

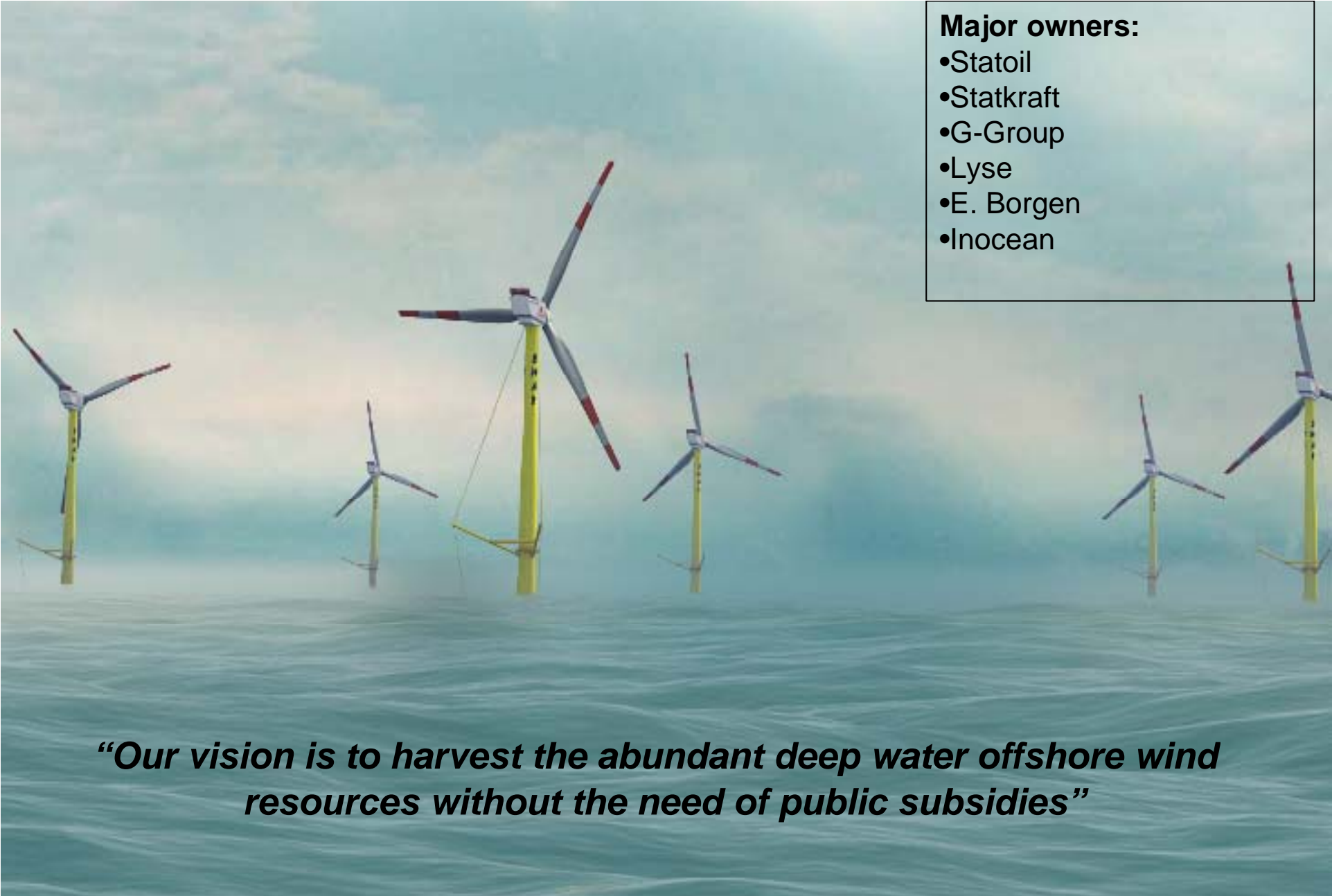
Wind Power R&D seminar

-deep sea offshore wind

***Development of the Sway
floating tower***

***Michal Forland
CEO***

SWAY

A photograph of several offshore wind turbines in the ocean. The turbines have yellow towers and three blades each, with red and white stripes on the blades. The sky is overcast and grey. The water is a deep blue-grey color.

Major owners:

- Statoil
- Statkraft
- G-Group
- Lyse
- E. Borgen
- Inocean

“Our vision is to harvest the abundant deep water offshore wind resources without the need of public subsidies”

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Sway business strategy:

The four key factors for success will be qualification of the technology through:

- *1:6 floating model Q1 2011*
- *Full scale pilot 2013*
- *Thereafter use the existing industry and their industrial and financial muscles by licensing the technology*
- *Use local manufacturers in the major home markets*

The logo for SWAY, featuring the word "SWAY" in a bold, white, sans-serif font with a slight shadow effect, set against a dark blue background.

Sway history in short

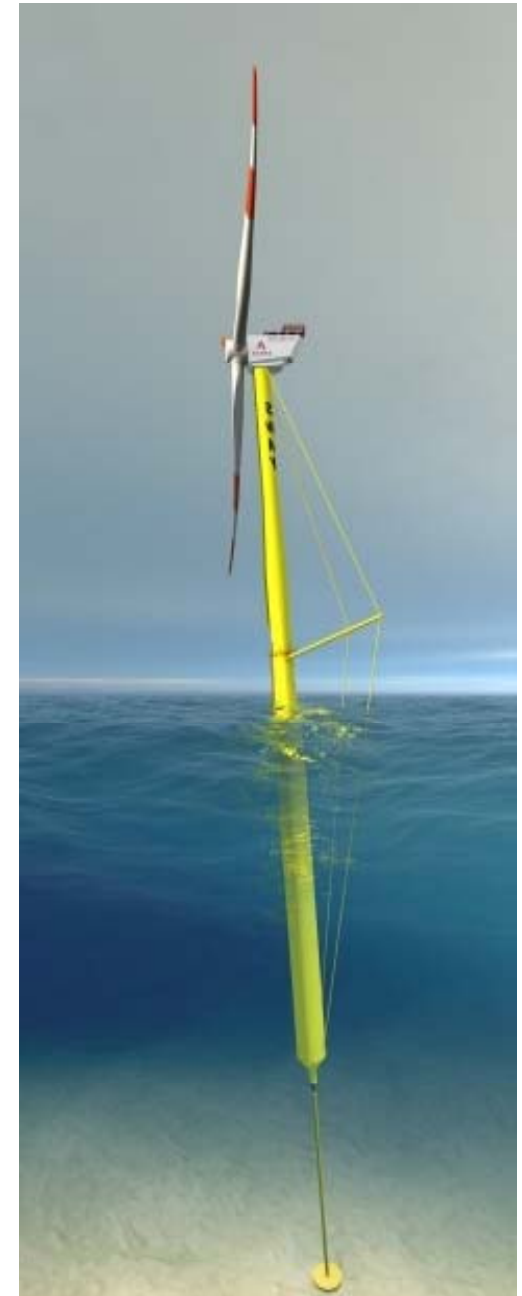
- Sway origins from oil and subsea industry
- 2002-07 Developed a fully integrated simulation tool
- 2007: €20M equity raise. Statoil and Lyse new co-owners
- 2007: Verification of scaled prototype in wave tank
- 2009: Sway received concession floater
- 2010: Split of Sway into two separate companies.
- Q1 - 2011: Deployment of 1:6 scale floater



