

# CREATING NEW HORIZONS IN OFFSHORE WIND



# WHO WE ARE



**'WE OFFER AN UNPARALLELED RANGE OF ACTIVITIES WITHIN THE OFFSHORE WIND FARM LIFE CYCLE'**

#### **CREATING NEW HORIZONS**

We are Boskalis and we create new horizons for our stakeholders. As a leading global dredging contractor and marine services provider, we offer a unique combination of experts, vessels and services. Maintaining the highest safety and sustainability standards, we deliver innovative and competitive all-round solutions to our clients.

#### **UNIQUE RANGE OF ACTIVITIES**

For the international offshore energy and renewables sectors we offer an unparalleled range of specialist services as either a service provider or a lump sum contractor for the execution of offshore oil & gas and renewable energy projects.

#### **OFFSHORE WIND PROJECTS FROM A TO Z**

Within the offshore wind industry Boskalis has a successful track record in providing services throughout every phase of a project. We perform geophysical and geotechnical surveys of the seabed, and locate, identify and remove any unexploded ordnance before installing foundations and converter stations. We take responsibility for the procurement of offshore wind turbine foundations and manage the logistical process from the fabrication yard through to the offshore installation for both floating and fixed offshore wind farms. We procure, install and bury export and array cables, and install rock to protect cables and prevent scour damage to offshore foundations. Once the wind farm is operational, we offer long-term subsea inspection, repair and maintenance services (IRM). With our knowledge and experience in the removal of offshore structures we are well positioned to remove offshore wind turbines and cables after their useful life.

DEVELOPMENT

PREPARATION



FABRICATION

TRANSPORT

SEABED

REALIZATION



FOUNDATION

OFFSHORE SUBSTATION

TURBINE

CABLES

SUBSEA

MAINTENANCE



TURBINE

DECOMMISSIONING

END OF LIFE



The planning, transportation and installation of offshore wind farms can be challenging due to harsh environmental conditions, varying soil profiles and scheduling risks. Our experience in every phase of the offshore wind farm life cycle, together with our versatile fleet of vessels and mission equipment, enables us to select the most effective solutions to deliver any offshore activity within project timelines and budgets.

# OUR ACTIVITIES IN THE OFFSHORE WIND FARM LIFE CYCLE



Foundation fabrication



Cable lay operations



Cable repair operations

## PREPARATION PHASE

- Early contractor involvement
- Permits and FEED assistance
- Concept foundation design (GBS, MPs, jackets)
- Geophysical and geotechnical survey
- UXO detection and removal
- Towing of floating structures
- Dry transport of foundations, substations, towers and turbines
- Supply of foundations
- Supply of cables

## REALIZATION PHASE

- Installation of fixed and floating foundations
- Installation of offshore substations
- Installation of scour protection
- Installation and burial of array and export cables, offshore net connection and landfall & cable pull-in

## MAINTENANCE PHASE

- Inspection, Repair and Maintenance for subsea cable infrastructure

## END-OF-LIFE PHASE

- Decommissioning of foundations, substations, cables

# OUR OFFSHORE WIND SOLUTIONS



Geotechnical vessel Ocean Vantage

**'THE WHOLE PACKAGE TO PREPARE THE SEABED; FROM SURVEY TO UXO- AND BOULDER CLEARANCE'**

## **GEOPHYSICAL AND GEOTECHNICAL SURVEYS**

Boskalis provides best-in-class geophysical, geotechnical and environmental marine surveys through its subsidiaries Gardline and Horizon. Our core business and expertise is the provision of marine surveys, which are critical for the correct design of the foundations of offshore structures such as wind turbines and associated infrastructure. Over the last 15 years we have successfully completed many marine survey projects for offshore wind farm developers in Europe and the US.

