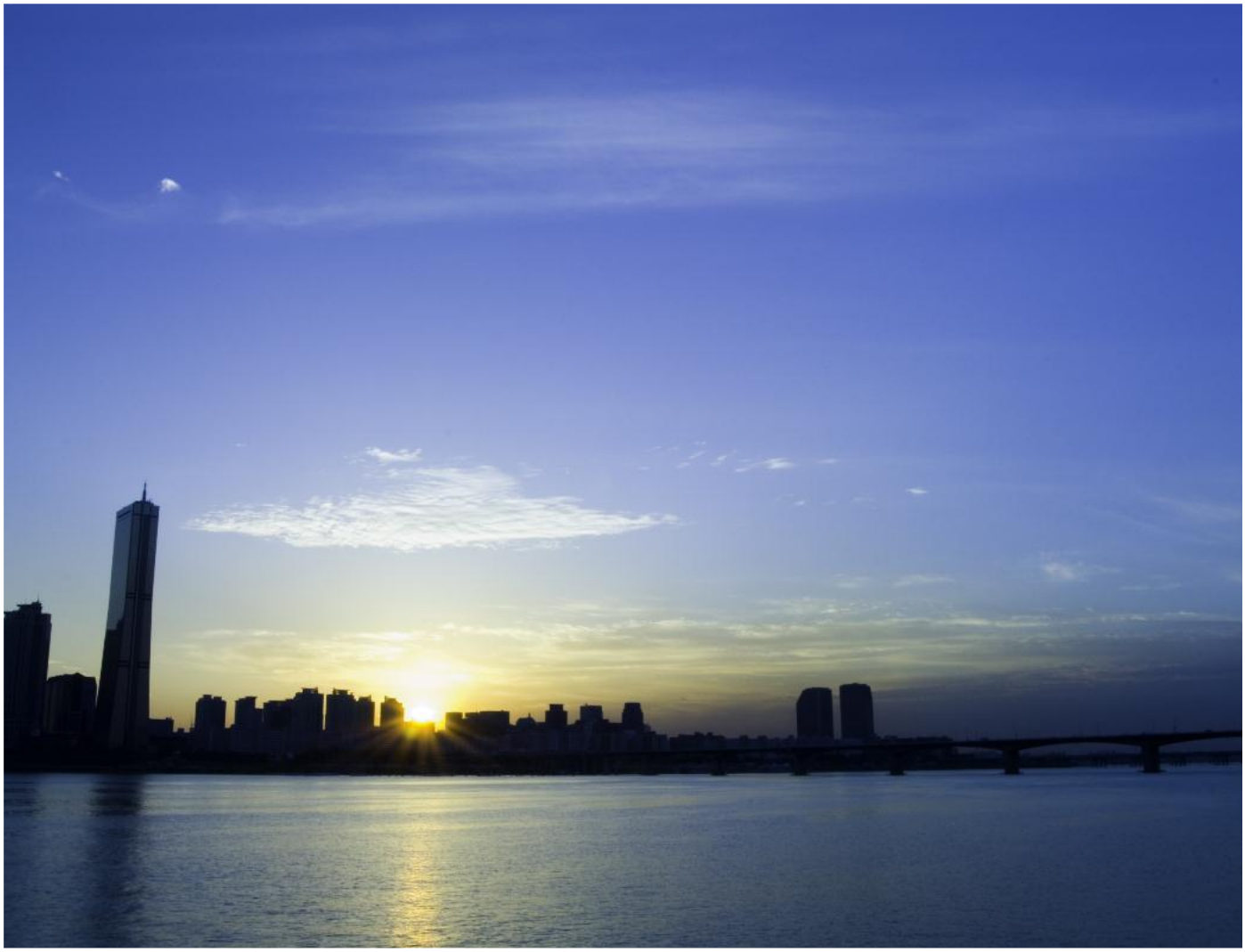
GE
Grid Solutions

Buk-Dangjin - Godeok

Transmitting Power to Cities

GE's HVDC technology powers a densely populated South Korean city



Imagination at work

83 km Undersea HVDC Line to the Coast

Project Overview

Country:	South Korea
Project:	Buk-Dangjin - Godeok
Customer:	Korea Electric Power Corporation (KEPCO)
Technology:	High Voltage Direct Current (HVDC) Line Commutated Converter (LCC)
Scope:	Design and supply of equipment for an asymmetrical monopole: 2 monopole line-commutated converter stations, including converter transformers, thyristor valves, cooling system, filters and control system
Rating:	1.5 GW, 0 to +500 kVDC

Customer Challenges

Looking for Energy Independency

With 51.3 million people[1], South Korea has experienced nearly a 35% growth[2] in energy demand in the last decade alone. South Korea is an energy-intensive nation, standing at eleventh worldwide in terms of total energy consumption[3]. The country faces the ambitious challenge of providing efficient energy to its densely populated areas.

South Korea imports a remarkable 82%[3] of the total energy it consumes. Since 2006, the Korean government has developed many new energy policies to become more energy independent, meet growing demand and increase energy efficiency.

Transmitting Power from Generation on the East Coast to Consumption Centers

With electricity consumption increasing at a rate of 5% in recent years, South Korea is struggling to keep pace with power generation capacity.

In August 2013, the country's power reserve level reached 3.4% due to unusually hot weather and stoppage of a large power plant, approaching dangerously 'alert' level. South Korea already has plans to construct new power plants to address generation needs, but the challenge is to connect them to the grid and ensure that the energy can be efficiently transmitted to the load centers.

