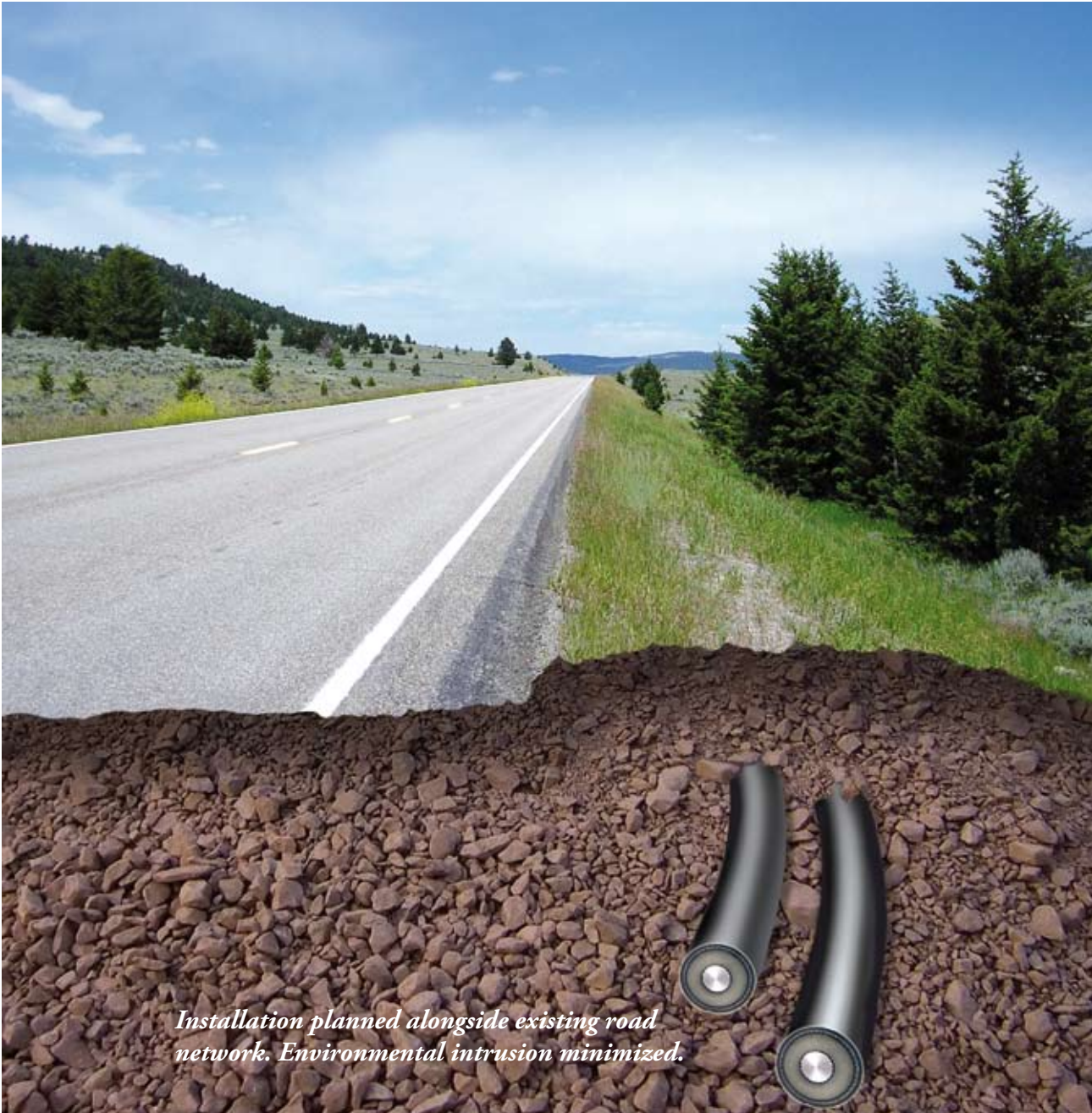
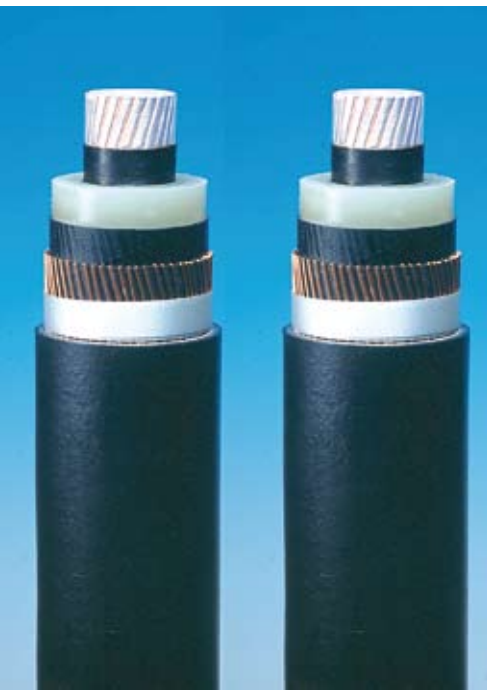


