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Traditio et Innovatio

LWET STIFTUNGSLEHRSTUHL WINDENERGIETECHNIK

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Supply chains for floating offshore wind substructures – a TLP example

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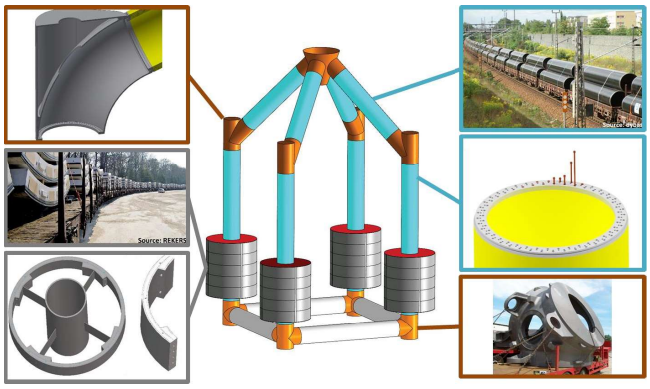
FLOATING OFFSHORE WIND

On November 4th 2016 the Paris Agreement on Climate Change came into force. To achieve the goals of this agreement CO_2 emission-free energy production is a key element. Offshore wind power will be a major player in this field. Hereby floating offshore wind solutions can provide an economically viable as well as ecologically friendly power source in water depths of 50m and deeper. From 2011 onwards, the University of Rostock has been involved in a floating offshore wind research project together with the company GICON. The GICON-TLP, a TLP substructure fabricated out of pre-stressed concrete elements, has been developed and tested over several years to reach a development stage as an economic and ecological solution. Tests of the final design in operation conditions have been done successfully at the ECN in Nantes within the course of MaRINET2.
Another characteristic of this TLP is the high level of modularity to maximize the flexibility within the supply chain and with suppliers.

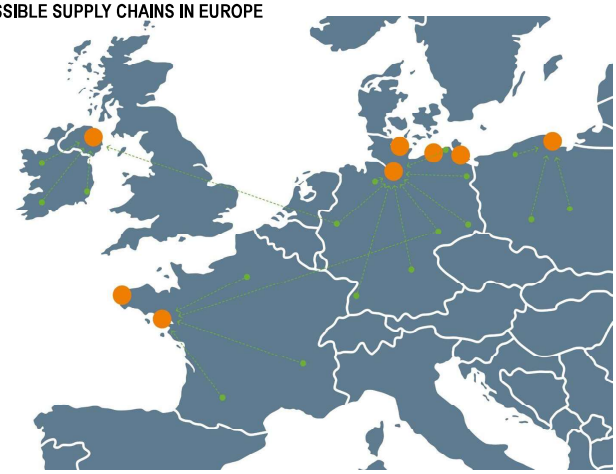
SUPPLY CHAIN OPTIMIZATION

- High modularity of the substructure → The TLP consists only of five main components:
  → Bottom and top nodes, transition piece, buoyancy bodies and pipes



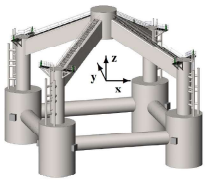
All components can be produced at multiple locations and thus by different suppliers. This leads to cost saving potentials based on the possibility to have a choice of suppliers. Additionally the production capacities of multiple suppliers can be used simultaneously. Since smaller and lighter components will be transporter during most of the transport process, logistical boundary conditions can be considered.

POSSIBLE SUPPLY CHAINS IN EUROPE

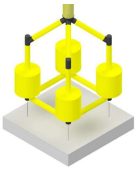


OPTIMIZATION THROUGH DEVELOPMENT

2nd Generation GICON-TLP



3rd Generation GICON-TLP



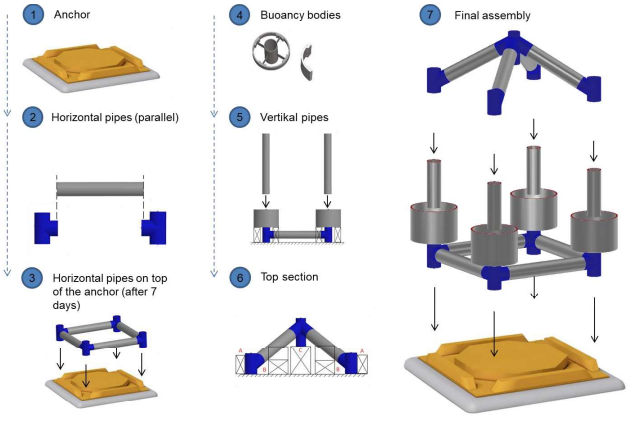
Throughout the development process, some changes have been made with regard to the optimization of the supply chain and manufacturability of the GICON-TLP. To reduce the costs of the structure, the material has been changed from steel to steel reinforced ultra-high performance concrete. Additionally the level of modularity of the structure has been increased by replacing the diagonal beams by pipes of the same type as used for the vertical and horizontal connections. This leads to lower costs for the yard as well as a reduced fabrication and installation time.

	SOF2 -2.3MW	SOF3 -6.0MW – Steel	SOF3 -6.0MW – concrete
Dimensions [m]	28x33x33	51x45x45	51x45x45
Mass [t]	800	1,800	3,400
Single heaviest component	Buoyancy Body 130t	Buoyancy Body 310t	Vertical Pipe 80t
Material	Steel	Steel	Steel-concrete
Material cost TLP [€/t]	2,500	2,500	450
Assembling time	4 months	Min. 4 month	4 weeks
Largest single component	10 m long 9 m diameter	14m long 14m diameter	28 m 3 m diameter

FINAL ASSEMBLY

- The final assembly can be done at a port close to the wind farm.
- All components will be delivered to the assembly side and assembled in four weeks.

Assembling of GICON-TLP Substructure



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