# **Advantages** and **disadvantages** of submarine power cables

The use of submarine cables has multiplied over recent decades, especially due to the development of offshore wind farms and the improvement of electricity supply security between countries or regions. However, like any technological infrastructure, they come with both benefits and challenges.

## Market

### Advantages

**Faster legalisation process**

Submarine cables are **easier to legalise** than land lines, as they **do not cross private property** or require approvals from as many authorities. This makes it possible to move forward with **large-scale projects**, such as cables hundreds of kilometres long, in **relatively short timeframes.** One example is the planned **interconnection** between **Morocco** and the **UK** to transport energy generated from solar.

### Disadvantages

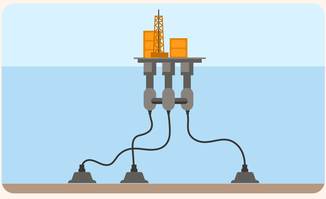
**High demand and dependence on manufacturers**

The submarine cable market is overwhelmed by **growing demand**, and the **main manufacturers cannot meet all production needs.** This gives them significant power, making it necessary for utilities to secure agreements years in advance to **guarantee supply.**

## Manufacturing

### Advantages

**Greater technical reach**



Unlike **HVAC cables**, which suffer significant reactive losses and are limited in range (around 120km at 220kV), **HVDC submarine cables have no technical limitations on length.** This enables the development of **interconnection projects stretching thousands of kilometres,** such as the ongoing cable system being built between Australia and Singapore.

### Disadvantages

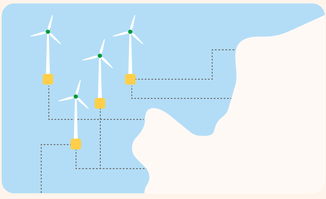
**Costly infrastructure and long-term planning**

The **manufacturing** and **laying of submarine cables** requires **coastal factories** and **specialised ships**, which involve large investments. Manufacturers therefore prioritise **large-scale projects** that justify these costs. In addition, project execution requires **long-term planning**, with schedules often locked in up to five years before installation.

## Transportation and technology

### Advantages

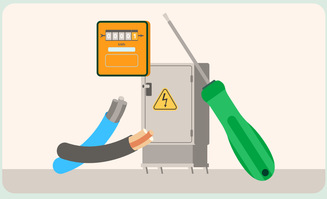
**Long-distance energy transmission**



Long submarine cables allow energy generated in **wind farms** located **more than 120km offshore** to be **transmitted**. Although this has not yet been developed in Spain due to the depth of its continental shelf, it is key to harnessing **offshore potential** in other countries.

### Disadvantages

**Constantly evolving technology**

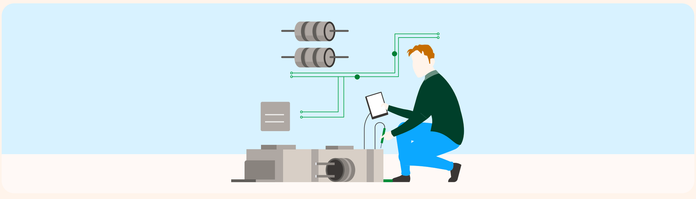


**HVDC cables** are undergoing **rapid technological development**, unlike **AC cables**, which are **already a mature technology.** In just a few years, their **voltage capacity** has increased from 400kV to 525kV, and **new cable technologies** such as **P-LASER and PPL** have emerged, while traditional technologies such as impregnated paper still coexist.

## Renewable energies

### Advantages

**Stability for renewable-based grids**



When connected to **HVDC-HVAC converter stations**, **HVDC cables** provide **synthetic inertia** and help regulate **frequency, voltage** and **reactive power** in the grid. This makes them particularly valuable in systems with **high renewable penetration** and **low synchronous generation**, as is the case in the UK.