



CASE STUDY

Huge test of state-of-the-art ideas *Republic of Korea's smart grid development*

Key point

- *The Korean smart grid case exemplifies how a government can nurture promising but still immature low carbon technologies to become an engine for economic growth.*

There was a vision...

Following the announcement of the Five-Year Green Growth Plan and the national vision, *Building an Advanced Green Economy* in 2009, the Korean Government pinpointed smart grid development as one of several directions for achieving low carbon green growth. The Ministry of Knowledge Economy and its subsidiary organization, the Korean Smart Grid Institute, are taking the lead in this ambitious initiative.

What was done?

The Government drafted the Korean Smart Grid Roadmap 2030 in 2010, which consists of a vision, short- to medium-term goals (2012, 2020 and 2030) and five implementing areas – smart power grid, smart consumer, smart transportation and smart renewables and smart electricity service. In conjunction, an investment plan worth 7 trillion won for technology development (Government: 2.2 trillion won, private sector: 4.8 trillion won) and 20.5 trillion won for construction of infrastructure (Government: 0.5 trillion won, private sector: 20 trillion won) was committed.¹

By 2030, the Government's efforts in smart grid development is expected to reduce approximately a total of 230 million tonnes of greenhouse gas emissions, create 50,000 jobs annually, generate 74 trillion won worth of domestic demand, reduce 47 trillion won worth of energy imports, discourage the construction of 3.2 trillion won worth of new plants and increase 49 trillion won worth of exports.²

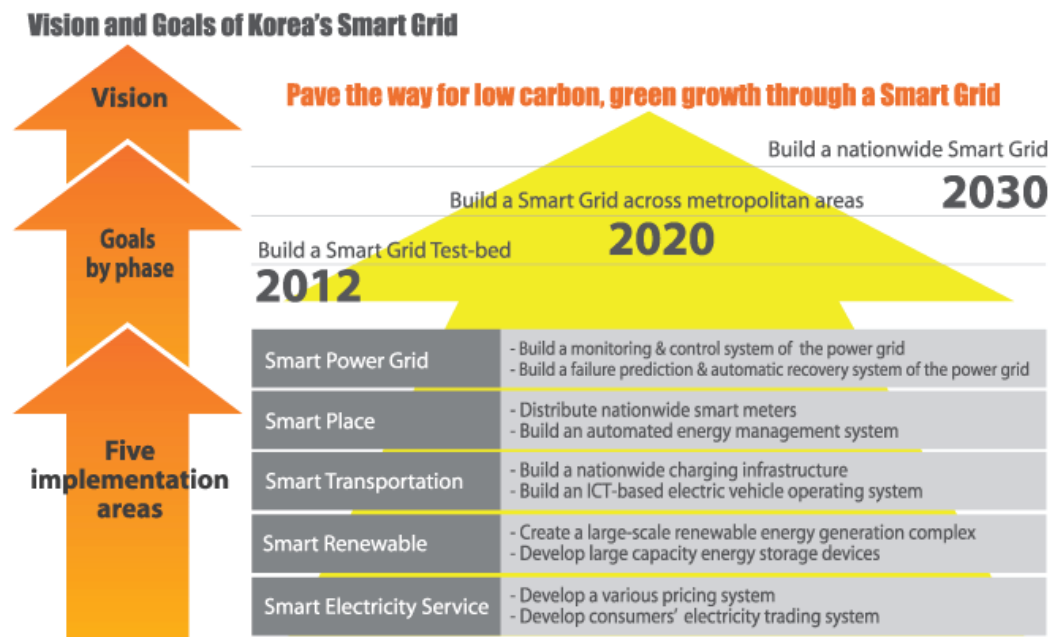
The roadmap cites several major milestones: i) build a smart grid test-bed by 2012, ii) build a smart grid across metropolitan areas by 2020 and iii) build a nationwide smart grid by 2030 (figure 1). The Government also expects to export the smart grid technologies abroad.³

¹ Ministry of Knowledge Economy and Korea Smart Grid Institute, "Korea's Smart Grid Roadmap 2030: Laying the Foundation for Low Carbon, Green Growth by 2030", pamphlet (Seoul, 2010). Available from www.smartgrid.or.kr/Ebook/Roadmap2/Roadmap2.html (accessed 30 September 2011).

² *ibid.*

³ Korea Smart Grid Institute website "FAQ's". Available from www.smartgrid.or.kr/10eng6-1.php (accessed 30 September 2011).

