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The NOWITECH Partners in 2015 are listed below:

The Host Institution:

SINTEF Energy Research

Research Partners:

- Norwegian University of Science and Technology (NTNU)
- Institute for Energy Technology (IFE)
- Norwegian Marine Technology Research Institute (MARINTEK)
- Sitfelsen SINTEF (SINTEF)

Industry partners:

CD-adapco
DNV GL
DONG Energy
Fedem Technology AS
Fugro OCEANOR AS
Kongsberg Maritime AS
Norsk Automatisering AS
SmartMotor AS
Statkraft Development AS
Statnett SF
Statoil Petroleum AS

Associate research partners:

Massachusetts Institute of Technology (MIT), USA
Michigan Technological University (Michigan Tech), USA
National Renewable Energy Laboratory (NREL), USA
DTU, Denmark
Fraunhofer IWES, Germany
University of Strathclyde, UK
TU Delft, Netherlands
Nanyang Technological University (NTU), Singapore

Associate industry partners:

Hexagon Devold AS
Enova
Energy Norway
Innovation Norway
Norwegian Wind Energy Association (NORWEA)
Norwegian Centres of Expertise Instrumentation (NCEI)
NVE
WindCluster Norway

Design og trykk: www.fagtrykk.no Miljømerket trykkeri. lisensnr. 2041 0811 Illustrations: SINTEF/Oxygen

NOWITECH
Norwegian Research Centre
for Offshore Wind Technology
Host institution
SINTEF Energi AS (SINTEF Energy Research)

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CENTRE FOR ENVIRONMENT-FRIENDLY ENERGY RESEARCH
The Research Council of Norway

NOWITECH

Highlights from 2015

Offshore Wind: It is time for the next wave!

Offshore wind farms will be an important part of a future sustainable energy system. IEA expects offshore wind to supply 5 % of the global electricity demand in 2050[1]. In Europe alone investments in offshore wind farms over the next ten years are expected to sum up to NOK 1000 billion. This represents a golden opportunity for development of new knowledge-based jobs.

The technology and market is still in an early phase with great potential for development and cost reductions. Targets are set to reduce the levelized cost of energy (LCoE) from offshore wind farms by 50 % within 2030[2]. Strong research and development efforts are paramount to reach such cost reduction. Offshore wind energy is prioritized in the Norwegian research strategy Energi21 and in the European SET-plan.

NOWITECH has proven a very effective spearhead for research, providing international visibility and impact.

Norway has an important role to play building on the research carried out in NOWITECH and in other projects, and utilizing the expertise from energy and maritime industries: Statoil is now taking the floating wind turbine concept, Hywind, to the next step with a 30 MW pilot wind farm. DNV GL is leading in consulting and certification services. Norwegian industry is competitive with supplies to the offshore wind market within marine operations, substructures, power collection and transmission. Norwegian entities are also active in European research projects. Still, there is very significant potential to increase the Norwegian engagement. According to Eksportkreditt Norge a viable goal is that a 10 % share of the supply to new offshore wind farms in Europe comes from Norwegian entities by 2020[3].

NOWITECH has prepared 40 innovations. Now it is time for the next wave!

I very much support this goal; and I am convinced that continued strong research together with the industry is vital to achieve this goal.

NOWITECH has proven a very effective spearhead for research, providing international visibility and impact. A set of separate projects could not have achieved this, thus with NOWITECH now being close to completion, it is time for new initiatives to continue the required research for value creation, new jobs and bringing down the LCoE from new offshore wind farms. NOWITECH has prepared 40 innovations. Now it is time for the next wave!

Director NOWITECH
John Olav Giæver Tande

Statoil is now taking the floating wind turbine concept, Hywind, to the next step with a 30 MW pilot wind farm to be installed in Scotland in 2017. Ill: Statoil.

1 IEA Technology Roadmap (2013) 2DS scenario
https://www.iea.org/publications/freepublications/publication/Wind_2013_Roadmap.pdf
2 European Wind Energy Technology Platform (TPwind), 2014, Strategic Research Agenda, www.ewea.org/report/tpwind-sra
3 http://syslagronn.no/2016/02/03/syslagronn/pa-tide-med-omstart-for-norsk-havvind_75421/
http://sysla.no/2016/02/17/syslagronn/markedet-fikser-ikke-havvind-av-seg-selv_77750/

Vision and goals for NOWITECH

NOWITECH is an international precompetitive NOK 320 million (2009–2017) research cooperation on offshore wind technology co-financed by the Research Council of Norway, industry and research partners.

Vision

- Contributing to large scale deployment of deep sea offshore wind turbines,
- An internationally leading research community on offshore wind technology enabling industry partners to be in the forefront.

Objective

Precompetitive research laying a foundation for industrial value creation and cost-effective offshore wind farms. Emphasis is on “deep-sea” (+30 m) including bottom-fixed and floating wind turbines.

