

ABB and Hitachi to form strategic power grid partnership for HVDC in Japan

New Joint Venture to build on Hitachi's strong local market presence and ABB's High Voltage Direct Current (HVDC) technology leadership to address Japan's new energy focus

Tokyo and Zurich, Dec. 16, 2014 – ABB and Hitachi announced today an agreement to form a joint venture, for high voltage direct current (HVDC) system solutions in Japan. The new entity, to be based in Tokyo, will be responsible for the design, engineering, supply and after-sales services related to the DC system of HVDC projects bringing in ABB's latest technologies to the Japanese market where Hitachi will be the prime contractor.

Hitachi and ABB will take equity interests of 51 percent and 49 percent respectively. This is the first step of a strategic partnership between Hitachi and ABB to contribute to the evolution of Japan's power network. Hitachi and ABB will explore further strengthening of the relationship and address opportunities to widen the scope for future collaboration.

The joint venture is expected to commence operations in the coming months, subject to the necessary approvals and statutory procedures.

"Since the first development in the 1970s, Hitachi has participated in every HVDC project in Japan and has continued to underpin the stabilization of the electricity grid. I am confident that the establishment of a new company combining the strengths of Hitachi and ABB will provide a framework for the timely provision of the new technologies required by the Japanese HVDC market. By enhancing and expanding the HVDC business through its partnership with ABB, which has a strong performance record in the global market, Hitachi will continue to contribute to the stabilization of Japan's electric power grid." said Hiroaki Nakanishi, Chairman & CEO of Hitachi, Ltd.

"ABB pioneered HVDC 60 years ago and has continually pushed the boundaries of this technology. Our presence across half the world's installed base and our capability to develop and manufacture all major components of the HVDC value chain inhouse have put us in a leading position in the industry", said Ulrich Spiesshofer, CEO of ABB. "We are proud to enter into this partnership with Hitachi with a solid reputation and extensive 100 year long experience in the Japanese market. Together we can build on our complimentary strengths to play our part in the evolution of Japan's power infrastructure."

HVDC is a technology used for transmitting electricity between two grid systems. The supply side power is converted from alternating current (AC) to direct current (DC) before being transmitted, and it is then converted back to AC in the receiving side system for use. The system is ideal for long-distance transmission due to its ability to minimize electricity losses and to its lower space requirements and construction costs. It is also suited well for interconnections between two different frequencies

The global HVDC market has seen many projects using line commutated converter technology (LCC)^{*1} HVDC systems since the 1970s, while the development of voltage source converter (VSC)^{*2} systems has advanced as a new technology since around 2000. In recent years there has been a particular focus on use for connecting renewable energy sources. This has seen an increase in VSC-HVDC transmission systems, that facilitate grid-

stabilization, and the demand for new installations is increasing. This technology is ideal for long-distance underground and underwater power links and interconnections and is increasingly being deployed across a range of applications. These include the integration of renewable energies from land-based and offshore wind farms, the mainland power supply to islands and offshore oil and gas platforms, city center in-feeds where space is a major constraint and cross-border interconnections that often require subsea links. Its ability to meet grid code compliance ensures robust network connections regardless of application.

In Japan, there were nine HVDC projects up until 2006, all of which deployed LCC type. Now, with the increasing introduction of renewable energy and innovation in electric power systems, demand for VSC-HVDC systems is expected to increase for applications such as wide-area power transmission grids and connection of off-shore wind farms.

Hitachi has participated in every HVDC project in Japan so far. In the Japanese market, which demands a high level of reliability, Hitachi has contributed through technology development and project management to the creation of HVDC systems that maintain high operation rates^{*3} ranking amongst the best in the world.

ABB pioneered HVDC technology, putting into operation the world's first commercial link in Sweden in 1954 and was again the first to introduce VSC technology (HVDC Light) in the 1990s. The company also holds many other world records in this technology. Over the years ABB has been awarded around 100 HVDC projects representing a total installed capacity of more than 120,000 MW, accounting for about half of the global installed base. ABB's HVDC Light solution leads the way in VSC technology and the company has delivered 14 of the 15 commissioned VSC links in the world.

The new joint venture will combine Hitachi's sales network, project management expertise, quality assurance processes and delivery performance record, with ABB's state-of-the-art HVDC technologies, and contribute to innovation in electric power systems in Japan.

*1. LCC-HVDC*1: A HVDC system with AC/DC converter using power semiconductor devices that requires the passing current to be zero when off (a thyristor). This was the principle method used from the 1970s onward, and there are many examples of it in operation. The system configuration is simple, and the technology mature; however, its installation entails a large number of restrictions as regards the power grid, necessitating grid stabilization measures in some cases such as reactive power compensation.

*2 VSC-HVDC*2: A HVDC system with AC/DC converter using power semiconductor devices that can be switched on and off at any time (IGBTs, etc.). There are less restrictions, compared to LCC type, as regards the power grid for its installation, and it has considerable benefits for grid stabilization, for example with respect to supplying reactive power. Since it requires no grid stabilization measures, it achieves a simpler overall configuration than LCC-HVDC systems.

*3 Reported in "A Survey of the Reliability of HVDC Systems" by the International Council on Large Electric Systems (CIGRÉ), and other sources.

Press Release

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About ABB

ABB (www.abb.com) is a leader in power and automation technologies that enable utility, industry, and transport and infrastructure customers to improve their performance while lowering environmental impact. The ABB Group of companies operates in roughly 100 countries and employs about 145,000 people. ABB in Japan is based in Tokyo and has been active in Japan over 100 years.

About Hitachi, Ltd.