## **UNEXPLODED ORDNANCE DETECTION AND REMOVAL**

We manage the risk of unexploded ordnance (UXO) in the offshore area and in coastal and shallow water zones. Before any offshore wind project can enter the construction phase this risk needs to be reduced to an acceptable level by today's standards. With a track record of about 50 projects within the offshore wind market only Boskalis is able to deliver a comprehensive package of risk mitigation for offshore wind projects. These comprise of research and risk assessment, geophysical survey, data interpretation and target discrimination, physical identification of UXO locations and clearance via avoidance, removal or low and high order detonation.

## **BOULDER CLEARANCE**

Our extensive knowledge of seabed conditions enables us to offer tailored solutions for boulder clearance operations. Taking the different geographical sites and client requirements into account, we are able to select the right equipment for the job. This ranges from deploying excavators to our state-of-the-art T-Rex boulder clearance tools, which are developed, designed and built in-house and can be deployed in various types of soil and boulder fields. All our tools can be operated from one of our large fleet of anchor handlers.

## 'OUR EXTENSIVE EXPERTISE COMBINED WITH OUR VERSATILE AND SPECIALIST FLEET GUARANTEES A SOLID FOUNDATION'

### FOUNDATION AND SUBSTATION TRANSPORT AND INSTALLATION

With its fleet of (semi-submersible) barges, heavy transport vessels and heavy lift vessels Boskalis is well positioned to transport and install offshore wind foundations, such as monopiles and jackets. Developments such as the globalization of offshore wind activities and the increased size of foundations are fueling the need for more and larger transport solutions. Boskalis owns the largest transport assets in the world and is the only offshore wind contractor with these extensive capabilities in-house, providing guaranteed capability and availability. We have a growing fleet of heavy lift vessels with a lifting capacity of up to 5,000 tons and large deck space for up to five large jacket foundations, which are valuable assets for the efficient construction of offshore wind farms.

