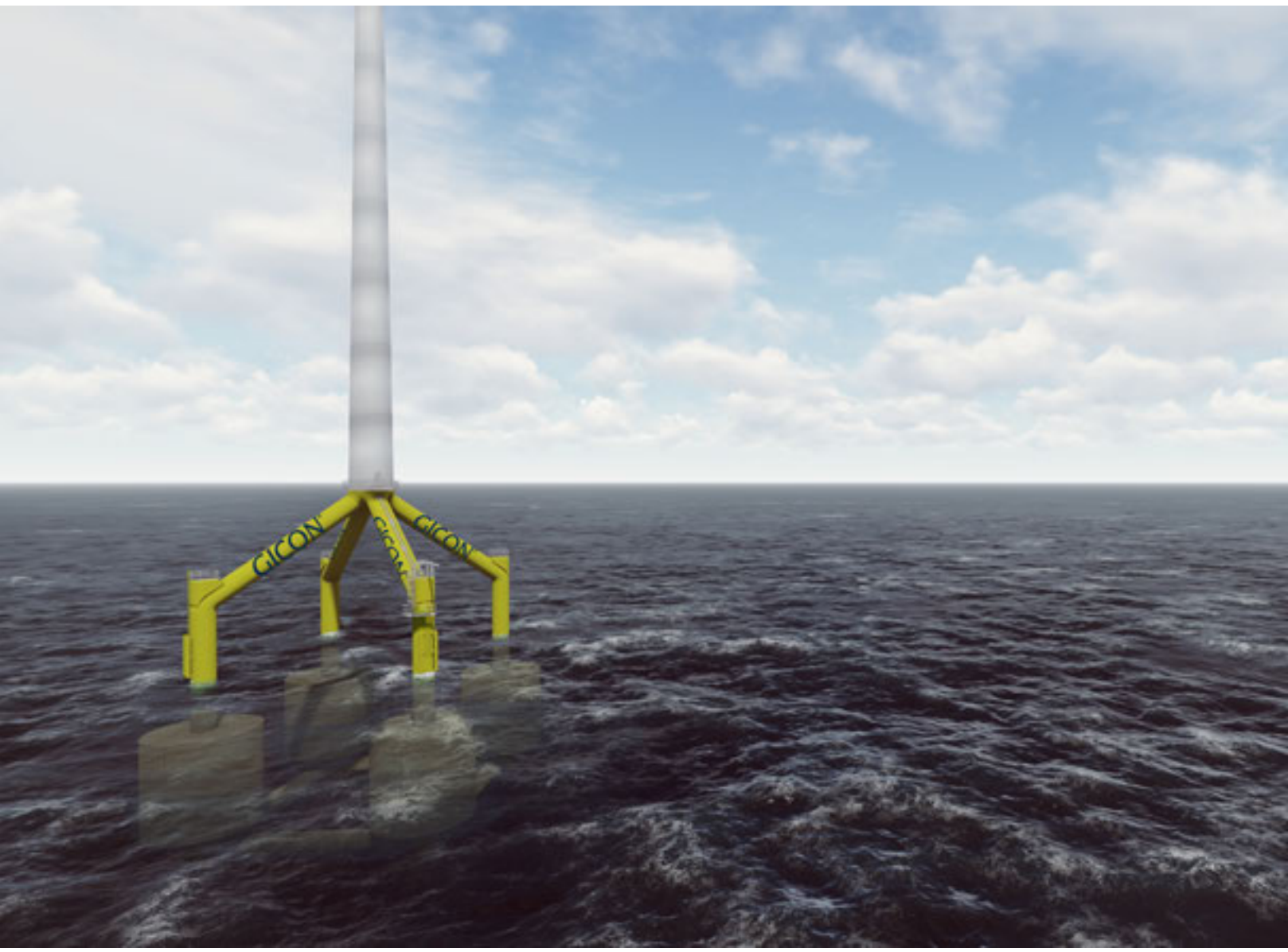
GICON®



GICON® - SOF

A modular and cost competitive TLP Solution

THE GICON® SOF
THE MOST INNOVATIVE TLP SOLUTION

Offshore wind power is one of the most important backbones of a sustainable energy supply. Current construction of classic offshore wind turbines is, however, associated with enormous technical, environmental and financial challenges. It is therefore crucial for the offshore wind industry to minimize these costs and risks. Another question of vital significance for the industry is the development of projects in deeper water with high wind yields. Approximately 75% of the global offshore wind potential is located in areas with water depths greater than 30 meters; at least two-thirds are in water depths greater than 50 meters.

