Nippon Foundation Seminar, Tokyo, Tuesday, 4th October 2016

Cluster of offshore sector and it's advantage in Norway from capacity building and research perspective

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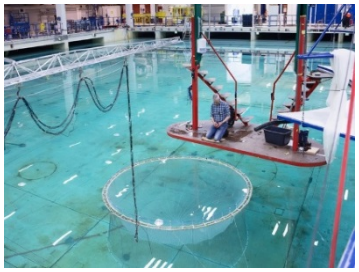
MARINTEK
Norsk Marinteknisk Forskningsinstitutt

SINTEF

Outline

- Setting the stage:
  - It's all about risk mitigation!
  - Marine Technology Center, Trondheim, Norway
  - Norway – 'super cluster' in maritime/offshore/aquaculture industries
- Technology developments in Ocean Space
  - Cross-cutting technologies and innovation in the blue economy - learning from other industries
- MARINTEK role in the innovation processes - mitigation of risk in technology development
- Innovation examples including some short films - O&G, offshore wind and aquaculture
  - Oil and gas: Goliat field development
    - Fixed offshore wind: de-risking mono pile for Dudgeon 402 MW OWF
  - Floating offshore wind: Cost reductions thru real-time hybrid testing
  - Aquaculture: SalMar: 'Ocean Farming'
- Concluding remarks



It's all about risk mitigation – you can never rest!

30rd December 2015

HER TRAFF BØLGEN: Boligkvarteret på riggen COSL Innovator ble truffet av bølgen som tok livet av en 53-år gammel arbeider. 17 lugarventiler ble slått inn av bølgen som skylte over riggen.

Five days in Norway that illustrates the strong need for 'world-class' knowledge, research and competence in the Ocean Space

31st December 2015

Leikeren Eide Barge 33 som er i drift er svært grunn, bare omlag 1,5 meter under havflaten. Den er utstyrt med tre høye overbygg, som gjør at vinden får godt tak.
FOTO: Eide

Rundt 300 personer ble evakuert fra to oljefelter i Nordsjøen i frykt for at en ubemannet lekter som slet seg skulle treffe plattformene.

3rd January 2016

World first test site/laboratory for autonomous technology
Inaugurated October 30th 2016

Marine Technology Center, Trondheim

MARINTEK

NTNU
Norwegian University of Science and Technology

AMOS

Norwegian Centre of Excellence
The Research Council of Norway

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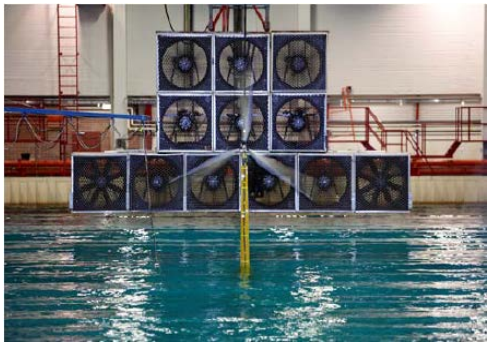
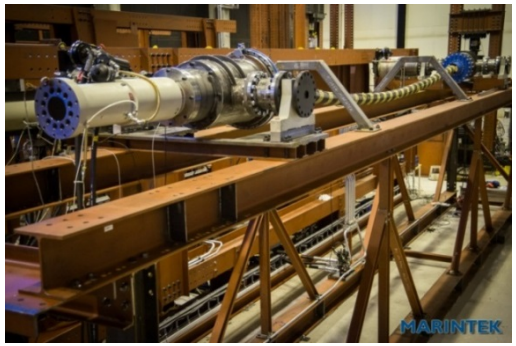
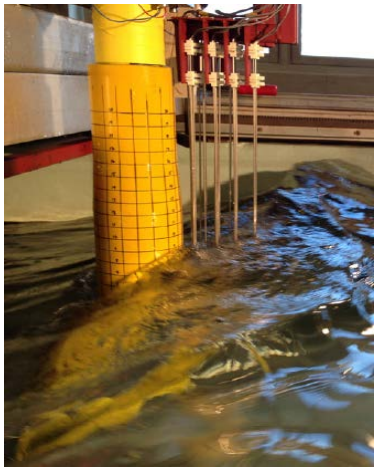
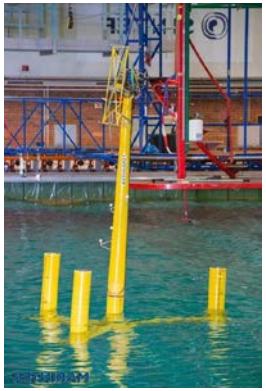
MARINTEK/NTNU unique capabilities and competitive advantage

