/rt/press/bbs/bbsView.do?bbs_seq_n=79321&bbs_cd_n=16



Wind	2.2	2.6	15.6	18.2	16.5
Biomass	15.2	13.3	19.0	18.0	7.7
Hydraulic	9.3	9.7	4.1	2.9	0.3
Geothermal	0.7	0.9	4.4	8.5	18.0
Marine	1.1	1.1	1.6	1.3	6.7
Waste	68.4	67.0	38.8	29.2	2.0

c. To focus on building a NRE market base by shifting from a government-led system to private partnerships. The aim is to upgrade the level of the wind energy technology and to take lead in the NRE.

d. To secure sustainable growth through expansion into overseas wind markets.

Korea has experienced a slight setback in its 4th basic plan for NRE technology development and deployment, such as the two-year delay in reaching a RPS obligation rate of 10% in the 3rd plan.

2.2 Progress of wind power industry in South Korea

47.2 MW of wind power was installed in 2014 and its cumulative wind power reached up to 608.5 MW last year. Most wind turbine systems were supplied by local manufactures since 2011.

Table 3. Cumulative wind energy capacity in South Korea

Year	Capacity	Year	Capacity
1998	1,200kW	2007	195,945kW
1999	3,345kW	2008	301,195kW
2000	4,845kW	2009	352,095kW
2001	6,825kW	2010	373,345kW
2002	10,575kW	2011	402,260kW
2003	14,055kW	2012	484,060kW
2004	37,445kW	2013	561,300kW
2005	65,445kW	2014	608,500kW
2006	174,795kW	Demolish: 2011 (2,085kW), 2013 (1,410kW)	

Domestic Wind Power Industry Situation²

For the last five years, the wind power was seen as the most competitive in price among new & renewable energy resources and drew lots of attention as one of the country's new growth engines. Major shipyards in Korea, as the global leaders in heavy industry, could develop the wind turbines somewhat easily and they could get most of the related components from local suppliers.

The government has concentrated on local production of components to secure the supply chain for wind projects. However, Korea's geographical conditions are not very suitable for wind power generation complexes due to the small landmass and limited wind in many regions. These unfavorable conditions serve as a trigger for Korea's wind power industry to search for markets overseas. Wind markets in industrialized countries in Europe seem to be a hard nut to crack for latecomers like Korea, especially with technical and financing barriers hindering a smooth entry.

In the turbine manufacturing sector, major heavy industry companies, such as Hyundai Heavy Industries, Samsung Heavy Industries, Daewoo Shipbuilding & Marine Engineering, Doosan Heavy Industries and

²Korea Wind Energy Industry Association (KWEIA), 'Annual Report on Wind Energy Industry of Korea 2015'



Hyosung Heavy Industries had shown outstanding performance at the beginning stage in 2011-2013. However, wind turbine manufactures have been faced with lots of difficulties in securing the wind projects at home and abroad. As a matter of fact, the proven track records of successful operations in the offshore are used to enter overseas offshore wind projects. Since most of the Korean companies are lacking technology and experience, makes entering into new markets difficult, especially when they try on their own. Fierce competition against global players like Vestas, Siemens, GE and Chinese companies, which have secured their competitive edge in technology and price, is a big hurdle to take.

On the other hand, international oil prices have nearly halved in the past year. Plunging oil prices have negative effects on the Korean wind power industry. Low oil prices has led the government to back away from its low-carbon growth strategy, including its strict allocation of emission rights and slow down its structural reforms of loosely-run state enterprises and other public corporations.

Factors influencing growth of wind energy

There are two major Factors to raise the growth of wind energy. The first factor is the construction of a 2.5 GW offshore wind farm in the Southwest Sea. According to the roadmap announced by the government, the 2.5 GW wind farm will be constructed through three stages over nine years, beginning in 2011. For the first four years, 60 MW of wind farm will be installed to demonstrate the performance of the Doosan Heavy Industries and Construction's 3MW wind turbines. Then, 400 MW of wind farm will be installed to accumulate operational experience and commercial purpose for the next two years. At the final stage, 2 GW of wind farm will be constructed with 5 MW wind turbines for commercial use. The total budget is estimated to be USD 7.5 billion.