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Water depth and weather conditions

- 60 – 300m+
- Designed for extreme weather conditions (North Sea).
- 100 year significant wave height $H_s=17\text{m}$
- Max single wave $H=30\text{m}$
- 20 years service fatigue life (60 years actual life)



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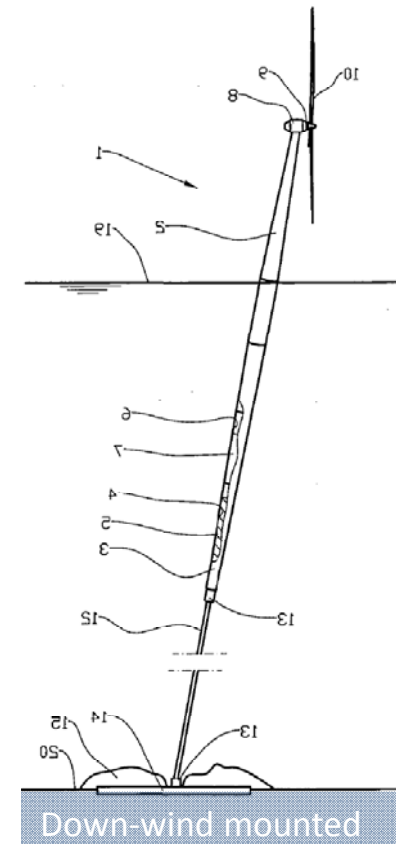
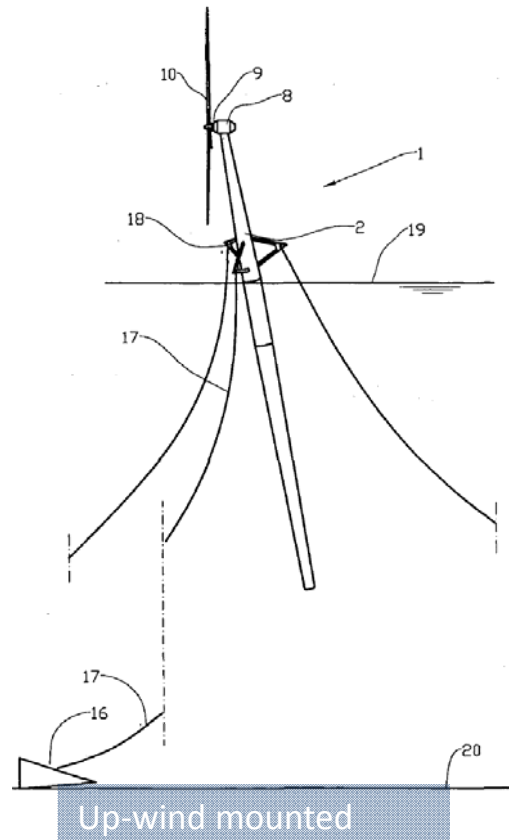
An offshore wind farm with several yellow and white turbines in a blue sea under a cloudy sky. A dark blue banner with the word 'SWAY' in white and green stylized letters is overlaid in the center.

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The road to the best technical solution

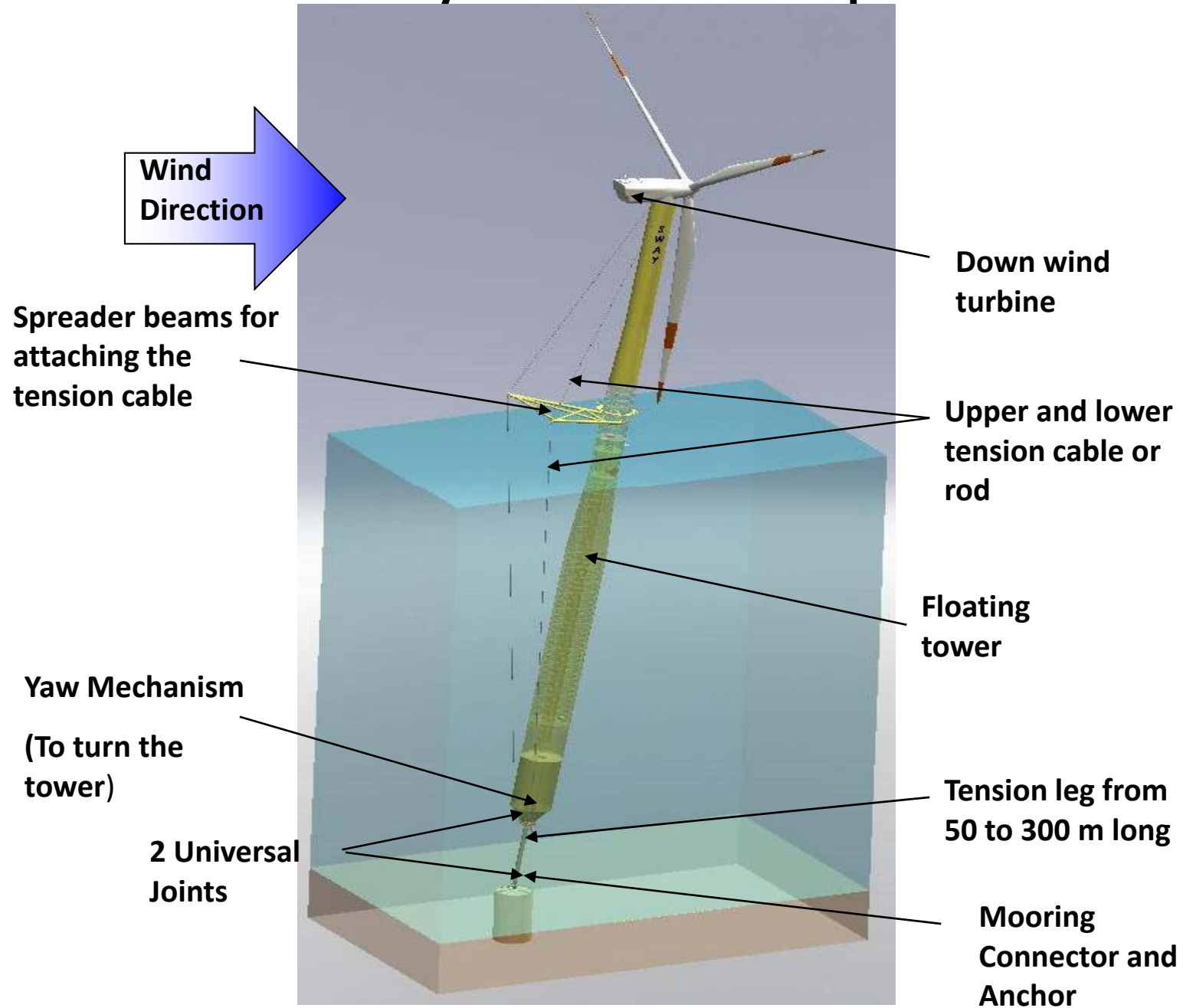
- Patented technology for floating towers, upwind and downwind mounted

