

# South Korea's Energy Strategy: Low-Carbon, Green Growth

By Young Seok MOON

## Background: Energy Crisis

Global warming caused by increased carbon dioxide emissions has been a concern for a long time, but last year, it emerged as an important global issue. The glaciers in the Arctic Ocean have gone from covering 7.5 million square km to 4.1 million square km over the past two decades, meaning that glaciers about the size of the Korean Peninsula disappeared every year during that time. With the disappearance taking place at increasing speeds, a maritime route has opened up that links Asia and northern Europe.

Furthermore, fossil fuel prices, including for petroleum, skyrocketed last year, and securing a variety of energy sources at reasonable prices has become an important factor for the quality of life and a nation's competitiveness.

Most importantly, the entire world, not just Koreans, feels that the near-absolute dependency on a finite supply of fossil fuel is simply too dangerous. The skyrocketing price of energy provides an opportunity for us to think about such issues, to reduce energy consumption and to calculate the individual and social costs of such an action. The experiences will serve as an important motivation to develop and supply alternative energy, a project which will require enormous funding in the future. And yet, willpower is not all that is needed to achieve a goal, particularly in a situation that will come at tremendous expense.

## South Korean Energy Situation & Prospect

Due to its numerous oil crises, South Korea has achieved a certain level of ability to respond to energy demand and supply crises and to manage demand. To respond to short-term energy demand/supply instability, it implemented an institutional base such as an oil stockpile and diversification of energy supply sources, and enacted basic

regulations such as the right to order demand/supply adjustment and the direct regulation of the consumption and rationing system in an emergency within the Petroleum Business Act and the Energy Use Rationalization Act.

As a result of the government's efforts to enhance South Korea's energy efficiency, its energy intensity (the amount of energy spent on producing \$1,000 of GDP) and GDP elasticity of energy demand have been consistently declining since 1997. In particular, as the country's industrial structures changed to low-energy consumption types, the GDP elasticity of energy demand and energy intensity in the manufacturing industry tended to improve. Also, through the government's energy diversification efforts, South Korea's oil dependence dropped to 43.4% in 2007 from 53.8% in 1990. Although its dependence on oil is decreasing, its dependence on foreign countries, especially those in the Middle East, is still high (80.7% in 2007).

Demand for primary energy is expected to increase by 1.6% annually from 2006 to 2030 and reach 342.8 million tons of oil equivalent (TOE) by 2030. Per capita energy demand is also expected to increase from 4.83 TOE in 2006 to 5.29 TOE in 2010 and 7.05 TOE in 2030. The security of a stable energy supply base for the future has become an important challenge.

Since the expected growth rate of energy demand is lower than the expected economic growth rate until 2030, energy intensity is expected to decline from 0.347 in 2006 to 0.319 in 2010 and 0.211 in 2030. The GDP elasticity of energy demand is also expected to decrease from 0.77 during 1998–2006 to 0.43 during 2006–2030.

As for energy demand by source, oil consumption is expected to increase by an annual average of 0.6% by 2030, and dependence on the Middle East for oil is expected to deepen. Therefore, stabilizing the import of oil will continue to remain a key task in South Korea's energy policy. Gas supply is more stable than oil supply since it is deposited widely around the globe and gas reserves are relatively