Another issue is the RPS program starting from 2012. Major electric power suppliers are required to provide 2% of the power with new & renewable energy resources including wind power in 2012. The rate will increase up to 10% in 2024. This regulation will stimulate power suppliers to invest in new & renewable resources.

Next Challenge

RPS is originally designed to encourage the power suppliers to invest in new & renewable energy resources. In case the power suppliers fail to meet the initial target, they are required to pay penalties of 150% of the renewable energy certificate standard price. After three years' practice, sometimes REC on-the-spot market prices are higher than 150% of REC standard prices, which means paying penalties would be cheaper. The two years' delay in reaching a RPS obligation rate of 10% from 2022 to 2024 will influence domestic wind energy industry.

Global wind turbine manufacturers offer full scope service agreements when they contract with local wind farm owners for a long-term. Wind farm owners and developers tend to avoid all the potential risks, therefore they rely on manufactures to get spare parts, solve engineering problems, complete daily operations and execute maintenance with all-inclusive contracts from beginning to end. For example, one of the leading turbine manufactures (Vestas) has 42.2% market share in the Korean wind energy industry. Moreover, they offer both a Turbine Supply Agreement and also an all-inclusive service package for ten years or longer. Many wind farm owners are not fully satisfied with Vestas' service due to the high-priced service and the quality of after-sales service. Most of all, wind farm owners have problems with the closed nature of Vestas, as they are very keen to keep information out of the hands of others.

Korea's offshore wind turbines are all installed in Jeju, which are developed by the Korea Institute of Energy Research. The project consists of one 2 MW STX direct drive turbine, installed in 2011 and



another 3MW Doosan turbine installed in July 2012. The certification and testing of wind turbine with five different types are being carried out at the R&D Center for wind turbine type testing owned Jeju National University.

In 2010, the Korean government set a target for offshore wind power of 2.5 GW by 2030. The plan was modified in April 2015 to include a new time line for 80 MW to be operational by 2018. Most of the projects under the 2.5 GW plan will follow the private-public partnership (PPP) model, in which the Korea Electric Power Corporation (KEPCO) will be a leading developer, together with Doosan Heavy Industries & Construction. Jeju has an ambitious plan to be a 'Carbon Free Island Jeju' by 2030 and to have several offshore wind farms with total capacity of 2 GW. A 30 MW offshore demonstration wind farm (Tamra offshore wind farm) is under construction, which is being developed by Posco and Doosan Heavy Industries & Construction.

Table 4. New offshore wind projects in South Korea (Under construction & Permit phase)

No.	Developer	Name of Project	Total Capacity (kW)	Site Location
1	KOWP	Southwest Phase 1	60,000	South Jella
2	Posco & Doosan	Tamra	30,000	Jeju
3	Daelim & KEPCO E&C	Hanlim	100,000	Jeju (Permit phase)
4	KOSPO	Daejeong	200,000	Jeju (Permit phase)
5	Halla Wind	North-East	160,000	Jeju (Permit phase)
6	Doarm	Shinchong	100,000	Jeju (Permit phase)
7	Doarm	Quiduck	100,000	Jeju (Permit phase)

Korean companies need track records before entering the European market. They concentrate to develop small and medium size offshore wind farms in jeju and mainland to obtain track records.

Since most Korean companies are comparatively weaker in overall wind technology and are lacking in operating experience, entering new markets alone creates a lesser chance to succeed. As a result, a strategic partnership with foreign companies with good technology and expertise in offshore wind is strongly recommended for power companies, wind energy system companies, and EPC companies. Such a business partnership will provide the Korean companies with stronger negotiating power and financing abilities as well.

