



German HVDC cable projects: at the core of the European Energy Transition

Prysmian
Group

Linking
the Future



Enabling Europe's clean energy transition

Prysmian Group,

the world leader in the energy and telecom cable systems industry, is playing a key role in developing **three vital energy projects** that will transport the **clean energy generated by wind power off the northern shores of Germany to the industry packed South of the country**, home of the European powerful productive engine, in a process that will help the entire Union's energy transition.

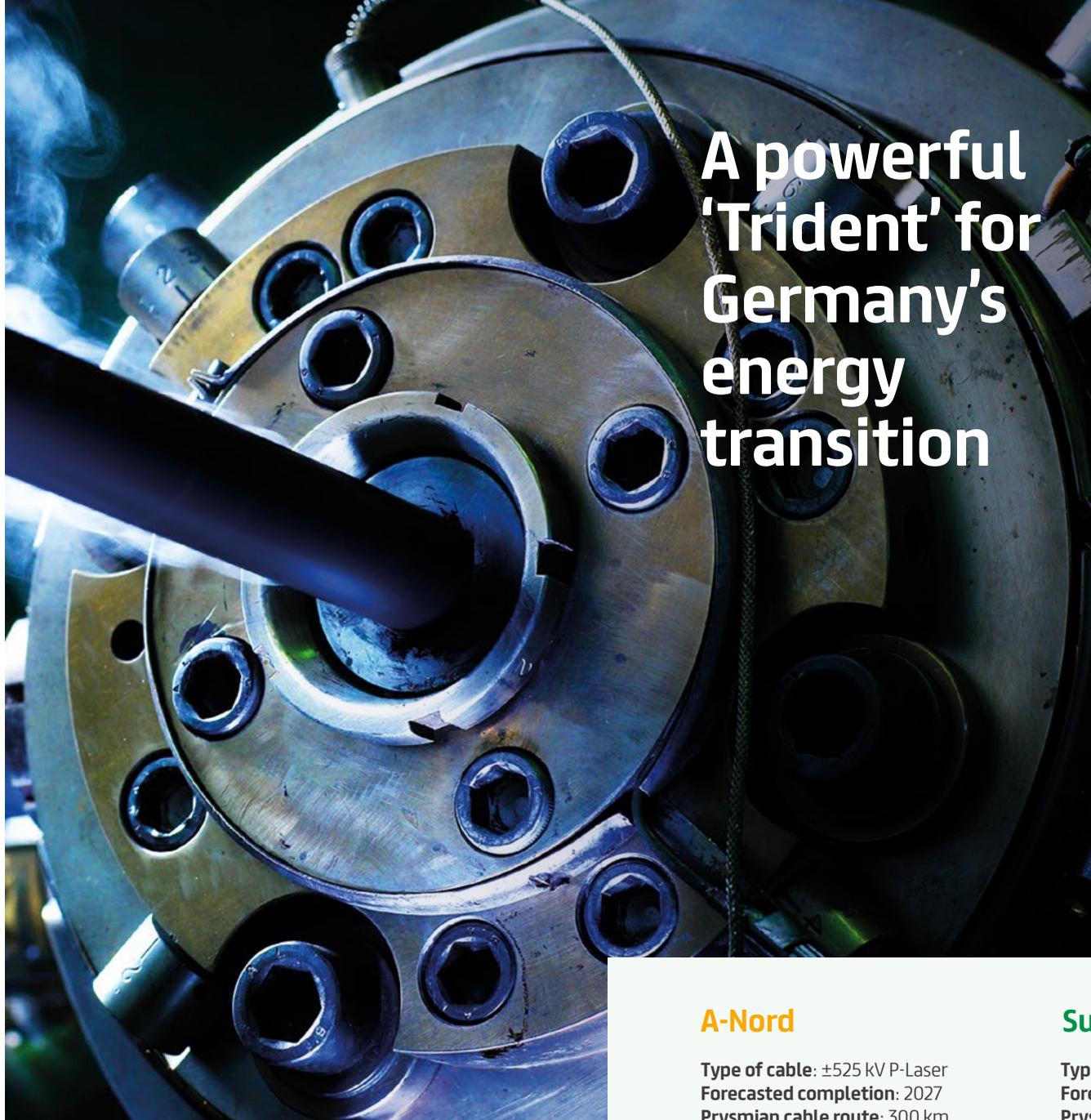
The **three innovative state-of-the art HVDC cable** connections will contribute to achieving decarbonization goals. To do so, Prysmian will develop smart and sustainable power grid infrastructures to support the energy transition in Germany and Europe.