TABLE 1

## South Korea's energy demand projections

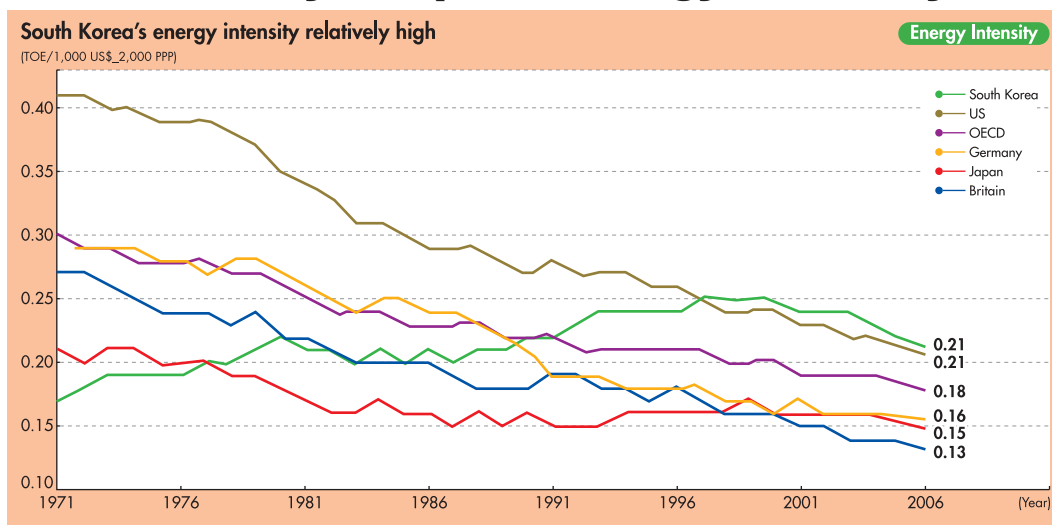
	2006	2010	2020	2030	Average annual change (%)	
					2006-2010	2006-2030
<b>GDP</b> (trillion won at constant price of 2000)	760.3	1,142.1	1,396.2	1,836.0	4.8	3.7
<b>Population</b> (thousand)	48,297	48,875	49,326	48,635	0.3	-0.1
<b>Primary energy demand</b> (million TOE*)	233.4	258.7	311.6	342.8	2.6	1.6
<b>Per capita energy consumption</b> (TOE*)	4.83	5.29	6.32	7.05	2.3	1.6
<b>Energy intensity</b> (TOE*/\$1,000 of GDP)	0.347	0.319	0.252	0.211	-2.1	-2.1

Note: \*tons of oil equivalent

Source: Korea Energy Economics Institute

CHART 1

## Internationally compared energy efficiency



### Manufacturing & energy-intensive industries' share in GDP very high

	South Korea	Japan	Germany	US
<b>Manufacturing-sector share in GDP(%)</b>	<b>27.8</b>	21.3	22.5	12.9
<b>Energy-intensive industry share in manufacturing sector(%)</b>	<b>31.6</b>	15.9	22.3	27.4
<b>Energy-intensive industry share in GDP (%)</b>	<b>8.8</b>	3.4	5.0	3.5

Source: Korea Energy Economics Institute

abundant. With the environment becoming an issue of ever-growing social significance, gas is gaining wide recognition as a cleaner fuel. Accordingly, global consumption of gas is expected to increase. At the same time, domestic consumption of gas is expected to increase rapidly. New and renewable energy is expected to sharply increase its share in South Korea's energy mix due to globally strengthened environmental regulations. However, as such a proportion is expected to be significantly lower than the global average, the government will continue to make efforts to increase the share of new and renewable energy within South Korea's energy mix. Electricity demand will continue to grow as demand for high-quality energy is increasing. Thus, it is expected to expand the basis for providing a stable and sufficient supply of electricity.

South Korea is executing various energy-conserving policies to improve energy efficiency, such as Voluntary Agreements (VAs), financial support, energy management examination, energy efficiency management programs, and energy use planning consultations. Moreover, in August 2008, government departments together established a 3rd National Energy Plan, the implementation of which is already underway. This plan aims to improve South Korea's energy efficiency by 46% over the next 25 years (2006-2030). Through this improvement, a total of 42.3 million TOE of energy is expected to be saved between 2006 and 2030, which would increase the energy intensity from 0.347 (TOE per \$1,000 of GDP) in 2006 to 0.185 in 2030.

### New Vision: "Green Growth"

On the occasion of the 60th anniversary of South Korea's found-

ing, President Lee Myung Bak put forward 'Low-Carbon, Green Growth' as the core of South Korea's new vision. According to his speech, "Green Growth" refers to sustainable growth that helps reduce greenhouse gas emissions and environmental pollution. It is also a new national development paradigm that creates new growth engines and jobs with green technology and clean energy. Green technology puts together information and communications technology, biotechnology, nanotechnology and culture technology, and transcends them all. Green technology will create numerous decent jobs to tackle the problem of growth without job creation. The renewable energy industry will create several times more jobs than existing industries. In the information age, the gap between the haves and have-nots has widened. On the contrary, the gap will narrow down in the age of green growth.

