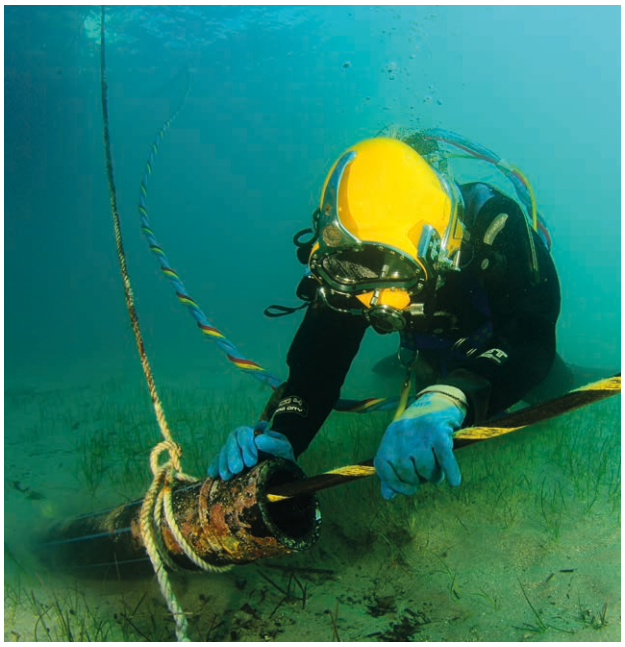
INTERCONNECTORS

The quest to link the Balearics to the Spanish grid

To decarbonise the Balearic Islands, it's currently necessary to import abundant renewable power generated in mainland Spain. *Jennifer Johnson* reports from Valencia on the bid to strengthen the link to the islands using submarine interconnectors.

Spain's Balearic Islands are known across the world for their idyllic beaches – with more than 82mn tourists flocking to the Mediterranean archipelago last year. But behind the white sand and crystal-clear seas lurks a dirty truth: the islands are still largely powered by coal. Almost 50% of energy consumed across the Balearics is generated at Mallorca's ageing Es Murterar power station. The facility is among the single most polluting power stations in all of Spain.

However, early this year, two of the station's four units will be shuttered in line with the regional government's new decarbonisation strategy. Last February, the Balearic Islands local parliament approved a climate change law that vows to source all energy from renewables by 2050. It also commits to the full closure of Es Murterar by 2025, though local media sources have speculated that 2027 might prove to be a more achievable target.



Divers are often needed to help install electricity cables close to shore.
Photo: Red Eléctrica

Initial connection

Coal phaseout on the Balearics is contingent upon the completion of a second electricity cable connection with the Spanish mainland. National grid operator Red Eléctrica installed the first-ever submarine link between Spain and Mallorca in 2011. The €420mn project, known as Rómulo, was undertaken to improve the quality and security of the Balearic Islands electricity supply. Prior to this, the archipelago's power system was made up of just two small subsystems – Majorca-Menorca and Ibiza-Formentera – which effectively kept the islands in a state of electrical isolation.

Laying electricity cables on the seabed is no simple feat, and work on Rómulo had to be completed by two specialised installation vessels, Norway's *Skagerrak* and Italy's *Giulio Verne*. The interconnection is made up of two power cables and a third 'return' cable, each weighing 6,700 tonnes. At its lowest point, the cables' route lies almost 1,500 m beneath the surface of the sea. Cable laying had to be completed by remotely controlled vehicles at these depths, while the ships utilised dynamic positioning and advanced propulsion equipment to remain stationary at the surface.

Since 2012, Red Eléctrica calculates that almost 16% of the Balearic Islands' electricity demand has been covered by renewables thanks to the Rómulo interconnector

Nearer to shore, auxiliary vessels and divers performed cable-laying duties, while submarine vehicles excavated trenches using high pressure water jets so that the cables could be buried. Fishing equipment and dropped anchors from ships have been known to damage or even sever electrical interconnectors, so it's essential to ensure they're protected. According to Red Eléctrica, the Rómulo link supplied roughly 30% of the Balearic Islands' electricity during its first year of operation. This figure rose to 40% at moments of high demand.

The grid operator also claimed that the cables reduced emissions from Balearic electricity generation by some 285,000 tonnes of carbon dioxide equivalent. These reductions are the result of increased power imports from peninsular Spain, which sourced over 40% of its energy from renewable sources last year. Since 2012, Red Eléctrica calculates that almost 16% of the Balearic Islands' electricity demand has been covered by renewables, thanks to the Rómulo link.

In the years that followed, Red Eléctrica also installed a submarine electricity connection between Ibiza and Mallorca, which allowed the Majorca-Menorca and Ibiza-Formentera subsystems to be linked into a single Balearic network.

A sustainable network

Menorca's existing power distribution and generation infrastructure has proved to be particularly vulnerable in the face of extreme weather events. The island was struck by a tornado in late October 2018 – leaving most of its residents without power for at least 24 hours. Some 70 portable electricity generation units had to be shipped in to provide backup power for Menorca's beleaguered citizens and visitors.

Just weeks earlier, the island had been hit by torrential rainfall, which also brought power outages and led to the deaths of 13 people. While the Spanish government had long been planning to connect Menorca with Mallorca, thereby increasing the resilience of the islands' electricity supplies, the bout of violent storms led them to fast track the project.

The *Skagerrak*, owned and operated by the Norwegian arm of Paris-headquartered cabling specialist Nexans, was once again enlisted to carry out cable laying works. Nexans installed the 41 km-long cable along the seabed at a maximum depth of 81 m over

the course of a week in early November 2019. The link itself – a three-core 132 kV submarine-underground cable – runs between the substations of Ciudadela and Cala Mesquida, in Menorca and Mallorca, respectively.

Extra care had to be taken in constructing the link's shore landing sites, which are located among meadows of *Posidonia Oceanica*, an important seagrass abundant in the ocean ecosystem.

Sometimes known as the 'lungs of the Mediterranean,' *Posidonia* is a critical source of oxygen for the coastal waters around the Balearics. However, scientists have warned that the seagrass is vanishing at alarming rates thanks to climate change and localised human destruction. To avoid digging into (and disturbing) the meadows, Nexans engineers constructed the cable's shore landing points using horizontal directional drilling. This method, the company says, guarantees the minimum environmental impact.

The 2011 connection between the Balearics and the Spanish mainland will be reinforced once a second interconnector is installed between them. While there is no official timeline for the construction of this link, the project is included in Red Eléctrica's 2021–2026 plan. Once this additional infrastructure is in place, more than 50% of the islands' electricity will be supplied from the Spanish mainland. Meanwhile, the Balearics will work to build their own renewable capacity as they pursue full decarbonisation by mid-century.

The *Skagerrak* has helped to lay many of Spain's submarine energy connectors.

Photo: Nexans

Island power

Ultimately, islands that are connected to their continental counterparts tend to enjoy more reliable electricity supplies, due to the backup effect of the connection. There are more than 2,200 inhabited islands across the European Union's 28 member states – but many of them continue to depend on pricey fossil fuel imports to generate their energy, despite plentiful renewable resources. Building connections within and between countries gives energy producers the opportunity to offload spare capacity when, for example, there is an excess of renewable energy.

Decarbonisation takes time, and islands like the Balearics have been slower to build their renewable capacity than the rest of Spain. Links with the mainland increase the share of renewables in the archipelago's energy mix but, in an ideal world, the Balearics – and other islands like them – would have enough installed renewable capacity to meet their own energy demands. While this independent, decentralised vision is still in the making, there's much to be said for staying connected. ●