The GICON®-SOF floating offshore substructure provides an ideal solution for these challenges.

GICON's SOF development provides a floating substructure for offshore wind turbines which can be deployed in water depths of 45 to 350 meters and more while achieving LCOE (Levelized Cost of Energy) of 5 to 8 € cent / kWh. This makes GICON one of the global development leaders for floating offshore wind substructures. The R&D project started in 2009 and includes renowned partners such as TU Bergakademie Freiberg (Freiberg Technical University and Mining Academy), Rostock University and Fraunhofer IWES. Thanks to the continous improvements based on results from research like extensive wind & wave tank tests, the GICON®-SOF is ready to prove its capacities in a full scale multi-megawatt prototype.

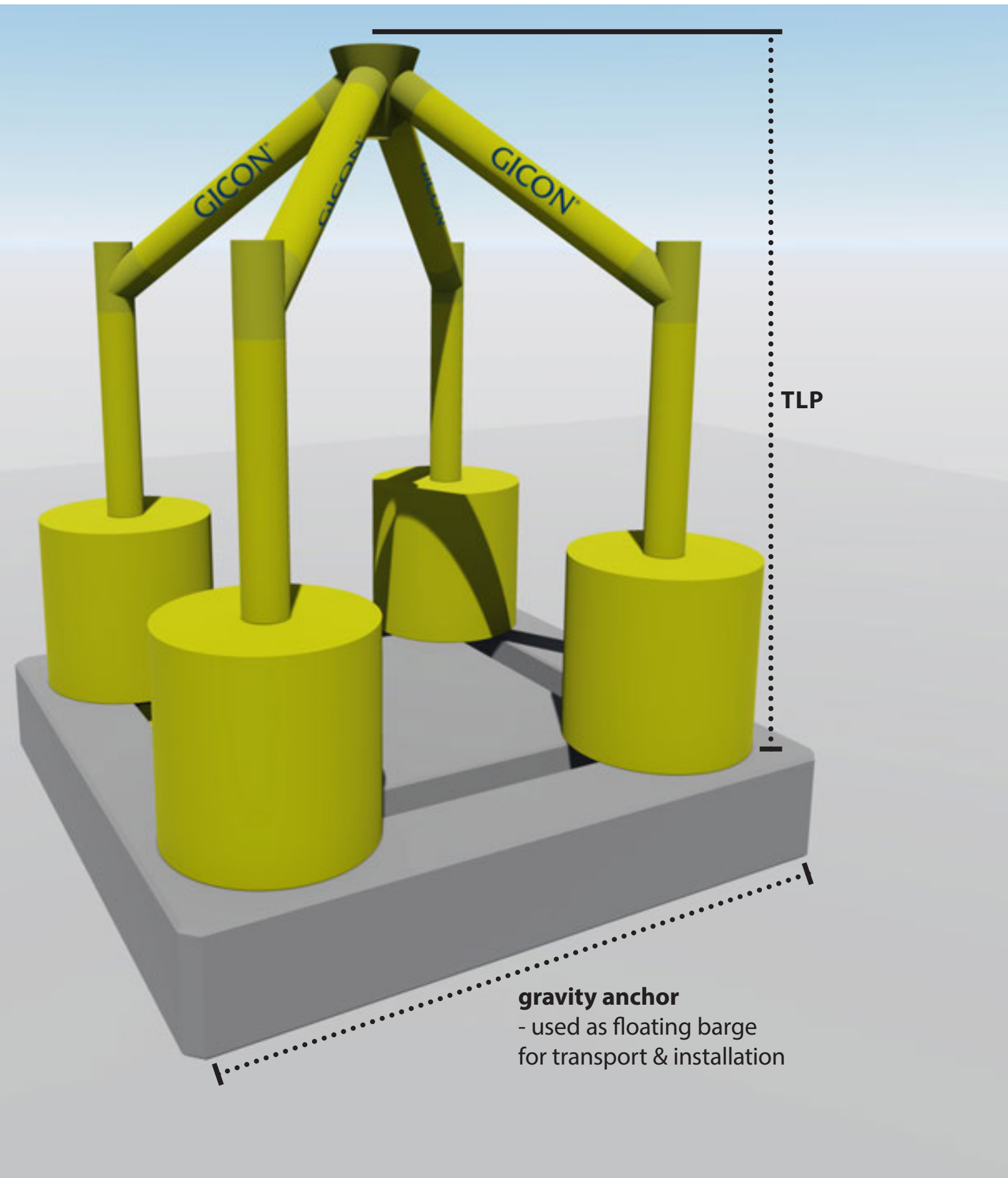
R & D Partners:

TU BERGAKADEMIE FREIBERG

TECHNISCHE UNIVERSITÄT
BERGAKADEMIE FREIBERG
The University of Resources. Since 1765.

LWET
LEHRSTUHL WINDENERGIETECHNIK

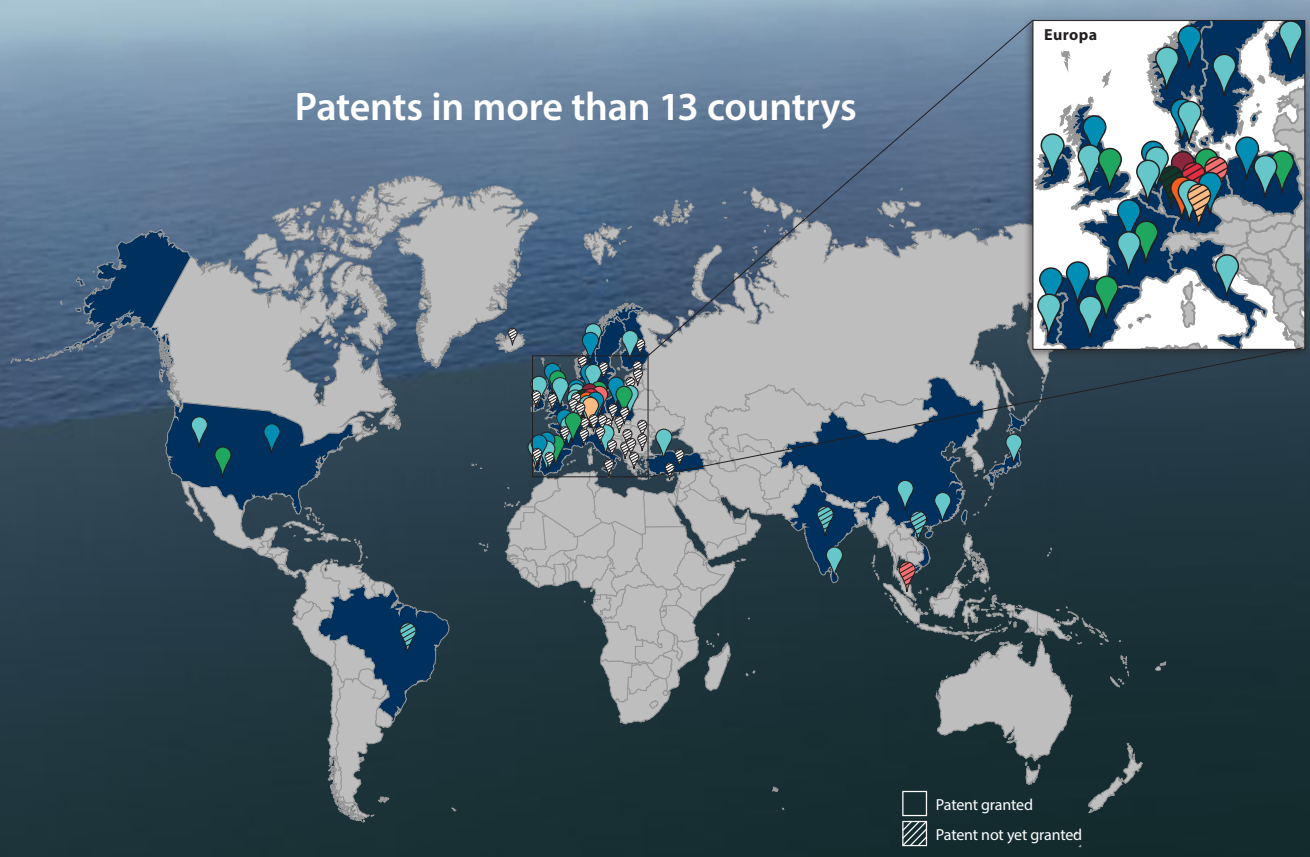
Universität Rostock
Traditio et Innovatio