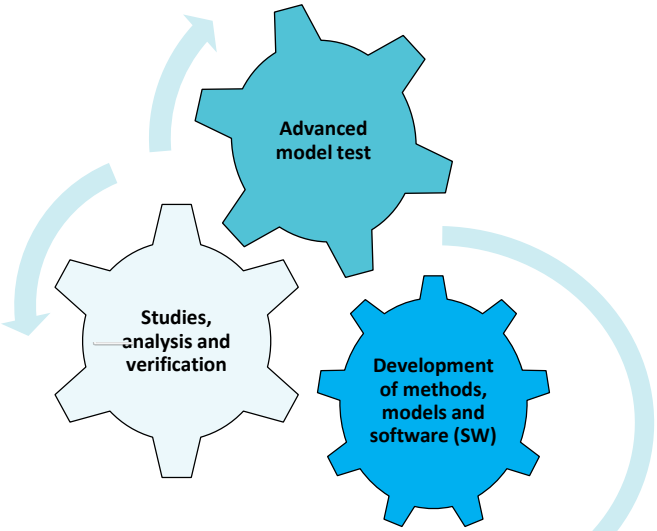
The sum of world-class infrastructure, SW and competence – close contact between industry, applied and fundamental research

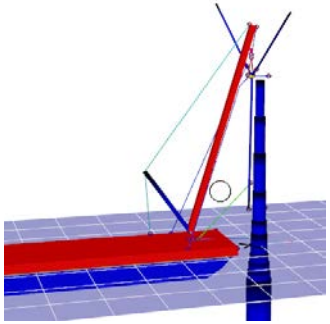


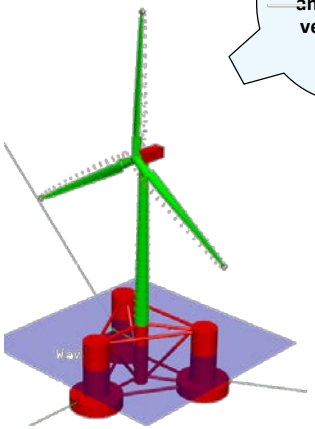


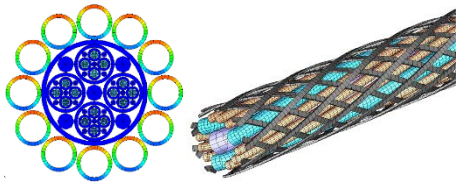


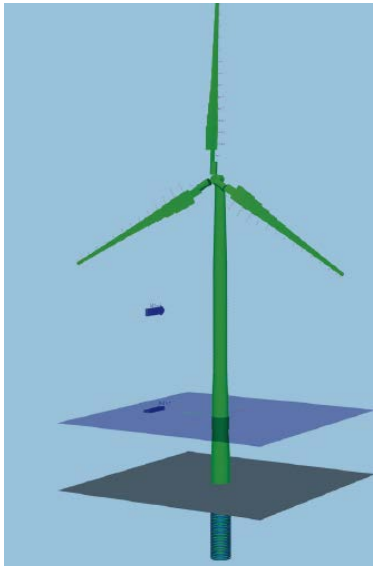




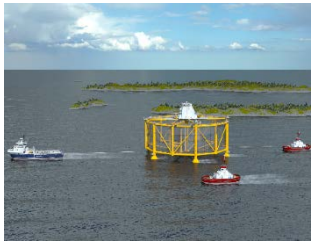




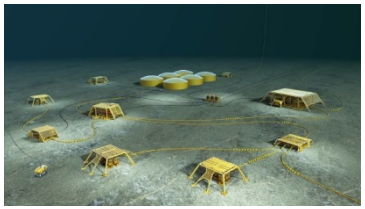




Norway – 'super cluster' in maritime/offshore/aquaculture industries








Aquaculture

Design, ship building industry
Operation offshore vessels

Research &
Development,
Technology, aquaculture

Oil & gas exploration,
operation & distribution,
aquaculture

Maritime service

Electronics
Subsea equipment

Offshore & Drilling Engineering

Knowledge hubs/clusters: **(prof. Torgeir Reve)**

- high concentration of innovative industrial actors
- interacting closely with advanced research institutions, venture capital and competent ownership
- ***In short: co-location, specialization, open innovation, cooperation and competition***