Figure 1: The Government's vision for the smart grid



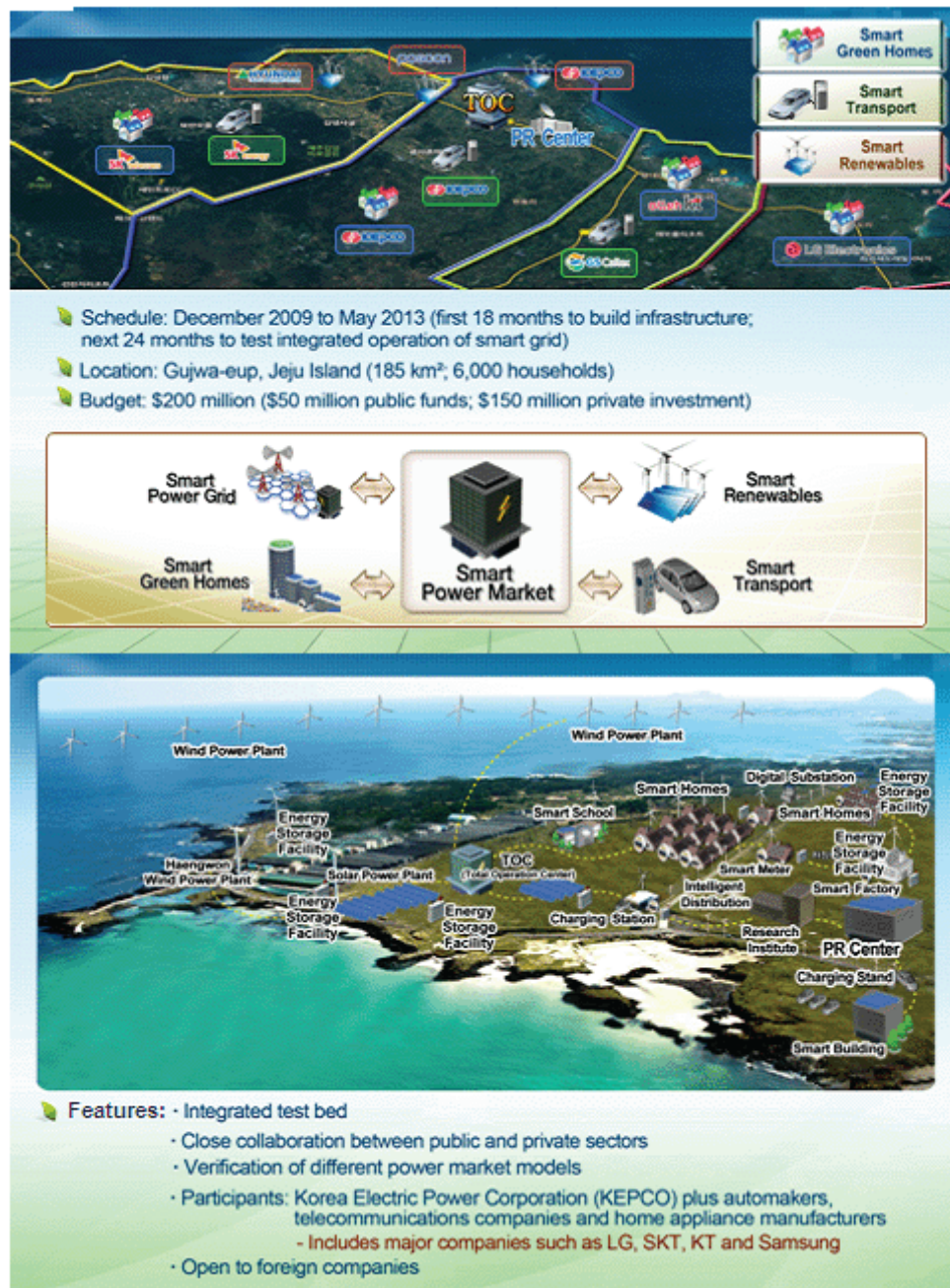
Source: Ministry of Knowledge Economy and Korea Smart Grid Institute, "Korea's Smart Grid Roadmap 2030: Laying the Foundation for Low Carbon, Green Growth by 2030", pamphlet, (Seoul, 2010). Available from www.smartgrid.or.kr/Ebook/Roadmap2/Roadmap2.html (accessed 30 September 2011).

The Jeju smart grid test-bed project

In 2009, the Government embarked on the construction of a smart grid test-bed in Jeju Island at the southern tip of the country, which is expected to be the world's largest smart grid demonstration project that showcases state-of-the-art technologies and applies innovative business models (figure 2). The Government will invest a total of 64.5 billion won (approximately US\$57.8 million) between 2009 and 2013.⁴

⁴ Korea Smart Grid Institute website "Korea's Jeju Smart Grid Test-bed Overview". Available from www.smartgrid.or.kr/10eng3-1.php (accessed 30 September 2011).

