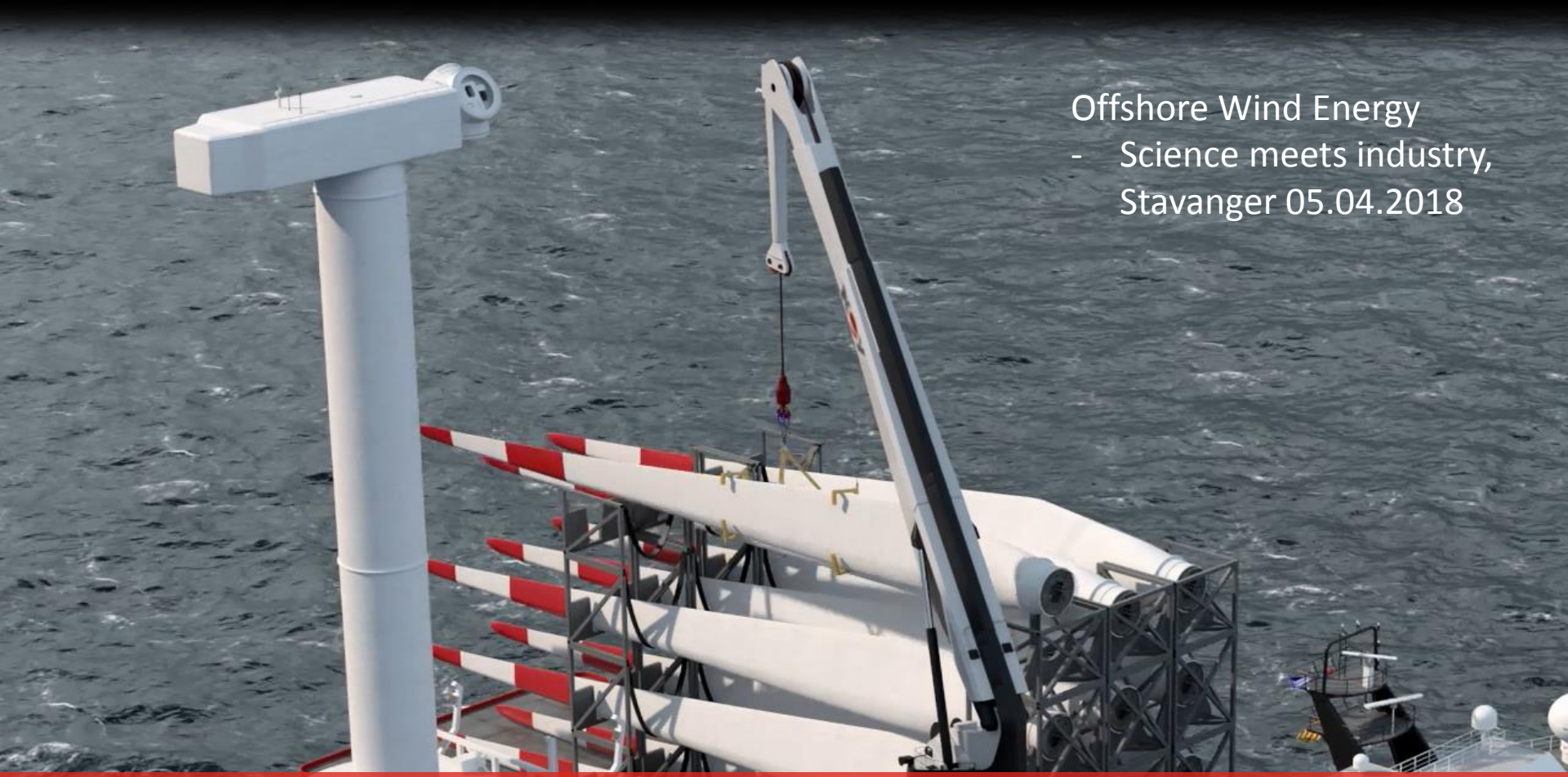


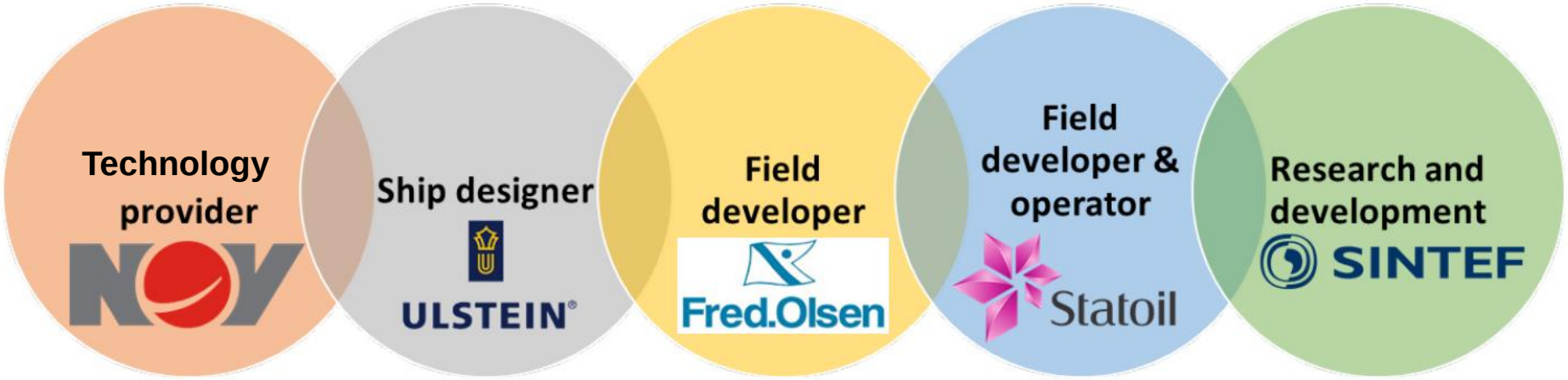
Offshore Wind Energy
- Science meets industry, Stavanger 05.04.2018

Floating installation concept
For offshore wind developments

Jens Ingvald Ornæs, Product Line Manager NOV Lifting & Handling

The Project

- 2-year development project, 9MNOK total budget



"The primary objective of the project is to develop a scalable, flexible and cost efficient installation method for large offshore wind turbines located at sea-depths exceeding current capabilities of jack-up vessels."

