

# **NOWITECH**

## **Innovations in offshore wind energy**

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**[www.nowitech.no](http://www.nowitech.no)**

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# NOWITECH in brief

- ▶ A joint pre-competitive research effort
- ▶ Focus on deep offshore wind technology (+30 m)
- ▶ Budget (2009-2017) EUR 40 millions
- ▶ Co-financed by the Research Council of Norway, industry and research partners
- ▶ 25 PhD/post doc grants
- ▶ **Key target: innovations reducing cost of energy from offshore wind**
- ▶ Vision:
  - large scale deployment
  - internationally leading

## Research partners:

- ▶ SINTEF ER (host)
- ▶ IFE
- ▶ NTNU
- ▶ MARINTEK
- ▶ SINTEF ICT
- ▶ SINTEF MC

## Industry partners:

- ▶ CD-adapco
- ▶ DNV GL
- ▶ DONG Energy
- ▶ EDF
- ▶ Fedem Technology
- ▶ Fugro OCEANOR
- ▶ Kongsberg Maritime
- ▶ Norsk Automatisering (TBC)
- ▶ Rolls Royce SmartMotor
- ▶ Statkraft
- ▶ Statnett
- ▶ Statoil

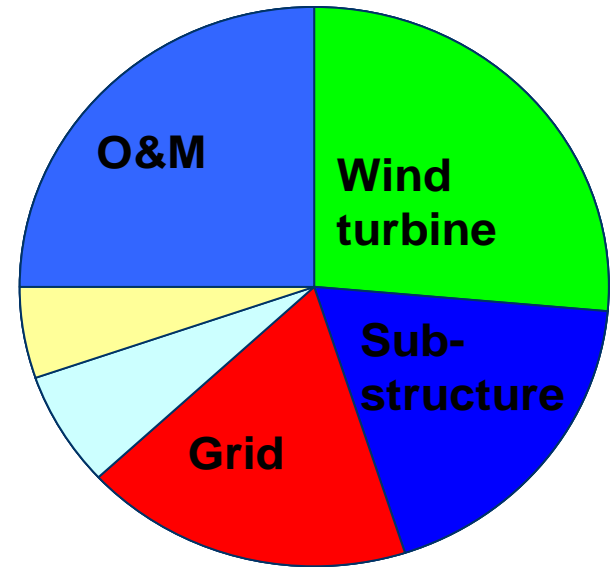
## Associated research partners:

- ▶ DTU Wind Energy
- ▶ Michigan Tech Uni.
- ▶ MIT
- ▶ NREL
- ▶ Fraunhofer IWES
- ▶ Uni. Strathclyde
- ▶ TU Delft
- ▶ Nanyang TU

## Associated industry partners:

- ▶ Devold AMT AS
- ▶ Energy Norway
- ▶ Enova
- ▶ Innovation Norway
- ▶ NCEI
- ▶ NORWEA
- ▶ NVE
- ▶ Wind Cluster Norway