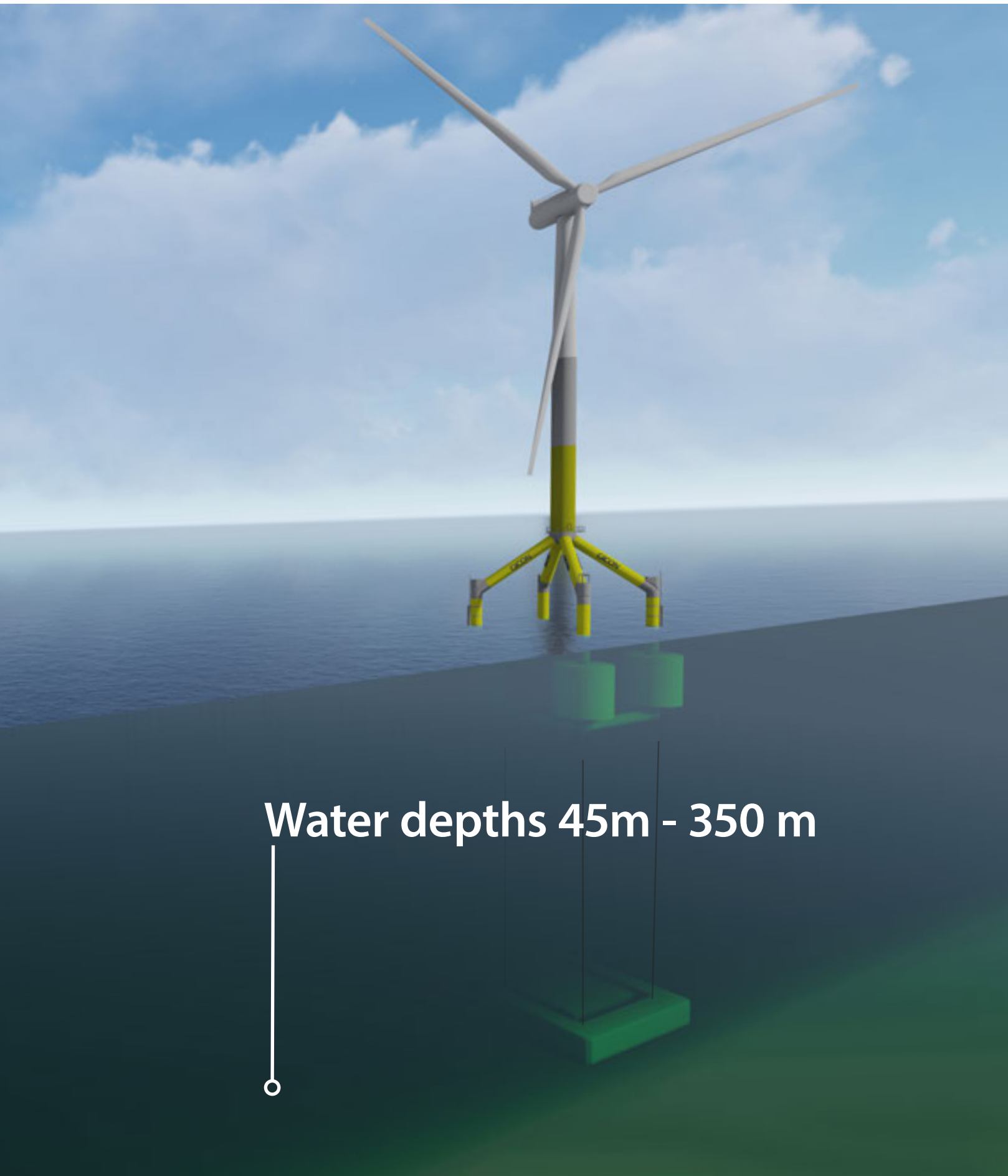

GICON
GICON
GICON
TLP
gravity anchor
- used as floating barge
for transport & installation