The Research Council of Norway

With funding from
The Research Council of Norway

ENERGIX

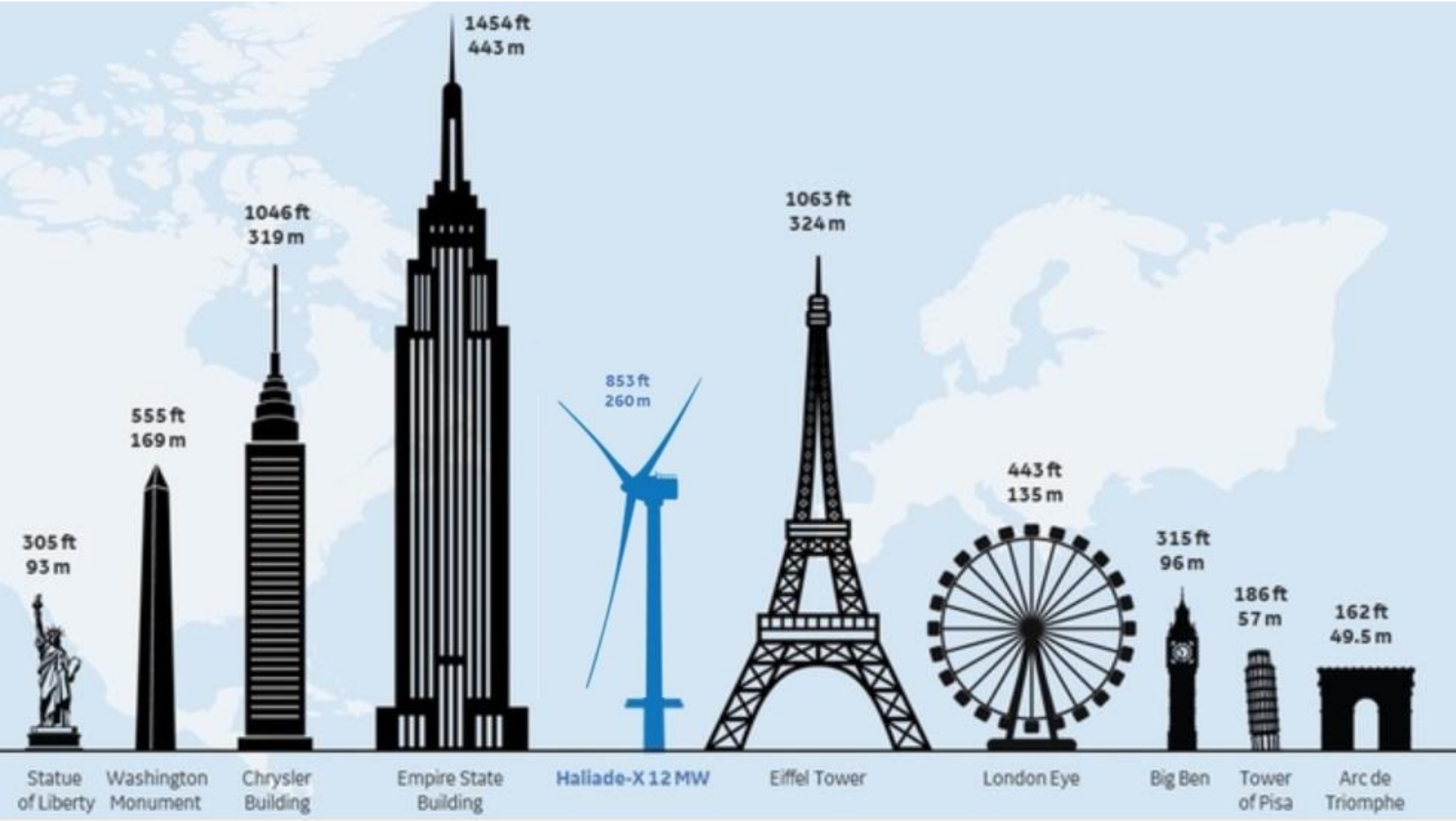
The Problem

- How to install really large turbines?