Three HVDC cable projects at the core of Europe's shift towards a low carbon future

The innovative and eco-friendly power cable solutions of Prysmian Group are supporting Germany's energy transition with three major projects that will place the country at the core of Europe also in the shift towards a low carbon future.

The three projects will lay underground, HVDC state-of-the-art cables all across Germany, from the Northern shores where the wind power is captured by the offshore wind farms, down to the mainland where the clean power is needed by households and industries. Prysmian will enable the German, and in fact of all Europe's, energy transition in a sustainable, enduring, future-proof fashion.

The HVDC cables of the three German projects, that will be produced in tens of thousand tons, will run underground for hundreds of kilometres, with thousands of people at work all across the country.



A powerful 'Trident' for Germany's energy transition



Three innovative state-of-the art HVDC cable connections

- 
~2,300 km
 HVDC underground power cables
- 
~93,000 tons
 of cables to be produced
- 
~2,000 people
 involved in the projects

A-Nord

Type of cable: ±525 kV P-Laser
Forecasted completion: 2027
Prysmian cable route: 300 km

A-Nord was awarded to Prysmian Group by German grid operator Amprion GmbH to design, manufacture, supply, lay, joint, test and commission a 1 GW ±525 kV HVDC underground cable system insulated with proprietary P-Laser technology, on more than 300 km, from Emden in Lower Saxony to Osterath in North Rhine-Westphalia.

SuedLink

Type of cable: ±525 kV XLPE
Forecasted completion: 2026
Prysmian cable route: 580 km

SuedLink was awarded to Prysmian Group by German transmission grid operators TransnetBW GmbH and TenneT TSO GmbH with the assignment to design, manufacture, supply, lay, joint, test and commission a 2 GW ±525 kV HVDC underground cable system on a route of 580 km, from Wilster in Schleswig-Holstein to the southern connection point at Bergrheinfeld, Bavaria.

SuedOstLink

Type of cable: ±525 kV P-Laser
Forecasted completion: 2025
Prysmian cable route: 270 km

SuedOstLink was awarded to Prysmian Group by German grid operator TenneT TSO GmbH with the assignment to deliver a ±525 kV HVDC underground cable system, with transmittable power of 2 GW on a single system, over a route of 270 km starting at the Southern Germany connection point at Isar, close to Landshut in Bavaria.

HVDC underground cable technology: the ultimate solution for environment and people

Outstanding technical features boasted by Prysmian Group

Underground HV cables present several benefits to energy final users and communities living where they are installed. Firstly, they help preserve landscapes and limit visual obstructions. In addition, these cables are less likely to be impacted by increasingly common extreme weather since they are more protected, thus require lower maintenance being less exposed.

Cables are more protected, therefore require lower maintenance

After the landscape has recovered, following the installation of the underground cable system, the new transmission line will be practically invisible in any open countryside **for its entire life span of over 40 years**. In addition, there's nearly no limitation to agriculture and farming on top of the trench once the installation is completed. The exposure to magnetic fields is in line with local and EU recommendation.

HV underground and submarine cable systems are the backbone of all power transmission networks. Indeed, HV underground cables, together with HV submarine interconnections, are an essential part of this development, both for

Prysmian Group boasts a global primacy in the high voltage submarine & underground cables, essential both for offshore wind power generation and for interconnections between different systems, countries and regions, for the development of larger, smarter, more integrated and sustainable power grids.

offshore power generation and for interconnections between different systems and countries, thus supporting the implementation of larger, more integrated, efficient and sustainable power grids.

High voltage cables are increasingly used across Europe. All over our continent and around the world, stakeholders are increasingly turning to underground and subsea cables to overcome challenges and obstacles linked to grid interconnectivity and expansion. **The long-term social benefits** of these type of interconnections outweigh the initial investment costs and result in minimal cost implications to the end consumer. High voltage cables embedded underneath the soil secure long-term electricity supply. That is why underground and submarine power cables are the future of sustainable electricity transmission in Europe.

Over
40
years

Transmission line invisible in any open countryside for its entire lifespan



There's nearly no limitation to agriculture and farming

Prysmian Group's global leadership in the HVDC field relies on knowledge gained from many years of experience in different aspects of cable manufacturing, ranging from AC to DC applications. Thanks to in-house R&D, material compounding and HVDC testing laboratories, time needed for the whole production process was also dramatically abated.