THE GICON® SOF
A SOLUTION FOR GLOBAL MARKETS

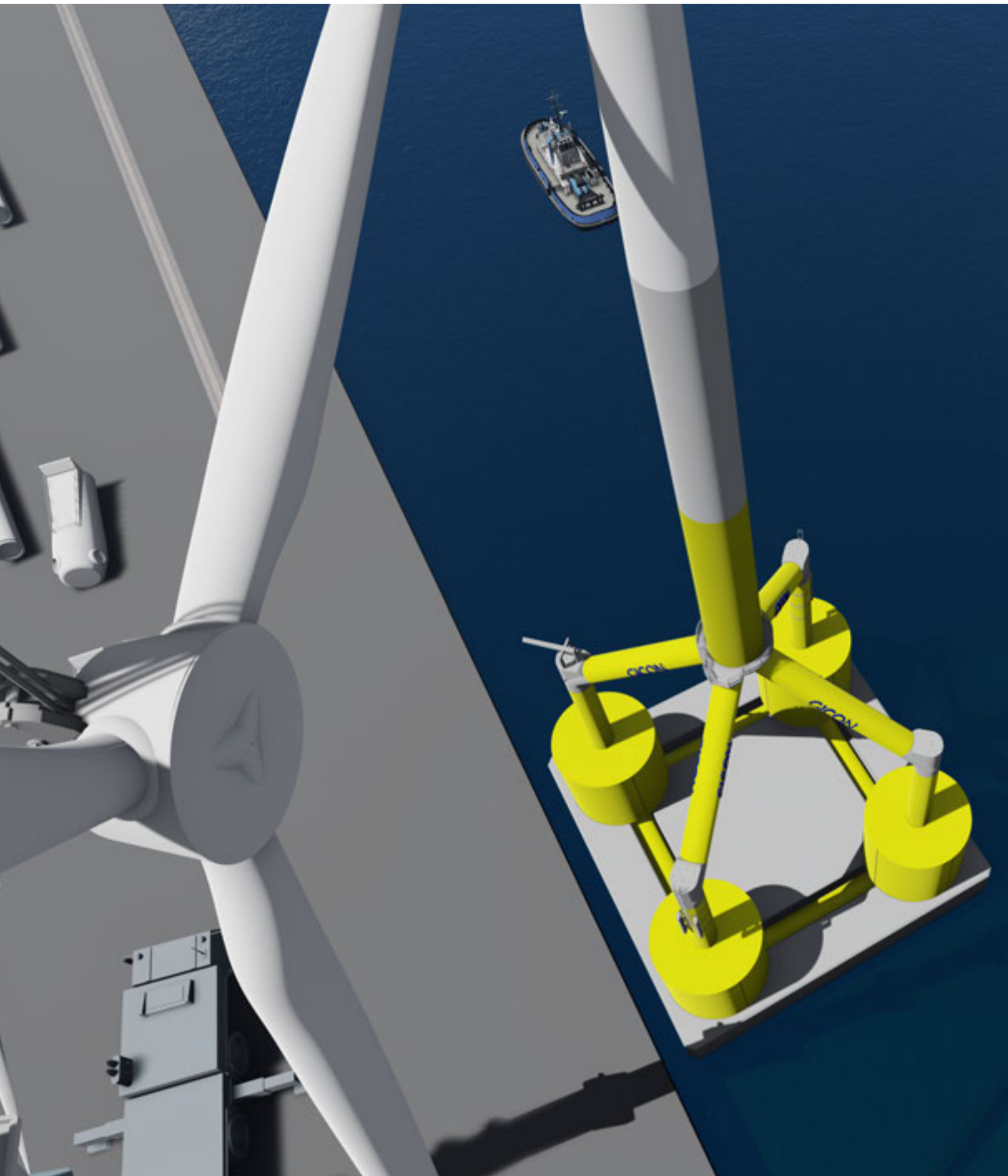
Offshore wind energy will be a major pillar of renewable energy worldwide. Since 60 - 80% of the global offshore potential is located in water depths > 50 m, current foundation concepts such as monopile and jackets are technically not feasible for the continued development of this energy sector. Floating substructures open up new opportunities for offshore wind projects in deeper water and at reduced cost.