Wind direction

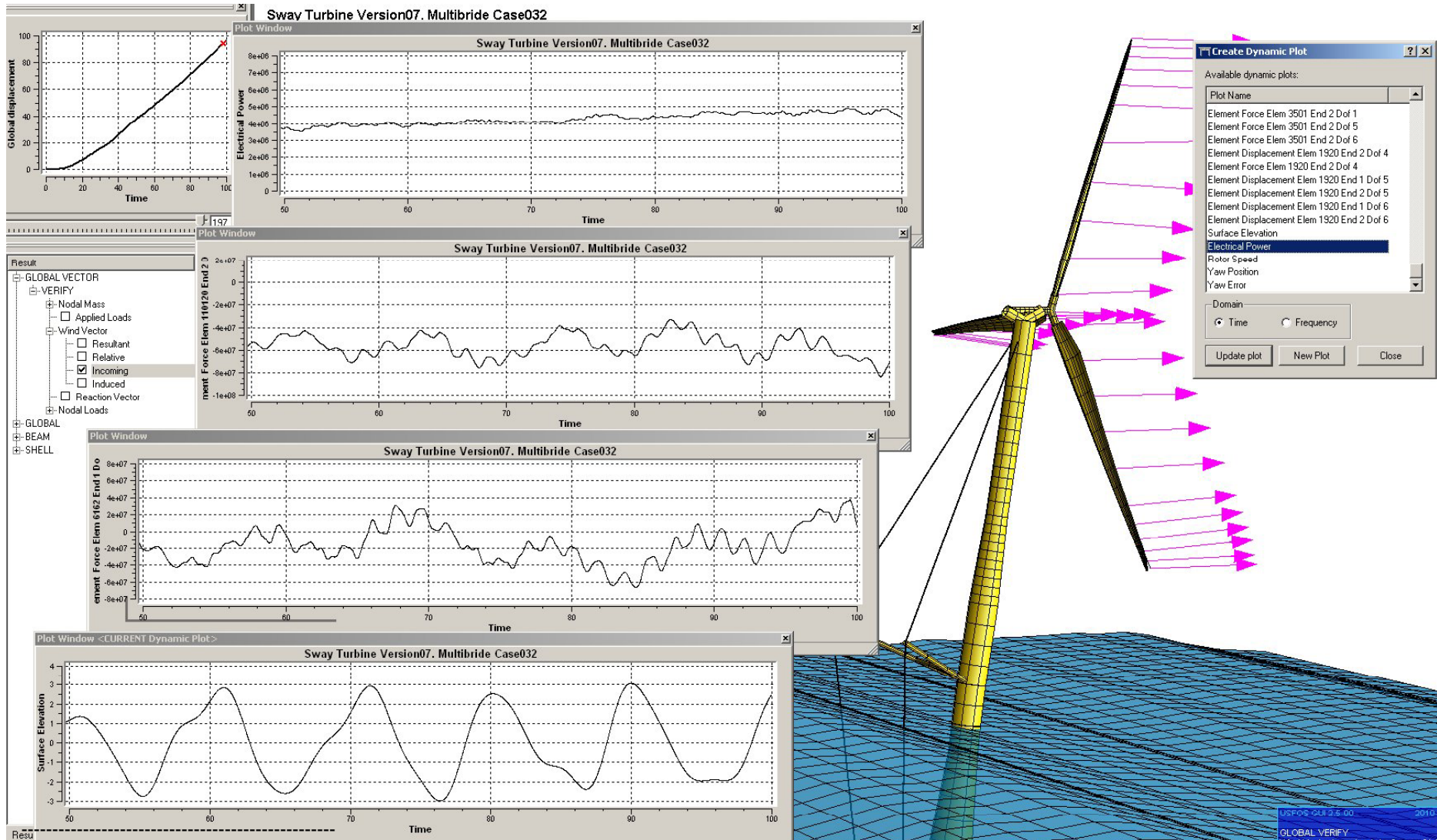


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System description

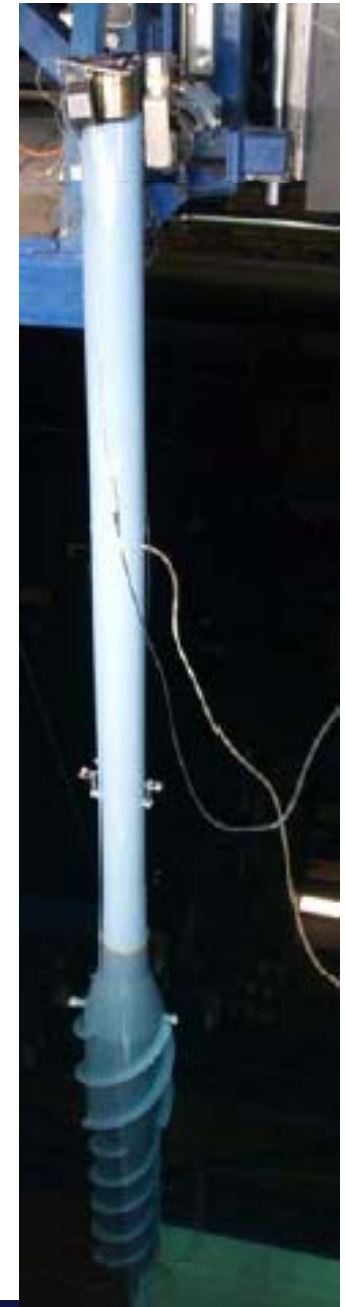
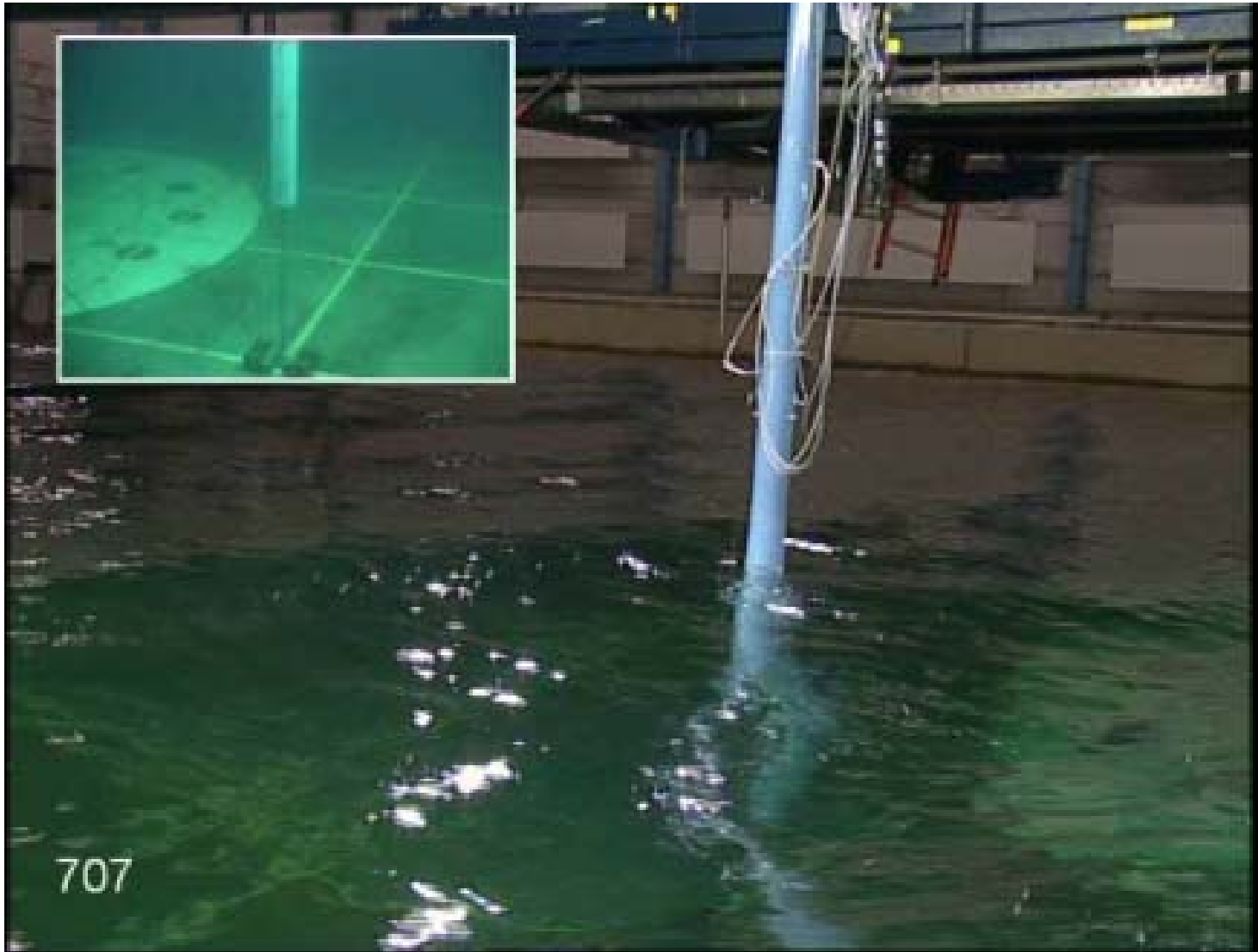