Source. https://www.gerenewableenergy.com/wind-energy/turbines/haliade-x-offshore-turbine.

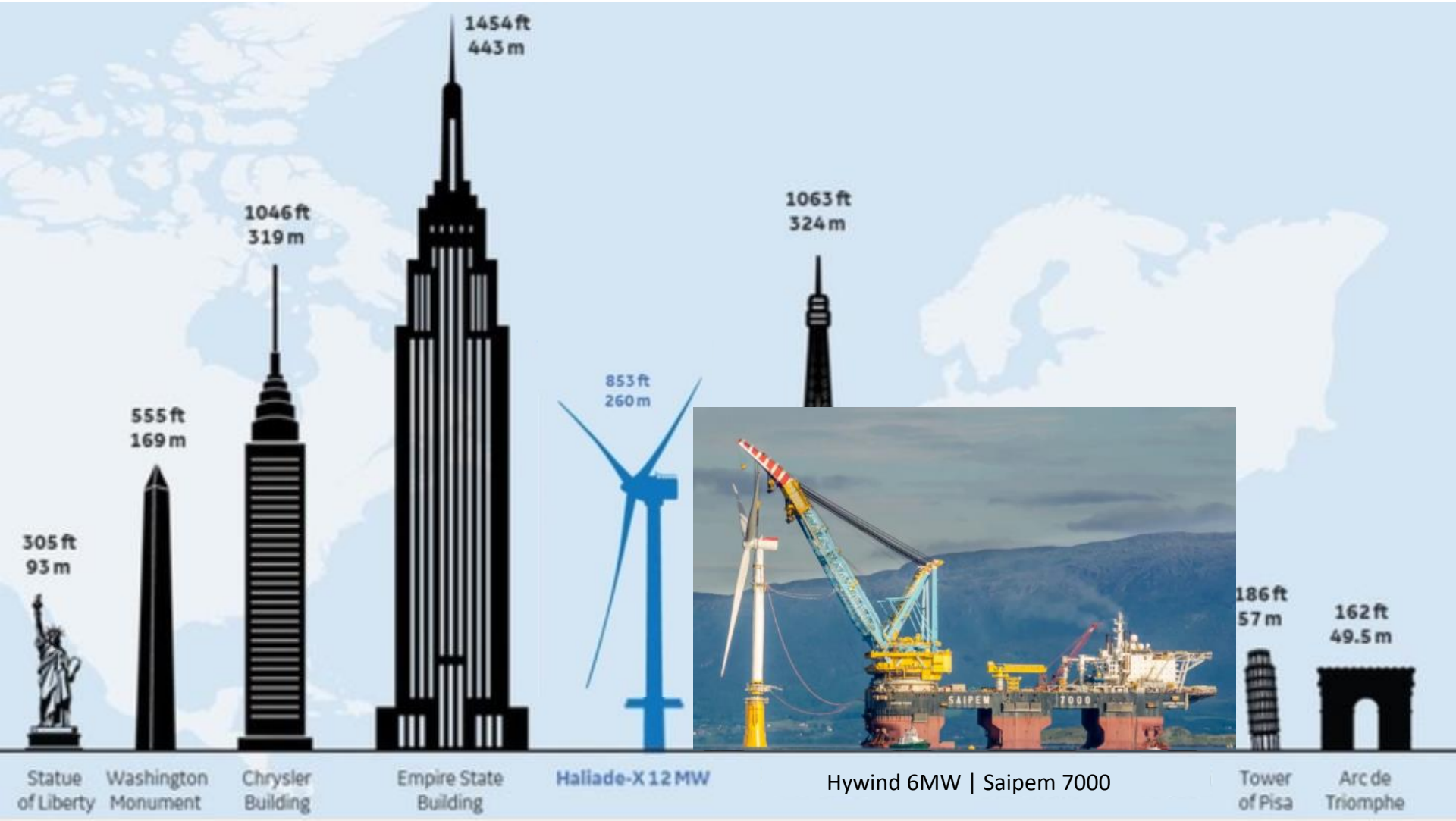
The Problem

- How to install really large turbines?