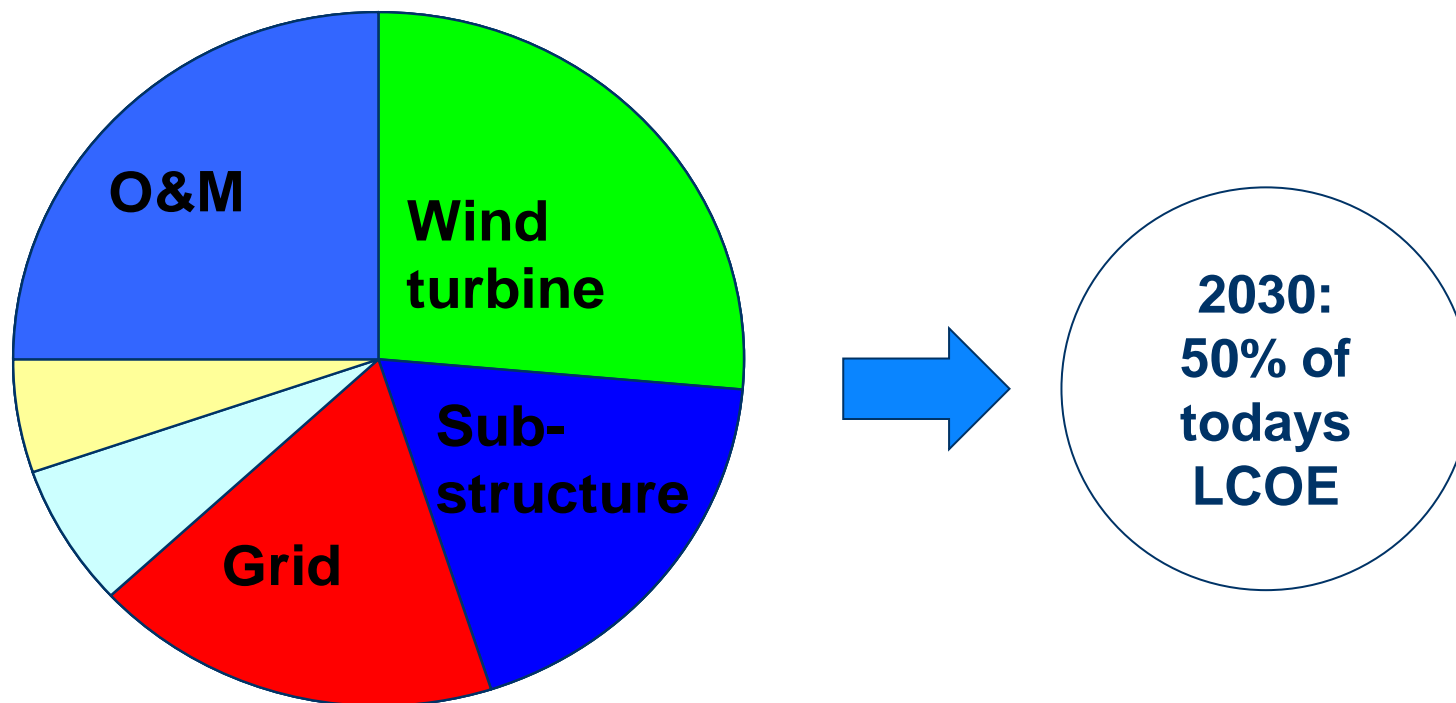
# NOWITECH focus area



**LPC distribution of offshore wind farm (example)**

**Key issue: Innovations reducing cost of energy from offshore wind**

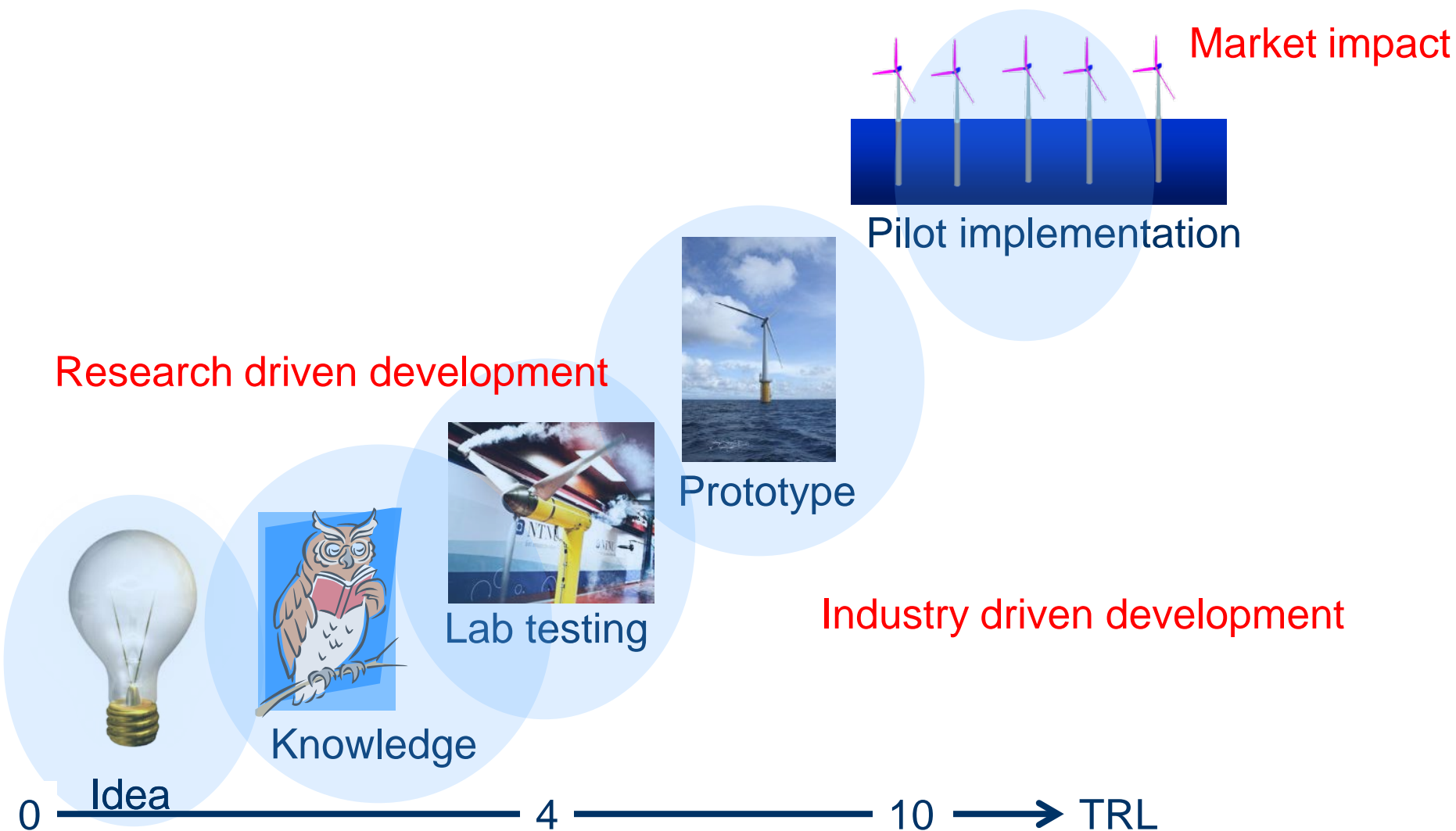
# Offshore wind main challenge: Reduce Cost of Energy