Hitachi, Ltd. (www.hitachi.com), headquartered in Tokyo, Japan, delivers innovations that answer society's challenges with our talented team and proven experience in global markets. Hitachi is focusing more than ever on the Social Innovation Business, which includes infrastructure systems, information & telecommunication systems, power systems, construction machinery, high functional materials & components, automotive systems, healthcare and others.

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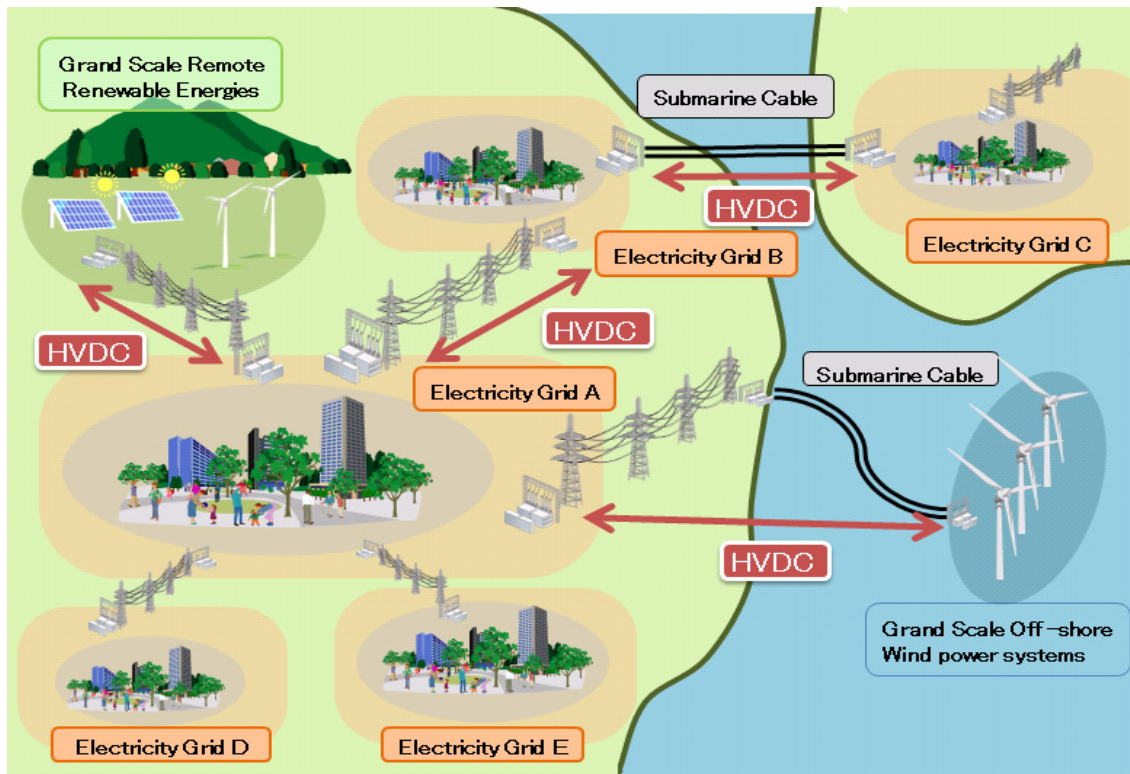
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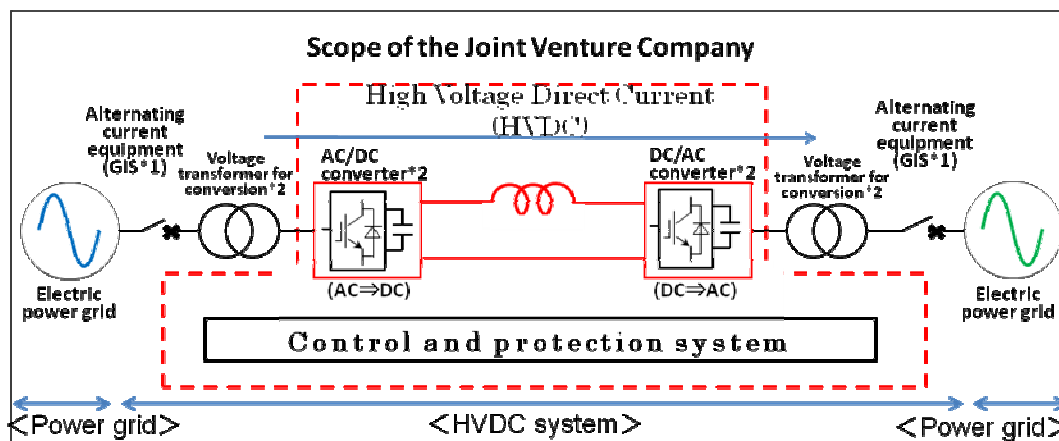
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Appendix

HVDC System : Where it is used



HVDC System : How it works



HVDC systems are used to transfer power between two electric power grids.

The system converts the supply side power from AC to DC and transmits the power in DC form. On the receiving side, the power is converted back into AC again to be used.

***1: Gas-insulated switchgear (GIS)**

Equipment installed at substations and switching stations at transmission points for distributing electricity generated at a power station to the demand-side (households and factories, etc.). The equipment comprises elements such as switchgear used to open and close the circuit and isolating switches for electrically isolating the circuit and discharging the voltage. The equipment and wiring are housed in a single gas tank to achieve a small installation footprint.

***2: Power electronics technology for electric power (Voltage transformer for conversion, AC/DC converter, etc)**

Technology that controls the flow of electricity, improves the quality of electric power and stabilizes the electric power grid using equipment such as AC/DC converters that use elements such as power semiconductors. In high voltage DC transmission, a converter is used to convert AC power from a grid to DC power for transmission.