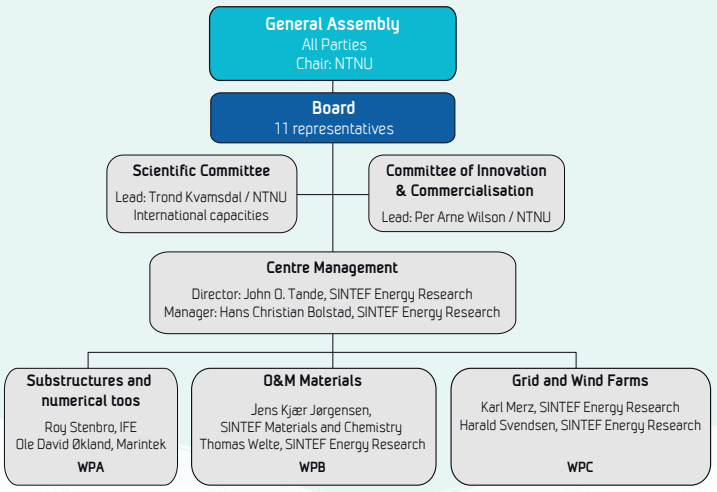
Key issues

Innovations, knowledge building and education aiming to reduce the cost of energy from offshore wind farms.

Organization

NOWITECH is organized with a General Assembly (GA), a Board, a Centre Director, a Scientific Committee (SC), a Committee for Innovation and Commercialisation (CIC) and a Centre Management Group (CMG).

The research activities are organised into three work packages (WPs): Substructures and numerical tools (WPA), Operation & Maintenance and Materials (WPB), Grid and Wind Farms (WPC).

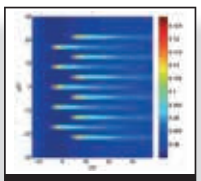


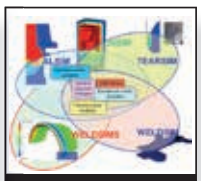
NOWITECH INNOVATIONS

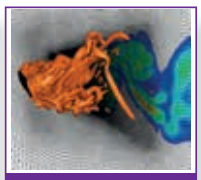
Highlights from 2015

Software | Numerical model/method | Technology/ Process | Research infrastructure

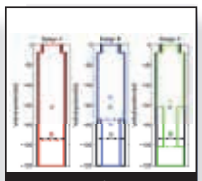

3DFloat integrated model
TRL7


3DWind park wake model
TRL6

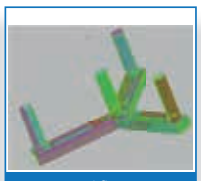

INVALS general purpose optimization
TRL8


Commercial grade rotor CFD
TRL6


Simo-Riflex
TRL7


WindOpt
TRL4

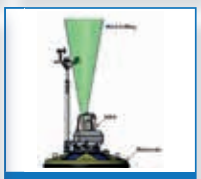

Real time hybrid model test in ocean basin
TRL3

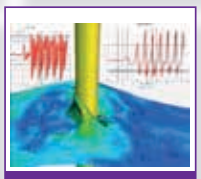

Novel floater
TRL2

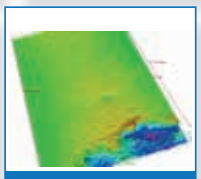

Variational Multiscale Error Estimator
TRL3


www.IFEM.no
TRL3

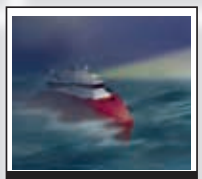

www.ASHES.no
TRL5


Seawatch Wind Lidar Buoy
TRL8

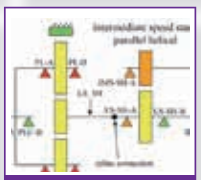

CFD simulation
TRL5

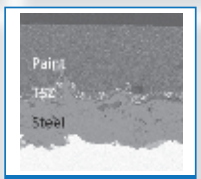

Droplet erosion resistant blade coatings
TRL3


Droplet erosion testing
TRL4


Fleet optimization
TRL4


Gearbox fault detection
TRL3


Gearbox vulnerability map
TRL4

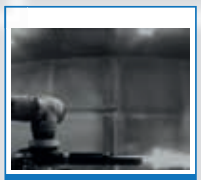


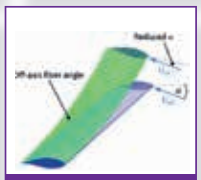
Dual layer corrosion protection coatings
TRL3

