



WIND ENERGY

SPECIALIST SOLUTIONS

The trend towards higher hub heights and larger rotors presents challenges in the construction and erection of wind towers and components. VSL International offers a diverse range of specialist solutions tailored to the wind energy market, which can be combined or applied as standalone services.

01 POST-TENSIONING SYSTEMS

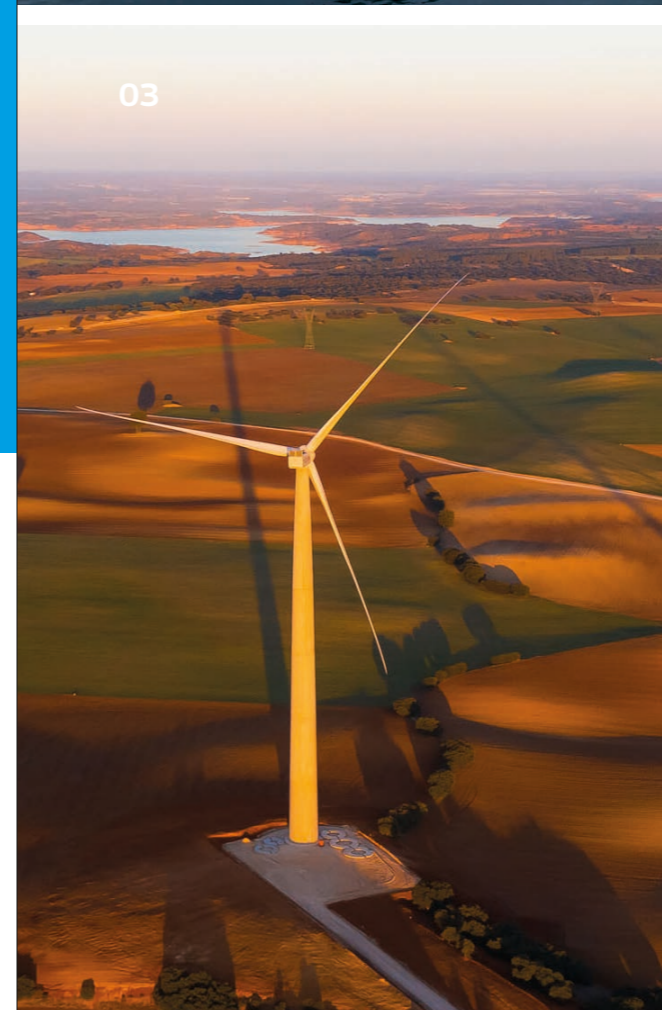


Most onshore concrete and hybrid towers use the post-tensioning technology to ensure the stability and durability of the structures throughout its service life.

Besides, foundations for fixed and floating offshore wind farms are more and more made of post-tensioned concrete to resist the immense loads they are subject to.

As a specialist company and worldwide leader in post-tensioning, VSL designs, manufactures and installs a wide range of post-tensioning systems, each perfectly suited for the project and ensuring its durability over the service life of the structure.

Among other technical solutions, **VSL has developed the E-WT external post-tensioning system**, specifically engineered to suit the technical requirements of the wind energy sector. It allows for efficient prefabrication and installation, while ensuring reliable structural behaviour of the tower throughout its service life.



01 / The 11 spar buoys for Hywind Tampen, the world's largest floating offshore wind farm, in Norway, have been equipped with VSL post-tensioning system (2023).

02 / The 78 gravity-based foundations of the Fécamp offshore wind farm, France, feature VSL post-tensioning system (2023).

03 / The 69 towers of the Gecama wind farm, Spain's largest wind farm, have been equipped with VSL's E-WT post-tensioning system, specifically designed for the wind energy needs (2022).

04 / The 40 towers of China Resources Shandong Jaucheng, one of the country's largest wind farms (2021), were built with VSL's E-WT post-tensioning system.

