

Submarine cable systems

Who We are

Tracing its industrial roots back to 1950, Hellenic Cables has evolved into a **leading provider** of reliable and sustainable cable solutions. With five manufacturing plants across three countries Hellenic Cables designs, manufactures and supplies a wide range of high and extra high voltage submarine and underground cables. The Company also provides a full suite of services and turnkey solutions which includes cable installation. The Company applies strict quality standards, certified systems and has a strong focus on R&D&I ensuring the high quality of products produced and the services provided.

Global demand for reliable and efficient energy transmission is increasing rapidly. Hellenic Cables contributes to that developing high value-added products and solutions. The Company has the experience and know-how to fully support and expand world's energy transmission and distribution networks whilst shifting to green energy to tackle climate change. Our vision is to enable the transition to a zero carbon economy through offering advanced products and services.



33 EUR million average annual investments (last 5 years)

In Hellenic Cables, investments of over **EUR 280 million** since 2011 were made for the production of high and extra-high voltage submarine and underground cables.

Submarine Projects

Project name Bell Island Interconnection Year 2014 Customer NFL Power Country Canada Length 11,3 km Cable Type 25 kV

Project name Mayflower Wind Year 2020-2025 Shell / OW Customer Country USA Length Up to 500km Cable Type 66kV IAC