Source: MENON Business Economics, NCE

Ocean Space - The Blue Economy (OECD report: "The Ocean Economy in 2030")

Shipping

Ocean Science and Management

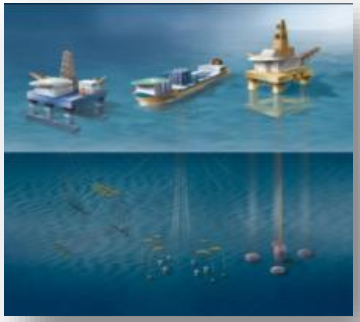
Marine mining

Tourism and consumer market

Offshore renewable energy

Coastal infrastructure

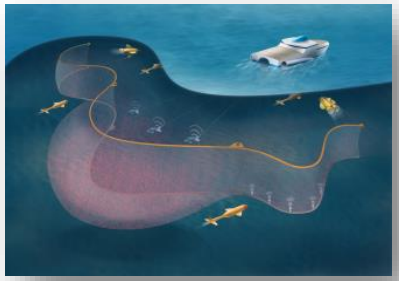
SUPER CLUSTER

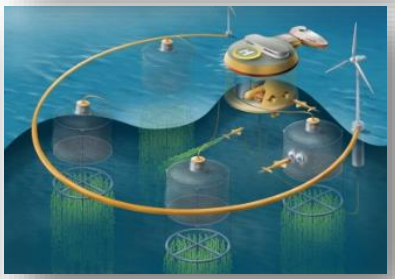


Oil & gas in deeper waters….

…. and in Arctic areas

Fisheries



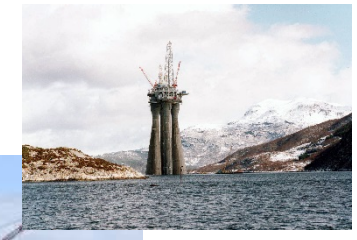


Aquaculture and biological production

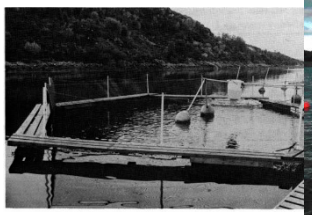
Technology developments in Ocean Space

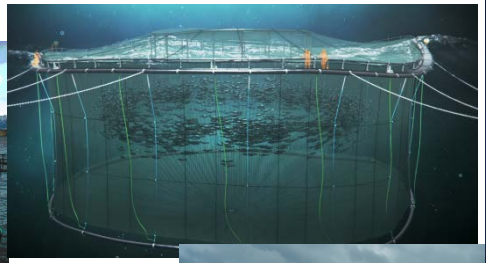
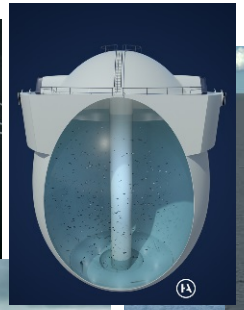
- **Cooperation – national and internationally** - 'cross-cutting technologies' capitalizing of strong maritime and offshore knowledge hubs!
- **Governmental involvement** - *"Why You Can Thank the Government for Your iPhone", Mariana Mazzucato, professor "The Economics of Innovation", University of Sussex, http://time.com/4089171/mariana-mazzucato/*