Patents in more than 13 countrys




Water depths 45m - 350 m

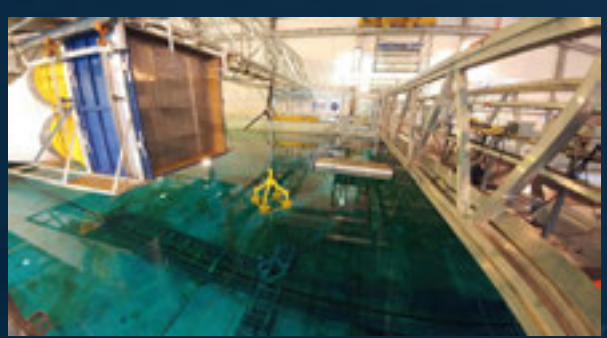
THE GICON® SOF
THE CONCEPT OF CHOICE



GICON and its research partners have been developing the GICON®-SOF since 2009 with the objective to address key challenges with regard to cost as well as fabrication and construction:

- A TLP is attached to the seabed with taut mooring lines. The structure's buoyancy which is much greater than its mass, is causing a strong upward directed force. By tensioning the mooring lines, the entire structure becomes firmly braced, resulting in a very stiff system that can withstand even the most severe weather conditions with minimum accelerations and deflections.
- Due to its inherent stability, a TLP can be designed much smaller compared to a semi-sub or a spar because a TLP's stability is not based on its outer dimensions. Even for large 6-10MW turbines, a TLP substructure is significantly smaller compared to a semisubmersible or spar. This allows for reduced fabrication cost as well as increased flexibility in the supply chain.
- When taking mooring systems into consideration, a TLP has a smaller footprint due to its straight lines compared to catenary mooring lines used with semisubmersibles and spars.

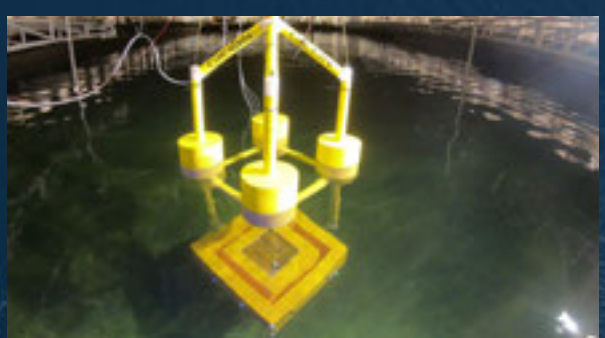
Succesfully tested



Wind- and wave tests (2017)

Laboratory in Hydrodynamics, Energy and Atmospheric Environment of Central Nantes/CNRS (France)

Subject of the test:
In ECN's water basin, waves with significant wave heights of 11.4 and 12.9 m were simulated, as such waves only occur statstically every 10 and 50 years, respectively.

