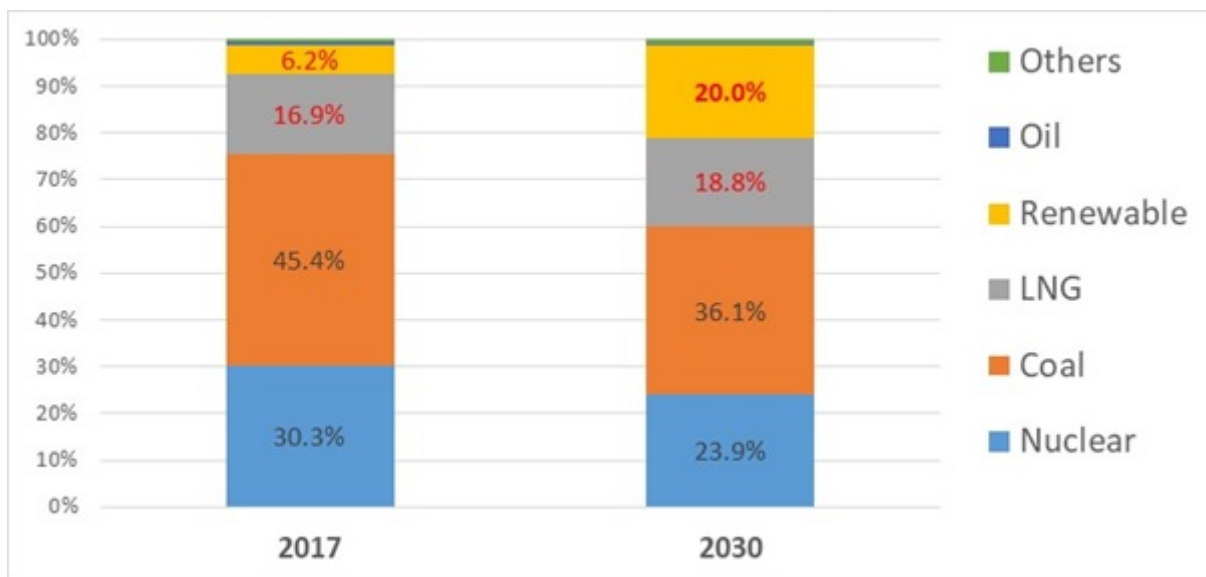


THE ROK ENERGY SECTOR: CURRENT STATUS, RECENT DEVELOPMENTS, AND ENERGY POLICIES



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CHUNG WOO-JIN AND LEE TAE EUI

SEPTEMBER 14, 2020

I. INTRODUCTION

In this Special Report, Chung Woo-jin and Lee Tae Eui describe the energy supply and demand situation in the Republic of Korea (ROK) energy sector, then describe existing projections of ROK energy use and the ROK energy policies likely to drive them. They discuss the ROK's involvement in

development of regional energy cooperation projects, describe the ongoing updating of the ROK Working Group's energy futures model, and provide conclusions noting the energy sector opportunities and challenges facing the ROK

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The full report is downloadable in PDF format [here](#).

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Banner image: Plan of the future energy mix in ROK power generation to 2030, based on data from *Long-term Energy Outlook, KEEI, 2019*.

II. NAPSNET SPECIAL REPORT BY CHUNG WOO-JIN AND LEE TAE EUI

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Summary

The ROK has limited natural resources and is more than 90% dependent on external sources of energy. Energy security has been the main issue driving energy policy in the ROK. The newly-launched Moon administration has placed environment protection a key element of the ROK's energy transition policy. The government proclaimed an acceleration of the phase-out of nuclear power and of aging coal-fired power plants, while expanding renewable energy. Gas-fired power will be also expanded to play a role in supplementing nuclear and coal-fired power as those types of plants significantly reduce their electricity production, as well as supporting the generation of intermittent renewable energy (wind and solar) by providing power during periods of low output of renewable electricity systems. Energy trades with neighboring countries can provide important solutions that can help to improve the feasibility of the ROK's energy transition policy. It will be challenging, however, for the ROK to trade energy with Northeast Asia countries using overland pipelines and transmission lines, due to the military and political tensions between the two Koreas. ROK energy policies are thus standing at a crossroads in terms of international political challenges as well as fuel supply economics.

6. Conclusions

As described in previous sections of this Report, energy policies in the ROK currently stand at a crossroads. The ROK has long secured energy resources that can be supplied inexpensively to

maintain its rapid economic growth. As a result, coal accounted for the largest share of electricity generation (39.1%), followed by nuclear power (30%) and LNG (21.4%) as of 2017. Nuclear power has played a critical role in energy security in the ROK, which imports almost all of its energy demands, and the use of nuclear power has significantly contributed to reducing the ROK's GHG emissions. 25 nuclear power reactors are operating in the ROK, ranking sixth in the world by number. In terms of nuclear power density (nuclear power installation capacity divided by national land area), the country ranks first in the world. The fine dust problem (particulate matter air pollution) has become a key political issue, as the concentration of fine dust particles has surged to record levels every year, severely threatening public health and the environment in the ROK, and coal-fired power plants have been regarded as one of the main sources of emissions of PM_{2.5}.