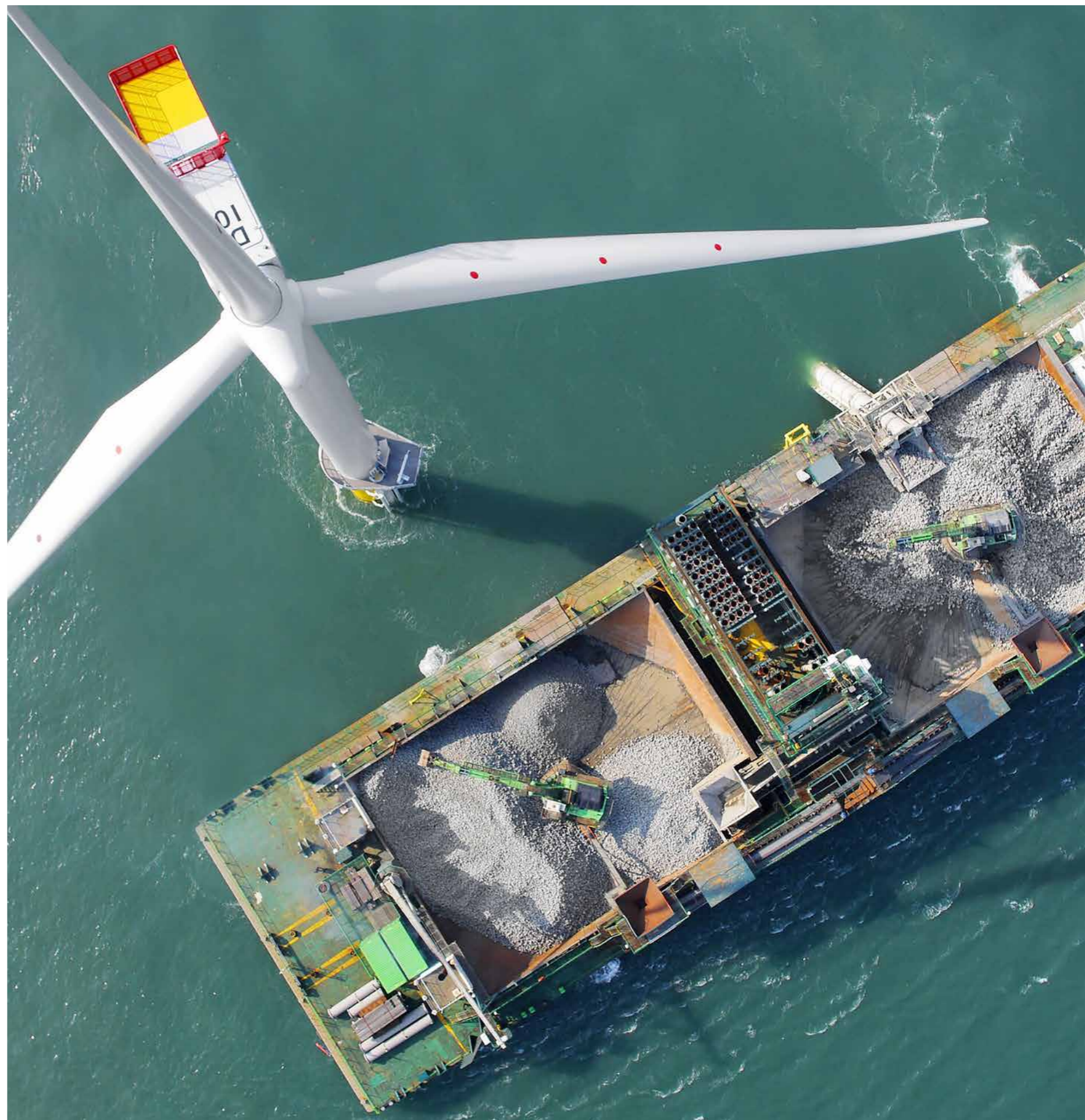
### SCOUR PROTECTION, SEABED PREPARATION AND (SOLID) BALLASTING SOLUTIONS

Wind turbine foundations, substations and power cables need to be protected against seabed erosion, anchors and fishing nets. Our DP2 fallpipe vessels are able to accurately install differently-sized rocks at various depths and close to installed structures. Cables are protected by installing pre- and/or post-lay rock berms.

Before installing Gravity Based Structures (GBS) the seabed needs to be prepared by installing a gravel bed. This will ensure stability and accurate positioning of GBS. To ensure the structure remains safe in even the harshest weather conditions, we are able to develop and install a solid ballast solution, including solutions for floating wind foundations. We can offer a total solution; we manage the procurement of the material, the loading of the fallpipe vessels as well as the transport and installation of rock to reduce our client's interfaces.