Snapshot from simulation



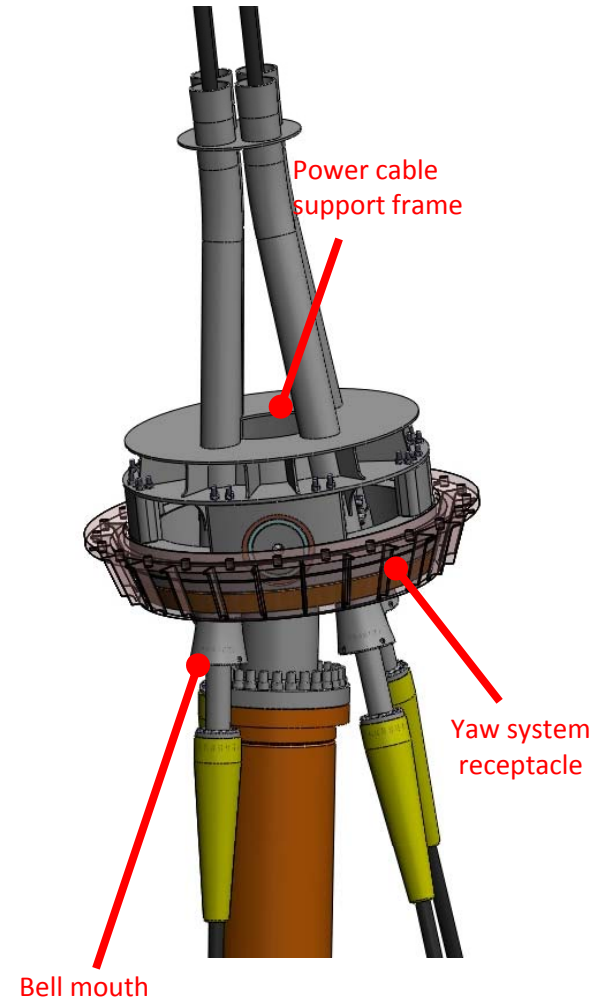
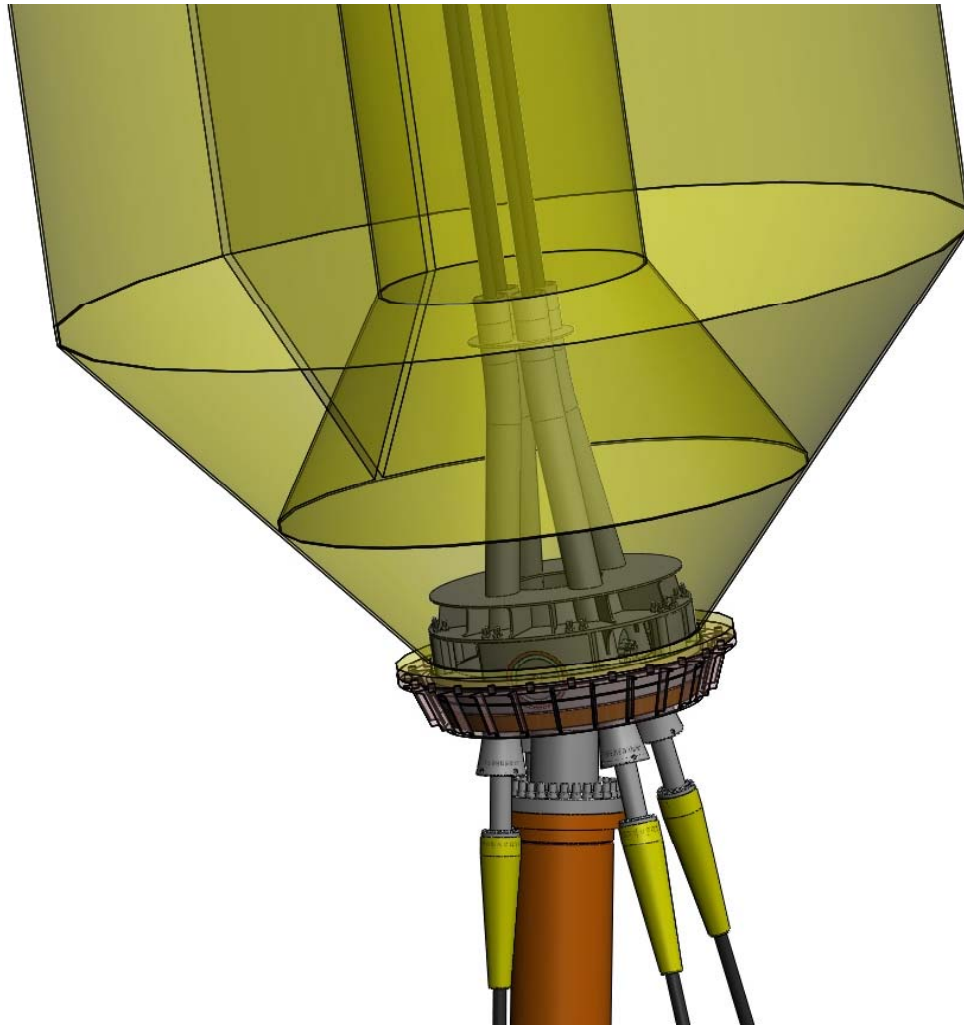
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1:45 tank test