Given these situations, the new government's pledge to implement a transition toward renewable energy represents a dramatic change in the ROK's energy policy, which has focused on the expansion of nuclear and coal-fired power production since the 1970s. After the current administration came to power, it decided to decommission the 11 reactors whose life spans are scheduled to run out before 2030, in addition to shutting down the Wolsung 1 reactor (which has already shut down) without prolonging its licensed life span. 10 aging coal-fired power plants are also due to be decommissioned earlier than the schedules set up in the previous electricity master plan. Electricity from renewables and LNG-fired power plants will fill the supply gap that caused by decommissioning nuclear and coal-fired power plants.

But, the energy transition policy has become embroiled in a major social controversy. The issues in the controversy center on whether or not renewables can play a role technically sufficient to help to bridge the supply gap caused by retirement of coal and nuclear power. First of all, lots of large-scale sites must be secured in order to expand renewable energy sufficiently, because large spaces are usually required to build most types of renewable energy facilities. The ROK has limited space, and 70% of its land area is mountainous. The target share of renewable energy in the electricity energy mix was set up to be 20% by 2030 in the 30-20 Renewable Energy Plan released by the current government in 2018. The main sources of renewable energy to be used to attain the target are solar photovoltaic and wind power, which will account for 82% of the renewable electricity energy mix. Previous ROK governments have also long tried to expand the use of renewable energy, and as a result, the current renewable share in the electricity energy mix has increased to around 5% in terms of power capacity. To be more precise, however, the portion of eco-friendly renewable sources such as solar and wind power is less than half of that total, with most of the other renewable sources listed coming from waste to energy power plants. This means that in order to achieve the target of the 30-20 plan, the power generation capacities of solar photovoltaic and wind power should increase by factors of 7 and 15, respectively, by 2030. This implies that the ROK has a long way to go in order to attain the goal of 20% of renewable energy in its generation mix. Natural gas is the most expensive fossil energy source for the ROK, and if its prices return to past levels reached when oil prices were over \$80-100 per barrel, ROK electricity bills could jump, leaving many ROK consumers carrying the burden of paying for the energy transition. Some opponents of the transition insist that the total volume of national GHG emissions will grow as the use of LNG increases to replace reduced nuclear power since the latter doesn't emit GHGs. At present, the amount of tax placed on the coal is not high enough to restrict its consumption or promote the use of renewable energy and LNG. The government has proposed a draft energy tax code that would increase the fuel tax on thermal coal by 28% while lowering the tax on LNG by 75%. Even after adjusting these taxes on energy sources, however, it is estimated that coal-fired generation will remain cheaper to run than gas generation. This implies that for the government's energy transition to be possible, it is necessary to introduce an environmental tax that imposes a tax on the energy sources based on the amount of GHG emissions from each resource. But such a tax system could put pressure on domestic energy prices, and thus place a further burden on the ROK's economy, which is currently in

recession.

Energy trades with neighboring countries can provide important solutions that allow the ROK's energy transition policy to be feasible. For example, if the ROK imports electricity on a large scale from Russia or/and China, the plans for the phase-out nuclear and coal-fired power plants, which are the main policies for the energy transition, could be carried out more feasibly. Without a lessening of military and political tension between the two Koreas, however, it will be a difficult task for the ROK to trade electricity with Northeast Asia countries over land-based transmission lines. Currently, dialogues for resolving the nuclear threat on the Korean peninsula are in progress between the United States and the DPRK, and the results of these dialogue will significantly affect the energy transition policies that the ROK's government plans to pursue. As a result, energy policies are standing at a crossroads in terms of political challenges as well as fuel supply economics in the ROK.

The next step of this project is developing a LEAP model for ROK based on recent energy data and current and projected energy trends. The ROK LEAP model that we are currently working on will consider scenarios of energy trading among the Northeast Asian countries, along with domestic energy transition scenarios. The ROK's 3rd Energy Master plan, which provides the policy basis for 10 energy sector sub-plans, is about to be announced. The 3rd plan will describe long-term domestic and international energy policy goals. The ROK LEAP model will consider current political issues associated with the Master plan, as well with the other sub-plans that have already been announced.

III. NAUTILUS INVITES YOUR RESPONSE

The Nautilus Asia Peace and Security Network invites your responses to this report. Please send responses to: nautilus@nautilus.org. Responses will be considered for redistribution to the network on

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