OWF (Offshore Windfarm) — EHV > 275 kV 🛛 🔿

Interconnection

– HV < 275 kV

— MV < 33 kV

Sales in more than 46 countries

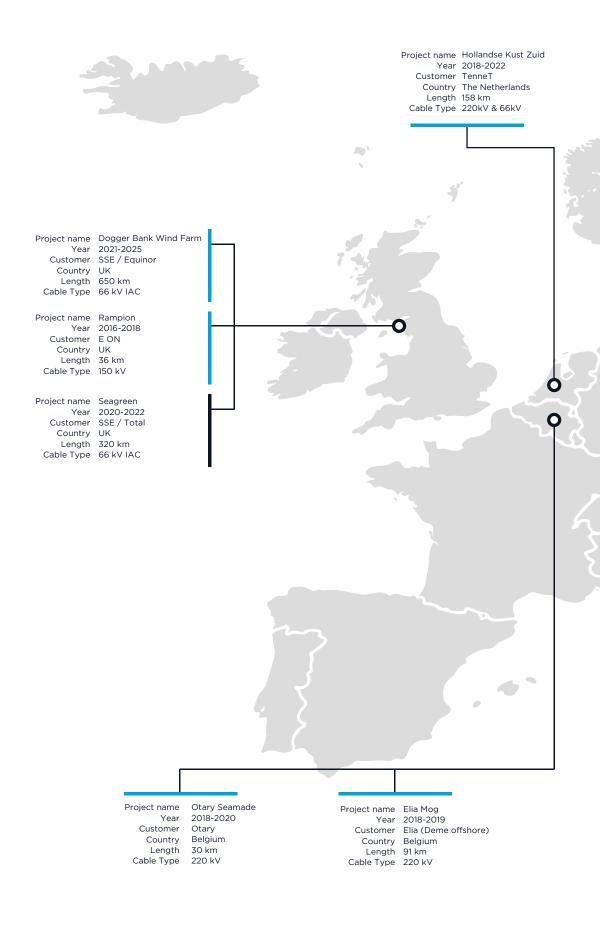


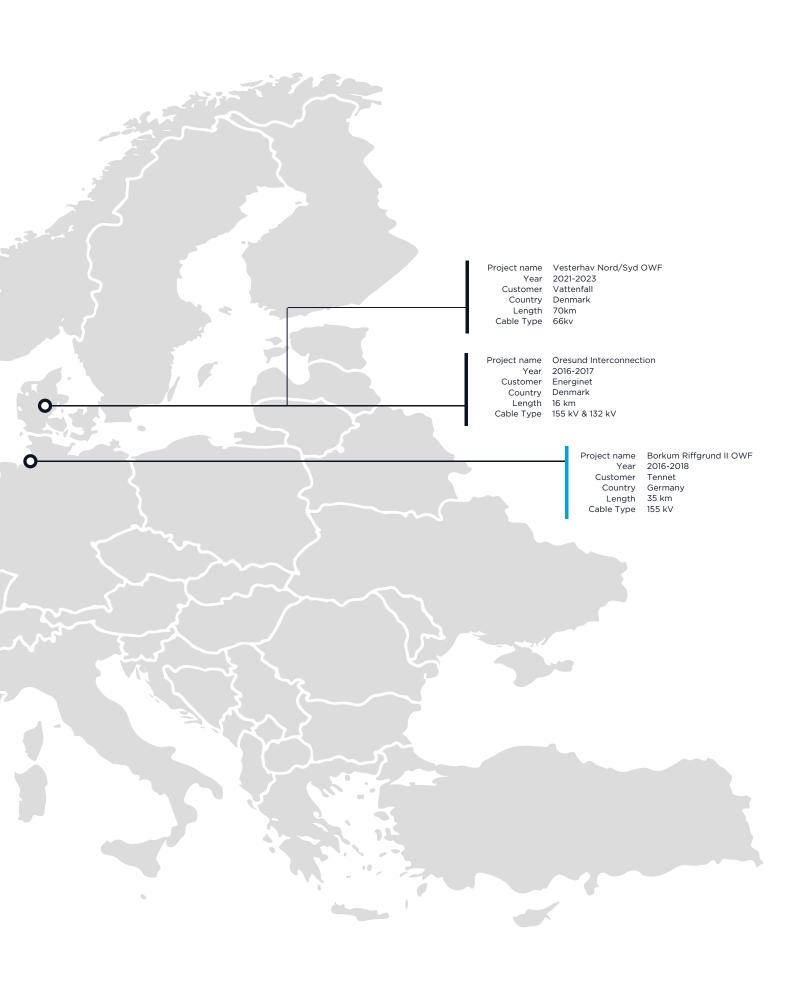
Established 1950

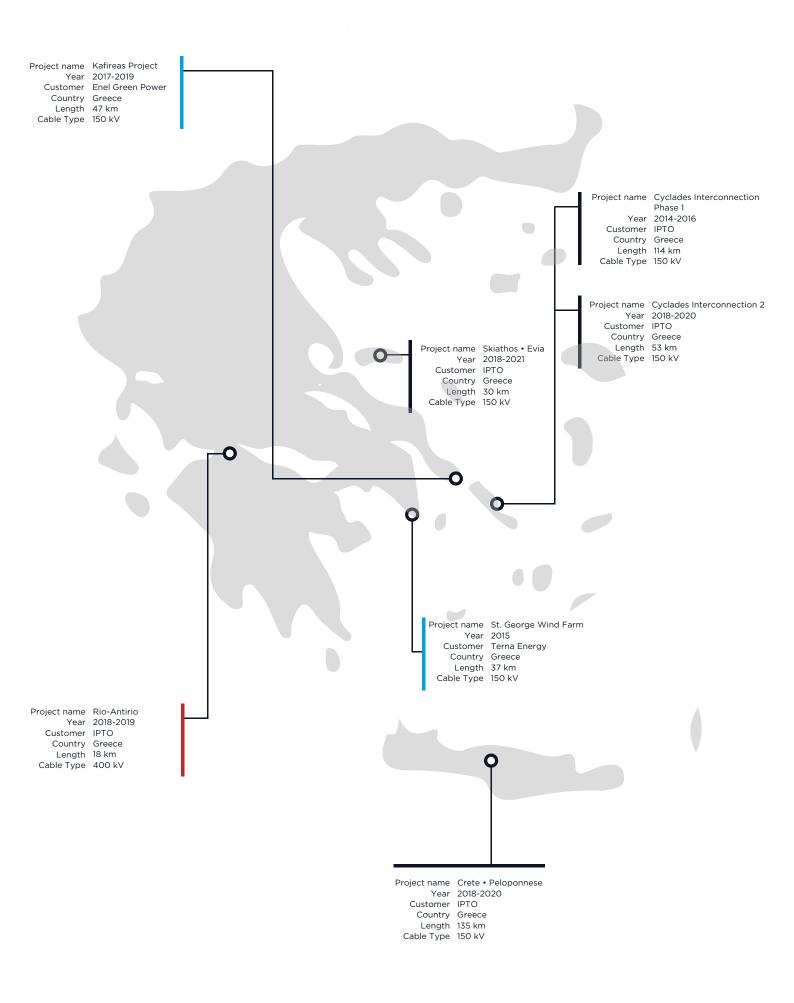


5 manufacturing plants in 3 countries









High & extra high voltage

AC cables for various applications

Subsea interconnectors

High Voltage AC submarine cables are 3-core or single core armoured, with copper or aluminium conductors, XLPE insulation and lead sheath over each insulated core as a radial metallic water barrier. Available voltage ratings range from 150 kV to 400 kV. Standard HV submarine cable designs typically include one or more optical units. Optical units are stranded during manufacturing between the outer interstices

created by the insulated conductors.

Export cables for offshore wind farms

Increasing size of individual turbines as well as overall wind farm sizes, naturally leads to continuously increasing requirements for power transmission capacities of export cables. This in turn translates to increasing voltage levels, from 150 kV, to 220 kV, 275 kV, or even higher.

