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The influence of South Korean energy policy on OPEC oil exports

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HIGHLIGHTS

- Analyze energy policy of South Korea and its energy profiles.
- Study the factors that affect South Korea to change its energy strategy and targets.
- Analyze the implications of South Korean energy policy on oil imports from OPEC.
- South Korea will continue importing oil from OPEC countries for the next decade.

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ABSTRACT

South Korea is the fifth top oil importer worldwide with 64% of its oil coming from OPEC member countries. Over the last 30 years, South Korea accounted for a rapid increase in energy use. This in turn led South Korea to be totally dependent on oil imports. Due to this increase, South Korea has been experiencing drastic changes in its energy system which could potentially impact its dependence on OPEC oil import. External and internal factors have forced South Korea to change its energy strategy and targets. These targets would be achieved by reducing its energy intensity and utilizing electricity and renewable energies in order to reduce its dependence on oil consumption. "Low Carbon, Green Growth" is one policy along with many other energy policies developed by South Korea for reducing greenhouse gases, thus this policy is receiving a remarkable attention today. These national policies along with other international ones are needed to mitigate greenhouse gas emissions and promote other green initiatives. This study puts emphasis on these policies as well as uses them to predict the future energy profile of South Korea and how these policies will impact on oil imports from OPEC member countries.

1. Introduction

As South Korea's economy grew, it increasingly became dependent on oil; natural gas and coal imports to satisfy its energy needs. In 2011, South Korea's share of crude oil imports from the Organization of the Petroleum Exporting Countries (OPEC) were estimated at 85.75% (OECD, 2012). In addition, it is today one of the world's largest greenhouse gas emitters. However, with the current financial crisis and Fukushima incident, South Korea is obliged to reshape its energy policies and reduce its dependence on fossil fuels to promote clean energy and reduce greenhouse gas emissions. As a result, the South Korean government announced the first national energy plan in 2008, which aims at increasing renewable energy usage, promote green technologies, and utilize high-efficient processes to reduce emissions.

Consequently, South Korea has been an advocate for green mitigation strategies in the Global Green Growth Institute (GGGI) and other green growth supporting groups. The creation of the GGGI was proposed in 2008 by President Lee Myung-Bak, to stimulate "Low Carbon, Green Growth". The institute was promoted by South Korea and all of its recommendations seemed to be linked to the country's businesses with solid experiences in these fields. This suggests that a considerable part of South Korea's green vision was meant to secure more international business contracts, acquire major investments, increase their private sector earnings, while reducing dependence on foreign petroleum imports (Global Green Growth Institute (GGGI), 2013).

Thus, through South Korea's recent history, energy policies were mainly aimed at providing reliable supply of energy at low prices. In recent years, a new energy policy paradigm has emerged in response to several changing internal and external factors. A previous study conducted by Kim et al. (2011) suggests that three different future energy scenarios have been developed for South Korea. The "Business-as-Usual" path assumes that existing policies and energy sector trends continue. The "National Alternative" path emphasizes on the application of energy efficiency and renewable energy measures. Finally, the "Regional Alternative" path models the inclusion of South Korea in a number of regional energy cooperation initiatives.

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The dependence of South Korea on energy imports has risen from over 60% in 1980 to 97.6% in 2000 (Kim et al., 2011). This led to a large increase in both energy consumption and CO_2 emissions while population growth is approaching zero percent. As shown in Table 1 (Kim et al., 2011) the energy indicators have increased substantially in almost every category. A significant body of previous work has been carried out on the influence of energy policy in South Korea and its energy consumption and emissions profiles. However, the main feature of this study is that it addresses the effects of these energy policies on the oil imports from OPEC member countries. To the best of the author's knowledge this issue has not been discussed in the literature to date. Therefore, this research attempts to study the effect of oil imports from OPEC countries on South Korea's energy profile. All predictions and speculations are based on legitimate factors that are presently driving South Korea's economy, as well as on the historical and future energy demand portfolios of South Korea.