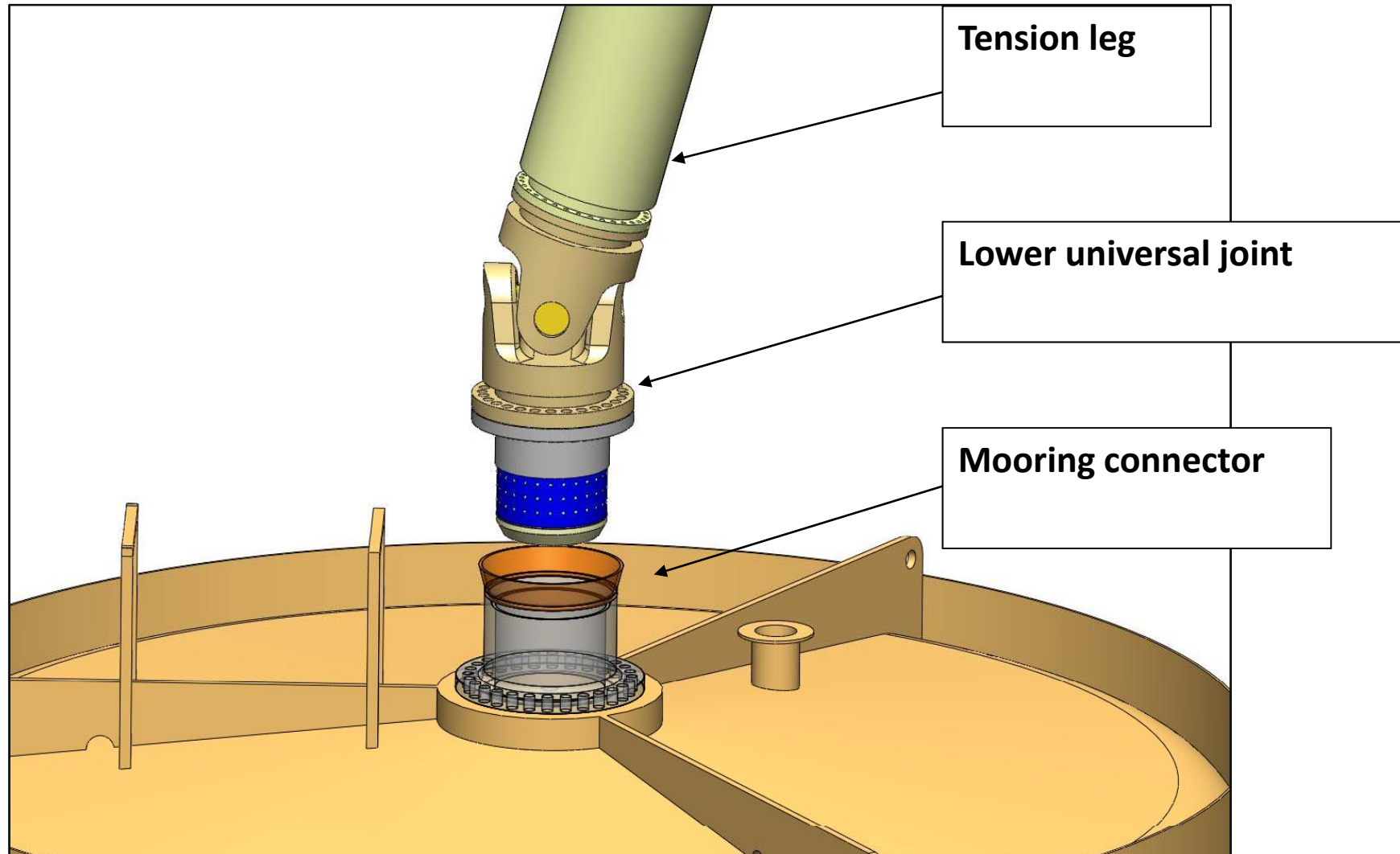
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Yaw mechanism



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Lower universal joint and anchor

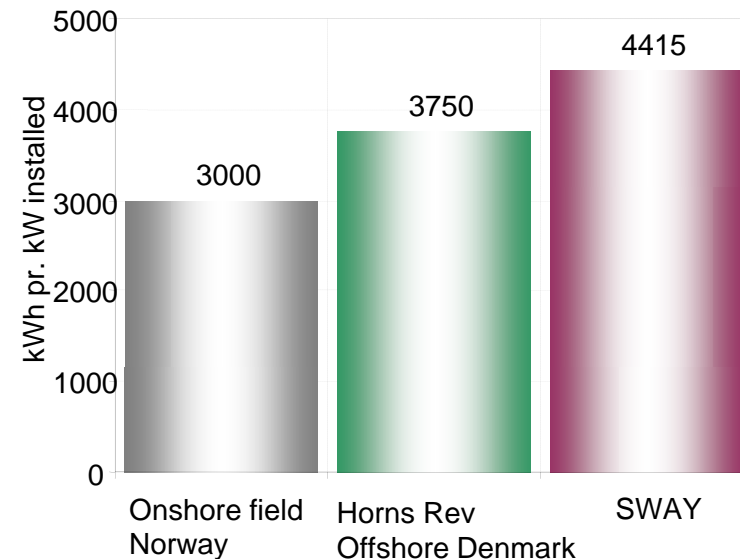


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Why deep water?