HVDC XLPE cables

AC transmission is used in distances typically in the range of 120 km. As distances increase however, significant decrease in performance is unavoidable, due to the increase of absorbed reactive power. Thus for longer distances, DC transmission is used instead, supported by the evolution of power electronics and typologies of AC-DC converters.

We offer HVDC cables with XLPE insulation. The use of an extruded insulation offers several mechanical and electrical advantages, such as lighter, easier-to-handle cables, which can operate at high temperatures and at high electrical stresses.

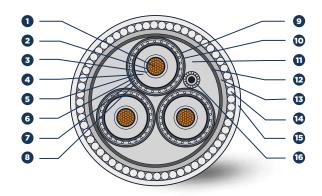
Besides working with world-class accessories manufacturers, we are currently developing our own HVDC accessory design and manufacturing capabilities.

Market leading capabilities for risk mitigation

Hellenic Cables has a unique advantage in the market, due to its recent investments in high capacity, state-of-the-art production equipment and storage facilities. All submarine cables can be manufactured in very long continuous lengths, minimizing the need of factory joints which reduces risks and facilitates installation. Factory joints are flexible splices performed on each core under the continuous protective layers of the cable and constitute an integral part of the cable itself. Minimizing the number of factory joints greatly reduces the risk of cable faults.

Optical fiber submarine cables for repeaterless links

We offer Light Weight (LW), Single Armoured (SA) and Double Armoured (DA) designs that include an optical core made of a sealed stainless steel tube containing the optical fibers. The optical fibers are placed loosely inside the tube with excess length and surrounded by a filling compound (jelly) containing a hydrogen scavenger. Over the optical core, successive protective layers are applied. For maintenance purposes, the cables up to 48 fibers are qualified to the Universal Quick Joint (UQJ).



66 kV AC Composite submarine cable design

- Conductor: Al or Cu round stranded
- Semiconducting tape
- 3. Conductor non-metallic extruded screencompound 4. Insulation: XLPE water-tree retardant
- Core non-metallic extruded screen
- 6
- Semiconducting waterblocking tape(s) Metallic screen: Copper wires
- Semiconducting waterblocking tape(s)
 Radial watertightness: AL/PE laminated tape or CU/PE
- 10. Sheath: HDPE and extruded semiconducting compound
- 11. Extruded profile fillers
- 12. Binding tape(s) with overlap
- 13. Polypropylene yarns, one layerstripe
- 14. Armouring: helically applied bitumen compound coated galvanized round steel wires
- 15. Polypropylene yarns, two
- 16. layers

- Armoured optical unit:

stainless steel tube, PE inner sheath, galvanized steel wire armour and PE oversheath

Inter-array cables

We manufacture 3-core armoured array cables, with copper or aluminum conductors and cross-sections up to 1,200 mm². For the shielding, copper wires are used, or coating with layers of copper, aluminum or lead.

The continuous increase of offshore wind farm sizes and wind turbine output power, has given rise to a clear trend towards higher voltage array cabling. We currently offer 66 kV inter array cables and consider the development of higher voltages.:

1. It doubles the power that can be transported over one cable, thus reducing the total length of cable required.

2. Fewer overall cables are required, thus reducing the amount of accessories and equipment required.

Dynamic cables

As near-shore, shallow water areas become saturated, especially in mature markets, further off-shore wind development will move further offshore or in deeper waters. Far-shore sites pose additional challenges for installation, O&M, and higher foundation costs moving into deeper water. Floating offshore wind would circumvent a number of these challenges, unlocking deep-water sites. This requires a new generation of cables, called "dynamic", specifically designed to withstand the additional stresses. Hellenic Cables develops intensively its offer of Dynamic Cables, both through extensive in-house R&D&I and participation in Development Programs.



Horizon 2020 - Flotant project

The main objective of FLOTANT project is the conceptual and basic engineering to provide, at low cost, increased flexibility and robustness to a hybrid floating structure implemented for Deep Water Wind Farms (DWWF). Main objective is to develop innovative dynamic power cable solutions and corresponding connectors providing an optimized power export system for deep water (100-600m) Floating Offshore Wind farms.

Carbon Trust - Floating wind joint industry project



The Carbon Trust is an independent, expert partner of leading organisations around the world, helping them contribute to and benefit from a more sustainable future through carbon reduction, resource efficiency strategies and commercialising low carbon technologies. The objective of the Dynamic Export Cable Development is to accelerate and support the development of dynamic export cables for use in offshore wind farms in time for commercial-scale floating wind farm development around the world. Hellenic Cables, participation in the JIP Carbon Trust was completed successfully in Q2 2021.