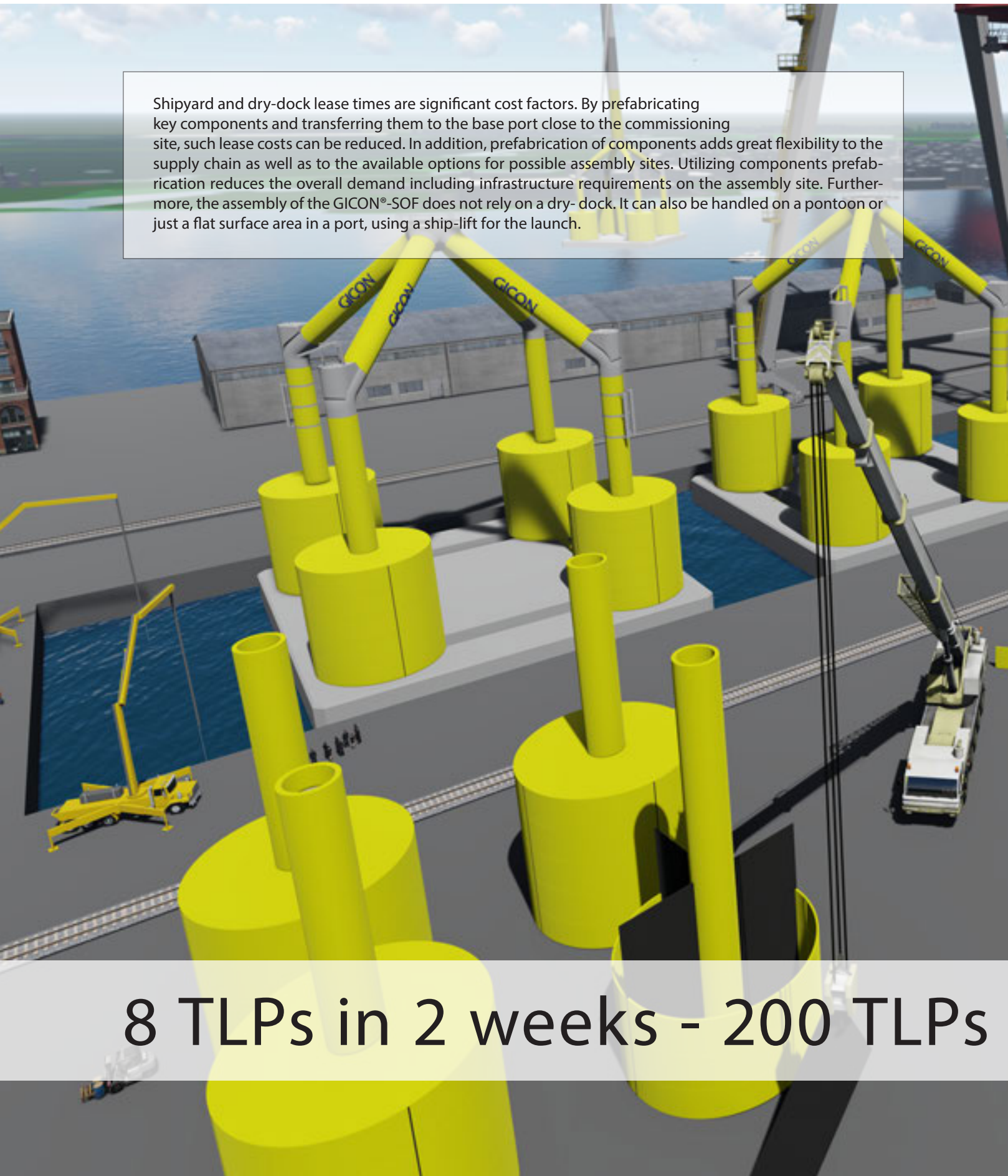


Transport- and Installation tests (2018)

SSPA Maritime Dynamics Laboratory in Gothenburg (Sweden)

Subject of the test:
Tests included the towing of the SOF using the buoyancy of the gravity anchor plate, the lowering of the gravity anchor plate and the pulling down of the SOF under smooth water conditions.

THE GICON® SOF MODULARITY



Shipyard and dry-dock lease times are significant cost factors. By prefabricating key components and transferring them to the base port close to the commissioning site, such lease costs can be reduced. In addition, prefabrication of components adds great flexibility to the supply chain as well as to the available options for possible assembly sites. Utilizing components prefabrication reduces the overall demand including infrastructure requirements on the assembly site. Furthermore, the assembly of the GICON®-SOF does not rely on a dry- dock. It can also be handled on a pontoon or just a flat surface area in a port, using a ship-lift for the launch.

