Underground power links by HVDC Light®

HVDC Light® is a state-of-the-art power system designed to transmit power underground and underwater. It offers numerous environmental benefits, including "invisible" power lines, neutral electromagnetic fields, oil-free cables and compact converter stations. HVDC Light® increases the reliability of power grids, and can be installed quickly.

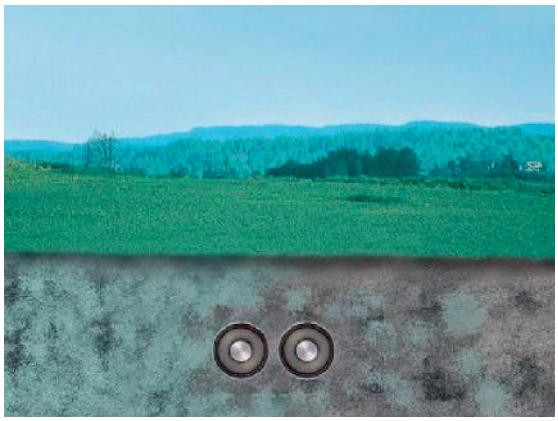
Your needs – Our response

Utilities are under extreme pressure to meet consumer and regulatory demands and expectations for a high quality, competitively priced power supply that has low environmental impact.
A key constraint in adding transmission capacity to existing AC grids is the requirement to neutralize environmental impact - often making overhead grid extensions impossible from an environmental perspective and unacceptable to neighbouring communities.
Meeting these needs with underground HVDC transmission is not only economically feasible, but adds power quality benefits much in demand by today's power networks.

Customer Value

The Murraylink project in Australia is today the world's longest underground power link with 94 % efficiency. HVDC Light® adds value to underground power links in the following ways:

- AC grid enhancements
- Reliable power supply
- Black start capability
- Easier permit procedure
  - Underground invisible cable system
  - Environmental friendly oil-free cables
  - Short installation and implementation time
  - Environmentally adapted converter stations
- Low project risk by
  - Easy permitting
  - Short construction and commissioning time
  - Minimizing time from decision to commercial operation
- Flexible, modular systems
  - Can easily be built or expanded to multi terminal system
  - Modular systems can be staged and installed to meet capacity demand
  - Comprehensive factory testing and fast installation
  - Short installation and implementation time
- Underground invisible cable system
  - Enables installations in existing right of ways e.g. existing cable ducts, roads, sub ways, railways, channels
- Compact, environmentally adapted converter station design
  - Reduction of station foot-print
  - Lower costs for land and civil works
- Health Safety and Environment (HSE) impact
  - Twin cable installation neutralizes magnetic fields
  - Enclosed equipment gives efficient noise suppression
- Low operation and maintenance costs



"Invisible" power lines are more acceptable to neighbouring communities than overhead lines

Scope of supply

- Feasibility studies to facilitate customer's business development process, including optimization of the entire project/system
- System analysis and network studies
- Engineering and project management
- State of the art HVDC Light® technology including turnkey supply of
- Converter stations with compact, adapted to the environment
- Light-weight, oil-free cables
- Quality assurance ensures the customer systems, operations, and maintenance staff receives proper training and documentation for a smooth transfer at Take Over
- Maintenance Support with short response thanks to remote diagnostics from supplier home base

ABB – pioneers of HVDC

ABB pioneered HVDC technology 50 years ago when the company built the world's first commercial high-voltage direct current transmission link in Sweden. Building on this world first, ABB has maintained its undisputed world leadership in HVDC transmission technology. We have supported our customers with more than 55 HVDC projects around the world providing more than 45, 000 MW of transmission capacity. And since 1999, with its new HVDC Light® technology, ABB is once again building a technological lead with solutions to customers' transmission challenges around the world.

Continuing to meet these needs will maintain ABB's leadership position.

For reference projects,please see the reverse side.
More information can be found on www.abb.com/hvdc

Reference list - HVDC Light®

PROJECT	In service	Power MW	DC voltage kV	Station location and AC grid	Trans-mission distance	Application	Customer
HÄLLSJÖN Sweden	1997	3	±10	Hällsjön, 10 kV Grängesberg, 10 kV	10 km (over-head)	Pilot system	VB Elnät, Sweden
GOTLAND Sweden	1999	50	±80	Näs, 77 kV Bäcks, 77 kV	70 km	Wind, Undergrounding	GEAB, Sweden
DIRECTLINK Australia	2000	3 x 60	±80	Terranora, 110 kV Mullumbimby, 132 kV	65 km	Undergrounding	TransEnergy, USA North Power, Australia
TJÆREBORG Denmark	2000	7,2	±9	Enge, 10,5 kV Tjaereborg, 10,5 kV	4,4 km	Wind, Undergrounding	Eltra, Denmark
EAGLE PASS USA	2000	36	±15.9	Eagle Pass, 138 kV (both sides)	NA (back-to-back)	Grid reliability	AEP, USA
CROSS SOUND USA	2002	330	±150	New Haven, 345 kV Shoreham, 138 kV	40 km	Grid reliability	TransEnergie US, USA
MURRAYLINK Australia	2002	220	±150	Berri, 132 kV Red Cliffs, 220 kV	180 km	Undergrounding	TransEnergie US, USA
TROLL A Norway	2005	2 x 41	±60	Troll A, 56 kV Kollsnes, 132 kV	67 km	Offshore	Statoil, Norway
ESTLINK Estonia - Finland	2006	350	±150	Espoo, 400 kV Harku, 330 kV	105 km	Grid reliability, Undergrounding	Nordic Energy Link AS, Estonia
VALHALL Norway	2010	78	150	Lista, 300 kV Valhall, 11 kV	292 km	Offshore	BP, Norway
NORD E.ON 1 Germany	2009	400	±150	Diele, 380 kV Borkum 2, 170 kV	203 km	Offshore wind	E.ON Netz Germany
Caprivi Link Namibia	2009	300	350	Zambezi, 330 kV Gerus, 400 kV	970 km (over-head)	Grid reliability	NamPower Namibia

More information regarding each specific project can be found on www.abb.com/hvdc

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