02 PRECASTING AND ERECTION



VSL International has long been a specialist in prefabrication for bridge construction and uses today its expertise for prefabricated concrete wind towers. **The precasting of the tower's concrete segments is a key element to comply with quality requirements** and specifications and to ensure timely delivery and erection.

We leverage on our experience, equipment, specialized staff and methods to set up and operate bespoke precast yards under all site conditions, even in remote areas. We also have

the ability to carry out erection of the precast elements, **based on our lengthy experience within the bridge construction industry.**

VSL optimizes and refines the design, precasting and erection process and interfaces in order to maximize value creation for our customers.



San Gabriel and Tolpan Wind Farms, Chile (2019): set up and operation of bespoke precast yards under all site conditions.

03 HEAVY LIFTING



Heavy lifting offers an alternative to standard in-situ or crane erection procedures, and it has become **a key construction method for both onshore and offshore wind farm installation and commissioning.**

VSL International provides bespoke solutions in the field, in particular:

- / Handling and loadout of very heavy components, such as floating offshore foundations
- / Tensioning of mooring cables for floating wind turbines
- / Alternative erection methods for rotor and nacelle assembly (RNA) for offshore wind turbines
- / Alternative erection methods for onshore wind towers

VSL has one of the largest pools of strand-jacks in the world. Our equipment is designed, assembled, and maintained in-house, which ensures high-quality service and response from our teams.



01



02

01 / An industry first to dismantle offshore oil & gas platforms in the North Sea, with Pickerill A&B oil & gas platforms, United Kingdom (2020).

02 / Skidding of 70 concrete caissons and load-out of 105 concrete caissons into the water for Tangier Med 2 container port, Morocco (2013).

04 SPECIAL FOUNDATIONS



Wind towers are subjected to continuous vibration-induced forces throughout their operational life. The design must consider the interaction of the supporting soil, the foundation, and the superstructure.

VSL International provides tailor-made and cost-effective foundation designs based on its proprietary systems and technologies and the wind tower's required performance.

This includes an optimization of the interfaces between the tower and the foundation system, and ultimately, of the cost of the entire structure.

VSL alternative foundation schemes may generate up **to 30% CO2 emission reduction** compared to traditional technologies.



Construction of the foundations for 30 wind turbine generators as part of the Watabak Wind Farm, Thailand (2016).