8 TLPs in 2 weeks - 200 TLPs

per year in one dry dock

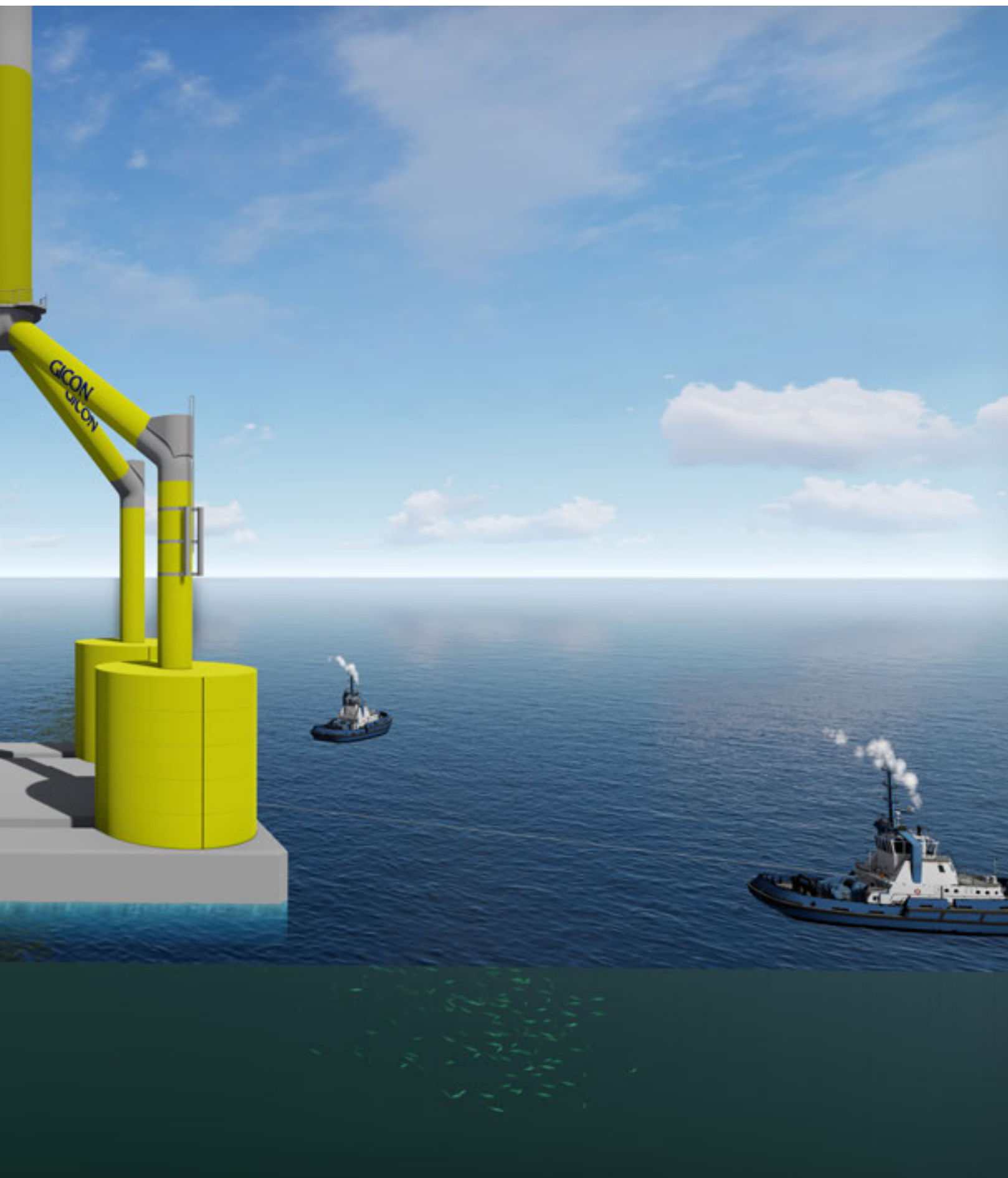
THE GICON® SOF
LCOE OF LESS THAN 50 EURO / MWH POSSIBLE

1. Higher revenues
Accessing high wind resource areas in deep water of 45m to 350m generates higher revenues compared to conventional bottom fixed turbines in shallow water with often inferior wind resources.

2. Reduced fabrication costs
One standardized substructure design can be utilized for an entire offshore wind park project. Also modular steel structure follow into similar cost reductions.

3. Reduced installation costs and installations risks
Substructure fabrication and turbine assembly happen completely at shore, independent from weather windows. The entire platform including turbine is then towed to the offshore deployment site. Expensive installation vessels or jack-up platforms are therefore not required.

4. Reduction of maintenance costs
If required, the entire substructure, including tower and turbine, can be replaced. Major maintenance work can be handled at shore.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