Part I
Renewable Strategies

Transition to Renewable Energy Systems, 1st Edition. Edited by Detlef Stolten and Viktor Scherer.

1
South Korea's Green Energy Strategies

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1.1
Introduction

The purpose of this chapter is to present an overview of South Korea's green energy strategies and policy goals set under the National Strategy for Green Growth: (1) government-driven strategies and policy towards green growth; (2) to narrow down the focus and concentrate on R&D for a new growth engine; and (3) to promote renewable energy industries.

The Republic of Korea is the world's fifth largest importer of oil and the third largest importer of coal [1] (see Table 1.1). Our green growth plan is to increase the share of new and renewable energy in the total energy supply from 2.7% in 2009 to 3.78% in 2013; we aim to double that share to 6.08% by 2020 and 11% by 2030 (Figure 1.1). The statistics of energy consumption from 2000 to 2010 in South Korea are presented in Table 1.2. The energy policy has focused on dealing with oil prices and supply during the post-oil shock period in the mid-1970s [2], but today's energy policy includes the plan and actions for addressing climate change and environment

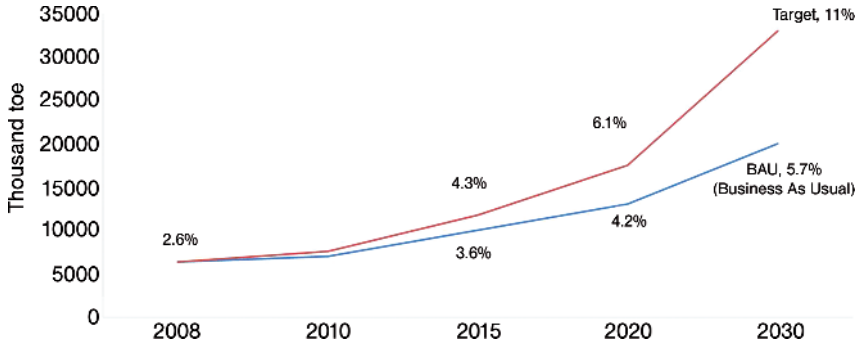

Figure 1.1 A scenario of renewable energy utilization plan from 2008 to 2030; toe, tonnes of oil equivalent. Source: MKE [3].

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Table 1.1 Producers, net exporters, and net importers of crude oil, natural gas, and coal.

Oil		Gas		Coal	
Net importers	**Mt**	**Net importers**	**Bcm[a]**	**Net importers**	**Mt**
United States	513	Japan	116	China	177
China	235	Italy	70	Japan	175
Japan	181	Germany	68	*South Korea*	*129*
India	164	United States	55	India	101
South Korea	*119*	*South Korea*	*47*	Taiwan	66
Germany	93	Ukraine	44	Germany	41
Italy	84	Turkey	43	United Kingdom	32
France	64	France	41	Turkey	24
The Netherlands	60	United Kingdom	37	Italy	23
Singapore	57	Spain	34	Malaysia	21
Others	483	Others	279	Others	213
Total	2053	Total	834	Total	1002

a Billion cubic meters.
Source: IEA [1].

Table 1.2 Statistics of energy consumption (thousand toe) from 2000 to 2010 in South Korea.

Year	Electricity	Heat	Renewable energy
2000	20 600	1119	2130
2001	22 165	1150	2456
2002	23 947	1223	2925
2003	25 250	1300	3210
2004	26 840	1343	3928
2005	28 588	1530	3896
2006	29 990	1425	4092
2007	31 700	1438	4491
2008	33 116	1512	4747
2009	33 925	1551	4867
2010	37 338	1718	5346

Source: MKE [13].

protection and securing energy resources. The Korean government has strategically emphasized the development of 27 key national green technologies in areas such as solar and bio-energy technologies, and pursued the target through various policy measures, such as the Renewable Portfolio Standard (RPS), waste energy, and the One Million Green Homes Project.

Thus, Korea's plan is to reduce carbon emissions, improve energy security, create new economic growth engines, and improve the quality of life based on green technologies.

In August 2008, Korean President Lee announced a "low-carbon, green growth" strategy as a new vision to guide the nation's long-term development. Five months later (January 2009), the Korean government responded to the deepening recession with an economic stimulus package, equivalent to US$ 38.1 billion, of which 80% was allocated towards the more efficient use of resources such as freshwater, waste, energy-efficient buildings, renewable energies, low-carbon vehicles, and the railroad network. In July 2009, a Five-Year Plan for Green Growth was announced to serve as a mid-term plan for implementing the National Strategy for Green Growth between 2009 and 2013, with a fund totaling US$ 83.6 billion, representing 2% of Korea's GDP. It was expected to create 160 000 jobs in the green sector, providing opportunities for both skilled and unskilled labor; the forecast rate was ~35 000 additional jobs per year between 2009 and 2013 [4].

