

Nexans



**Turnkey cable solutions
to better deploy your windfarm infrastructure**

Nexans expertise supports your network's evolution



Both on land and offshore, Nexans has the expertise to interconnect large wind turbines and complete windparks to local or distant grids. For medium and high-voltage cables, we are one of the few companies who can oversee complete installation, from initial pre-qualification, design, customized production, logistics, installation, testing and pre-commissioning. This includes all accessories as well, a key element in any failsafe energy network. Offshore, we supply and install the marine MV links between wind turbines and the transformer platform, and also the MV or HV transmission link to the onshore substation. Beyond this we have a full range of transmission and distribution cables for bringing local power production to the grids. Not only do we provide a full range of energy cables and services,

we are also experts in the telecommunications infrastructure needed to manage windparks, including control and data cables, copper and fiber Local Area Networks.

Nexans expertise for a revolutionary technology

- World supplier of underground cables, submarine cables, overhead conductors and data/telecom systems
- Close partnership with developers, power utilities, installers and contractors
- Mastery of maritime conditions based on oil & gas submarine energy and telecom cabling experience
- Unsurpassed onshore and offshore installation experience and design capabilities, using advanced equipment, special software for overhead transmission line and dynamic cable applications
- Complete range of accessories: purpose designed joints, terminations, transition joints between various types of cable.



Winds of change for the energy industry

The international wind industry market is continuing to achieve record growth. In fact, despite occasional lulls, wind power has held its position as the world's fastest growing energy source, with over 30% growth yearly. According to experts, free, abundant and inexhaustible wind has the potential to be an 80 billion Euro annual business by 2020! Even today, wind produces enough electricity to satisfy the needs of 50 million people worldwide. At present, 73% of global wind energy is produced and consumed in Europe. By 2020, it is estimated that 12% of the world's energy will be produced by wind in some 50 countries. Some recent trends include: a move from onshore to offshore installations, the steady upscaling of wind turbine power output, and an upswing in demand around the world.

Power utilities and independent power providers are turning to windfarms as an alternative to traditional fossil-fuel based energy. This is also being driven by continuously expanding power demands and the concern of many countries to fill the gap with a certain percentage of renewable energy.

The switch requires new kinds of expertise. On land, the steady upscaling of old turbines, and ever-bigger generators mean that the network must have room for added output, and be capable of making multiple connections and reliable links. Since the available space for land-based wind turbines is limited in Europe, most recent projects are offshore, and some even far offshore (50 to 200 km). This requires submarine cables, maritime installation expertise, and a mastery of long-distance transmission techniques. Finally, there is the problem of connecting variable energy – with its sudden highs and lows depending on wind velocity – to a grid that demands, above all, stable energy.

What wind park power utilities expect from cable manufacturers:

- Expertise and engineering assistance at the design stage, including feasibility studies
- Onshore and offshore turnkey capability for transmission and distribution. This includes full mastery of installation, both in remote land-based and offshore sites, including specialized installation equipment.
- A comprehensive range of high-quality windfarm infrastructure cables and accessories from one supplier at competitive prices
- Constant innovation to meet evolving technologies and standards



Nexans provides a comprehensive range of cables for windfarm infrastructure...

Medium-voltage cables

- Onshore underground single-core cables (typically 33 kV) connect the rows of wind turbines and, in parallel, links them to an onshore substation
- Offshore cost-efficient submarine 3-core copper cables with integrated fiber optic elements and customized armor designs to link the turbines.

For Horns Rev Offshore Windfarm (Denmark) Nexans supplied, laid and turnkey installed all inter-turbine cables and radial connections to the transformer platform.

For Arklow Bank Offshore Windfarm (Ireland) we supplied inter-turbine cables, as well as the 16.5 km exporting cable leading to a cable-station close to shore.

High-voltage cables for transmission

- Onshore AC transmission: cables ranging from 60 kV to 500 kV, XLPE insulated, are used for power transmission from the onshore windpark substation to the central grid.
- Offshore AC transmission: submarine cables ranging from 60 kV to 500 kV with various designs available: 3-core XLPE cables (60-225 kV); single core XLPE up to 400 kV.

- Onshore and offshore DC transmission up to 500 kV applicable for high transmission requirements and long distances: mass-impregnated cables with an Integrated Return Conductor, and Polymer-based insulated DC cables.

For Horns Rev, Nexans designed, manufactured and successfully type-tested a 21 km long 150 kV 3-core submarine cable, which was installed in three days between land and an offshore substation, using a special cable-laying ship.

Overhead MV and HV conductors

Although most inter-turbine connections (MV) are underground for land-based windparks, overhead aluminum-alloy conductors are used to move power from a distant location to the domestic grid.

Nexans provides a wide range of sizes and alloys according to customer needs, with various alloys adapted to each country's standards, climate and terrain.