Transport and installation of jacket foundations by crane vessel Bokalift 1



Scour protection installation by fallpipe vessel Seahorse

### SUBSEA CABLE INSTALLATION

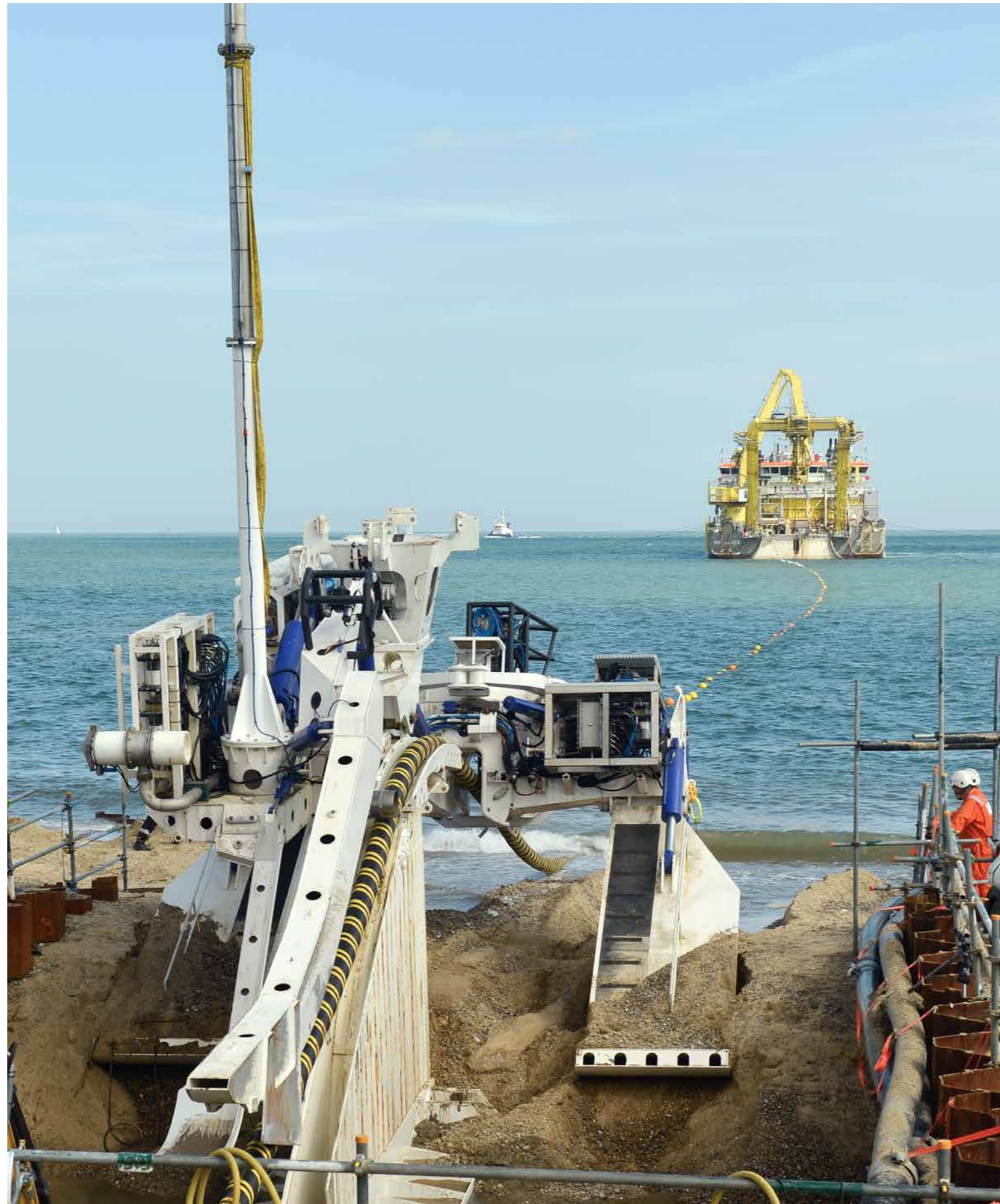
We have a successful track record as a leading contractor in subsea cable installation. We use our own custom-built vessels and advanced equipment to offer a full package of solutions for the installation and burial of export and inter-array cables, including pre-lay ploughing, simultaneous laying and ploughing, and post-lay burial services (jet trenchers and cutters). When required our service offering includes route design, Cable Burial Risk Assessment, cable supply, permitting assistance and cable transport. We also specialize in cable repairs, where our experience is unrivalled with the replacement of over 50 cable joints across more than 20 repair and replacement campaigns. This includes the replacement of more than of 100km of cable. We have the expertise, resources and knowledge to carry out the full range of repair works, engineering and planning in-house. Our extensive fleet of vessels combined with our worldwide cable storage solutions ensures quicker response times in the event of cable failures.

### DIVING AND ROV SERVICES

We use air diving, saturation diving and an owned fleet of dive support and ROV support vessels and mission equipment to provide subsea inspection, repair and maintenance service for offshore wind projects. We offer total solutions based on fully-equipped diving support vessels and modular dive spreads, in-house project management and engineering, and management of our own ROV equipment, ranging from inspection class to full work class systems.