The national goals had been established through strategies and policies such as the Presidential Committee on Green Growth [4], the National Basic Energy Plan and Green Energy Industry Development Strategy [5], the Basic Act on Low Carbon Green Growth and Related Legislation [6], and National Strategy and Five-Year Implementation Plan [4]. Eventually, the goal for Korea is to move away from the traditional "brown economy" to a "green economy" model where long-term prosperity and sustainability are the key objectives.

1.2
Government-Driven Strategies and Policies

In an effort to push forward the national goals, the Presidential Committee on Green Growth (PCGG) [4] was launched to facilitate collaboration in deliberating and coordinating various green growth policies across ministries and agencies. Green growth committees were also set up under local governments. Both the central government and local governments worked out 5 year green growth plans and have invested 2% of the GDP annually. Also, the Korean government was the first in the world to lay the groundwork for the continued pursuit of green growth by enacting the Framework Act on Low Carbon, Green Growth. It paved the way for reducing greenhouse gas (GHG) emissions in a groundbreaking manner through a market system by legislating the Greenhouse Gas Emissions Trading Act, supported across various political parties. Thus the government prepared the legal and institutional groundwork and also the framework for putting green growth as the new paradigm for national progress into practice.

The National Basic Energy Plan [7] established specific measures to increase energy efficiency, decrease energy intensity, and achieve the target to increase the renewable energy portfolio to 11% by 2030. The government plans on reaching this target by implementing programs such as the Smart Grid, the Two Million Homes strategy (which aims to have two million homes run on a mix of renewable energy resources by the end of 2018) and an 11 year renewable energy portfolio standard (RPS), which will replace the Renewable Portfolio Agreement (RPA) and feed-in tariffs (FITs) currently in operation by 2012. In 2005, the Ministry of Knowledge Economy (MKE)'s predecessor, the Ministry of Commerce, Industry and Energy, established the RPA, signing an agreement with the nine largest energy suppliers to provide financial support of US$ 1.1 billion between 2006 and 2008 and administrative support for clean and renewable energy projects. The aim was to increase the use of clean and renewable energy in the industrial sector and reduce 170 000 tons of GHG FIT regulations mandate electricity utilities to buy electricity generated by clean and renewable energy at a price fixed by the government, which then compensates the utility to offset the difference in price from conventional energy supplies. It has been noted that the FIT market-based instrument has been the driver behind the increased supply of clean and renewable energy in the nation but has also been criticized as being anti-competitive and causing difficulty in forecasting electricity generation. Because of this, the government planned to replace the FIT in 2012 with the RPS that will mandate utilities to generate a specific amount of clean and renewable energy. The RPS will be operated by the MKE and will mandate utilities with generation capacity over 2000 MW to obtain certain amount of renewable energy. The amount of renewable generation mandated was 2% in 2012, increasing to 10% in 2022. Participants will be able to meet their quotas either by buying renewable energy certificates (RECs) from independent power providers, or by earning RECs through their own generation. The expected share of the individual green energy sources for the 11% for 2030 is illustrated in terms of photovoltaics (PV), wind, bioenergy, and so on in Table 1.3.

There were two approaches leading this green energy technology effort: (1) select 27 key green technologies to concentrate on while bridging the technology gap, and (2) establish an assistance program for green technology R&D to lead emerging green technology for the future. The Green Energy Industry Development Strategy focused on both early growth engine technologies, such as PV, wind, smart grids and LEDs, and next-generation growth engines, including carbon capture and storage, fuel cells, and integrated gasification and combined cycle technologies.

PCGG developed the legislative framework for green growth, called the Basic Act on Low Carbon Green Growth. In January 2010, the Korean President signed and promulgated this Act, which mandated a target for GHG emission reductions, renewable energy supply, and energy savings and security.

Table 1.3 Prediction of renewable energy demand (thousand toe) and (in parentheses) the expected share of the individual green energy sources (%).