**EU TP wind KPI in new SRA:**

**Reduce LCOE by 50% from present levels for similar sites by 2030**

# From R&D to innovations to cost reductions



# Innovations in NOWITECH (def.)

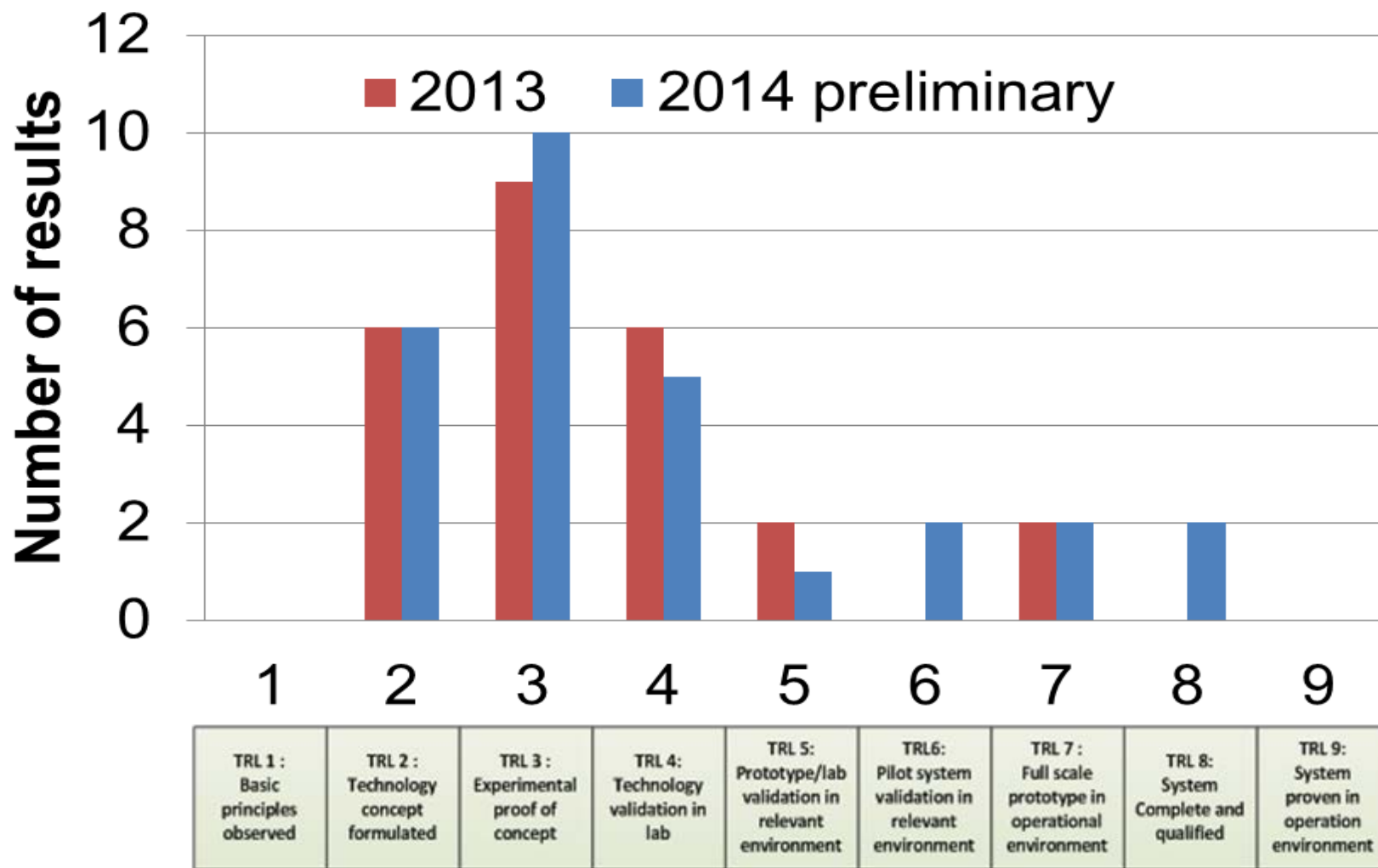
.. are **research results** with potential to be further developed into new or significantly improved goods, services or processes **providing value** for industry and/or society.

## The innovation strategy of NOWITECH

...is to bring forward relevant research results to a certain maturity at which further development is typically industry based towards more competitive and commercial application.