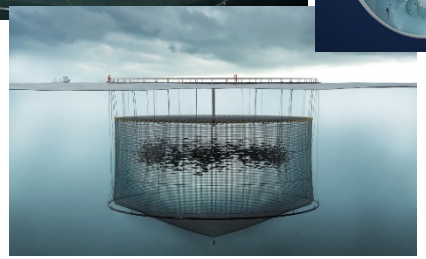






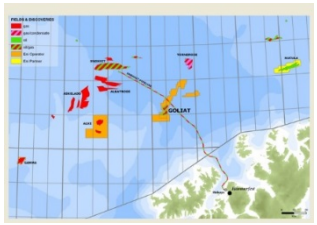


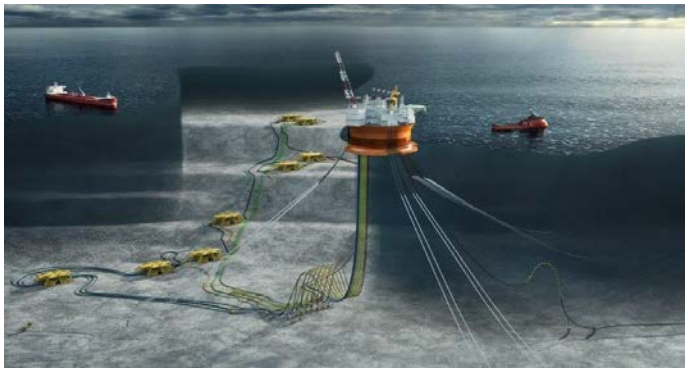





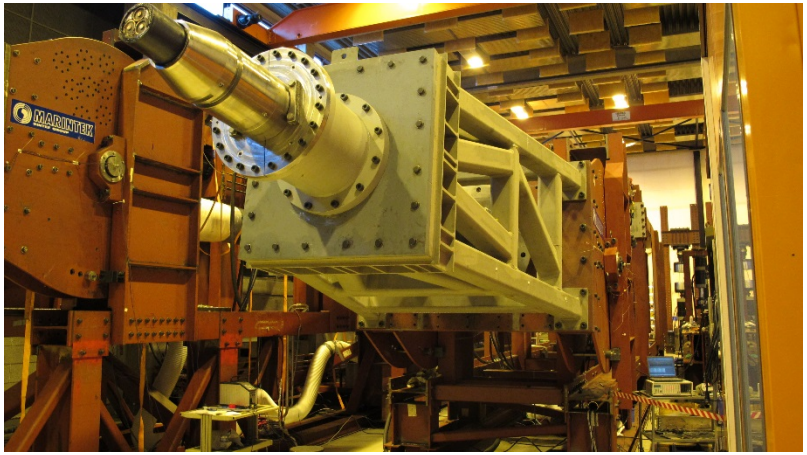

Now!

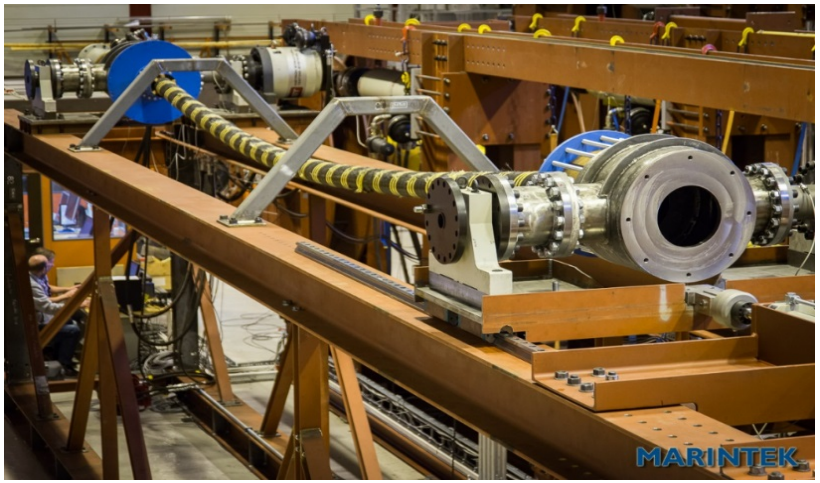
Technology and innovation example #1: Oil and Gas – the Goliat development