- Similar Capex to shallow water, but 20-30% higher annual production
- Flexible positioning (fisheries and other interest)
- Possible to place nearby load centers (save onshore grid)
- Many countries have no alternatives to deep offshore; Spain, US, Japan and Portugal
- Unlimited source of cost competitive clean energy available from 2015
- Potential to reduce costs significantly (30-50%) the next 10-15 years by technology steps.
- Floaters can be game changer in renewable contribution to world energy production

Productivity in kWh/kW installed wind power



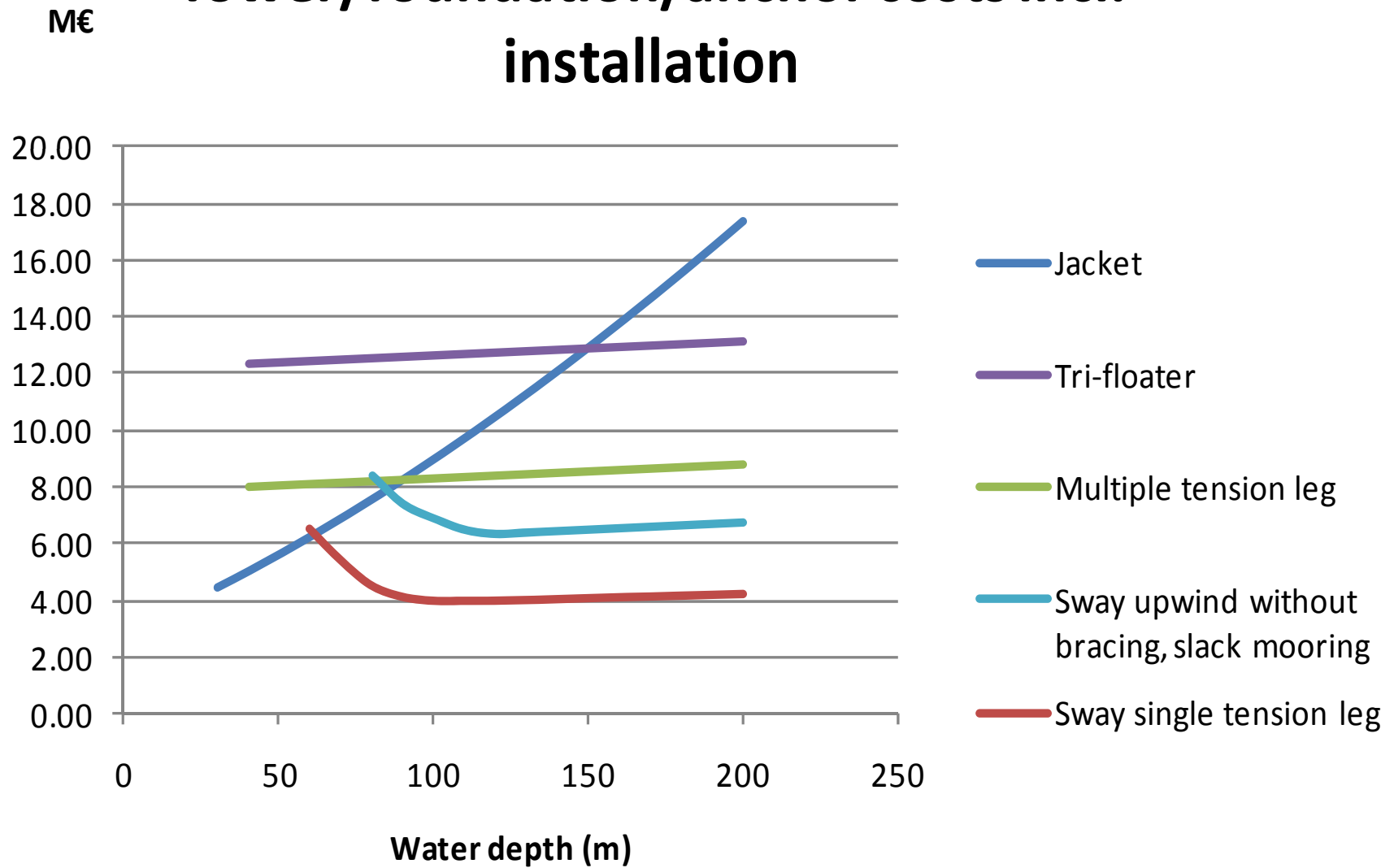
Market for the SWAY floater technology

- Large scale power export to the onshore grid – Asia, USA, Europe etc.
 - *USA (North East and West coast)*
 - *Canada*
 - *Ireland*
 - *Portugal*
 - *Spain*
 - *France*
 - *Italy*
 - *Malta*
 - *Other Mediteranian countries*
 - *Norway*
 - *Japan*
 - *South Korea*
 - *and many more*



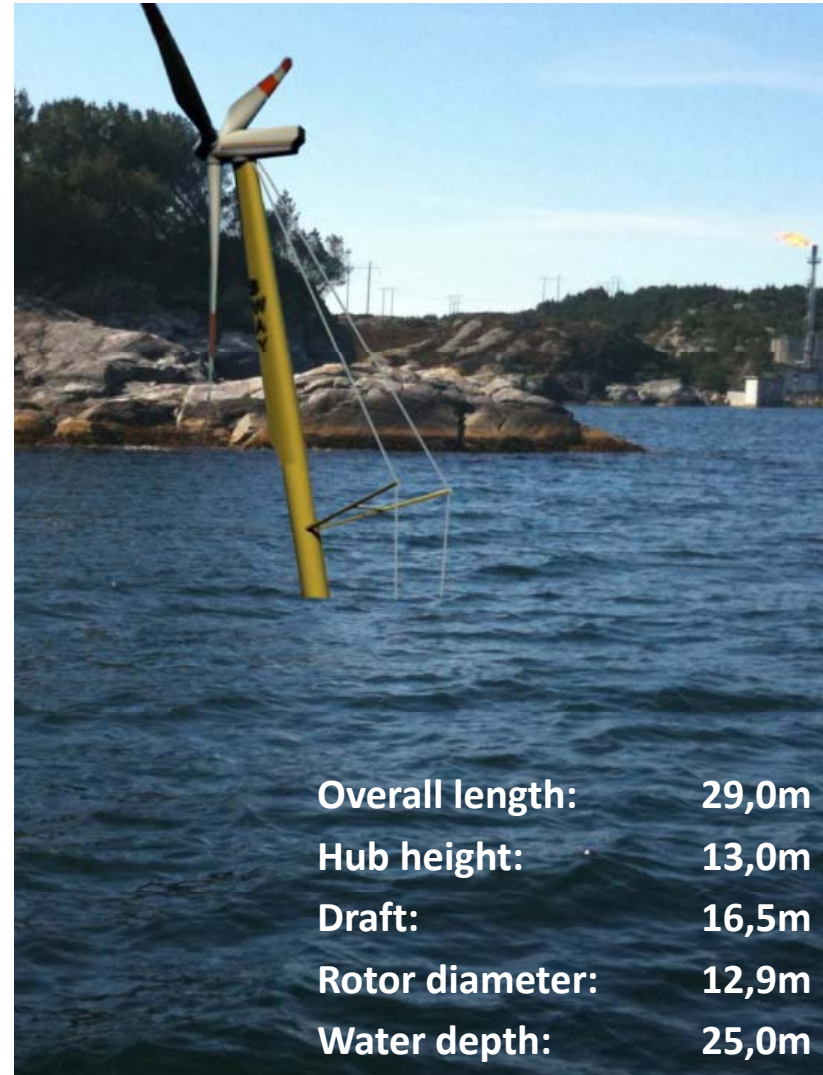
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Tower/foundation/anchor costs incl. installation