All MV and HV accessories

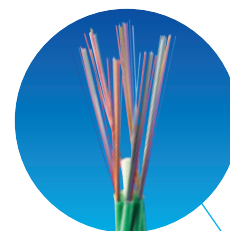
Normally, subsea cables should not have joints. However, Nexans supplies purpose-designed joints and terminations for XLPE insulated cables, as well as transition joints between various cable types.

Nexans manufactures terminations and joints which make splicing quick, easy and long lasting.

Auxiliary equipment and systems

Corrosion protection systems; mechanical support and protection systems (hang-off and clamping systems, protective shells/slabs/mattresses).

Nexans hang-offs securely fasten heavy energy cables on top of the J-tubes, well above sea level. They are easy to install, and fully relieve any pulling force on the sealing ends.



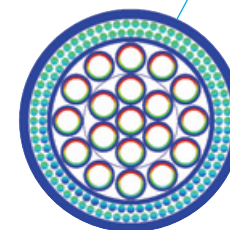
Fiber optic data cables



Local Area Networks



Medium-voltage cables



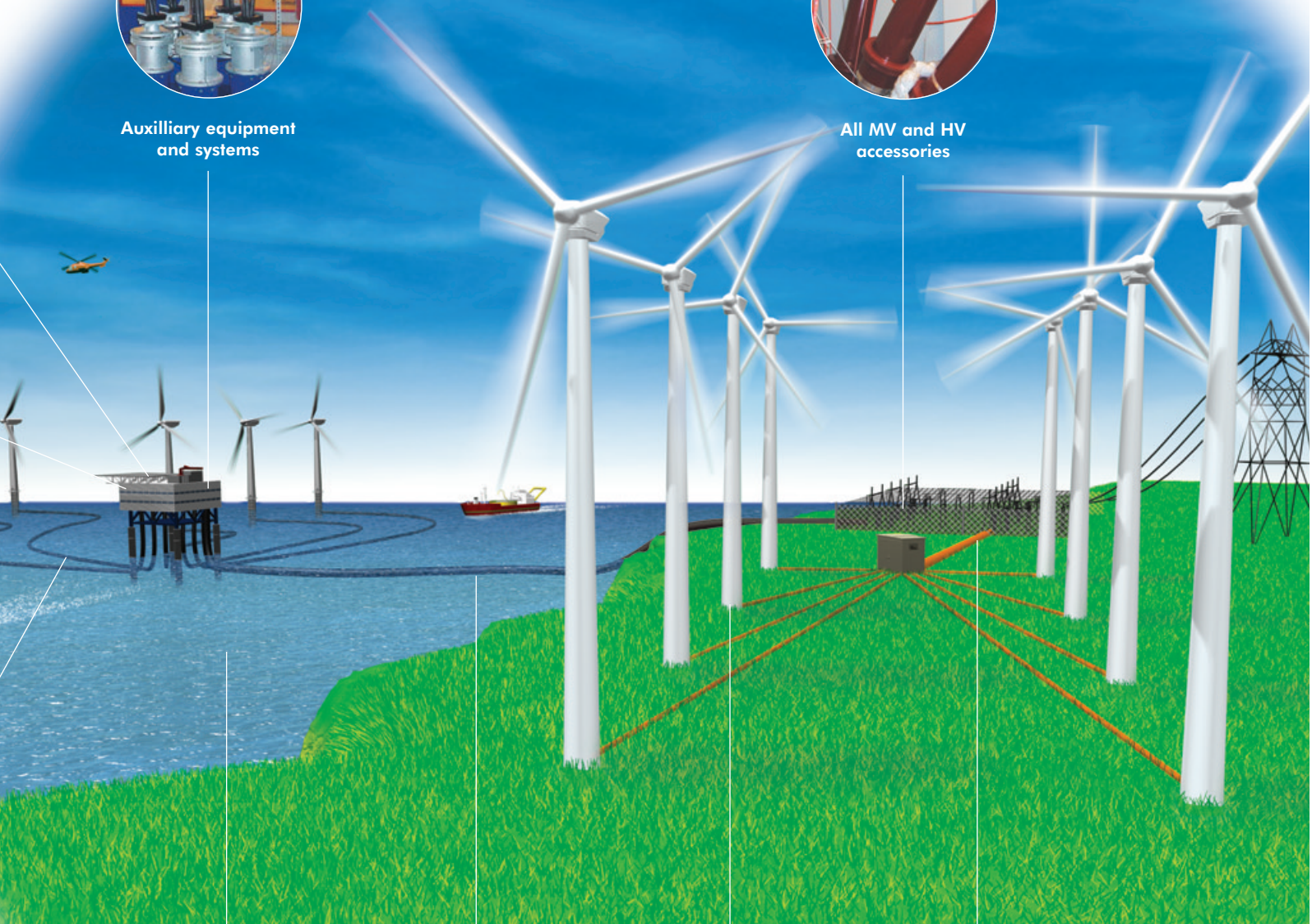
Cable installation software



Auxilliary equipment and systems



All MV and HV accessories



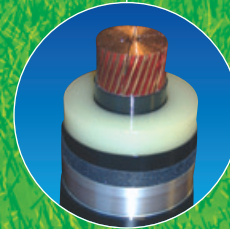
Special laying vessels, Capjet trenchers and Spider dredger