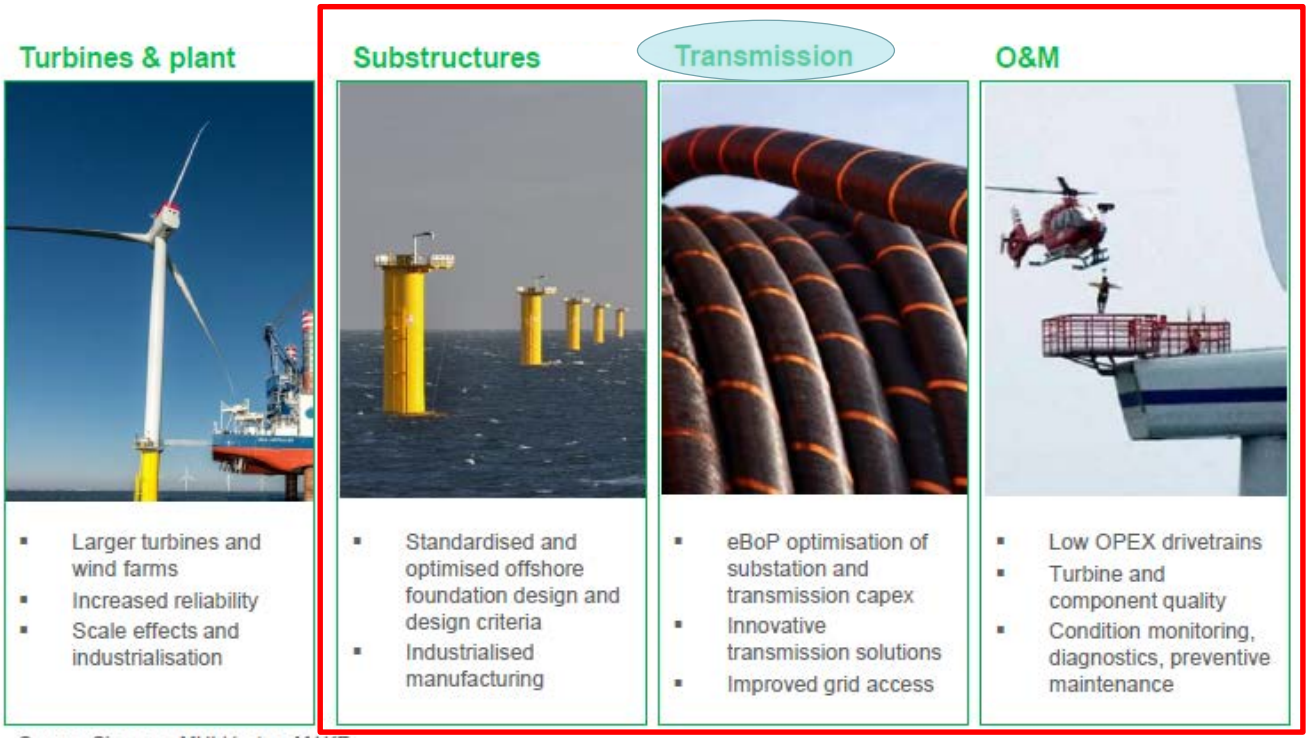


Flexible risers => Umbilicals =>
Subsea Power Cables



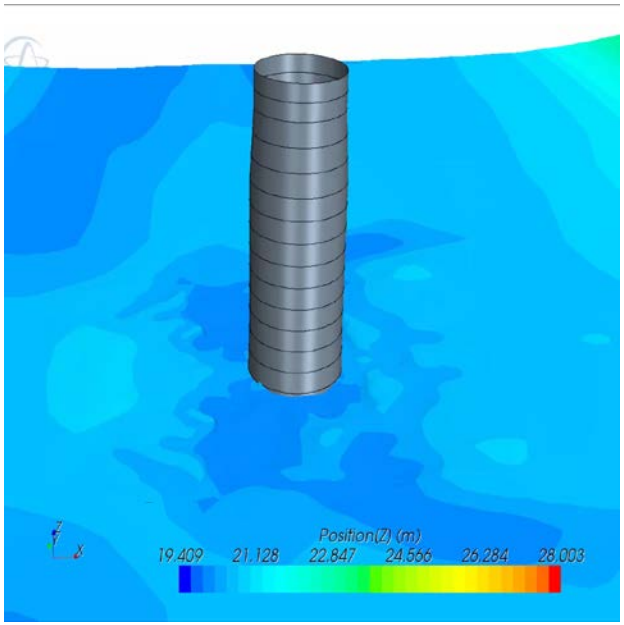


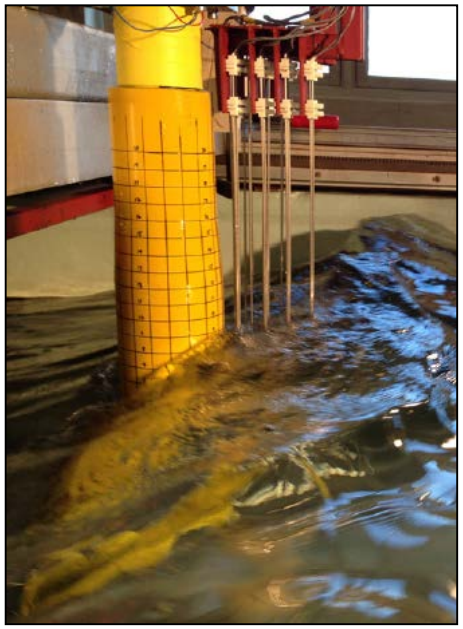
Offshore wind: Norway has a strong positions in offshore technologies from oil and gas that is crucial to meet cost reductions in OW