Cable laying operation by cable laying vessel Spirit



Shore landing of export cable by cable laying vessel Ndurance and HD3 plough

**‘THE SUBSEA INFRASTRUCTURE HAS NO SECRETS FOR US; WE DESIGN, INSTALL, BURY AND MAINTAIN THE OPTIMAL SOLUTION’**

### DECOMMISSIONING

With our extensive experience in the removal of offshore structures we are able to offer tailor-made solutions for the decommissioning of offshore wind farms. We take into account the specific characteristics of each site, with our main focus being not only to limit the environmental footprint of the removal operations, but also to significantly reduce the overall cost of this phase. Our fleet has the ability to remove an entire offshore wind farm including offshore substations, foundations, turbines and cables. Our services cover the whole decommissioning process including, but not limited to, the offshore survey, on- and offshore preparations, engineering, cutting/dismantling, removal and transport as well as handling the onshore dismantling, recycling and disposal.

## 'EXTENSIVE SOLUTIONS FOR THE COMPLEX TRANSPORT AND INSTALLATION OF FLOATING WIND FARMS'



Transport of floating foundation by semi-submersible barge Fjord

### FLOATING WIND FARM SOLUTIONS

At offshore locations with water depths up to about 800 meters floating wind turbines offer an attractive solution for generating wind energy. However, floating wind farms also presents a range of new complexities in terms of fabrication, assembly, transport and installation. The floating foundations vary from tension leg platforms and semi-submersible platforms to spars. With our existing experience in the offshore energy sector, both offshore wind and oil & gas, combined with our transport and installation solutions we have the ability to execute and optimize the logistics and installation for floating wind farms globally.

In this relatively new market Boskalis already established a track record. We executed the towage of a floating wind turbine for world's first commercial floating wind farm, Hywind Scotland. Furthermore, we performed the load-out and float-off of one of the floating foundations and towed a foundation to the integration port for the WindFloat Atlantic project, offshore Portugal.

For world's largest floating offshore wind farm, Kincardine, we have been contracted as Transport and Installation contractor. We are responsible for the transport of all floating foundations from the fabrication yard to the integration yard, the mooring installation, load-out and float-off of the floating foundation and the towage and hook-up of the floating turbines in the field.



Floating foundation being submerged by semi-submersible barge Fjord

# YOUR CHOICE OF PARTNERSHIP AND CONTRACT

'WE ARE ABLE TO OFFER A COMBINATION OF ALL OUR CONTRACTING DISCIPLINES RESULTING IN EFFICIENCY AND DECREASED COMPLEXITY IN MULTIDISCIPLINARY PROJECTS.'

## CONTRACTING SOLUTIONS

Boskalis prides itself on being an experienced, open and transparent contractor. With our large variety of vessels and activities we are used to a wide range of contract forms:

- Day-rate charter (e.g. BIMCO for the hire of vessels, barges)
- Lump sum contracts (e.g. LOGIC Marine Construction for subsea or marine works)
- Engineering Procurement Construction and Installation (EPCI) and Balance of Plant (BOP) agreements: e.g. FIDIC Yellow for the construction of offshore wind farms

## PARTNERSHIP AND EARLY ENGAGEMENT

In addition to the classic contracting process and format we can offer substantial added value in a partnership role. In a partner-driven development process the project risks and opportunities are shared, resulting in a lean construction process. Early engagement will:

- Encourage innovation
- Improve feasibility and bankability
- Optimize initial data collection
- Reduce disputes
- Increase certainty of budget and planning
- Shorten the development process
- Anticipate risks and opportunities
- Maximize value opportunities
- Optimize supply chain integration
- Reduce tender & procurement costs

An added benefit is that risks can be properly balanced by allocating them to the party that is best suited to take them on. By optimizing in a partnership through early engagement the lowest cost of energy can be achieved.

Boskalis has experience with various partnership principles, from Early contractor involvement and Pre-construction agreements to Joint Development Approach. Costing can be agreed based on a 'closed book' or 'open book' approach with a view to complete transparency and maximizing the advantages of the partnership to all involved. We know from experience that significant capex reductions can be achieved through early engagement.