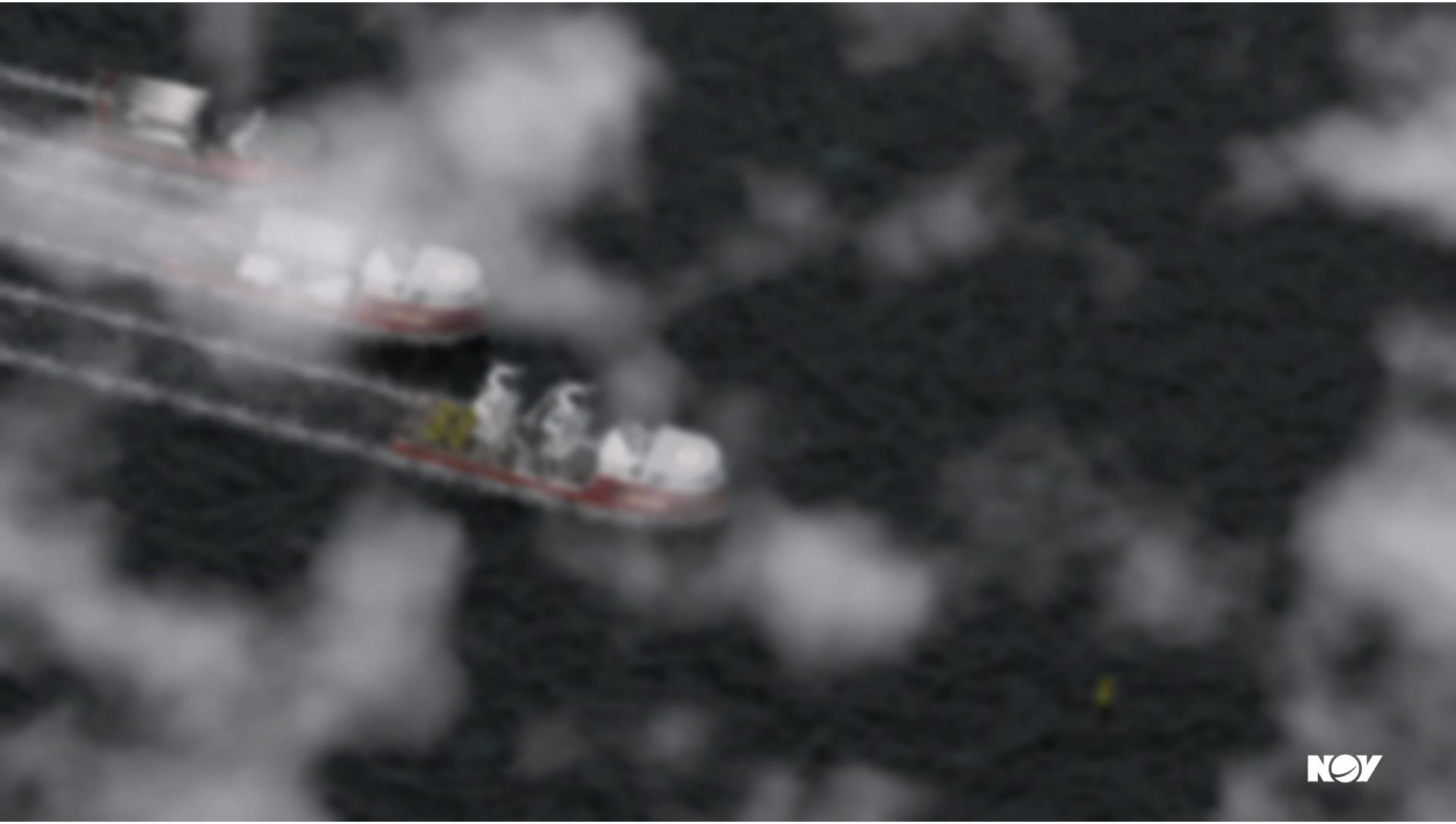
The Problem

- How to install really large turbines?