# Reliable electrical transmission over long distances, using ABB cable systems

HVDC Light





HVDC Light cables are manufactured at Karlskrona. They are then transported on drums to the location where they are to be buried in the ground. The picture above shows the first HVDC Light cable, which was installed on Gotland as early as 1999.

### **With new electrical supply systems, security is the key to success**

When new systems for efficient electrical distribution are developed and put into use, security, safety and environmental considerations are the common objectives for both consumers and producers. They were also the starting points when ABB developed its concept for cost-effective power transmission using HVDC Light.

### **Works all around the clock**

Success came quickly. The world's longest land-based power transmission cable has worked all around the clock, day after day. When this document was printed, the Murray Link in Australia had been in operation for rather more than four years. A corresponding installation on a smaller scale, on the Swedish island of Gotland, has delivered power since the end of the last millennium.

### **Connect-hide-forget**

It is with this real-life experience that ABB puts its unique competence, as well as its quality stamp within cable systems into play, in order to compete for the investments that are needed to strengthen Europe's electrical transmission network. Through similar projects, we know that the future is already here. This brochure is our way of sharing our thoughts about a secure, long-term and cost-effective means of electrical distribution, that will continue working even when hard autumn storms rage. The idea is as

equally obvious as it is self-evident: Connect-hide-forget! The cable is designed so as not to cause risks for personal injury, even if an accident occurs and the cable is cut by a digger. The power is then immediately cut. Unhindered by weather conditions such as lightning, storms and icing, the cable delivers electrical power in an environmentally friendly, stable manner, with a minimum of maintenance.

### **Quality at every stage**

Quality is the most important aspect of our business. And it applies to the entire chain, from selection of raw materials to the last installation on site before power starts flowing. All our quality work is built on calculations, testing and experience. Each cable must, for example, be qualified before it is produced and delivered. This assumes type-testing, where the cable is subject to different types of stresses in accordance with internationally defined demands, amongst others extremely high voltages for short periods of time, in proportion to the cable's performance. This was done with HVDC Light, qualified for 150 kilovolt, and also for a corresponding cable with a capacity of 300 kilovolt. Theory and practice bound together in one unit.

### **Quality verified production**

ABB produce cable systems using well proven technology. They are based on the same production technology used for our alternating current cables.



The splicing technique is important. When the splice is correctly executed, it unites two lengths of cable to a harmonic unit with exactly the same performance as the cable itself. The technique is developed and certified by ABB, who have also produced and installed several sea cables with extremely high safety demands, using the same methods. The ends of both cables are spliced with a splicing sleeve, shown before the splice is installed. The figure shows two cable ends and a splicing sleeve. The splice is in the background.

ABB has used these processes for more than 30 years, with installations all around the world, even in many towns and municipalities in Sweden. Production of HVDC Light is made in lengths of about one kilometre. Splices are made with the same high quality demands. They are prefabricated and designed to couple together cable lengths to single units when installed.

Our employees are given continuous training in splicing and each splice is qualified and tested in the same way as the cable. The cable system comprises harmonic units that have the same quality demands.

### **The installation fades into the background**

The installation of the cables is important. To the outer, it is very similar to the extensive installation of optical fibre cable that is currently in progress. There are however, considerable differences:

We dig somewhat deeper, to increase the mechanical protection and safety aspect.