**Transfer of knowledge between R&D and industry is critical for successful innovation**

# Successful innovations are achieved

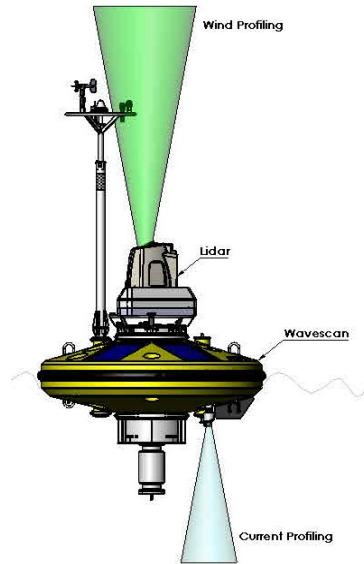




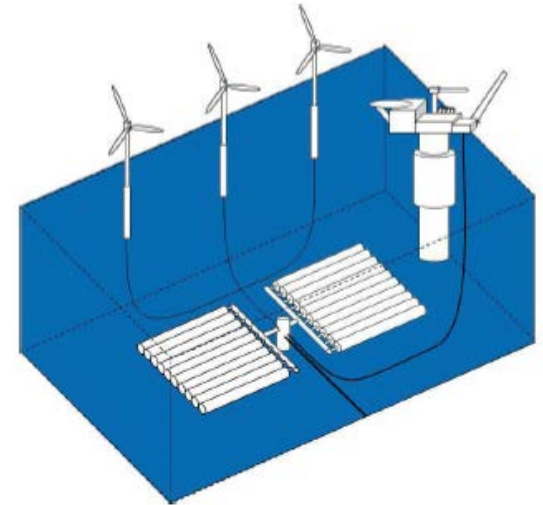
# Tour de Innovations



**ThermaSiC**



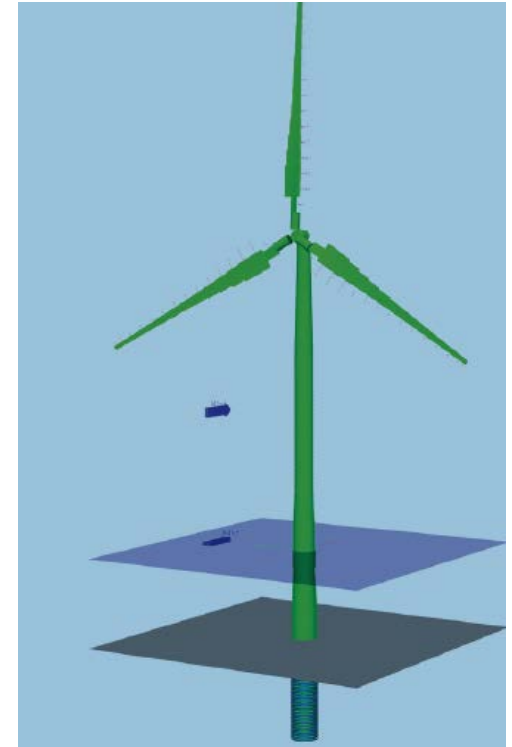
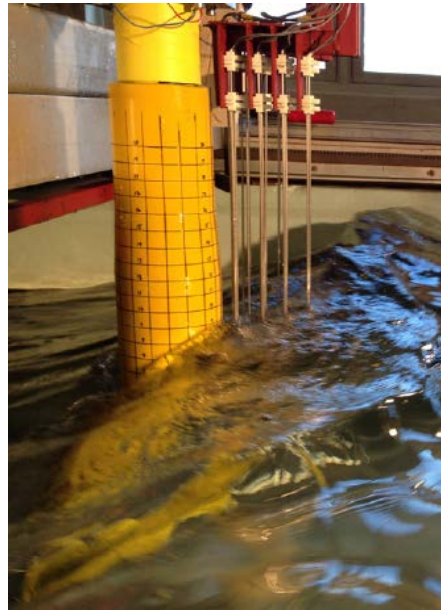
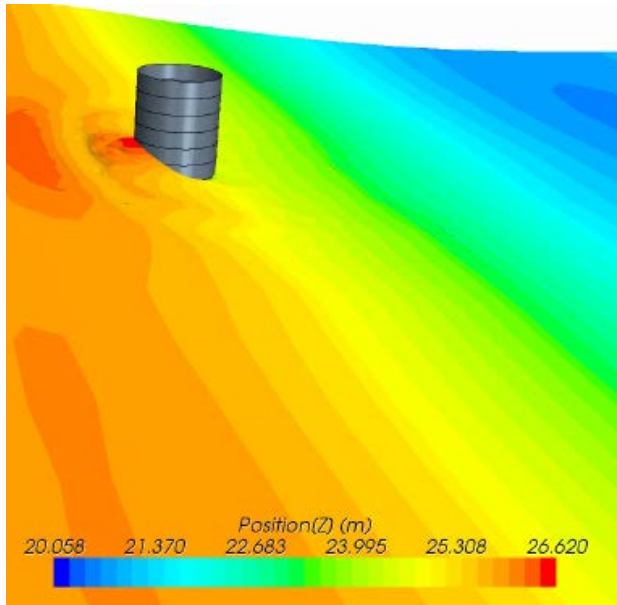
**Fugro Oceanor  
SEAWATCH**