The paper is structured as follows. Section 2 examines South Korea's current energy profile including mid-term (2011–2016) and long-term (2010–2024) energy demands for different energy sources. The electricity outlook and capacity expansion plans are highlighted in this section, as well as the new projects and their influence on South Korea's future energy needs. Section 3 focuses on the external and internal factors that could affect the energy demand and supply. Section 4 discusses the implications of these factors on OPEC oil imports. Section 5 outlines South Korea's new strategy, which is known as "Low Carbon, Green Growth," and how this new plan will help to mitigate climate change and expand on an international scale. Finally, in Section 6, concluding remarks are drawn from the analysis.

2. Overview of South Korea's current and future energy profile

An approach to forecast South Korea's energy demands is based on estimating its industrial expansion considering products and plans. Such estimations play an important role in predicting demand. These estimations can be obtained from data published by the Korea Energy Economics Institute (KEEI) such as the "Mid-term Korea Energy Demand Outlooks"(Korea Energy Economics Institute (KEEI), 2011, 2012). Also, by examining the infrastructures of residential areas, population growth, and the income levels, estimations of energy demands for sectors such as nuclear power and coal consumption can be obtained. The aforementioned factors can be examined using data reported by the Korea Energy Economics Institute (KEEI) (Korea Energy Economics Institute (KEEI), 2011, 2012). The second approach is based on South Korea's "5th basic plan for long-term (2010–2024) electricity supply and demand"(Korea Energy Economics Institute (KEEI), 2012). This plan includes capacity expansions projects and measures needed to meet the energy needs. This approach includes plans to expand nuclear plants, substitute energy generators and improve energy transport and transformation.

Nuclear power has been regarded as a very attractive option towards energy stability and security, nuclear can help to reduce greenhouse gas emissions significantly. On the other hand, magnetic generators, whose energy consumption is much lower than that of conventional generators, can be used as part of the generator substitution plans. Therefore, improving transportation and transformation energy consumptions can be achieved through renewable energy sources since it reduces electricity dependence. Hence, it is pertinent to state at this point that renewable energy plays an important role in South Korea's current energy plans. The main focus of these plans and approaches is based on the use of energy efficient machines and equipment. If these plans are followed and successfully implemented, this can lead to reductions on the total amount of oil imported by South Korea from OPEC member countries on the long run.

2.1. Mid-term energy demand outlook (2011–2016)

Total primary energy demand is expected to rise at an annual average rate of 2.73% from 2011 to 2016 and reach 311.8 million tons of oil equivalents (toe). A careful look at the figures in Table 2 (Korea Energy Economics Institute (KEEI), 2012) clearly show that the demand of all energy sources in South Korea will increase until 2016 and will most likely continue to increase after that year. The per capita energy demand is expected to rise from 5.45 to 6.14 toe by 2016 due to an increase in the use of technology and higher income levels (Korea Energy Economics Institute (KEEI), 2012).

Table 1
Energy indicators of South Korea (Kim et al., 2011).

Category	1981	1990	1995	2003	2007	2009	Average annual growth rate (%)	
							1981–1990	1990–2007
Primary energy consumption (million toe)	46	93	150	215	237	242	8.2	5.6
Per capita energy consumption (toe)	1.18	2.17	3.34	4.50	4.88	4.97	7.0	4.9
Energy/GDP (toe/million Won)	0.31	0.29	0.32	0.31	0.28	0.28	−0.7	−0.13
CO_2 emissions (million t-CO_2)	136	239	367	474	516	545	6.5	4.5
CO_2 emissions per capita (t-CO_2)	3.51	5.57	8.14	9.90	10.7	11.2	5.3	3.8
GDP (trillion Korean Won)	148	321	467	691	831	850	10.2	6.1
Population (million)	38.7	42.9	45.1	47.8	48.5	48.7	1.2	0.72

Table 2
Primary energy demands outlook of South Korea (Korea Energy Economics Institute (KEEI), 2012).

Category	2011	2012	2013	2014	2015	2016	Average annual growth rate (%)
Oil (million bbl)	801	807	829	843	856	869	1.60
Coal (million ton)	125	127	128	132	141	156	4.27
LNG (million ton)	36	38	40	42	41	39	1.60
Hydro electric (TWh)	8.0	8.4	8.5	8.6	8.7	8.8	1.88
Nuclear power (TWh)	150	160	176	186	193	198	5.39
Other (million toe)	6.4	6.8	7.4	7.8	8.2	8.7	5.95
Total primary energy (million toe)	271	275	285	294	303	312	2.73