Power transformers

HVDC transformers
Building trust through a solid engineering tradition

Power and productivity
for a better world™

HVDC
Green and cost effective power transmission

ABB pioneered HVDC transmission technology in the 1950s. Being the undisputed leader for more than half a century, ABB continuously develops the HVDC technology to meet the demands of economic and sustainable transmission and integration of different electricity generation types. ABB HVDC transformers are at the heart of these systems.

Xiangjiaba – Shanghai 800 kV HVDC

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HVDC at a glance

The HVDC technology – high voltage direct current – is used to transmit electricity over long distances by overhead transmission lines or submarine cables. It is also used to interconnect separate power systems, where traditional AC connections cannot be used. HVDC transmission offers, for instance, controllability and low total investment cost compared to AC solutions for long-range transmission.

Cost efficient and environmentally sound long-distance transmission

Over long distances, HVDC offers a cost effective alternative to AC transmission. By means of interconnecting links, existing generating plants in the networks are used more effectively so that construction of new power stations can be deferred. This makes economic sense while minimizing the environmental impact.

Making sustainable energy sources economically feasible

ABB's HVDC Light™ power system is designed to transmit power under ground and under water, even over long distances. It offers an alternative to conventional AC transmission systems and local generation including connecting wind farms to power grids. Other applications include shore power supply to islands and offshore oil and gas platforms.

The role of HVDC transformers

HVDC transformers are at the heart of HVDC transmission systems. Their main application is to transfer power between an AC system and the DC transmission network. HVDC transformers are also used to ensure an appropriate tapping range for part of the DC voltage and for reactive power control, serving as an integrated part of DC transmission.

1. Platform Borwin Alpha, with 3 HVDC Light transformers, 2009 | 2. Windpower | 3. Ph.D Uno Lamm, the father of HVDC power transmission.

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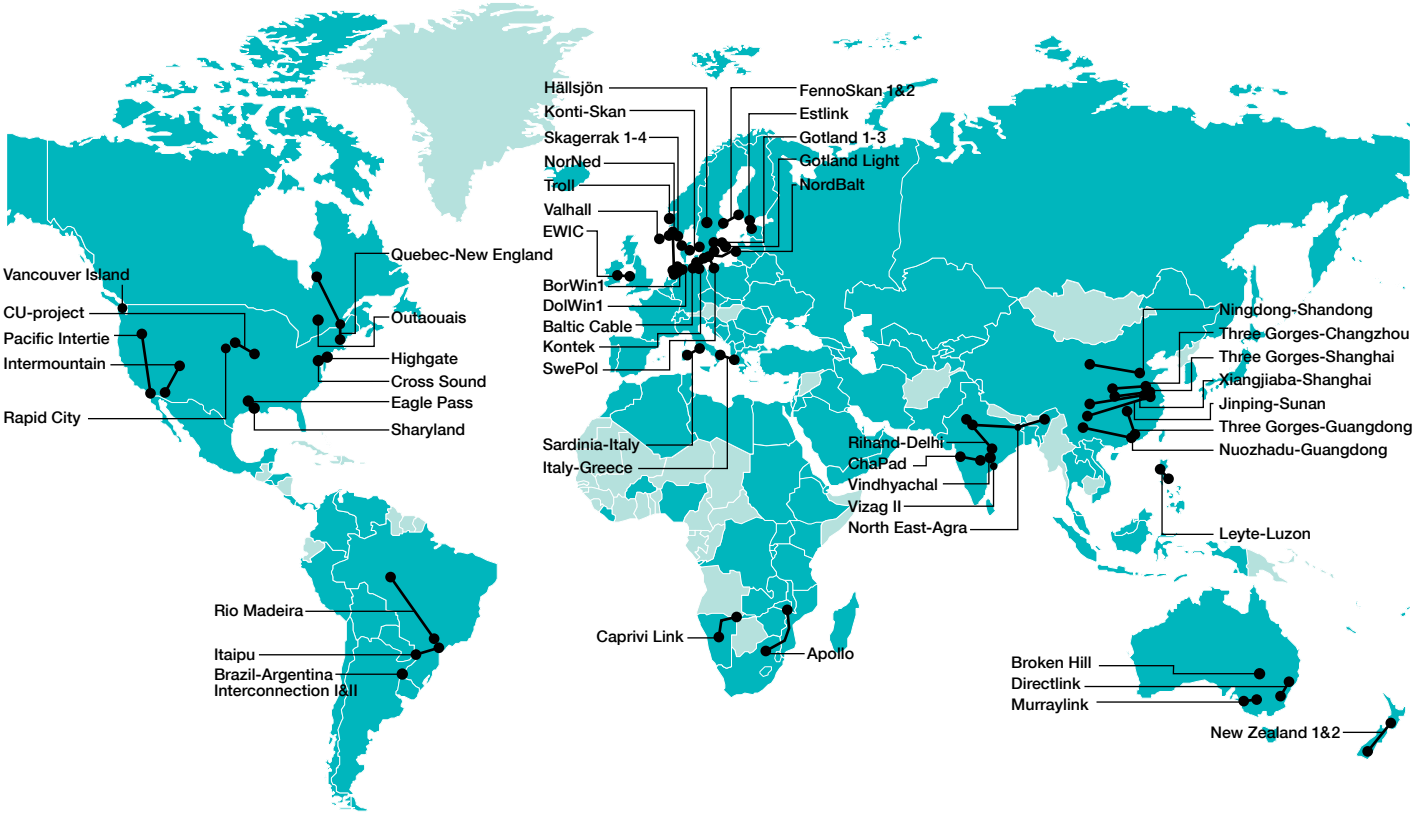
Customer value based on extensive experience

ABB has delivered more than half of the world's 140 HVDC projects. Furthermore, ABB has designed and manufactured more than 350 HVDC converter transformer units in the 80–800 kV DC voltage range. Our extensive experience helps us deliver outstanding value to customers worldwide.