**Sub-Hydro**

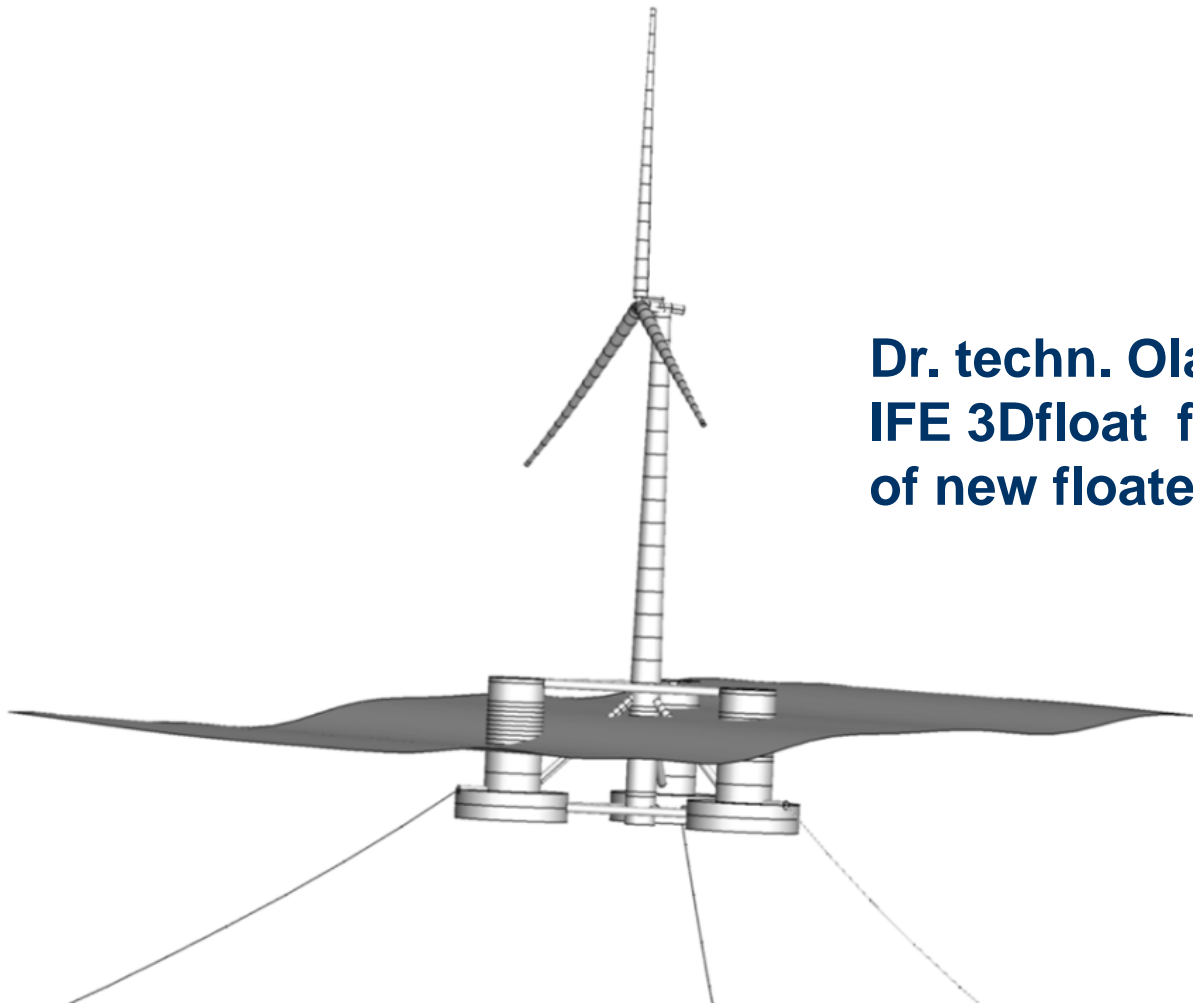


# Tour de Innovations



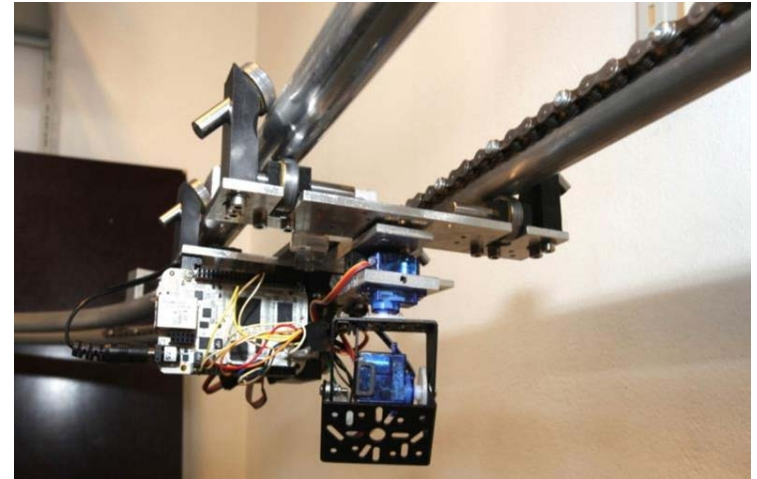
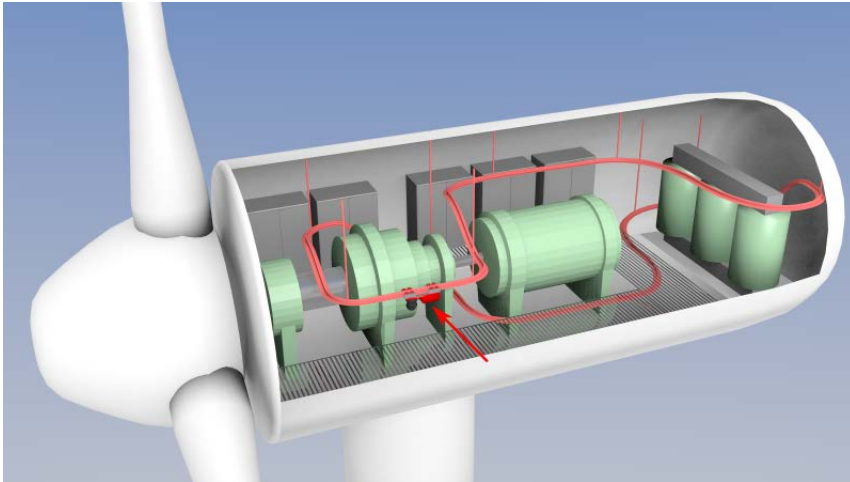
**De-risking monopile for Dudgeon 402 MW Offshore Wind Farm**  
MARINTEK using CFD, lab experiments and FE SIMA analysis

# Tour de Innovations



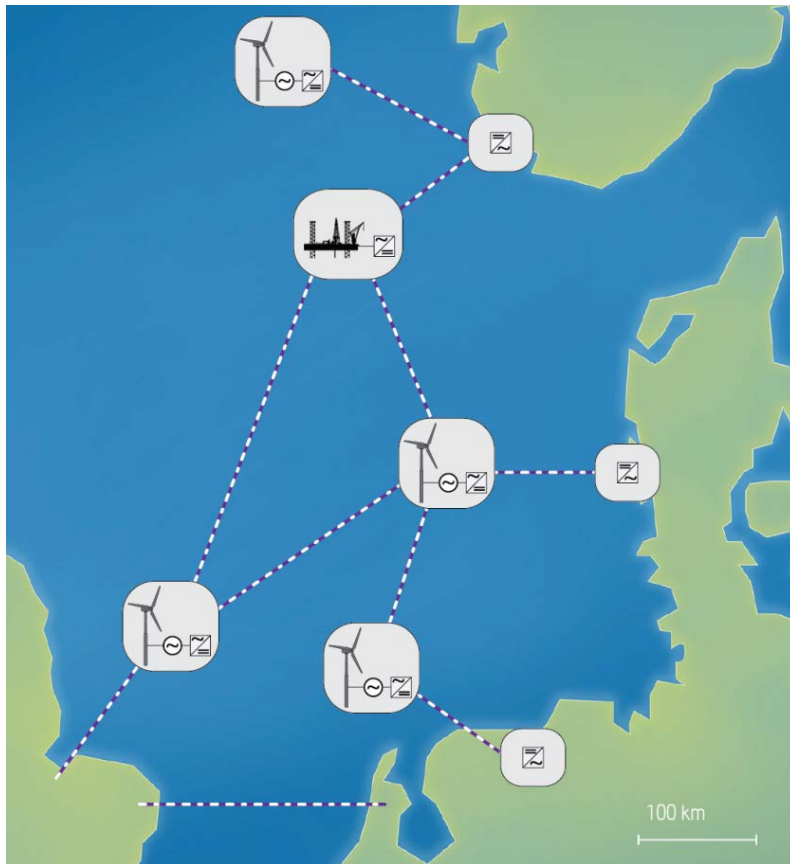
**Dr. techn. Olav Olsen use  
IFE 3Dfloat for development  
of new floaters**

