

Korea: On the Path of Reforming Energy Systems with 4th Industrial Revolution Technologies

The Demand for Eco-friendly Energy

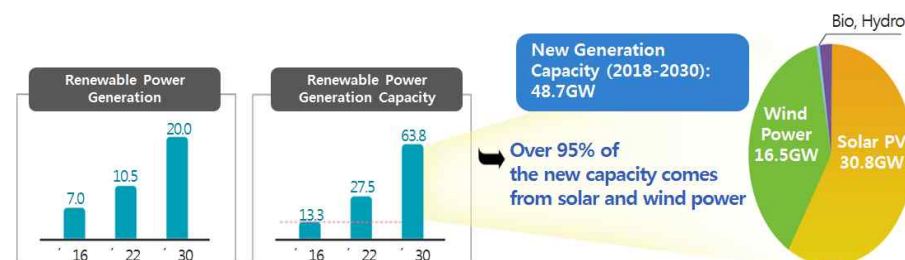
In recent times, Korea has seen a greater demand from consumers for a new energy policy as it suffers from the effects of climate change and fine dust particles. Consumers seek energy sources that not only guarantee a stable and efficient supply equivalent to existing energy sources but also contribute to the environment, public health and safety. To meet such expectations, the Korean government declared to open the "era of safe and clean energy" in June last year. Since then, the paradigm of energy policy has shifted to generate more from renewable energy and LNG. In the process, however, it would be critical to secure a stable supply and demand while improving demand management, such as energy efficiency, using core technologies of the 4th Industrial Revolution. Moreover, strong policy support, for instance R&D, should also follow.

Renewable Energy 3020 Plan

Renewable energy generation costs, including that of solar PV and wind power, have been plummeting due to the development of renewable energy technologies, the enhancement of procurement competitiveness and track records of project operators. As such, the generation costs of renewables are expected to equal or even be lower than those of fossil fuels by 2020. Considering such an outlook, the Korean government announced last year the "Renewable Energy 3020 Plan" to increase the ratio of renewable energy to 20% by 2030 from its current level of 7%.

To begin with, renewable energy, in which waste and bio are primarily used, will be increased to a total of 64GW by adding 49GW of new solar PV and wind power facilities by 2030 to the current capacity of 15GW. To achieve this target, the government will prohibit the reckless

development of individual sites and undertake large-scale projects by introducing a site planning system. For instance, a maximum 11GW solar PV site will be built in a 15,000ha area of reclaimed land in Seosan and a maximum 19GW wind farm in public lands. Moreover, the fee for using the shared area for floating solar PV will be dramatically reduced to 2~8% from its current level and the period required for authorization will be reduced to the 1/3 of the current level.



In addition, the Korean government is planning to make improvements to renewable energy projects. Until now, they have been led primarily by developers, but in the future local residents and the general public will be encouraged to take part to share such profits. To do so, the government will expand countertrade to reimburse surplus power generated from independent solar PVs in cash. When farmers participate in, they will receive a 50% tax exemption for farmland conservation charges. These measures will not only facilitate the voluntary participation of the public, but also increase public support when establishing a renewable energy complex.

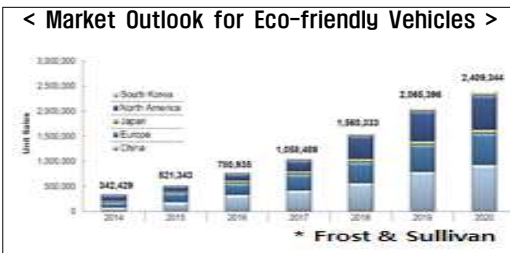
The Development of New Energy Industries with 4th Industrial Revolution Technologies

Another momentum for the energy revolution is the convergence of 4th Industrial Revolution technologies, such as AI, IoT and big data, with the entire energy cycle, including generation and consumption. Technological convergence is expected to give birth to new industries over a wide spectrum of areas by delivering smarter energy systems.

In power generation, an integrated control system will be established to precisely forecast the amount of power generated from renewables to ultimately address the intermittency of renewable energy. In power transmission, transformation and distribution, the supervisory control & data acquisition system (SCADA) as well as the distribution automation system (DAS) will be introduced to enhance energy efficiency. Moreover, a smart distributed generation system, which combines renewable energy with the energy storage system (ESS) and energy management system (EMS), will be deployed nationwide. By 2020, every household in Korea will have an advanced metering infrastructure (AMI) to efficiently adjust power consumption. By doing so, power trading and related service markets, such as small-scale DER trading, can be brought to life.