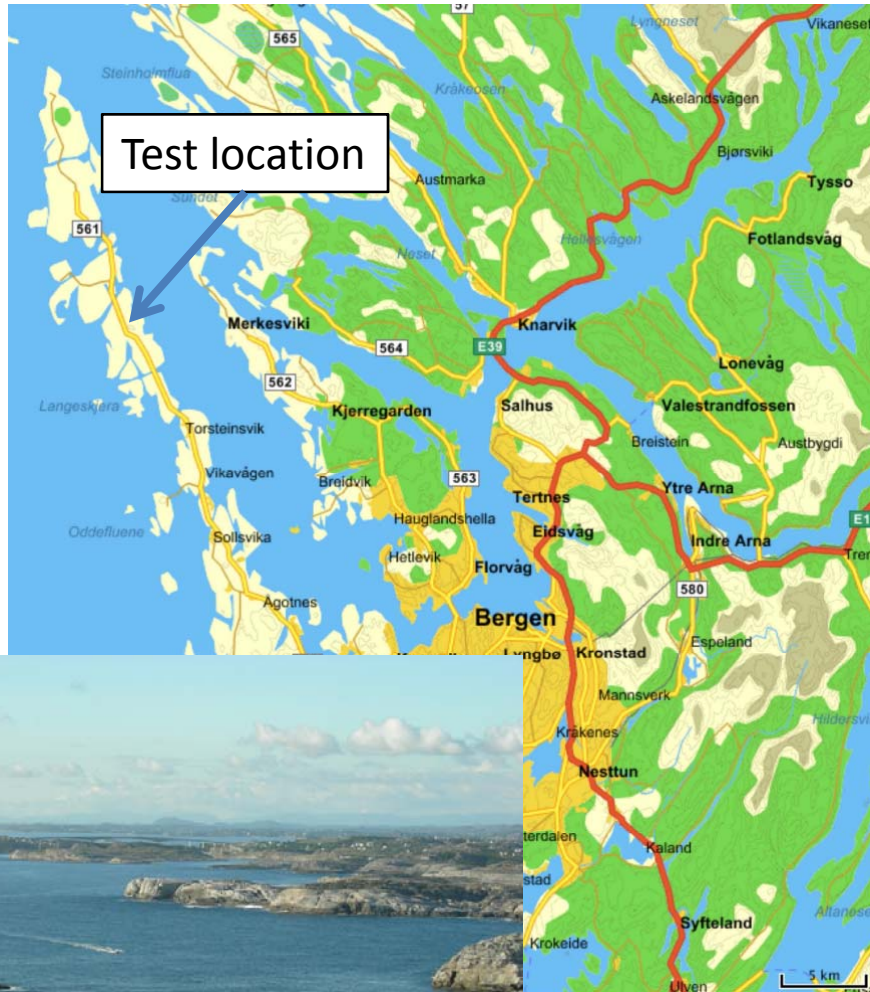
Sway floating tower 1:6 scale in Q1 2011

The test location is near Oil & Gas service facilities at Kollsnes, appx 40 minutes drive from the Bergen airport and Bergen city centre