# OUR VERSATILE AND SPECIALIST FLEET



**11** SEMI-SUBMERSIBLE HEAVY TRANSPORT VESSELS



**4** CABLE-LAYING VESSELS AND BARGES



**5** DIVING SUPPORT VESSELS



**2** HEAVY LIFT VESSELS



**15** SURVEY VESSELS



**2** SEMI-SUBMERSIBLE OCEANGOING BARGES



**4** FLOATING SHEERLEGS AND CRANE BARGES



**15** ANCHOR HANDLING TUGS



**7** CONSTRUCTION SUPPORT VESSELS



**5** OCEAN TOWAGE TUGS



**3** SUBSEA ROCK INSTALLATION VESSELS



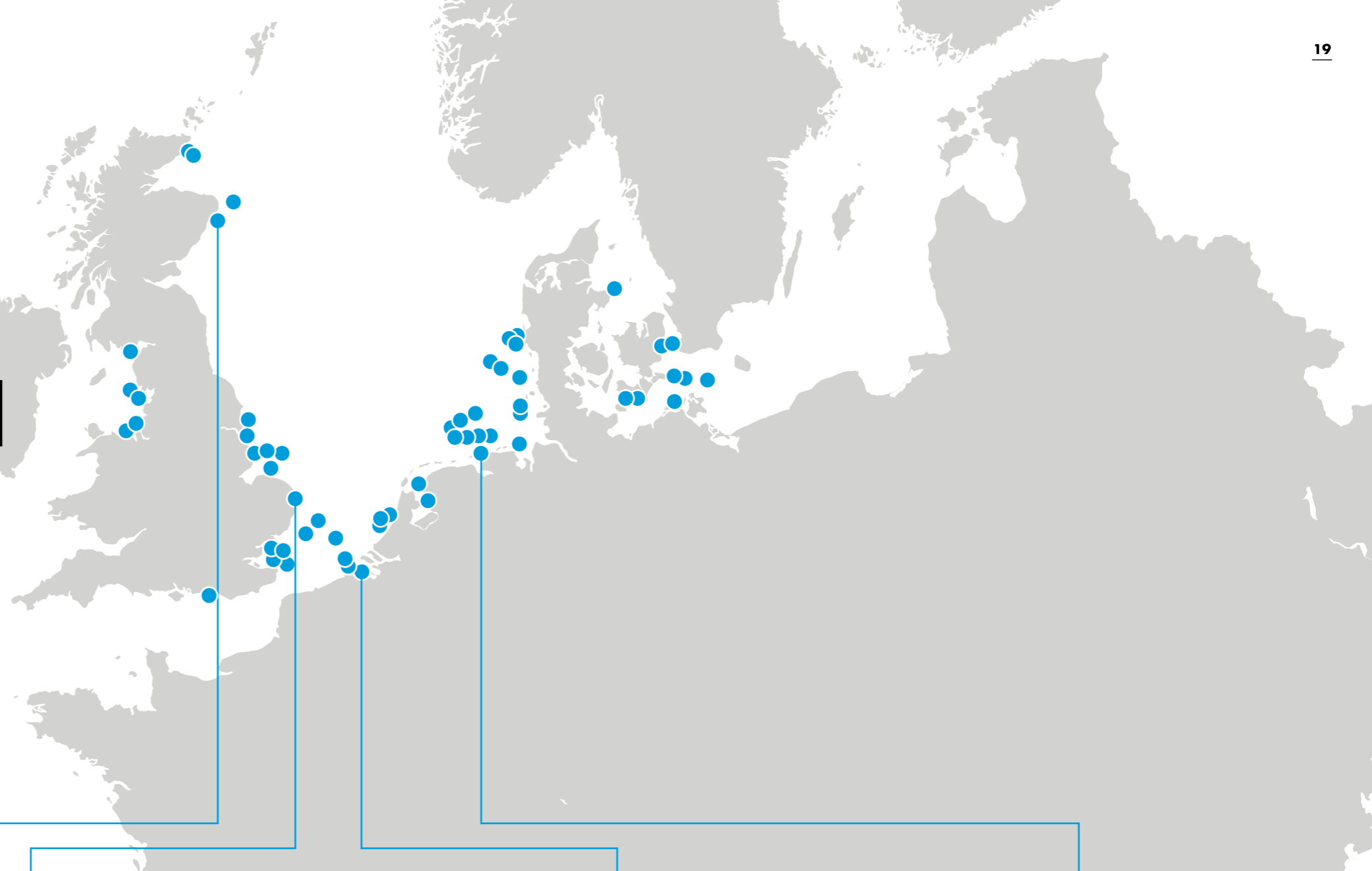
**6** TRENCHING EQUIPMENT



**8** ROVS

Boskalis operates one of the largest fleets of specialized offshore vessels and equipment in the world. Our fleet includes crane vessels, cable-laying vessels, heavy transport vessels, trenching support vessels, fallpipe vessels, semi-submersible heavy lift vessels, diving support vessels, construction support vessels, (anchor handling) tugs, floating shearlegs and survey vessels. Furthermore we have specialized mission equipment such as trenching equipment such as ploughs, jetting and mechanical trenchers, subsea pre-piling frames, ROVs and various innovative subsea cable tools to support and enhance our activities in all phases of an offshore wind project.

# OUR OFFSHORE WIND ACTIVITIES IN NORTHWEST EUROPE



Highlighted projects:



## ABERDEEN BAY

- Balance of Plant contract
- Managing the design and fabrication of the jacket foundations
- UXO survey and removal
- Installation of eleven suction bucket jacket foundations
- Scour protection
- Supply, installation and burial of 66 kV inter-array and export cables
- Installation of the wind turbines



## EAST ANGLIA

- Transport and installation of 102 jacket foundations
- Engineering, Procurement, Construction and Installation contract for the burial and installation of 136 kilometers of 66kV inter-array cable



## BORSSELE ALPHA/BETA

- Cable fabrication and transport
- Removal of out-of-service cables
- Installation and burial of more than 250 kilometers of export cable up to 10 meters below the seabed
- Rock placement