±525 kV HVDC cable technology for more efficient, reliable and eco-friendly power transmission

±525 kV HVDC cable technology enables more efficient, reliable and eco-friendly power transmission over long distances. The technology is qualified with P-Laser and XLPE insulation.

Cable systems designed at a higher voltage level and with large conductor cross-sections provide optimal technical solutions for long distance and high power transmission with minimized land use. **±525 kV allows a reduced quantity of cable to transmit the same power** (if compared for example to ±320 kV), requiring less space, less trenches and less civil works to install the system, while also increasing the overall benefit for large projects.

Safety is a must at Prysmian Group, as its cables and systems boast the highest standards, with regard to all aspects that may affect people and communities' life, such as magnetic fields, heat dispersion, heating temperature, just to mention a few.

In order to support and enable at best the energy transition, **Prysmian Group** has developed world class technical solutions that range from bigger cables and conductors, that allow more power and lower energy losses, to longer connections, to deeper subsea links, that make no connection impossible.

The development of **HVDC cables for voltages up to 600 kV** is rooted in **Prysmian's wide** and long experience, built upon the knowledge gained from all the different aspects of the entire cable manufacturing process, that allows to afford successfully the most challenging projects across the world on land and sea.

Prysmian takes care of people's life from a technological standpoint as well:



±525 kV

has a lower environmental and civil impact compared to other types of cables



±525 kV

allows to use half of the cables reducing civil works, trenches, impacts for installation

XLPE and P-Laser: excellent solutions fit for advanced projects

In the field of the EHV application for DC current, Prysmian Group pursued the development and industrialization program of ±525 kV extruded cables systems, after the successful completion of the pre-qualification tests at ±525 kV obtained in 2019 for the two qualified solutions: XLPE and P-Laser.

XLPE technology main advantages are longer transmission lengths with lower system losses, lightweight cable qualified at the highest voltages.

XLPE is a cross-linked polyethylene-based insulation, with a dedicated formula for DC systems application. XLPE technology requires a cross-linking process, essential for stabilizing the insulation material as the process determines the presence of cross-linking by-products, such as methane, cumyl alcohol, acetophenone. These by-products should be

removed, after the cross-linking with a specific thermal treatment process, known as “degassing”, that decreases the amount of residual by-products present in the cable. Electrical and thermomechanical working performance should be selected accordingly, to guarantee reliable system operations at the ever-increasing voltage levels.

XLPE technology main advantages are longer transmission lengths with lower system losses, lightweight cable qualified at the highest voltages.

P-Laser cable technology is based on High Performance Thermoplastic Elastomer insulation which, compared to cross-linked polyethylene-based, does not require the crosslinking process and, not having cross-linking by-products, does not require the time-consuming degassing process.

P-Laser technology main advantages are more efficient cable manufacturing and lower environmental impact, using an in-house developed insulation material with excellent electrical properties.

A further very important advantage is that the material itself is fully recyclable, which will become mostly relevant for the decommissioning stage of old HVDC links. Moreover, it is important to point out that the P-Laser

technology is fully compatible with existing cable accessories and can be integrated in networks using different insulation technologies.

XLPE

-  XLPE insulation up to **600 kV DC** for underground and submarine applications
-  Lower system costs and lighter cables for voltage levels up to **320 kV**
-  New material with low electrical conductivity
-  High material cleanliness
-  Same thermal performance of DC XLPE used so far up to **320 kV**
-  Same technological platform used for XLPE AC and DC cables

P-Laser

-  Innovative HPTE insulation up to 600 kV DC for underground and submarine applications
-  Over **30,000 km** experience in MV networks
-  Higher thermal performance properties for increased power transmission capability
-  Operating temperature range increased
-  **Reduction of Co₂ emissions** by up to **30%**
- 100% eco-friendly** and fully recyclable materials*

*Refers to the end-of-life phase of Life Cycle Assessment (LCA) evaluation

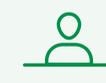


We take care of the environment, to the benefit of all stakeholders

Sustainability is a hallmark at Prysmian Group, as we put the wellness of Earth and of all the forms of life on it always first. The three German HVDC power transmission projects we are developing are firmly anchored to this approach.