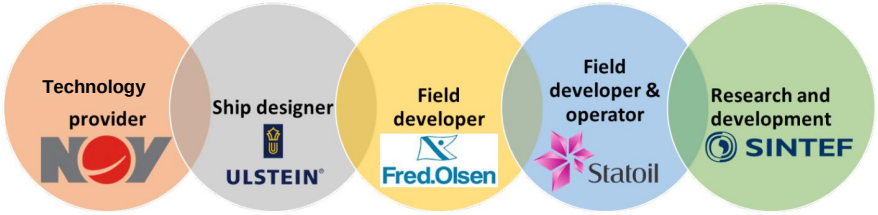


Challenging the Status Quo

- Do we have to do complex lifts 125+ meters up in the air?



Project Details



1. Installation concepts – state of the art. Specify functional requirement and acceptance criteria for transportation and installation.

2. Develop the lifting and installation arrangement (i.e. motion compensated crane and jacking system), including structural design to TRL 4/5. Focus on reducing number of complex crane operations w/high precision demand.

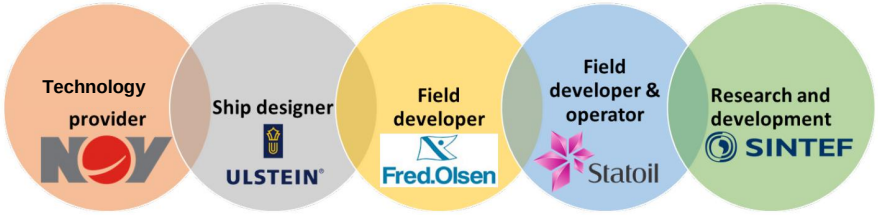
3. Identify vessel concept(s) to support transportation and installation.

4. Establish and verify operational procedures for the transportation and installation.

5. Identify optimal turbine delivery value chain design, including logistical requirements and performance goals.

6. Define factors for realization of the concept including fabrication, risk, cost and schedule. This also covers potential design adjustments on WT.

Specific Challenges



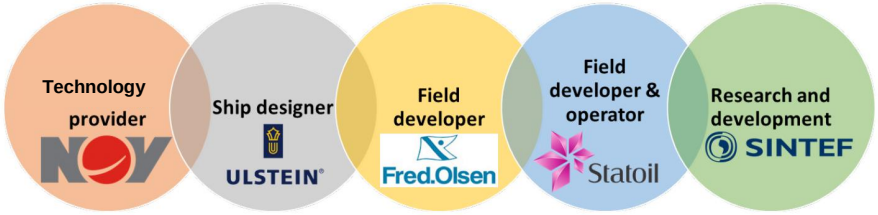
1. How can an installation concept be designed that will allow assembly of the OWT's components to be done at lower heights – without the need for an installation equipment (crane) in the same size as the wind turbine itself?

2. How can such a concept be designed to be well suited for both bottom-fixed and floating offshore wind farms?

3. What are the enabling parameters that will make the concept attractive for both floating and bottom-fixed vessels - providing a broad market adoption for the installation equipment to drive down the equipment investment cost?

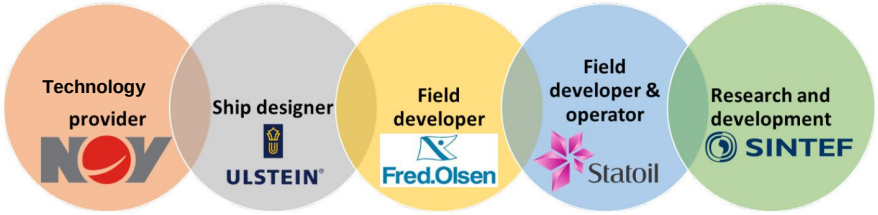
4. Can the concept, or parts thereof, be used to reduce cost and complexity in other phases of the wind farm life cycle, e.g. blade replacement, demobilization?

Opportunities



1. Technology transfer from O&G to offshore wind including motion compensation systems used in FDU's and Subsea Construction
2. Vessel Design
3. Logistics
4. Weather Windows
5. Windfarm Maintenance, and demobilization

Deliverables



1. Conceptual validation of installation equipment that will support a roadmap leading to cost efficient installation of large and extra-large offshore wind turbines - floating and bottom fixed.

    - Requirements for / Validation of installation equipment
    - Requirements for Vessel
    - Requirements for WT, incl. tower and foundations

2. Project results will on a holistic level provide insight on where a Wind Farm Operator should invest to gain the highest return (as reduced LCOE).

    - Installation vessel and equipment capabilities
    - Logistics, vessel utilization and environmental constraints
    - Modifications to WT, incl. tower and foundations

Who has the first question?