# Tour de Innovations



**Reducing O&M costs by Remote Presence**  
**Norsk Automatisering**

# Tour de Innovations

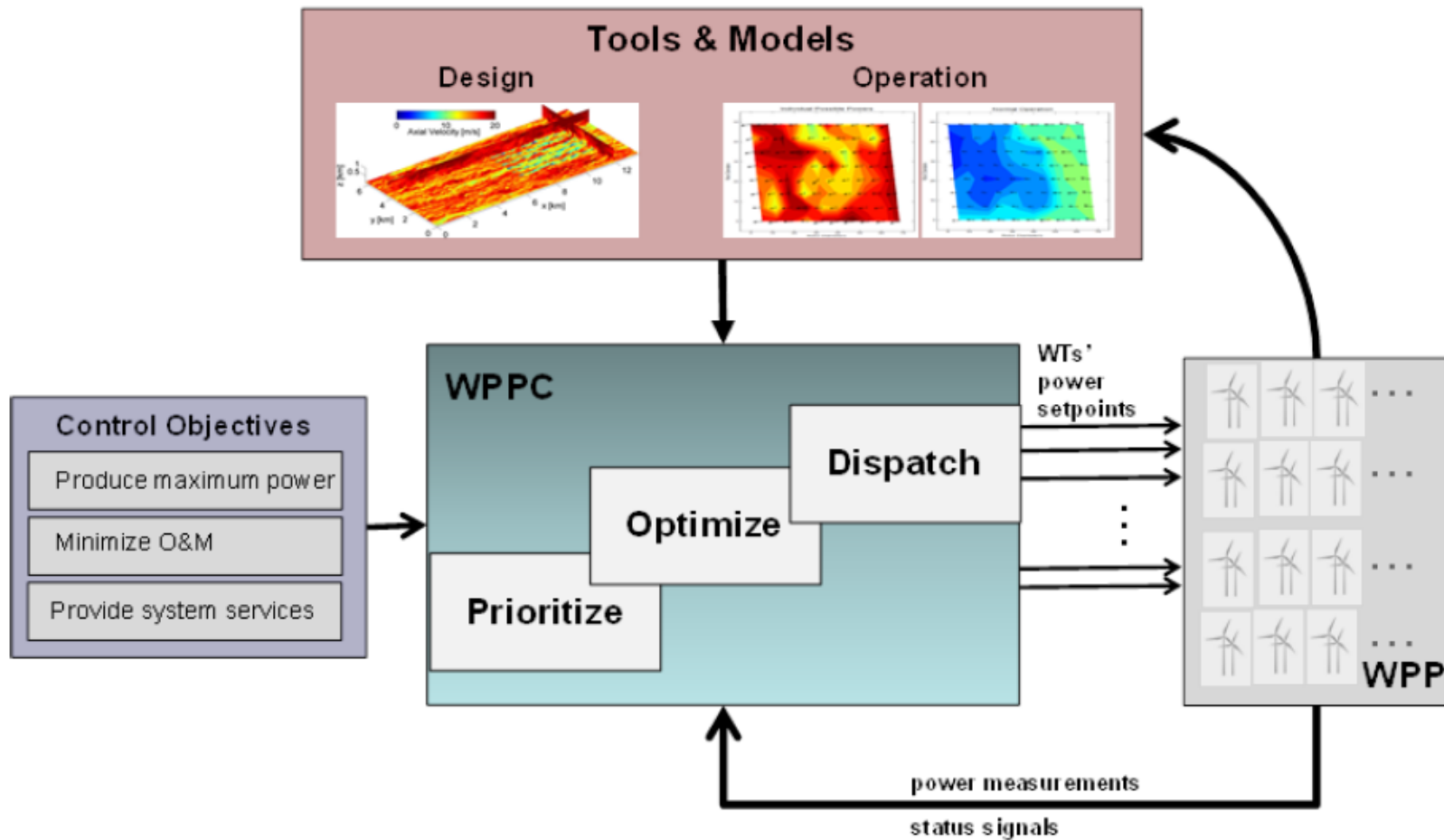


- ▶ Operation and control
- ▶ Converter interoperability
- ▶ System stability
- ▶ Fault handling
- ▶ System services
- ▶ Security of supply
- ▶ New market solutions



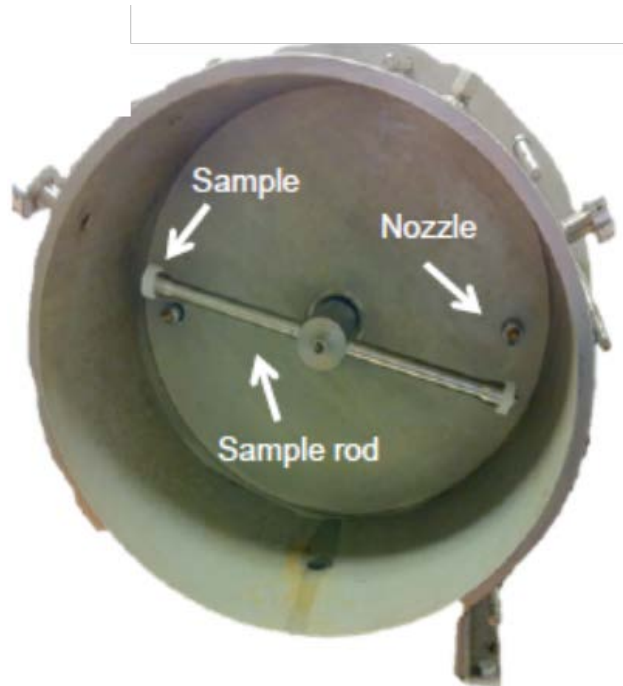
**Enabling far offshore wind farms with HVDC and VSM technology**