High-voltage cables for transmission offshore



Fiber optic accessories



High-voltage cables for transmission onshore

...to improve power output and performance

Fiber optic data cables

Whether onshore or offshore, optical fiber cables are increasingly being twinned with MV and HV energy cables to provide remote control of rotor speed, blade angle, braking, temperature, hydraulic levels, etc. via distant Programmable Logic Controllers (PLCs) which have now replaced sequential relay circuits for machine control.

24 optical fibers were integrated into the submarine power cable for the Arklow wind turbines off Ireland, 12 optical fibers into the submarine cables for Horns Rev, and 12 optical fibers into the submarine cable linking land-based wind turbines on the island of Smøla (Norway) to the mainland.

Fiber optic accessories

Nexans produces a full range of fiber access routing technologies, including splicing and modular distribution frames. Nexans' FiberArt™ splicing modules optimize fiber routing in towers and substations.

To make the connection between submarine cables and terrestrial networks, Nexans has an entire range of waterproof closures.

Local Area Networks

To assure high levels of wind-farm and local infrastructure security, Nexans has both advanced fiber and copper LAN solutions for complete monitoring, control and communications/surveillance functions.

The kind of data speeds previously available onshore are now available offshore, which means that power utilities can now plan a decade ahead without expensive retrofitting.

Cable installation software

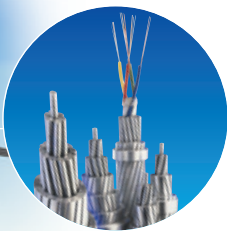
Power Line Systems (PLS) software ideally positions aerial conductors on the terrain in terms of conductor-type, terrain profile, spans, length, etc.

For marine conditions, Nexans' custom software determines ideal cable design according to wind tower behavior in a dynamic environment.

Special laying vessels and Capjet trenchers and Spider dredger

To meet the submarine cable challenge, Nexans operates special cable laying vessels, Capjet seabed trenchers and the Spider dredging system.

Nexans' family of Capjet Remotely Operated Vehicles have already buried more than 3,500 km of cables and pipelines worldwide, protecting them from ship anchors and trawling equipment.



Overhead MV and HV conductors

Nexans... integrating synergy throughout your network... and beyond...

To help you meet your goals of efficient installation, especially offshore, and broad network reliability, Nexans goes beyond cable to offer a number of important services:

Expertise

Over many decades, Nexans has accumulated expertise in onshore, aerial and offshore energy/telecom cables, components and installations. We also understand the overall energy context, from power generation, to transmission and final distribution within national and international grids. We are especially concerned with finding the most suitable cable solution to meet customer expectations, though cable types and standards vary widely across the world.

Global presence

Being pre-qualified in many countries around the world for infrastructure, we are well-positioned to take on multi-supplier projects and international joint ventures, providing an offer that goes both upstream and downstream. With plants on five continents and representatives in over 65 countries, we can follow them with ease. We can even count on our local production plants to provide power utilities with needed cable on the spot. Nexans stands behind each of its products, wherever it is manufactured. Our name is our guarantee. We are key players on a host of windfarm infrastructure projects, both onshore and offshore, worldwide.

Performance

We execute your projects within strict deadlines, and this includes installation which can depend on variable "weather windows" using advanced surveying, and laying equipment. Since technical specifications are often locally-determined, we do our utmost to find appropriate and interconnective solutions. Given the fluctuating nature of wind power production, at every point in the network, we seek innovative ways to reinforce the stability and consistency of power production, transmission and distribution. Our various tested and durable accessories play an important role, too.

Partnership

We are concerned with developing solutions for tomorrow's low-carbon environment in which wind power will play a leading role. Sometimes this is done internally within the Nexans research and development resources. But this is also carried on intensely with outside firms who have complementary skills and products. By working together, we aim at finding cabling solutions which will be beneficial to all parties involved. The important thing is to bring value to the table for each and every project, and develop cooperative solutions which will lay the foundations for secure energy distribution in the next quarter century.





Global expert in cables and cabling systems

Nexans is the worldwide leader in the cable industry, with an industrial presence in 29 countries and commercial activities in 65. The Group employs 17,000 people. Its sales amount to 4 billion Euros. Nexans brings an extensive range of advanced copper and optical fiber cable solutions to the infrastructure, industry and building markets. Its cables and systems can be found in every area of people's lives, from telecommunications and energy networks, to aeronautics, aerospace, automobiles, railways, buildings, petrochemicals, medical applications, etc.

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