Energy	2008	2010	2015	2020	2030	Average annual increase (%)
Solar thermal	33 (0.5)	40 (0.5)	63 (0.5)	342 (2.0)	1882 (5.7)	20.2
PV	59 (0.9)	138 (1.8)	313 (2.7)	552 (3.2)	1364 (4.1)	15.3
Wind	106 (1.7)	220 (2.9)	1084 (9.2)	2035 (11.6)	4155 (12.6)	18.1
Bioenergy	518 (8.1)	987 (13.0	2210 (18.8)	4211 (24.0)	10357 (31.4)	14.6
Water power	946 (14.9)	972 (12.8)	1071 (9.1)	1165 (6.6)	1447 (4.4)	1.9
Geothermal	9 (0.1)	43 (0.6)	280 (2.4)	544 (3.1)	1261 (3.8)	25.5
Marine	0 (0.0)	70 (0.9)	393 (3.3)	907 (5.2)	1540 (4.7)	49.6
Waste	4688 (73.7)	5097 (67.4)	6316 (53.8)	7764 (44.3)	11021 (33.4)	4.0
Total	6360	7566	11731	17520	33027	7.8
Total primary energy supply (million toe)	247	253	270	287	300	0.9
Ratio (%)	2.58	2.98	4.33	6.08	11.0	

Source: MKE [3].

1.3 Focused R&D Strategies

For the growth of renewable energy, strategic R&D is required. The Korean government has identified renewable energy as its next engine for growth by focusing on selected R&D investments and increasing its budget (Figure 1.2 and Table 1.4). In 2011, the MKE announced the strategy of renewable energy R&D [8] by selecting five core sectors for power generation technologies: PV, wind power, bioenergy, coal, and fuel cells.

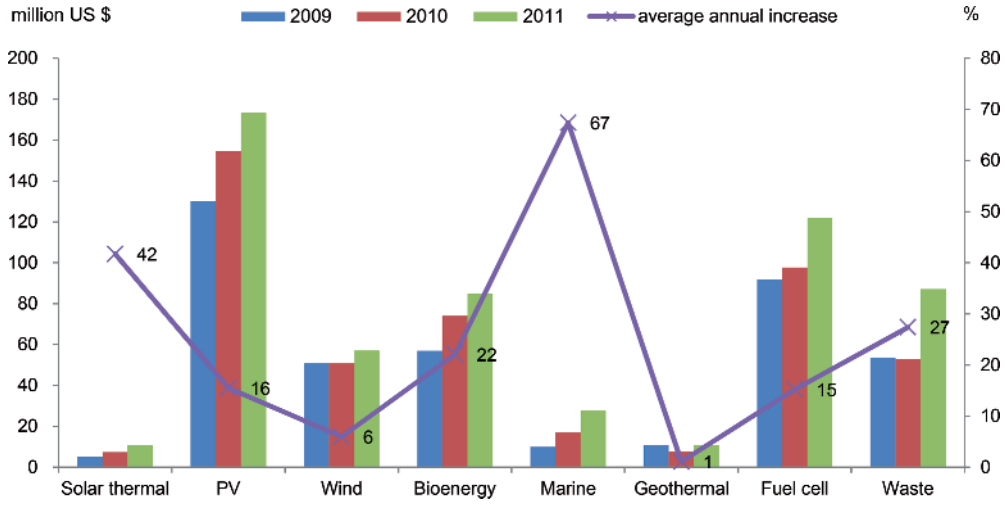

Figure 1.2 R&D budget of renewable energy in South Korea.

Table 1.4 R&D budget of renewable energy in South Korea.

Energy	Budget (million US$)			Average annual increase (%)
	2009	2010	2011	
Solar thermal	5	7	11	42
PV	130	155	173	16
Wind	51	51	57	6
Bioenergy	57	74	85	22
Marine	10	17	28	67
Geothermal	11	8	11	1
Fuel cell	92	98	122	15
Waste	54	53	87	27
Total	404	455	564	18

Source: GTC-K [9].

The commercial and technical feasibility of renewable energy requires a considerable level of R&D and field demonstration. It also requires a fully integrated approach across many interdepartmental agencies. For example, offshore wind projects [10] have been planned for both South Korea's southwest coast and the southern island of Jeju. Its target has been to generate 100 MW offshore wind capacity by 2013, and to achieve 600 MW by 2016 and 2.5 GW by 2019. This included not only an increased R&D budget, but also an intensive field demonstration project plan for global applications.