Table 5. Wind power facilities in Operation in Korea

No.	Name of Project	Date of Commercial Operation	Total Capacity (kW)	Number of Units (EA)	Site Location	Owner
1	Ulleung-do	1999	600	1	North Gyeongsang	North Gyeongsang Province
2	Pohang	2001	660	1	North Gyeongsang	North Gyeongsang Province
3	Jeonbuk	2007	7,900	10	North Jeolla	North Jeolla Province
4	Hangyeong	2007	21,000	9	Jeju	KOSPO
5	Deagwanryeong 1	2004	2,640	4	Gangwon	Gangwon Province
6	Maebongsan	2012	8,800	9	Gangwon	Taebaek City



7	Teongdeok	2006	39,600	24	North Gyeongsang	Youngduk Wind Power
8	Gangwon	2006	98,000	49	Gangwon	Gangwon Wind Power
9	Sinchang	2006	1,700	2	Jeju	Jeju Energy Corporation
10	Yangyang	2006	3,000	2	Gangwon	KOMIPO
11	Woljeong	2006	1,500	1	Jeju	KIER
12	Daegi	2007	2,750	2	Gangwon	HYOSUNG
13	Gori	2008	750	1	Busan	KHNP
14	Taegisan	2008	40,000	20	Gangwon	Taegisan Wind Power
15	Sinan	2008	3,000	3	South Jeolla	Dongkuk S&C
16	Yeongyang	2008	61,500	41	North Gyeongsang	Macquarie PE
17	Seongsan 1	2009	12,000	6	Jeju	KOSPO
18	Hyunjung	2009	1,650	1	Ulsan	Ulsan City
19	Saemangeum	2009	2,000	1	North Jeolla	North Jeolla Province
20	Samdal	2009	33,000	11	Jeju	Hanshin Wind Energy
21	Nuaeseom	2009	2,250	3	Gyeonggi	Gyeonggi Province
22	Yongdae	2010	4,500	6	Gangwon	Inje County
23	Gimnyeong	2010	1,500	2	Jeju	Jeju Energy Corporation
24	Wollyeong	2010	2,000	1	jeju	GS E&R
25	Yeongwol-Jeobsan	2010	2,250	3	Gangwon	Gangwon Province
26	Seongasn 2	2010	8,000	4	Jeju	KOSPO
27	Shihwa-Bangameori	2010	3,000	2	Gyeonggi	K water
No.	Name of Project	Date of Commercial Operation	Total Capacity (kW)	Number of Units (EA)	Site Location	Owner
28	Yeongheung 1	2011	22,000	9	Incheon	KOSPO
29	Gyeongpo	2011	3,000	2	North Gyeongsang	Poscoplantec
30	Daemyoung Yangsan	2011	3,000	2	South Gyeongsang	Daeyoung GEC
31	Gyeongin	2011	3,000	2	Gyeonggi	K water
32	Woljeong 1 (Offshore)	2012	3,000	1	Jeju	KIER
33	Gasiri	2012	15,000	13	Jeju	Jeju Energy Corporation
34	Woljeong 2 (Offshore)	2012	2,000	1	Jeju	KIER
35	Taebaek	2012	18,000	9	Gangwon	KOSPO
36	Yeonggwang	2012	2,000	1	South Jeolla	DSM
37	Gapado (Stand-alone)	2012	500	2	Jeju	KOSPO
38	Gyeongju	2012	16,800	7	North	EWP



					Gyeongsang	
39	Yeonggwang-Jisan	2012	3,000	1	South Jeolla	EWP
40	Changjuk	2012	16,000	8	Gangwon	KOSPO
41	Sinan (Mixed)	2013	9,000	3	South Jeolla	Dongyang E&C
42	Haengwon Village	2013	2,000	1	Jeju	Haengwon Wind energy Village
43	Yeongheung 2	2013	24,000	8	Incheon	KOSEP
44	Daegwanryeong 2	2013	2,000	1	Gangwon	Gangwon Province
45	Daemyoung Yeongam	2013	2,000	20	South Jeolla	Daemyoung GEC
46	Honam	2014	20,000	10	South Jeolla	EWP
47	Gimnyeong (Proto Type)	2014	10,500	2	Jeju	Jeju Province
48	Windmill Yangsan	2014	10,000	4	South Gyeongsang	Windmill Power
49	Gasado (Stand-alone)	2014	400	4	South Jeolla	KEPCO
50	Saemangeum Garyuk	2014	3,300	2	North Jeolla	EKR
51	Heangwon	2014	14,450	13	Jeju	Jeju Energy Corporation
Sites:51, Units:345, Capacity 608,500kW						