04 HORIZONTAL DIRECTIONAL DRILLING



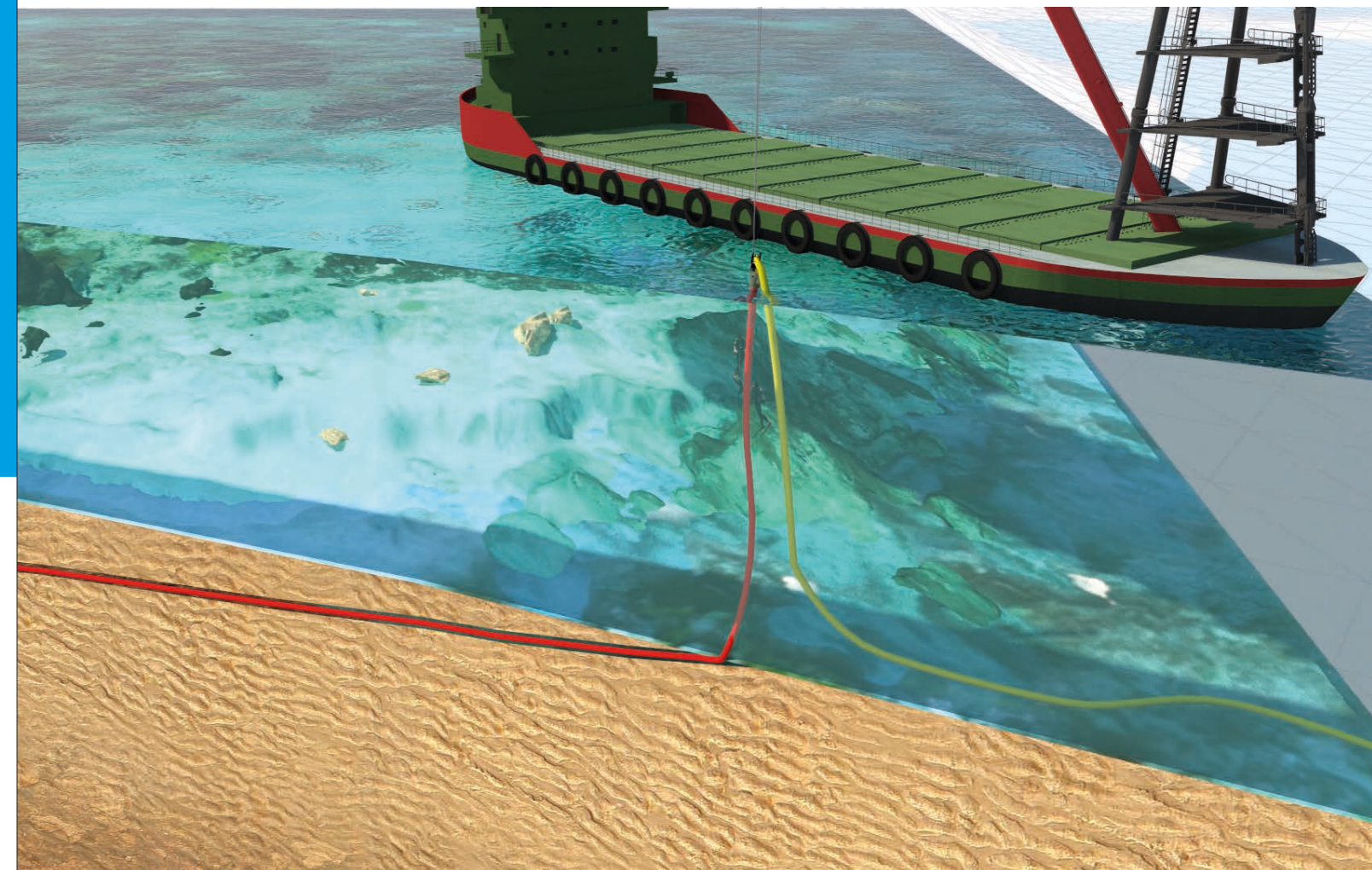
Offshore windfarms are connected to the grid via underwater cables that transmit the electricity produced by the turbines.

Horizontal directional drilling (HDD) is a trenchless, environmentally friendly method that minimizes impacts to key infrastructure and protected areas and is ideal for the installation of transmission cables at the interface between land and sea.

HDD can be used in all geologies from soft soil to hard rock while achieving a high degree of accuracy. As a geotechnical specialist, VSL Intrafor has the expertise and the specialized equipment to install the cables from offshore wind farms, including where they come ashore.

VSL International provides a design-and-build package that can include:

- / Pipeline and conduit installation
- / Submarine and landfall installation of cables
- / Drilling of extra-long ground freezing holes
- / Directional grout hole installation of extra-long horizontal ties
- / Hole trajectory design
- / Pit launching
- / Parallel installations
- / Installation



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4 key areas of expertise

TECHNOLOGIES FOR DURABLE STRUCTURES

We ensure the development and constant improvement of our portfolio of in-house technologies, including post-tensioning systems, stay-cables, ground anchors and VSoL® systems for retained-earth walls.

CIVIL WORKS

We help our clients with construction designs and methods, and provide operational skills for specific applications such as bridge deck erection, containment structures and heavy lifting.

ASSET PRESERVATION, STRUCTURAL REPAIRS & UPGRADING

We offer tailored services to suit your structure's life cycle, from inspections and assessment through to repair works and upgrading.

FOUNDATIONS & GROUND ENGINEERING

We are specialists in ground engineering and special foundations thanks to our long history of proven design and build capabilities gained on the most complex and varied projects.

A 360° approach to make our clients' projects possible