Installing our cables alongside well established road networks, without having to close off traffic, is both cost-effective and environmentally friendly. This principle has been used in many installations, all around the world, for a considerable number of years. We have solved cable laying problems across water by using bridges or by drilling beneath the bottom. We have always chosen the most efficient and environmentally friendly alternative, while retaining efficiency and safety.

### **Advantages of HVDC Light**

HVDC Light is not just a cable construction, it is also a cost-effective and environmentally friendly system for



When the cable is installed, there is no trace of it except the markers. The photo is from Gotland and the cable is buried in the right hand road bank.

secure electrical distribution. Unlike alternating current, where people and animals are exposed to a magnetic field that alternates in time, HVDC Light cables have a static field that is considerably less than the earth's magnetic field and thus harmless.

The proposed EU norm is 100 times higher than the earth's magnetic field.

### **No disturbances**

Our cables are buried in the ground. There is no visible intrusion and existing overhead transmission lines can be torn down, something that has already occurred in Bergshamra in Stockholm, where traditional transmissions lines were previously placed over a nursery school. Noise disturbances, that always occur with overhead transmission lines, are eliminated.

### **Comparable total costs**

The cost for burying cables in the ground is usually calculated as somewhat higher than aerial lines with a corresponding technical capacity.

However, there has been a considerable narrowing of the gap over the last few years. The lifespan for our cable solution has turned out to be greater than previously calculated and the cost of interruptions due to storms affects the calculation positively, to the advantage of the land-cable solution. In addition, the cost of right of way is less and the buried-cable alternative has a more positive effect on both forestry and agriculture, as well as on cultural and leisure activities in the area affected. Our opinion is that the buried-cable alternative, from a social-economic perspective, creates a win-win-situation for both the consumer and the producer.

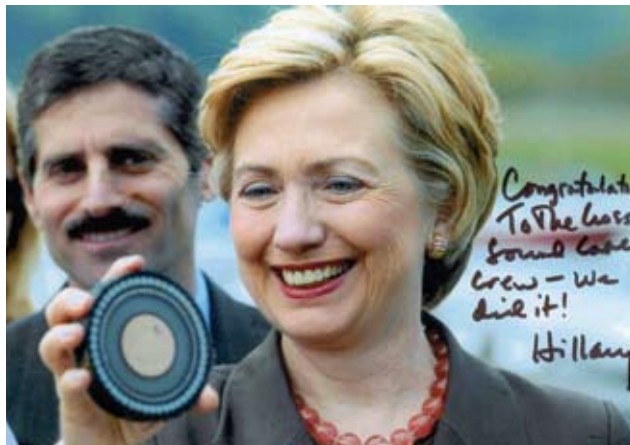


ABB has more than 50 years experience of cable installations around the world.

Hillary Clinton congratulating a successful project. Cross Sound was put into operation in 2002 and has functioned since then with no interruptions.

So far, ABB has installed more than 1600 km of HVDC Light cable. Here are a few examples:

**Land cable projects**

Murray Link, Victoria - South Australia  
The longest land cable in the world  
200 MW at 150 kV, 2 x 180 km, year 2002

Gotland, Sweden  
50 MW at 80 kV, 2 x 70 km, year 1999

**Submarine cable projects**

Estlink, Estonia - Finland  
350 MW at 150 kV, 2 x 75 km submarine cable,  
2 x 29 km land cable, year 2006

Troll A gas platform, Norway  
80 MW at 80 kV, 4 x 68 km, year 2004

Cross Sound, USA  
330 MW at 150 kV, 2 x 42 km, year 2002

**Facts about HVDC Light cables for power transmission**

Voltage	300 kV
Type tested for	592 kV
Power	300 MW - 1100 MW
Weight	10-20 kg/meter depending on capacity
Diameter	10 cm
Insulation	Plastic (extruded polymer)
Conductor	1000 mm <sup>2</sup> aluminium

All materials are recyclable

Trench width normally seven meters, can be reduced to four meters



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**Extract from a debate:**

*“By burying cables, one creates a better environment for those who live nearby. One also ensures better delivery security as well as releasing valuable land for building development”*