

## Rural microgrids seoul

In this Special Report, Woohyun Hwang describes the current status and recent development of microgrids based on renewable energy sources and other generation in the Republic of Korea (ROK). The types of microgrids constructed in the ROK are described, along with policies related to microgrid development and implementation, and financing arrangements for microgrids in the ROK. The paper includes an prologue on the impact of the covid-19 pandemic on microgrids in the ROK.

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Government plans call for the installation of up to 63.8 GW of renewable energy, producing 20% of national generation, and reducing national CO<sub>2</sub> emissions by 37% by 2030 as a part of fulfilling the ROK's commitment to the 2015 Paris climate change agreement. Government subsidies are provided for renewable energy sources such as solar, wind, and bio energy and power producers are obligated to incorporate renewable generation in their generation portfolios through the use of renewable energy credits (RECs).

This paper introduces the evolution and development of microgrids and related smart grid development based on plans by the national government, local governments, and power companies during the last 10 years in Korea, and presents the results of and prospects for microgrid development in Korea.

Microgrids are defined in Korea as installations that connect renewable electricity generation with energy storage systems to produce electricity and supply it in conjunction with the central grid or use it independently. The renewable energy resources used in microgrids are primarily photovoltaic, wind and small hydropower or bioenergy generation. Energy Storage Systems consist of lithium-ion or lithium phosphate batteries, power control systems, and operating software (Figure 1). There are three types of Micro grids in Korea, as described below.

In terms of economics, there is no big difference between these types of microgrids because each model is similar. However, the 100% self-sufficient type requires the additional power to be backed up in the event of bad weather or equipment failure. On the other hand, the diesel generator and central grid connection type do not require much backup battery capacity compared to the independent type, and are therefore less expensive and are stable from an operating perspective.

As of the end of 2018, the capacity of power generation facilities such as nuclear power, coal, gas, and renewable energy in Korea totaled 119 GW. The transmission grid system operates at 765,000V, 345,000V, and 154,000V, and substations for each voltage are installed between the transmission grid and the distribution lines to supply power by stepping down the transmission voltage. Distribution voltage is typically 22.9kV, with low voltage power at 220V and 380V supplied to households and businesses (see Figure 2).

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