# Tour de Innovations



## SmartWind (H2020) wind farm control concept

# Tour de Innovations

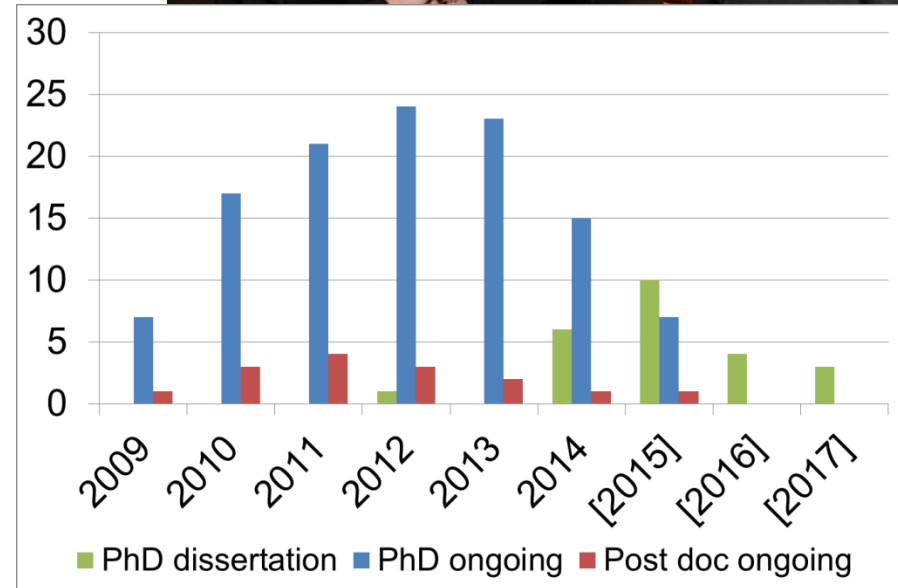


**Droplet erosion test facility developed by SINTEF MC**



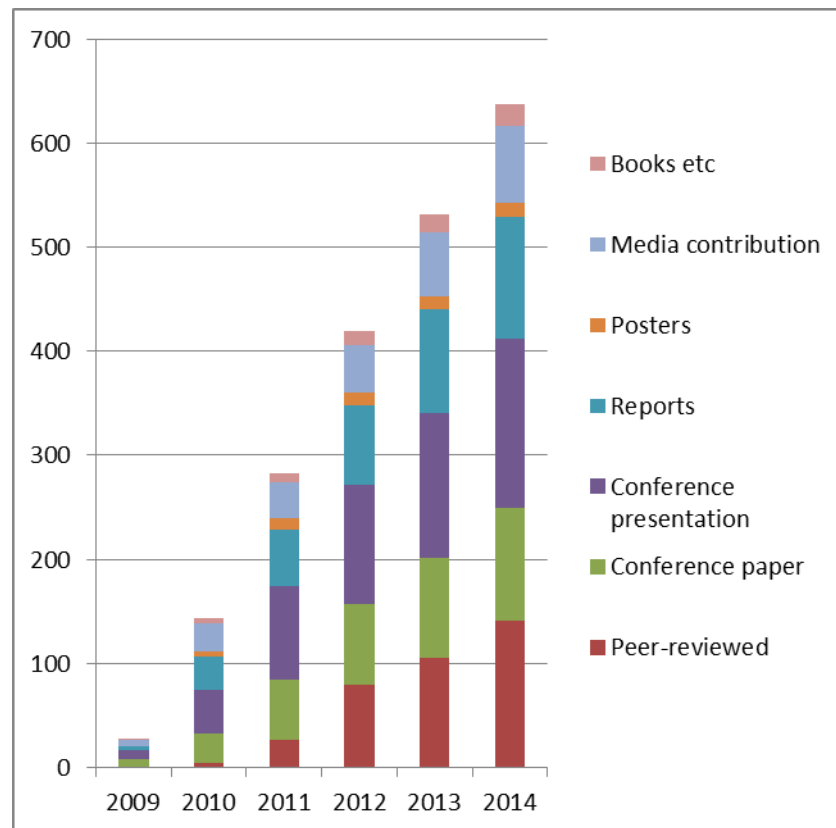
# Recruitment and education

- ▶ 24 PhD and 5 post doc students are granted by NOWITECH
- ▶ In addition, through other funding, 25 PhD students and 3 post docs are ongoing at NTNU
- ▶ Since start of NOWITECH some hundred master students have specialized within wind energy
- ▶ The Erasmus Mundus European Wind Energy Master (EWEM) programme gives further weight to the wind education at NTNU and NOWITECH



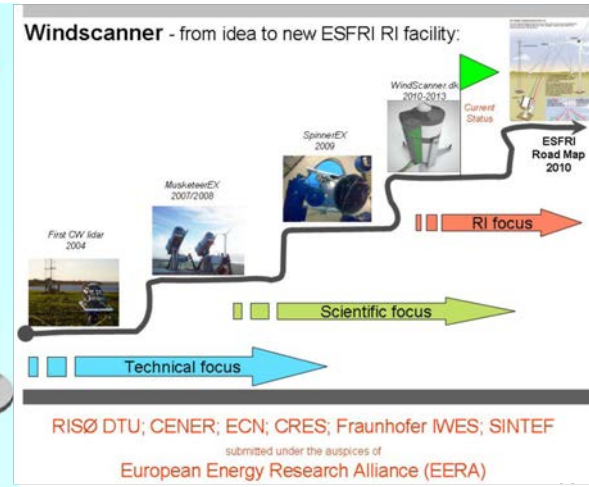
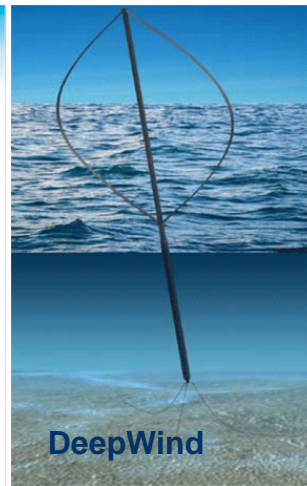
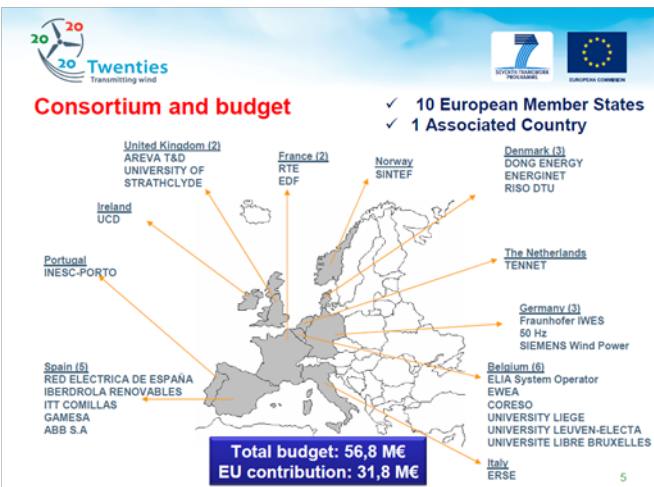
# Efficient dissemination of results