University of Exeter EXETER



Hellenic Cables has sponsored a post-doctoral study to develop in collaboration with the University of Exeter numerical hydrodynamic and fatigue service life modelling of dynamic submarine cables including fatigue testing for validation.

Services | **Turnkey solutions**

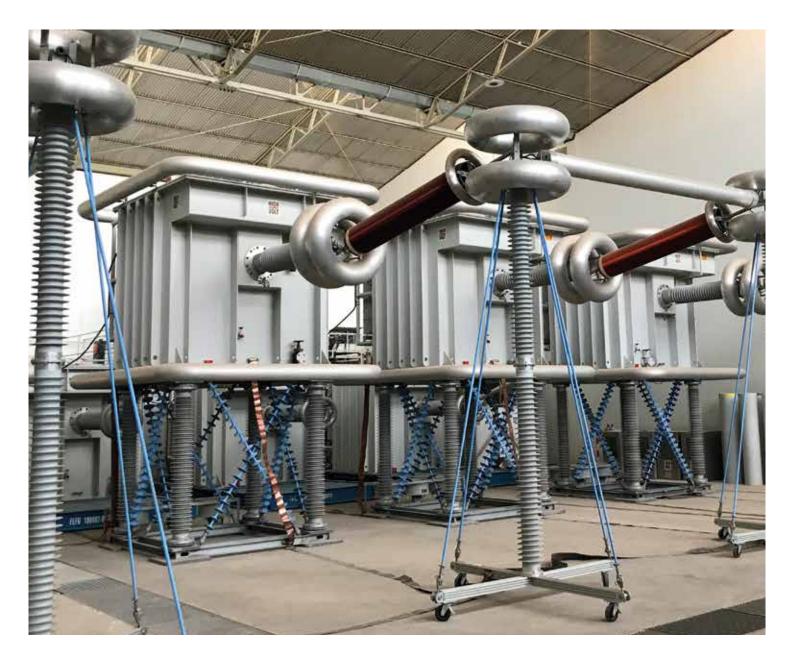
In addition to its innovative and specialised products, Hellenic Cables provides a complete range of services and solutions, tailored to each customer's requirements: One of the most important services provided to customers by Hellenic Cables are the integrated turnkey solutions, concerning high-end projects. Hellenic Cables offers a wide range of integrated solutions - from design and installation, to customer staff training and site testing supervised by experienced personnel.

Our capabilities in submarine cable projects include:

- Performance of cable route
- 2. Design & Engineering of the svstem
- **3.** Manufacturing of submarine and land cables
- **4** Transportation of cables on site
- **5.** Installation & Protection of the cables
- **5** Supply of accessories, including repair, transition joints and cable terminations
- 7. Project Management
- 8. Commissioning of installed system
- 9. Training & Technical Support

Corinth Production Facility

Hellenic Cables operates one of the largest and most advanced submarine cable plants in the world. Located near Athens, Greece, Corinth production facility is undergoing an investment program in excess of EUR 200 million over the last 10 years to become a trusted provider of turnkey submarine cable solutions for the Offshore Wind industry and Submarine Interconnections globally. Corinth plant has its own port for direct loading of submarine cables and a certified testing laboratory. The production facility is certified according to ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, ISO 50001:2011, ISO 22301:2012, and ISO 27001:2013.



In-house testing facilities

Hellenic Cables' lab features state-of-the-art equipment to carry out development tests, type tests and qualification tests for AC cable systems up to 500 kV and DC cable systems up to +/- 600 kV. In addition, an upgrade of the existing facilities was carried out to conduct electric series tests on long submarine cable lengths.

The facility, can apply maximum voltage of 450 kV and will be used to carry-out tests on cable lengths up to 60 km with a rated operating voltage of 220 kV.

Quality

Hellenic Cables applies strict quality standards and certified management systems that ensure high quality of their products and services, while setting the framework for continuous improvement. Products bear compliance markings and quality labels by internationally recognised certification houses, confirming the continuous controls carried out during the production process and the high standards on which they are produced. All Hellenic Cables' production facilities are certified according to EN ISO 9001:2015, EN ISO 14001:2015, and ISO 45001:2018.

Sustainability

Hellenic Cables has incorporated the principles of Sustainability into its business operations, as they are a key tool for their long-term growth. The promotion of employee health and safety in every activity, the environmental protection, the comprehensive coverage of customer needs, and the support for the local communities in which the Company operates are the main sustainability issues considered by Hellenic Cables and are reflected in its Sustainability Policy.

Demanding and unexpected conditions could affect productivity, profitability and stakeholder confidence. For this reason, a Business Continuity Plan is developed, certified according to ISO 22301:2012.





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