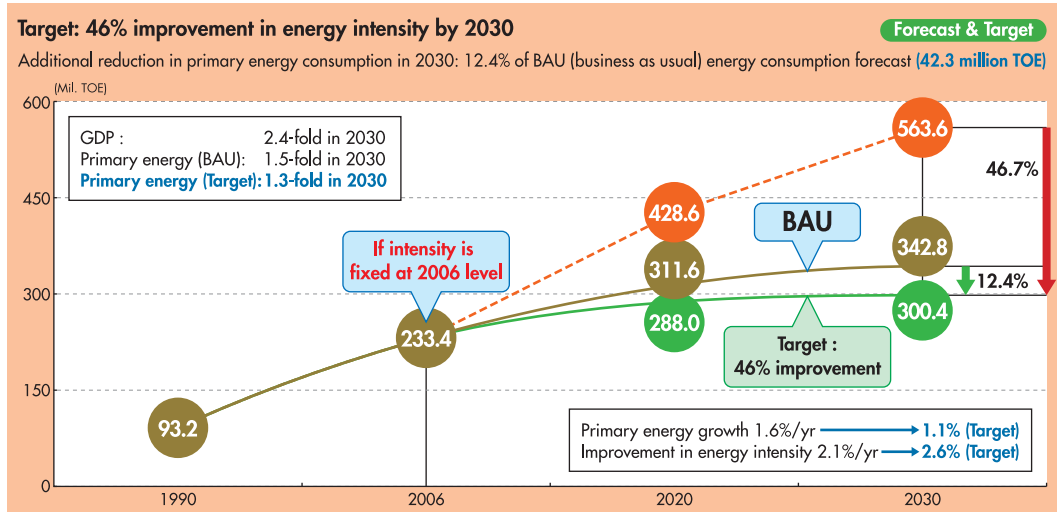
Currently, the South Korean economy is undergoing difficulties stemming from the energy crisis. The socioeconomic divide and job shortages are putting an increasing burden on ordinary citizens. There is a growing sense of crisis that we might collapse. To weather this crisis and jump the threshold to advancement, more creative ideas and dauntless resolution are needed.

Now, we are witnessing changes in civilization. The world has gone through the stages of agricultural, industrial and information revolutions. It is entering the age of an environmental revolution. Leaving behind the era of wood, coal and oil, an age of new energy is now being opened.

For South Korea, which does not produce even a single drop of oil, such changes are both a crisis and an opportunity as well. In retrospect, South Korea has exhibited great capacities in turning crises into opportunities. It took the first oil shock as a springboard for its

CHART 2

## South Korea's energy intensity target



Source : Korea Energy Economics Institute

inroads into the overseas construction market and advancement of local industries. The second oil shock served as a catalyst for growth while prompting the pursuit of stability and opening to the outside world. Now is the time for us to turn the recent surge in oil prices into an opportunity to transform economic fundamentals and create new growth engines.

Green growth will enable a “Miracle on the Korean Peninsula” to succeed the “Miracle on the Han River.” When South Korea first manufactured its own vehicles, the technology gap with the advanced countries amounted to a span of at least 50 years. As far as semiconductors are concerned, it was more than 20 years behind. However, the country grew into a technology powerhouse that ranks first in terms of producing semiconductors and ships, and fifth in automobiles. If we make up our minds before others and take action, we will be able to lead green growth and take the initiative in a new civilization.

### Action Plan: South Korea's “National Energy Plan” up to 2030

Following President Lee's announcement of “Low-Carbon, Green Growth” as the paradigm for the future, the South Korean government finalized its “National Energy Plan” in 2008. Under this road map, to be used until 2030, the government said it will reduce the ratio of reliance on fossil fuel in total energy consumption from 83% to 61% and increase the use of renewable energy from 2.4% to 11%. The government also proposed making nuclear electricity production account for 59% of the nation's power generation capacity, up from the current 36%.

When President Lee first announced the slogan “Low-Carbon, Green Growth,” many responded cynically, calling it a tactic to improve his image during a governance crisis. However, the plan

announced recently shows the president has a feasible blueprint. Whatever it is called, the direction in which the nation is moving in terms of energy consumption is timely.

With regard to energy efficiency improvement, the plan set a target to improve energy intensity from the present 0.341 by 4% to 0.185 in 2030, while upping the oil and gas self-sufficiency rate from the current 4.2% to 40% in 2030.

To carry this out, the government along with the business circle will invest around 110 trillion won in facilities and research and development (R&D) for renewable energy. A target has also been laid out to step up South Korea's global market share in key sectors of renewable energy, including solar energy, wind energy and hydrogen cells, raising it from the current 0.7% to reach 15% in 2030.

Facility investment for renewable energy, which is estimated to require 100 trillion won, will be appropriated by the government paying 28 trillion won and the private sector funding 72 trillion won. In overall R&D investments, 7.2 trillion won will come from the government, while 4.3 trillion will be shouldered by the private sector.