1.4
Promotion of Renewable Energy Industries

Based on a consensus among public and private stakeholders, the national strategy for renewable energy envisaged three main directions: (1) a technology roadmap, (2) dissemination and commercialization of technologies, and (3) promotion of export and revenue growth. The Technology Roadmap [3] for green energy placed periodic goals for the industrialization of technology development in three phases: phase I (2008–2010), phase II (2011–2020), and phase III (2021–2030). This roadmap linked a product from commercialization to the global market. From the 27 green technologies, several core technologies were selected to promote global market domination through renewable energy convergence strategies. In the past, the government has driven the dissemination and commercialization of technologies [3]; however, the policy was changed to promote private sector-led approaches for competitiveness. This was mainly because the government-driven policy appeared to limit the effectiveness of performance.

For the past few years, supporting strategies for export and business growth [11] have been successful. For example, major energy firms with both financial assurance and tax support mechanisms successfully built a system for corporate growth. Today, private sector participation has been promoted actively through drastic regulatory improvements. The Korean government has established the "Reregulation Support Centre" to support SMEs entering overseas markets. As a result, Korea's relative clean technology ranking has improved from eighth to fifth, being one of the world's top five fastest climbers (Figure 1.3).

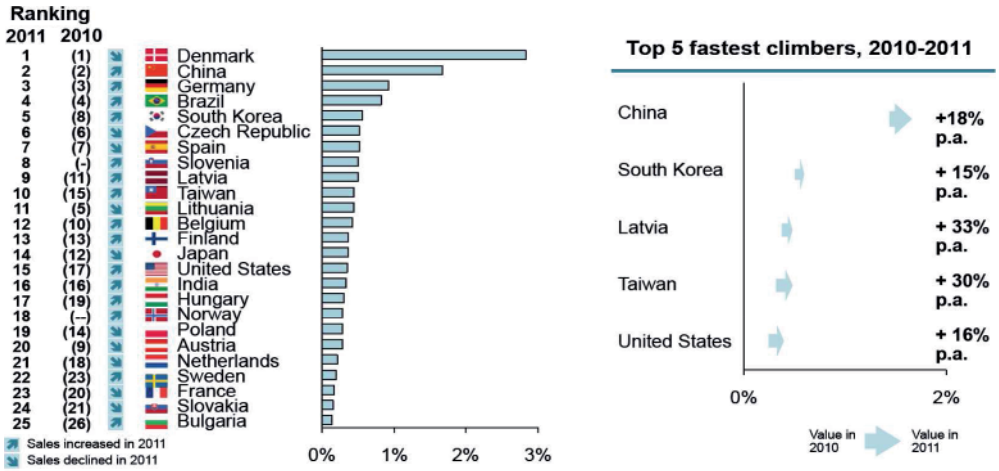

Figure 1.3 Relative clean technology ranking. Source: van der Slot and van den Berg [12].

1.5 Present and Future of Green Energy in South Korea

Although there is still much to be accomplished, South Korea has successfully pushed its green technology initiatives in the last 4 years. With continued support by the government and private sector, South Korea should expect further momentum with the changing economic landscape, as green industries are emerging as a new growth engine. As a consequence, the green industry has been growing rapidly, and the export of green products is rising sharply. The government's efforts in expanding R&D in green technology has transformed the way in which companies have invested in top-ranking green technologies, which is now attracting the attention of the global markets.

With regard to the international proliferation for green growth, South Korea will increase its green Official Development Assistance (ODA) to more than US$ 5 billion from 2013 to 2020. South Korea's green ODA will shift to the Global Green Growth Partnership. To support green growth systematically in developing countries, South Korea will work through the Global Green Growth Institute (GGGI), which was founded in June 2010. The Institute will expedite cooperation between developing and developed nations, while encouraging partnerships between the private and public sectors. In this way, developing countries will receive the necessary policy support, in addition to skills and know-how, more efficiently.

In March 2012, the Green Technology Center Korea (GTC-K) was launched to become the hub for technical cooperation needed to support green growth in the developing world. GTC-K is also responsible for training and educating international experts in relevant fields. The GGGI will be the centerpiece of the global green growth strategy, whereas GTC-K will be the technology arm of green growth in developing countries. The Green Climate Fund was created as the result of the United Nations Climate Change Conference in Durban, South Africa, in December 2011. The fund will provide financial resources for green growth strategies and technologies. With strategy, technology, and finance addressed in this green triangle, it is the hope that green growth initiatives will escalate. South Korea will continue to strive to build on this green triangle, so that this architecture can be utilized by all developing and developed countries.

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