Executing successful projects

Each project is assigned a certified and experienced Project Manager, who is responsible for all aspects of the project. Having supplied to a large number of projects, ABB's experience covers all stages of a project – which is reflected in our high customer appreciation rankings. Serving many customers from all over the world has given us a deep understanding of the varying customer requirements and operating conditions that characterize HVDC transformer projects.

In-house sourcing

ABB has complete in-house control of the design and manufacturing of key components for HVDC transformers, including bushings, tap changers and insulation material. Customers benefit from this by being supplied reliable transformers from a well-proven supplier. Furthermore, in-house supply of key components improves our control of sourcing during the execution of the project.

Rapid development and commissioning

Drawing on a wealth of experience and unmatched research and development (R&D) investments, ABB has a proven record of delivering excellent performance in record-short time. A perfect example is the world-record-breaking speed with which the 800 kV Xiangjiaba–Shanghai project in China was developed. The transformers were installed and commissioned one year ahead of the original customer schedule.

Operating in some of the world's most prestigious HVDC projects

ABB's customer reference projects include HVDC transformers in operation in the world's largest hydropower projects, interconnection of power grids over sea or land, and flexible connection of wind power generation.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1 NorNed, Classic long distance transmission, 2007 | 2 Borwin 1, Light offshore, 2010 | 3 EWIP Light cable transmission, 2011 | 4 Outouais, back-to-back, 2009

R&D and technology leadership
The basis for successful HVDC transformer projects

Strong basic research is key to ABB's versatile design solutions, which are converted into highly efficient HVDC transformers. For over half a century, ABB has been putting its R&D and technology to use in the design and manufacture of HVDC transformers – ensuring excellence in every detail.

Specific requirements for HVDC transformers
HVDC transformers are, in contrast to AC transformers, subject to both AC and DC insulation stresses as well as harmonics in the load current. ABB has a deep understanding of the different net system operating conditions, magnetic dynamics and insulation performance, which is crucial to the design of high-quality transformers.

Insulation requirements for both HVAC and HVDC
HVDC transformers are particularly dependent on efficient insulation, both for AC and DC voltage. ABB is at the forefront of basic research as well as dielectric design, building on our exceptional competence and technology capabilities, such as direct measurement of electric fields using electro-optical methods.

Verified short circuit strength
ABB has long been a driving force in the development of transformers with very high short circuit strength, including HVDC transformers. ABB conducts a large number of short circuit tests, and according to KEMA statistics*, ABB's short circuit strength is more than twice as high as the market average.

Production friendly design
Besides being technically advanced, an HVDC transformer must also be easy to produce. ABB HVDC transformers are designed according to the most stringent technical requirements, without introducing unnecessary complexity. This results in robust transformers, supplied with high delivery performance.

Individual designs, standardized methods
In order to combine individual design with high product quality, ABB adopts a design and production philosophy based on customized products and standardized working methods. Our global TrafoStar design and manufacturing platform defines common design rules, which allow us to produce truly customized transformers with consistently high quality, regardless of the manufacturing facility.

A KEMA public report *) and ABB statistics indicate that ABB short circuit reliability is more than twice as high as the market average.

*) R.P.P. Smeets, L.H. te Paske. Fourteen Years of Test Experience with Short-Circuit Withstand Capability of Large Power transformers Travek VIIth Int. Sci. and Techn. Conf. on Large Power Transf. and Diagn. Syst., Moscow, 2010

Rio Madeira, Classic long distance transmission, 2011. Presently the largest and most powerful HVDC unit ever manufactured.

Full support from transportation to training

The quality of every delivery is assured throughout the entire business process – from sales to commissioning of the equipment. ABB's worldwide presence with more than 50 transformer facilities and 25 service centers worldwide ensures that after-market support will never be an issue.


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1 NorNed, 2007 | 2 Drying process | 3 Sylmar, 2004 | 4 Training

Transportation

ABB normally arranges transportation from factory to the place of installation. All ABB HVDC transformers are dispatched with bushings, conservator and accessories removed. Due to their large size, the transformers are shipped without oil. The oil is transported separately in barrels or tanks.

Installation

On arrival at the installation site, our trained engineers prepare the transformer for its working life by carefully reassembling parts that have been dismantled for safe transit, refilling it with oil and performing the necessary onsite tests to ensure long and trouble-free life. Customers can choose between a supervisory or full-installation agreement.

Service

Each transformer comes with a technical guarantee and full backup, including field support and global after-sales service. In addition to ABB factories, local branch offices, agencies and representatives are present throughout the world. Diagnostic assessment, onsite repairs, upgrades and spare parts deliveries are available worldwide.

Training

Training of customer personnel on the maintenance and service of transformers, including accessories, can be carried out at our training centers or at other sites according to customer request.

Contact us

ABB Ltd.
Affolternstrasse, 44
P.O. Box 8131
8050 Zurich, Switzerland

www.abb.com/transformers

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