If the plan is carried out, it will result in savings of \$34.4 billion in energy-related imports and create 950,000 new jobs. To increase the percentage of power generated by nuclear reactors, the country will build 10 new reactors by 2030, which will cost 111.5 trillion won (some \$100 billion at the time of writing). To build these reactors, the government will acquire more nuclear power plant sites by 2010. Currently, there are 20 nuclear reactors in operation in South Korea.

Germany, the world's most competitive nation in the renewable energy industry, established the German Renewable Energy Act (EEG) in 1991 and guaranteed that it would prioritize the purchase of energy generated from renewable sources, regardless of its production cost. The law also guarantees that it will pay high prices for the next 20 years, making it easier for renewable energy suppliers to enter the market. Such a measure comes at the expense of con-

sumers because the prices are reflected in electricity bills, and each German household will have to pay an additional 2 euro (\$2.94) a month for this project. South Korea cannot be an exception. The expansion of renewable energy use will be a burden for households and companies. Under the latest energy plan, the government has decided to produce more electricity from nuclear plants to make the burden easier to bear. There have already been objections to the plan to build more nuclear plants, but we must ask ourselves first if we are willing to drastically cut down our power consumption or pay for a sudden increase in electricity bills.

Another important issue is if South Korea is ready to catch up with Germany and Japan, the pioneers in the renewable energy industry. Although South Korea is the world's 13th-largest economy, the nation is not capable of developing all fields of alternative energy. Therefore, South Korea must reinforce its cooperation with the technology pioneers in each field and concentrate on niche markets first in order to succeed in expansion. Future competitiveness depends on finding a way to expand involvement in this market.

The most important factor in the new energy plan is participation. It is difficult to convince people who are not experiencing that much inconvenience to change their behavior to secure an unseen future reward. It is a crucial matter that requires voluntary participation by all strata of society, particularly companies and civic groups. The key to success is society's faith that we can and must participate in this new energy program.

### Green Technology: New Growth Engines

The government will make all-out investments to boost the use of new and renewable energy from the current 2% to more than 11% by 2030 and, ultimately, to more than 20% by 2050. R&D investment in green technology will be more than doubled, thereby making South Korea a leading powerhouse in the green technology market, which is expected to amount to 3 quadrillion won by 2020.

In addition, great emphasis will be placed on nurturing eco-friendly and highly efficient green cars as one of the new growth engines. It is said that the Stone Age did not end for a lack of stones, and the oil age will end long before the world runs out of oil. Even if soaring oil prices drop in the years to come, now is the time to bid farewell to the era of excessive oil dependence.

Key sectors in the new future growth engines are energy and environment, including pollution-free coal energy that can produce synthetic fiber using low-grade coal; seaweed-based marine biofuel that substitutes for coal energy; and solar cells. Eight industries are directly related to the government's "Low-Carbon, Green Growth" vision.

The key businesses were divided into three groups according to the time they take to develop – projects on the development of media convergence, cultural content, product design, software, next-generation semiconductors, information technology and marine industries are aimed to be completed within five years.



Businesses to be extensively developed in the next decade included advanced mobile communications, fuel cells, light-emitting diodes, solar cells, radio frequency identification tags/ubiquitous sensor networks, nuclear reactors, displays and healthcare technology.

Following them in the longer term are greenhouse gas retrieval and use, new medicines, industrial materials, robotics, marine biofuel, non-polluting coal and eco-friendly cars, which could take more than 10 years to be fully developed.

In line with green growth, the category of energy and environment took the biggest part with six businesses. Non-polluting coal energy, for example, aims to replace 8% of domestic petroleum use and create 150,000 jobs by 2018. The technology is about commercializing production of synthetic petroleum from low-quality coal, as well as recycling carbon dioxide generated during the process. In the project of marine biofuel, seaweed will be used as material to produce biofuel as substitution for petroleum resources, which will contribute to replacing 20% of local gasoline, according to the plan.

Admittedly, South Korea has lagged behind in the carbon era, but the country should move a step ahead in the coming hydrogen era. The road ahead will be bumpy and will sometimes come to rivers with rapid currents and to valleys that are deep and rough. There will also be difficult periods of suffering and inconvenience. If South Korea makes an audacious and swift move just as it did to advance its information capabilities to make up for belated industrialization, the country will undoubtedly be reborn as a "green power." **JS**

*Dr. Young Seok Moon is Director, Climate Change Research Department, Korea Energy Economics Institute.*