Over the next few years, South Korea aims to connect the plants, located mainly on the east coast, with the consumption centers on the diagonal of Seoul-Pusan. It has become increasingly difficult to obtain permits to build new overhead lines. The government has decided that the best solution to avoid such issues in the future is the use of High Voltage Direct Current (HVDC) in conjunction with cables.

Sources:
1 - World Bank
2 - Index Mundi
3 - EIA

HVDC Key Benefits

- Efficient transmission of electricity through insulated cable over long distances
- Fast, accurate, fully-controllable and measurable power flow
- Generation from remote source may be injected directly where needed
- HVDC converter station presents lower environmental impact compared to generation plant
- HVDC underground cable significantly reduces right-of-way visual impact compared to overhead line

The Solution

In mid-2014, GE was awarded Phase I of a HVDC Line Commutated Converter (LCC) project through its joint venture, KEPCO-Alstom Power Electronics Systems (KAPES), to design and supply equipment for a 33 km energy corridor in Seoul region.

The 1.5 GW power capacity HVDC link will be configured as an asymmetrical monopole, with a rating of 0 to +500 kVDC. The link will transmit energy produced by the Dangjin power plant in the west of South Korea to Godeok, east of Seoul.

The second phase of the project will add another asymmetrical monopole with an additional power capacity of 1.5 GW, completing the HVDC link in a bipole configuration with 3 GW power capacity and ±500 kVDC.

The project will allow KEPCO to deliver a reliable supply of electricity to people and businesses across the Asanman bay to the densely populated west coast of Godeok, bypassing a 100 km detour that an alternating current scheme would have used and avoiding the construction of a new overhead line.

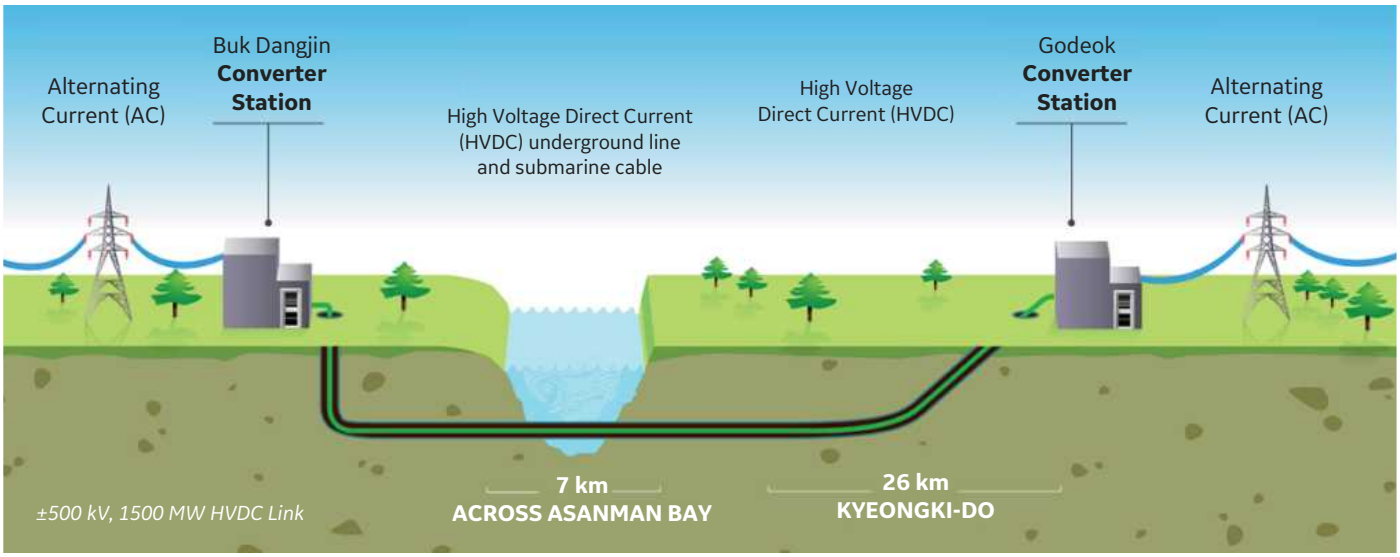
With fast, accurate power flow, HVDC effectively prevents the spread of blackouts. It reduces transmission losses by 30% compared to conventional alternating current lines, thus being more economical and environmentally-friendly.

The Supergrid: South Korea's New Growth Engine

KEPCO, the largest utility in South Korea, is responsible for generation, transmission and distribution of electricity, contributing to 93% of Korea's electricity generation. The Buk-Dangjin project is a step towards its mid- to long-term plan in developing a Supergrid to address growing energy demand and to create a new growth engine by exporting electric power. HVDC is key to enabling this large-scale project, with benefits such as higher operational efficiency in power supply, more active exploration of regional energy resources such as gas and hydro power, and integration of renewable energy sources for future growth.

KAPES Joint Venture

In 2012, Grid Solutions, previously Alstom Grid, and Korea Electric Power Corporation (KEPCO), announced the creation of KEPCO Alstom Power Electronics Systems (KAPES) joint venture, with the focus of delivering HVDC projects in South Korea, critical to ensuring the country's sustainability and reliability. The long-term strategic aim is to increase Korean transmission grid capabilities based on Grid Solutions technology, and support the long-term plan of KEPCO to develop the Supergrid.



Buk Dangjin project overview

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