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Location

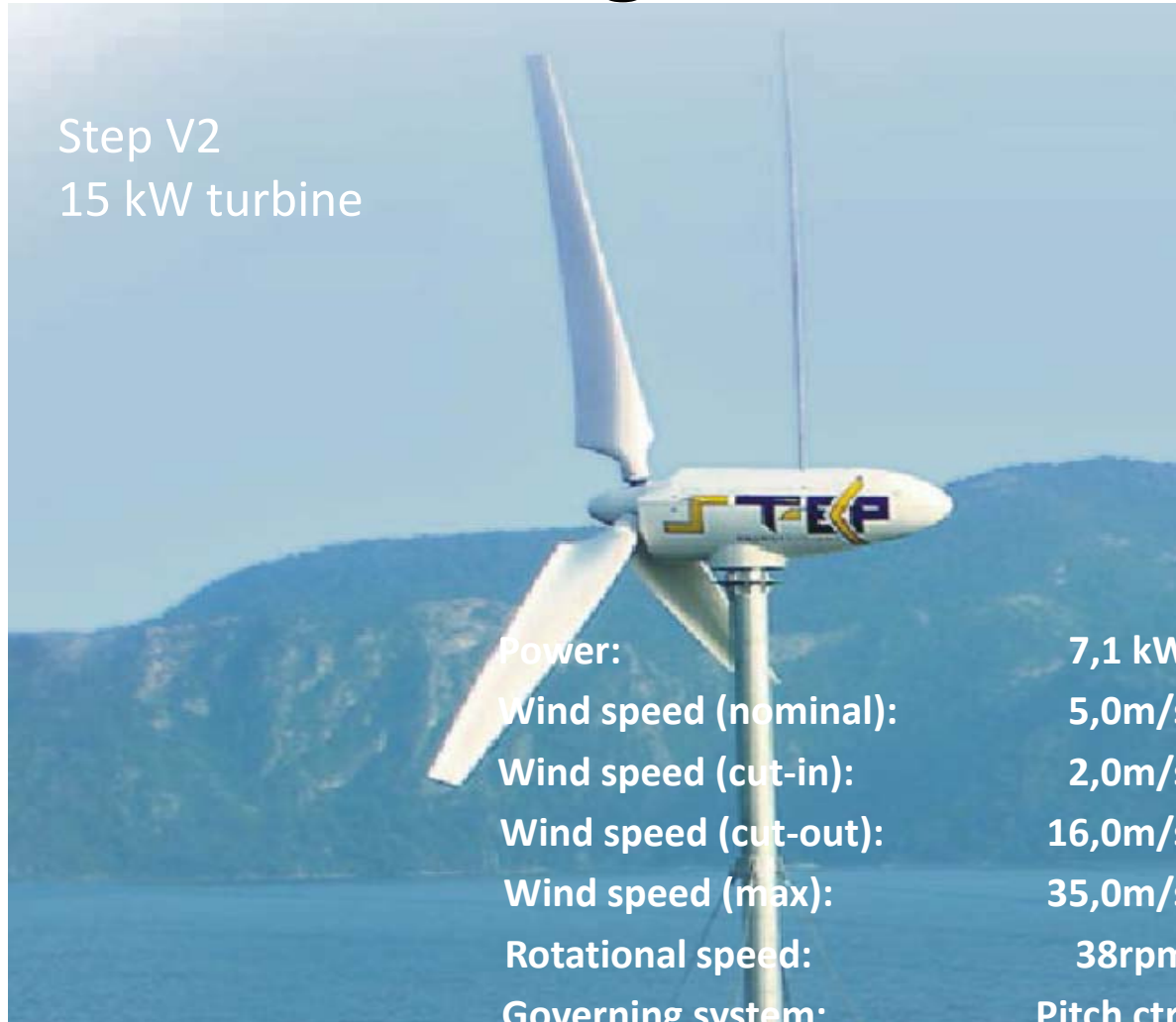


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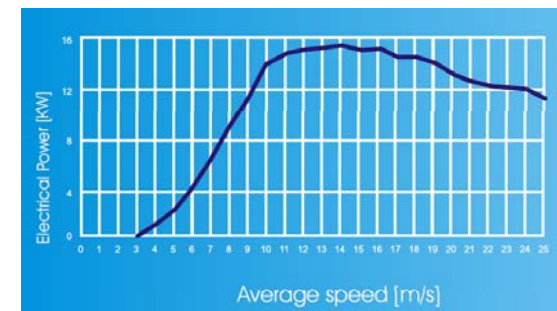
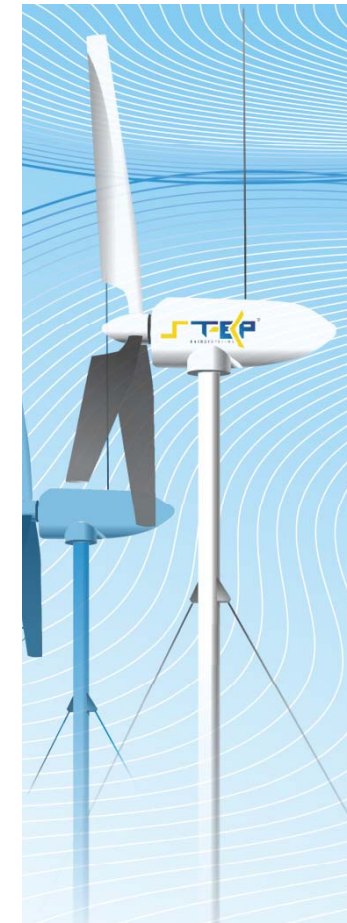
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Model testing turbine

Step V2
15 kW turbine

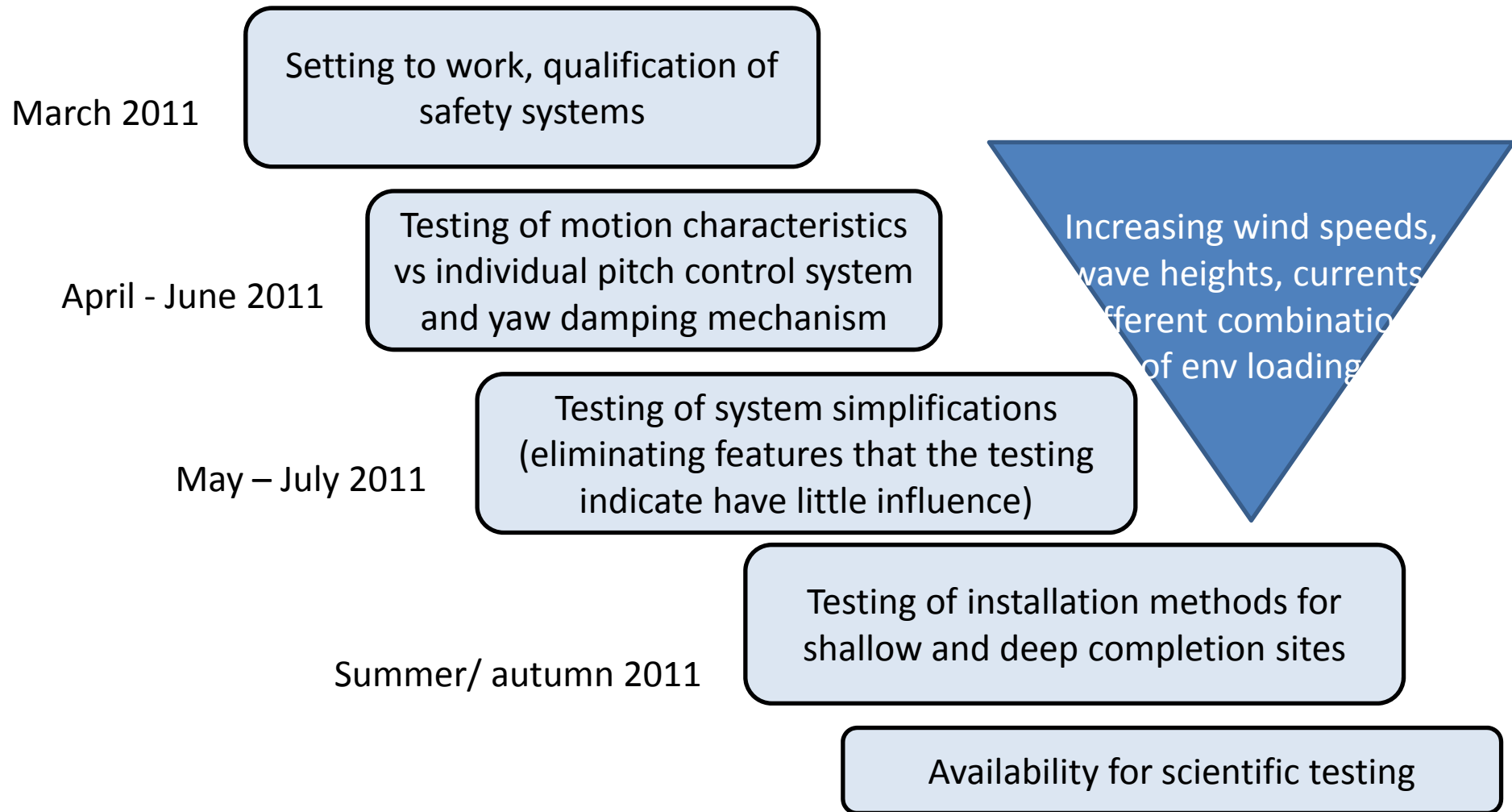


Power:	7,1 kW
Wind speed (nominal):	5,0m/s
Wind speed (cut-in):	2,0m/s
Wind speed (cut-out):	16,0m/s
Wind speed (max):	35,0m/s
Rotational speed:	38rpm
Governing system:	Pitch ctrl



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Test program



Muchas gracias por su atención!

Learn more about Sway at:

www.sway.no



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