## DOLWIN BETA & GAMMA

- Dry transport of High Voltage Direct Current (HVDC) converter platform (DoIWin Beta)
- Transport and float-over installation of HVDC platform topside (DoIWin Gamma)
- Survey and seabed preparation
- Anchoring and installation
- Rock placement
- Diving and ROV works, cutting of pile sleeves

# OUR OFFSHORE WIND ACTIVITIES IN THE USA

Highlighted projects:



## EMPIRE WIND

Geophysical, geotechnical and environmental survey



## HUDSON NORTH AND SOUTH

Geophysical survey

# OUR OFFSHORE WIND ACTIVITIES IN TAIWAN

Highlighted projects:



## YUNLIN

Scour protection installation for 71 monopile foundations



## CHANGFANG & XIDAO

Transport and installation of 62 three-legged foundations

'WE MANAGE COMPLEXITY, MITIGATE RISKS AND SIMPLIFY EXECUTION.'

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### WHAT SETS US APART

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UNPARALLELED RANGE OF ACTIVITIES

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COMMITMENT TO SAFETY

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ABILITY TO MANAGE COMPLEXITY

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COMBINING SPECIALIZED SERVICES INTO INTEGRATED SOLUTIONS

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VERSATILE FLEET OF VESSELS AND MISSION EQUIPMENT

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INNOVATIVE AND SUSTAINABLE SOLUTIONS

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GLOBAL PRESENCE

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# LET'S TALK

'TELL US ABOUT YOUR  
CHALLENGES'

For over 100 years Boskalis has been helping clients meet some of the toughest challenges. How can we help you? Give us a call and tell us about your challenges. Visit our website: [www.boskalis.com/offshore](http://www.boskalis.com/offshore)

## **Boskalis**

Rosmolenweg 20  
P.O. Box 43  
3350 AA Papendrecht  
The Netherlands

[offshore.energy@boskalis.com](mailto:offshore.energy@boskalis.com)  
T +31 78 6969000  
F +31 78 6969555

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