Figure 2: Jeju Island smart grid test-bed overview



Source: Korea Smart Grid Institute website, *Jeju's Smart Grid Test-bed Overview*. Available from www.smartgrid.or.kr/10eng3-1.php (accessed 30 September 2011).

The project aims to raise energy efficiency, build eco-friendly infrastructure that reduces CO₂ emissions, create new growth opportunities and enhance the quality of life.⁵ More specifically, it aims to reduce electricity costs and energy consumption through the application of smarter technologies, renewable energy and efficient energy services.⁶

There are five areas of implementation: i) smart power grid to build smart power infrastructure, ii) smart place to lay the foundation for efficient energy use, iii) smart transportation to lay the foundation for expanded distribution of electric vehicles, iv) smart renewables to manage clean energy reliably, and smart electricity service to manage clean energy reliably and v) provide new electricity services. The demonstration project covers two

⁵ *ibid.*

⁶ Mark McDonald, "To Build a Better Grid", *The New York Times*, July 28, 2011. Available from www.nytimes.com/2011/07/29/business/global/to-build-a-better-grid.html?_r=1&pagewanted=all (accessed 30 September 2011).

phases: The basic stage (2010–2011) focused on infrastructure development for the smart power grid, smart place and smart transportation components. The expansion stage (2012–2013) on integrated operations focuses on smart electricity service components, providing innovative power services and renewable energy sources to the power grid.⁷ The test-bed project is a partnership between the Government, private companies, research institutes and academia (approximately 10 consortiums, 168 companies in five areas).⁸

Figure 3: Map of the Republic of Korea



Source: Google Maps website. Available from <http://maps.google.com/> (accessed 30 September 2011).

Results

More than 2,000 (among the 6,000 total) homes have been connected to the test grid since July 2011. The residents received new electrical meters, switches, home appliances and other technologies to enable a two-way real-time communication between the end user and the utility company to encourage electricity use when it is at the cheapest rate. The Government and the private sector covered the cost of the solar panels and storage batteries, worth US\$15,000 for each set-up, which have been installed in 150 homes so far. This allows the end users to generate their own electricity and sell the surplus to the utility companies. AC/DC quick-charging stations have been set up for the 31 residents who own electric cars.⁹

Future prospects

The Jeju Island project will be followed by similar projects at the city level in the coming years. The Government expects three to four cities will have smart grid technologies by the end of 2013.¹⁰

The Korean Government is currently implementing a US\$25 million technology project in Chicago, Illinois in the United States that involves installing energy-saving equipment in a maximum of 14 buildings (commercial and residential) and provides funding to R&D programmes on smart-grid technology in universities. The project is working to propel Illinois as the country's leader in smart grid development and R&D, resulting in the creation of job opportunities.¹¹ The Republic of Korea hopes that the Chicago project will open new opportunities to export its smart grid technologies around the world, a long-term goal included in the Smart Grid Roadmap.

⁷ Korea Smart Grid Institute website "Test Bed Background". Available from www.smartgrid.or.kr/10eng3-3.php (accessed 30 September 2011).

⁸ Korea Smart Grid Institute website "Jeju Test-bed Budget and Consortium". Available from www.smartgrid.or.kr/10eng3-5.php (accessed 30 September 2011).

⁹ McDonald op. cit.

¹⁰ McDonald op. cit.

¹¹ Julie Wernau, "South Korea Launches Energy Savings Project in Chicago," *The Chicago Tribune*, July 21, 2010. Available from http://articles.chicagotribune.com/2010-07-21/business/ct-biz-0722-korean-tech-20100721_1_buildings-aon-center-south-korea (accessed 3 October 2011).

Considerations for replicating

The Five-Year Green Growth Plan, a national R&D strategy, the Smart Grid Roadmap and an investment plan politically and strategically positioned the smart grid technology as an emerging national industrial priority to drive future economic growth. The Korean case exemplifies how a government can nurture promising but still immature low-carbon technologies through appropriate national policy frameworks, short- to long-term policy measures, public investments and innovative partnership schemes with the private sector. The Korean case also shows how a government can support and bridge technologies in demonstration projects to move towards the commercialization phase. The methodologies applied in the Republic of Korea can be a reference point for developing countries that seek to use technological innovations as a driver of economic growth or want to strengthen their deployment capacity.

Further reading

Korea's Smart Grid Roadmap 2030: Laying the Foundation for Low Carbon, Green Growth by 2030 (Seoul, Ministry of Knowledge and Economy, Government of the Republic of Korea and the Korea Smart Grid Institute). Available from www.smartgrid.or.kr/Ebook/Roadmap2/Roadmap2.html.