Internally lead-sheathed cables are fuelling the surge in wind power

According to the International Energy Agency's projections, wind energy is set to become the EU's largest power source by 2027, overtaking coal, nuclear and gas. One of the reasons for wind's acceleration is the development of offshore windfarms, which have a number of advantages over onshore farms. Offshore turbines can be sited near densely populated coastal areas, while the higher offshore wind speeds produce more power per unit of capacity than onshore farms.

There are many benefits to using wind farms offshore vs onshore. In the first instance, given that the average size of onshore wind turbine blades being manufactured today is 50m, the land required to build effective wind farms is therefore at a premium. The wind speeds offshore are steadier and faster than on land, meaning much more energy can be generated. With many coastal areas requiring higher energy supply due to larger population centres and the presence of more industrial zones, building offshore wind farms close to coastal areas can help to meet those energy needs from nearby sources.

To best utilise the energy generated offshore for the mainland grid therefore requires reliable infrastructure. Internally lead-sheathed high-voltage subsea 'export' cables are critical to delivering this. One of the latest and most prominent wind power developments is Ørsted's Hornsea 2 project, set to be the world's largest wind farm once operational from 2022. The project will utilise over 200km internally lead-sheathed high-voltage cables linking the wind farm's substation to the onshore substation.

A growing reliance on offshore technology means an increasingly important role for lead. Lead extrusion was first introduced as a water barrier for subsea cables in 1924. Today, internally lead-sheathed cables are a critical piece of the infrastructure supporting Europe's growing renewable energy demands, the cable's sheathing provides necessary and continuous protection from water across thousands of kilometres of cable. According to ENTSO-E´s 2020 Ten-Year Network Development Plans and national TSO plans, some 45,000km of high and extra high voltage submarine cables are to be deployed in Europe in the coming decade, covering a route of around 23,000 km. This length only

accounts for around 39% of the total route length of all high and extra high voltage power lines needed in Europe by 2030.

A key advantage of lead is its durability. Internally lead-sheathed cables have a usable lifetime of up to 50 years and are free of corrosion, minimising the need for maintenance. There is no alternative that provides the same level of continuous extrusion, water protection, longevity and corrosion resistance. The EU's workforce is also well-protected as it manufactures and installs these cables – industrial manufacture follows strict risk management processes where the lead is fully contained inside the cable and cannot be released during its operational lifetime.

High-voltage internally lead-sheathed cables for sub-marine applications are vital to the growth of Europe's renewable energy market, and vital in keeping Europe connected. They are used for power transmission and super-grid power balancing between offshore islands, between countries, and even across geographic regions, which means they are as central to offshore power transmission as they are on land. With linternally lead-sheathed cables enabling this highly efficient transmission, lead is a key enabler in the future wind energy system.

Testing underway on a prototype lead extruder. Used to apply lead sheathing to cables, extruding the metal onto the cables in this way enables longer service life under high stress.

Fact file

- The usual guaranteed commercial lifespan for a sub-sea cable is 25 years, but internally lead-sheathed cables double this and offer a useable lifetime of up to 50 years – a reliable and durable solution for high-voltage installations in harsh conditions and environments with limited possibilities of intervention in case of a failure
- In 1954, the world's first HVDC link – 96km of internally lead-sheathed cable linking the Swedish island Gotland to the mainland – became operational. By 2015, there were almost 8,000km of HVDC submarine power cables in the world, more than 70% of which are in European adjacent seas
- Internal lead sheathing is used in the **world's longest subsea high-voltage cables**. The 580km-long NorNed link provides an electricity interconnection between Norway and the Netherlands and has been operational since 2008; at 730km long, the North Sea Link will take the lead as the longest subsea interconnector once operational from 2021
- Current offshore wind farm and interconnector projects underway in the EU will rely on more than 3,000 km of new internally lead-sheathed cables to become operational
- By 2020, all EU countries need infrastructure in place to allow at least 10% of the electricity produced by its power plants to be transported to neighbouring countries; target likely to be raised to 15% by 2030. 17 Member States are on track to reach the 2020 target, but more interconnections are needed: internally lead-sheathed cables will continue to support the growing, stable and reliable European super-grid

Developed in conjunction with Europacable and H Folke Sandelin AB, this case study highlights just one of the many essential uses of lead that provide societal benefits and boost the EU's economy

For Europe's future, lead matters.

Lead Matters