A platform to utilize big data in the power sector is also under establishment. The platform is expected to encourage electricity savings by allowing consumers to monitor their power use, consumption patterns and electricity bills in real time. This will likely lead to the creation of new businesses, such as energy efficiency consulting services. If the platform is successfully established in the power sector, it will also be applied to the gas and heat energy sectors.

Electric vehicle, which has a five-fold energy efficiency and a ten-fold cost saving advantage for maintenance compared to an internal combustion engine car, is the core of new energy industries as it can achieve



smart energy consumption on the road. To have more such vehicles on street, the Korean government is planning to develop technologies to double the energy density of EV batteries, introduce more incentives such as a special EV charging price system, and dramatically improve the EV infrastructure by 2020. Moreover, a home-charging infrastructure will be established in 4,000 apartment complexes nationwide, and by the end of 2018, EV charging stations will be installed in all expressway

rest areas. In particular, to reduce the inconvenience of EV users, 240 center areas, such as big markets and shopping malls, will have EV chargers in place. By doing so, the number of chargers will double from 10,000 units in 2017 to 20,000 by the end of 2018. All these measures are likely to increase the number of EVs from the current figure of 25,000 to 60,000 by the end of 2018.

R&D Investment Promotion Centered on Eco-friendly Energy Technologies

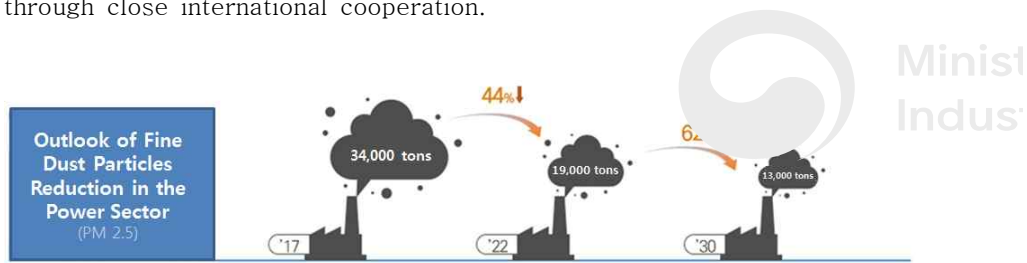
As the energy industry requires large-scale infrastructure as well as significant time and effort for technological development, governments should strive to develop core technologies and invest in technological innovation over a long-term perspective compared to other industries. In this light, the Korean government increased public R&D investment in clean energy from USD 490 million in 2016 to USD 640 million in 2017, with the figure set to rise to USD 980 million by 2021. Moreover, to support the technological development of venture companies in new energy industries, the government will spare no efforts in providing public funds, including a newly-established fund for new electricity industries.

To secure key technologies, the ratio of core technology R&D will be increased to 40% by 2018 from its current 30%. Support for cultivating the brightest minds and developing large-scale convergence projects will be expanded to create new growth engines by converging core technologies of the 4th Industrial Revolution, such as AI, IoT and big data, with conventional energy industries. Investment in demonstration projects for new energy industries will also be expanded to approximately USD 100 million, a 32% increase compared to 2017. In particular, the Korean government will provide its full support to companies in the new energy industries by focusing new investments in overseas demonstration projects. In effect, the companies will be able to

build capacity to export and venture into promising overseas markets in Southeast Asia, Central and Latin America and the Middle East,

International Cooperation for Eco-friendly Energy

Recognizing that fossil fuel consumption will remain high after 2040 even in the midst of the increasing use of renewable energy, we should understand that developing technologies for cleaner fossil fuels is as equally important as widely deploying renewable energy. By 2022, Korea plans to allocate USD 6.4 billion towards replacing environmental facilities, such as dust collectors and deSOx systems, to minimize the impact of environmental pollution from coal-fired power generation. By doing so, fine dust particles produced during power generation will be reduced to 13,000 tons in 2030, a 62% decrease from 34,000 tons in 2017. However, such efforts can only bear fruits when accomplished through close international cooperation.



Moreover, cooperation between countries and companies is imperative for the convergence and distribution of 4th Industrial Revolution technologies. In this light, Korea is undertaking 14 jointly funded projects by concluding MOUs on cooperation in energy technology development with eight countries, beginning with the US and Canada in 2011 to Germany, the UK, Mexico, Indonesia and France. In addition to these projects, 117 projects have been underway since 2011 with a total of 27 countries using the internal networks of domestic research institutions. The Korean government sincerely hopes that the 16th IEF will be an opportunity to further enhance international cooperation for the generation and efficient use of eco-friendly energy.