All units certified according to **ISO 9001** and **ISO 14001**. Full compliance with the highest international environmental and quality standards



3 new offices in Germany to boost our customer proximity

- Bayreuth
- Wuerzburg
- Wuppertal



~200-people multicultural team recruited for the three projects



“Zero defects” and “Right first-time” approach

The **three HVDC cable projects** we are developing in Germany will get Prysmian Group even closer to communities in the country that stands at the core of Europe, by improving the sustainability and the efficiency of a crucial energy infrastructure.

We set up a new regional organization to better support project execution and to stay closer to our clients and involved communities with new offices in Bayreuth, Wuerzburg and Wuppertal that is also the site of our plant. A multicultural project team of around 200 people was recruited to work

on the three projects. The new team boasts a professional experience with specific skills in projects management, logistics, installation, system design, site management and other fields.

At Prysmian Group, we believe that sustainability is an all-encompassing issue that influences the entire life cycle of every product and system, and in order to achieve the highest possible standards we put quality excellence in action. This is true in everything we do: from the procurement of raw materials to the delivery of the finished project,

At Prysmian Group, we believe that sustainability is an all-encompassing issue

from supplier selection to strict quality testing and certification, from our **“Zero defects” to our “Right first-time” approach**. We do so by keeping firmly in mind the benefits for our ultimate customers: the communities of Germany who will have access to clean, safe and enhanced power to feed their activities and their homes.

Prysmian Group: linking energy and information to global growth

Prysmian Group is the world leader in the energy and telecom cable systems industry, with almost 140 years of experience, sales of over €10 billion, more than 28,000 employees and 104 plants in over 50 countries.

Prysmian Group supports the development of smarter and greener power grids, from Asia-Pacific to the Americas, from Europe to the Middle East to Africa. Prysmian power cable solutions help major utilities to transmit and distribute power thanks to its unmatched manufacturing capabilities and an unwavering commitment to R&D.

PowerLink, a brand of Prysmian Group, develops the most advanced “turn - key” submarine and underground cable systems and solution. It designs, produces and installs high and extra high voltage cables and systems for the underground and submarine power transmission, directly from power stations to primary distribution grids with the final objective of enabling the energy transition. PowerLink fields the most state-of-the-art cable-laying vessels in the world (Giulio Verne, Cable Enterprise and Ulisse) plus the newest addition, the breakthrough Leonardo da Vinci, as well as a wide range of high - tech burial tools, offering extended project versatility with deep-water installation capabilities of up to 3,000 m, as well as shallow water and near-shore solutions.



INTEGRATED WORLDWIDE ORGANIZATION

140
years

PROVEN FINANCIAL SOLIDITY, ETHICS & INTEGRITY AND HERITAGE OF INSTALLING AND MANUFACTURING CABLES FOR MORE THAN 140 YEARS



ONE-STOP SOLUTIONS PROVIDER



TECHNOLOGY LEADERSHIP



PROVEN TRACK RECORD OF HV SUBMARINE & UNDERGROUND HV CABLE SYSTEMS



OUTSTANDING INSTALLATION CAPABILITIES

Powerlink

A Brand of Prysmian Group

Enabler of the energy transition

Always aware of the need to minimise our impact on the planet, we're constantly driving innovation in our industry, aiming to optimise supply chain processes, reduce total cost of ownership for our customers and help them achieve sustainable, profitable growth.

We are highly committed to develop greener and smarter power grids and act as a technology enabler of Energy Transition towards a cleaner and smarter world.

The Energy Transition is very much linked to the capability to transmit and dispatch energy and our cables are the backbone that make power grids stronger and energy dispatchment safer, cleaner and reliable.

A sustainable industrial footprint

In Germany, the heart of the energy transition, **we are the leading cable supplier** to energy utilities with manufacturing plants in Nordenham, Schwerin, Berlin, Neustadt b. Coburg, Nuremberg, Wuppertal, plus 4 R&D centres. Our **1,900 employees** strong workforce in the country produces yearly **110,000 tons** of energy cables and **1,200,000 km** optic fibre cables.

Six offshore windfarms now operating in the **North Sea** are being powered by **HVDC** submarine cables installed by **Prysmian**: BorWin2, BorWin3, DolWin3, HelWin1, HelWin2, and SylWin1. A seventh, DolWin5, is now under construction.

We have been committed also in the upgrade of the **German land power grid** with the **ALEGrO project**.



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