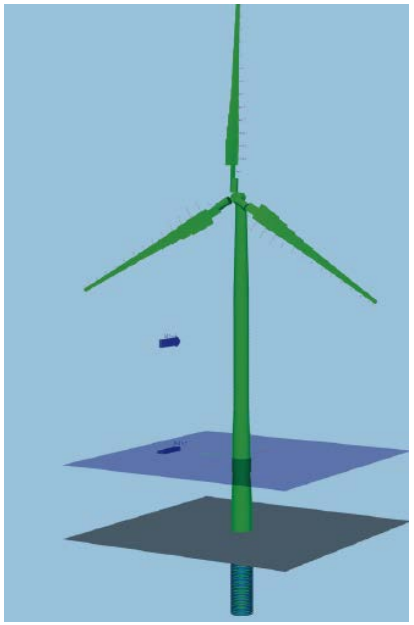


Source: Siemens, MHI-Vestas, MAKE

Technology and innovation example #2: Offshore wind – de-risking mono pile for Dudgeon 402 MW OWF





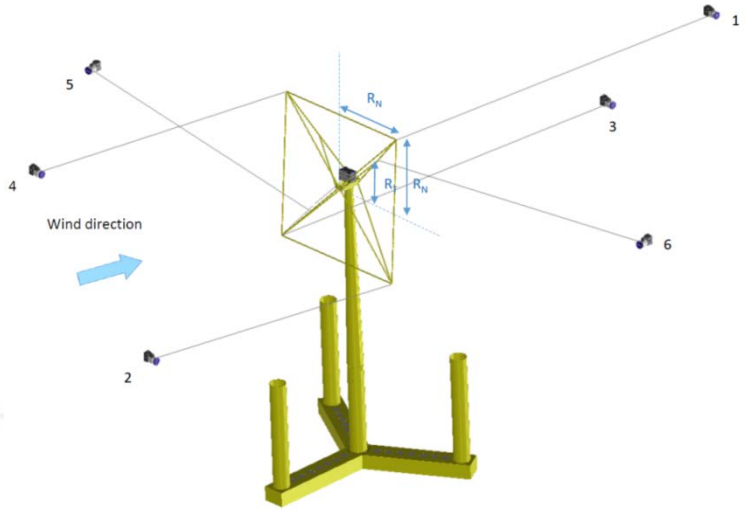


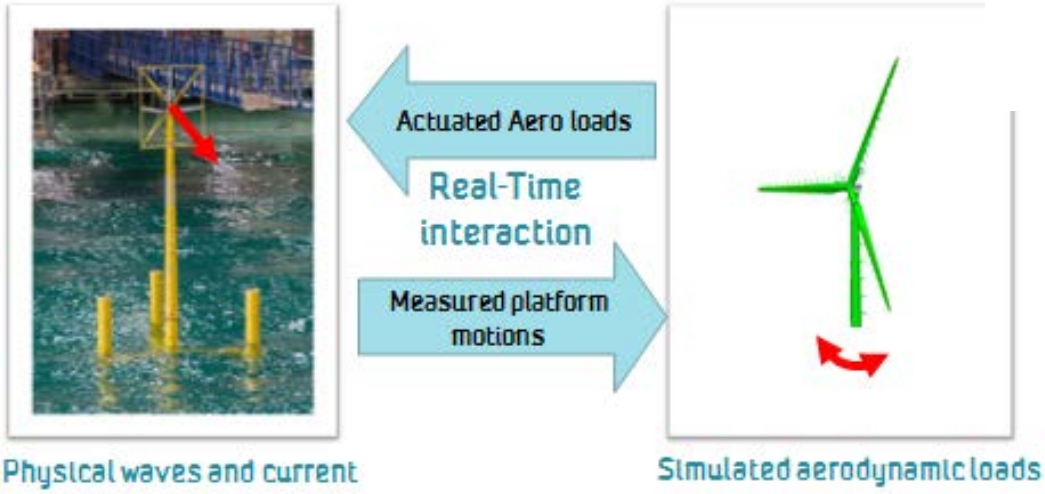
Combining advanced numerical analysis - CFD, fully automated laboratory experiments and coupled finite element analysis using SIMA, MARINTEK 'state-of-the art' SW developed from the oil and gas industry