- ▶ Active use of web, newsletters and e-room for information sharing
- ▶ 637 publications by NOWITECH at e-room database with full text access for all partners
- ▶ Workshops/meetings for partners
- ▶ Established seminar series on **Industry meets Science** with Wind Cluster Norway
- ▶ Wind energy R&D conference held every January in Trondheim: **EERA DeepWind**



# An attractive partner on the international scene

- ▶ Active in EERA, TPwind, EAWE, IEA, IEC
- ▶ Heading offshore works within EERA JPwind and TPwind
- ▶ Partner in EU projects, e.g.: Twenties (2009-), DeepWind (2010-), HiPRWind (2010-), EERA-DTOC (2012-), InnWind (2012-), WindScanner (2012-), LeanWind (2014-), EERA IRP wind (2014-), BestPaths (2014-) ; + H2020 applications



# NOWITECH achievements



Successful innovations



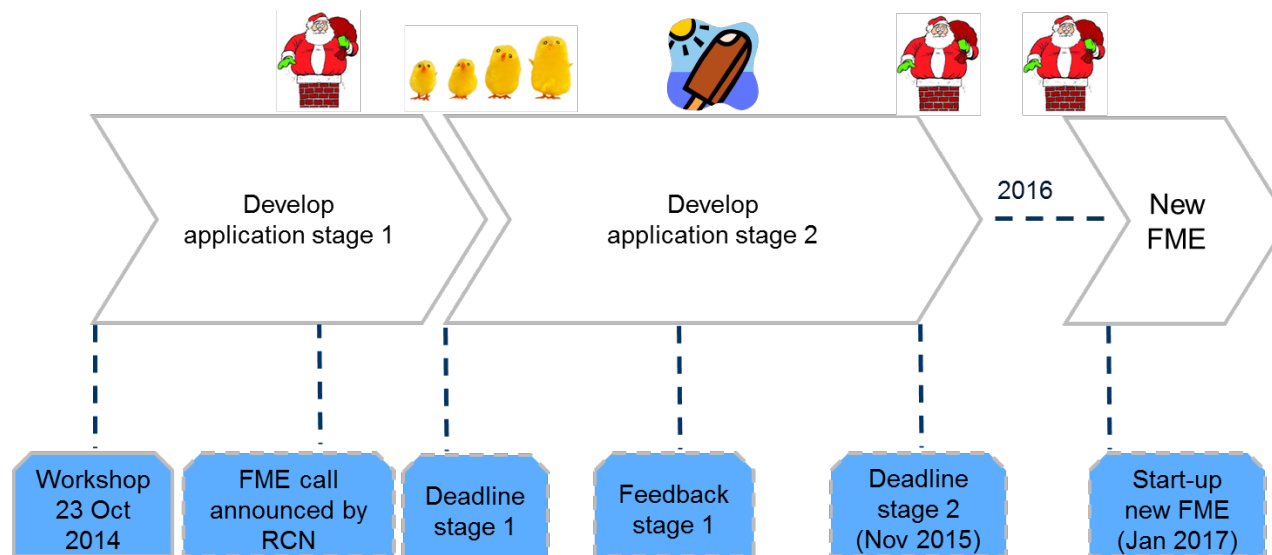
Excellence in research



Strong educational program

# A new FME on offshore wind is in preparation

- ▶ As suggested by the boards of NOWITECH and NORCWE the research partners had a joint workshop to discuss a possible future new FME on offshore wind (2017-2024).
- ▶ This was successful with the partners agreeing on a process to prepare the best possible FME application on offshore wind energy.
- ▶ A core team was selected with Finn Gunnar Nielsen, Kristin G Frøysa, Trond Kvamsdal and John Olav G Tande for driving the process.
- ▶ Industry parties are invited to join a Industry Reference Group for the further reporting and dialogue on the development of the new FME.

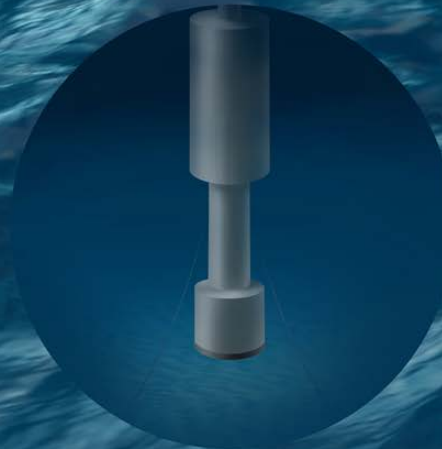




# We make it possible!

NOWITECH is a joint 40M€ research effort on offshore wind technology:

- Numerical tools and sub-structures
- O&M and materials
- Grid and wind farms



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