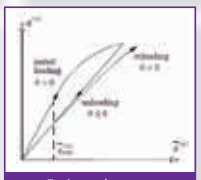
NOWIcob
TRL4

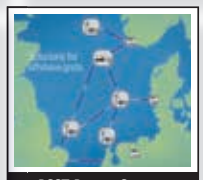

Remote Presence
TRL5

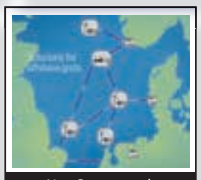

Routing and scheduling
TRL2

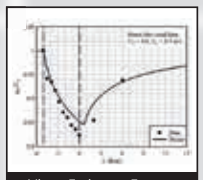

Thermally sprayed SiC coatings
TRL4


Buckling resistant blades
TRL3


Fatigue damage simulation
TRL4

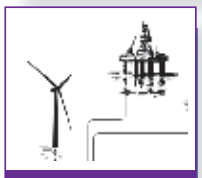

PSST Power System Simulation
TRL3

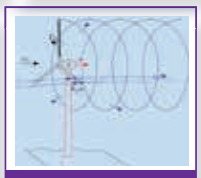

Net-Op network optimization
TRL3

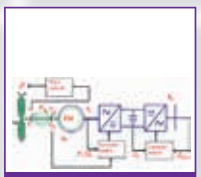

Viper Estimate Energy Output from Offshore Wind Farms TRL3


Smartgrid Lab HVDC grid
TRL4


Control of multi-terminal HVDC grid
TRL4


Wind Supply to Oil & Gas
TRL3


Turbine control
TRL3


Wind turbine electrical interaction
TRL2

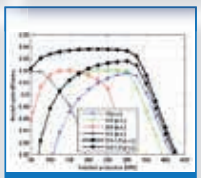

Network Reduction
TRL2

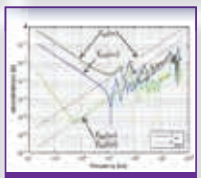

STAS linear State-Space Wind Power Plant Analysis
TRL2


PM generator magnetic vibrations
TRL4


PM generator integrated design
TRL3


Wind farm collection grid optimization
TRL1


Long distance AC transmission
TRL1


Wide-band model of wind farm collection grid
TRL2

NOWITECH Innovation Award

The NOWITECH Innovation Award was established in 2015 with the aim to stimulate and reward knowledge-based innovation and/or entrepreneurship within the field of offshore wind energy.

The winning innovation represents, when fully developed, a step change in offshore wind turbine technology, enabling the power from large offshore wind turbines to be transported to shore without the use of any expensive offshore substation. The two award winners Sverre Gjerde and Pål Keim Olsen have carried out critical work in bringing this innovation forward as part of their PhD work at NTNU on high voltage DC generator technology for offshore wind turbines. They have demonstrated the technology in laboratory scale, and their work is well documented.

Pål Keim Olsen and Sverre Gjerde received the award during the NOWITECH Innovation Day18 June 2015

Education

The PhD and Postdoc studies in NOWITECH are carried out as an integrated part of the work packages. The Scientific Committee (SC) has the overall responsibility for developing the PhD and Postdoc programme. This include an active recruitment strategy, organization of joint PhD forums and training, exposing them to industry and leading international research groups. A total of eight PhDs successfully defended their doctoral work in 2015 at NTNU on offshore wind energy.

Annual number of MSc theses in offshore wind energy at NTNU since start of NOWITECH.

During 2015, professors and scientific staff at NTNU, with relations to NOWITECH, were supervisors for 48 **MSc students** with theses on offshore wind energy. This is a remarkable increase from previous years (see figure), and demonstrates high and increasing interest in offshore wind energy among master students at NTNU.

INNOVATION

NOWITECH

EDUCATION

RESEARCH & OUTREACH

Research & Outreach

The scientific results of the Centre are disseminated efficiently and are achieving international recognition.

EERA DeepWind conference

A main event for communicating open results from NOWITECH is the EERA DeepWind conference held every year in Trondheim. The EERA Deep- Wind'2015 Deep Sea Offshore Wind R&D Conference, February 4-6, was a success with a mix of plenary presentations with broad appeal and presentations in parallel sessions and posters on specific science and technology themes.

Accumulated number of publications in NOWITECH.

Communicating NOWITECH

1: John Olav Tande from NOWITECH and Nils Røkke, Climate Director in SINTEF, wrote an op-ed in Adressa 17 June, explaining why wind power is a good idea. 2: 20. November, GEMINI.no, presented a new method for testing wind turbines, developed at NTNU and MARINTEK in the NOWITECH project. 3: 3. September, John Olav Tande, held an open lecture at NTNU, where he spoke about all the innovations from NOWITECH and why the world needs offshore wind. 4: Preparing for the United Nations Climate Negotiations in Paris, the Research Council of Norway hosted an event during Arendalsuka. The Minister of Climate and Environment, and leading the Norwegian delegation in Paris, Tine Sundtoft, received a "Climate Card" from NOWITECH, on why we need wind farms at sea.

NOWITECH Norwegian Research Centre for Offshore Wind Technology

CENTRE FOR ENVIRONMENT-FRIENDLY ENERGY RESEARCH
The Research Council of Norway