Technology and innovation example #3: Offshore wind – cost reductions thru real-time hybrid testing

Testing offshore wind turbines is challenging due to conflicts in scaling laws:

Wind loads scales differently than wave loads



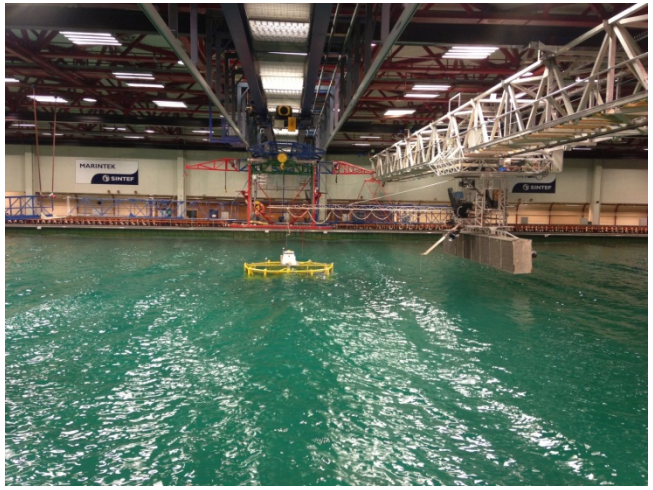


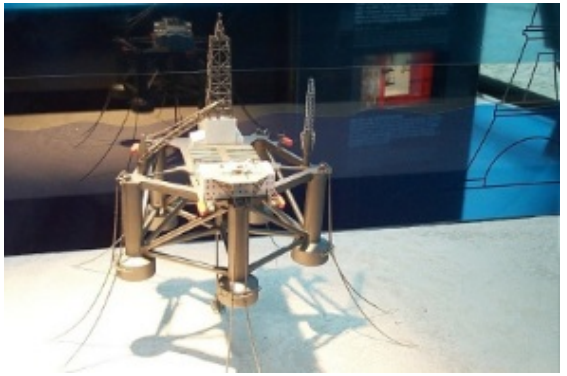
MARINTEK together with NTNU have developed a new method for testing offshore wind turbines:

Combine experiments with real time simulation

Link to YouTube video: https://www.youtube.com/watch?v=jzRDKdyFCTI

Technology and innovation example #4: Aquaculture – 'Ocean Farming'





'Smedvig Tankrederi a.s.' in Stavanger, the first Norwegian drilling rig built in 1971 - "West Venture" (source: www.stavanger.clickwalk.no)

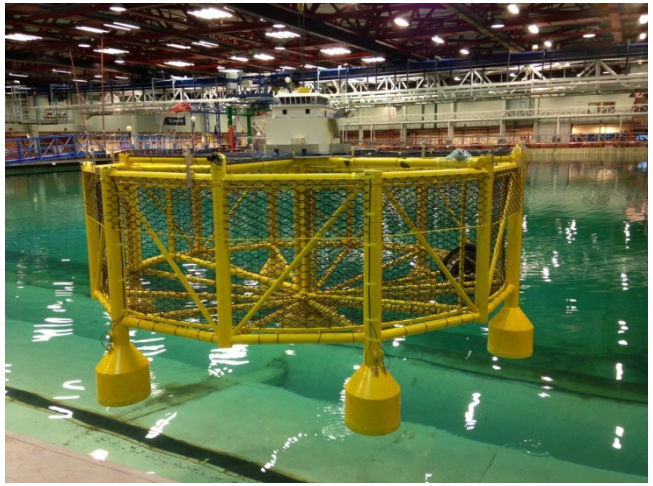


Photo: MARINTEK/Ocean Farming/SalMar

Concluding remarks

- ✓ **Norway is in a good position for a large growth in the Blue Economy from a capacity building and research perspective – capitalizing of our world-class maritime and offshore/maritime knowledge hubs ("super cluster")**
  - ✓ OECD report: "The Ocean Economy in 2030"
- ✓ **There is a strong will for cooperation and commitment by both the Norwegian government and the industry to secure existing and to explore the new opportunities in the Ocean Space**
- ✓ **"Open innovation" is essential**
  - ✓ A very close contact between industry, applied and fundamental research is vital for "boosting" the industrial innovation processes

EXPOSED

sfi Centre for Research-based Innovation
The Research Council of Norway

Student design projects

LIFES50+

"INNOVATIVE FLOATING OFFSHORE WIND ENERGY"


Thank you for your attention!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