



NOWITECH final event 22-23 August 2017

# Education make an impact

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**NOWITECH**

Norwegian Research Centre for Offshore Wind Technology

# Contents

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- Multidisciplinary Integration
- Scientific Excellence
- Transfer of Expertise
- Quo Vadis

# NOWITECH Educational Programme

**229 MSc and 25 PhD  
educated for industry\***

MSc	229
PhD ongoing	7
PhD final	18
Post doc	3



**\*numbers are per end of 2016**

# Multidisciplinary Integration

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# PhD and Postdoc at IME (8+2)

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- **Dept. of Electric Power Engineering (5+1)**

- Gerard Doorman (S. Völler\*, Mar 2010)
- Olav B. Fosso (NN, ?? 2011)
- Hans K. Høidalen (A. H. Soloot, Oct 2009)
- Marta Molinas (A. R. Barrera Cárdenas, Feb 2011)
- Robert Nilssen (Z. Zhang, Jan 2010)
- Arne Nysveen (M. Valavi, Dec 2010)

- **Dept. of Engineering Cybernetics (2)**

- Thor I. Fossen (M. D. Pedersen, Jan 2010)
- Amund Skavhaug (Ø. Netland, Apr 2010)

- **Dept. of Mathematical Sciences (1+1)**

- Trond Kvamsdal (K. Nordanger, Nov 2010, M. Kumar\*, Jan 2011)

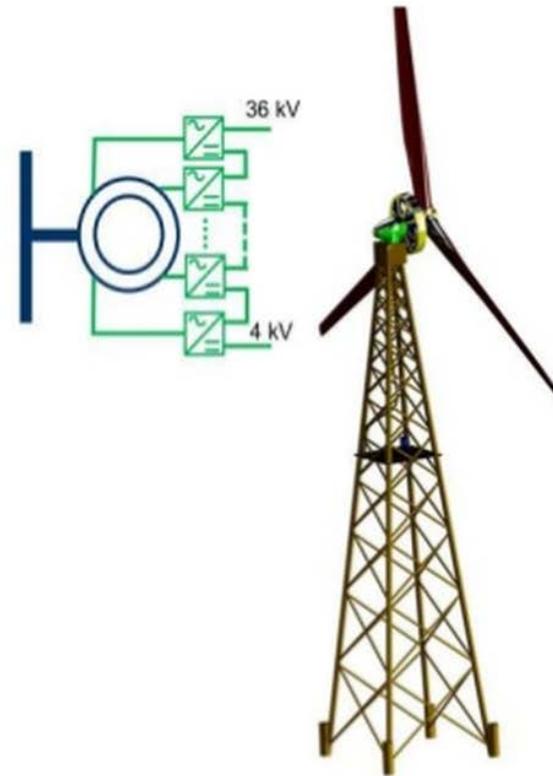
# PhD and Postdoc at IVT (15+2)

- **Dept. of Civil and Transport Engineering (3)**
  - Michael Muskulus (M. Alagan Chella, Oct 2010, E. v. Buren, Aug 2009, D. Zwick, Aug 2009)
- **Dept. of Energy and Process (4)**
  - Ole G. Dahlhaug (L. Frøyd, Aug 2009)
  - Per Å. Krogstad (T. Bracchi, Sep 2009, Pål E. Eriksen, Aug 2010)
  - Lars Sætran (M. Resell, Oct 2010)
- **Dept. of Engineering Design and Materials (2+1)**
  - Andreas Echtermeyer (A. Antonarulrajah\*, Oct 2010, K. Cox., Nov 2010)
  - Roy Johnsen (F. Mubarok, Mar 2010)
- **Dept. of Marine Technology (4+1)**
  - Torgeir Moan (M. Karimirad\* Nov 2010, M. I. Kvittem Aug 2009, C. Luan, Aug 2011, K. Wang, Aug 2010)
  - Sverre Steen (V. Chabaud, Aug 2011)
- **Dept. of Production and Quality Engineering (2)**
  - Jørn Vatn (Z. Hameed, Oct 2009, NN 2011)

# NOWITECH Reference Wind Turbine

- Multidisciplinary collaboration:
  - PhD/Postdocs driving force in design
  - PhD/Postdocs did the design verification
- Knowledge transfer
- Framework for research

## NOWITECH 10 MW reference turbine



### Initial design parameters

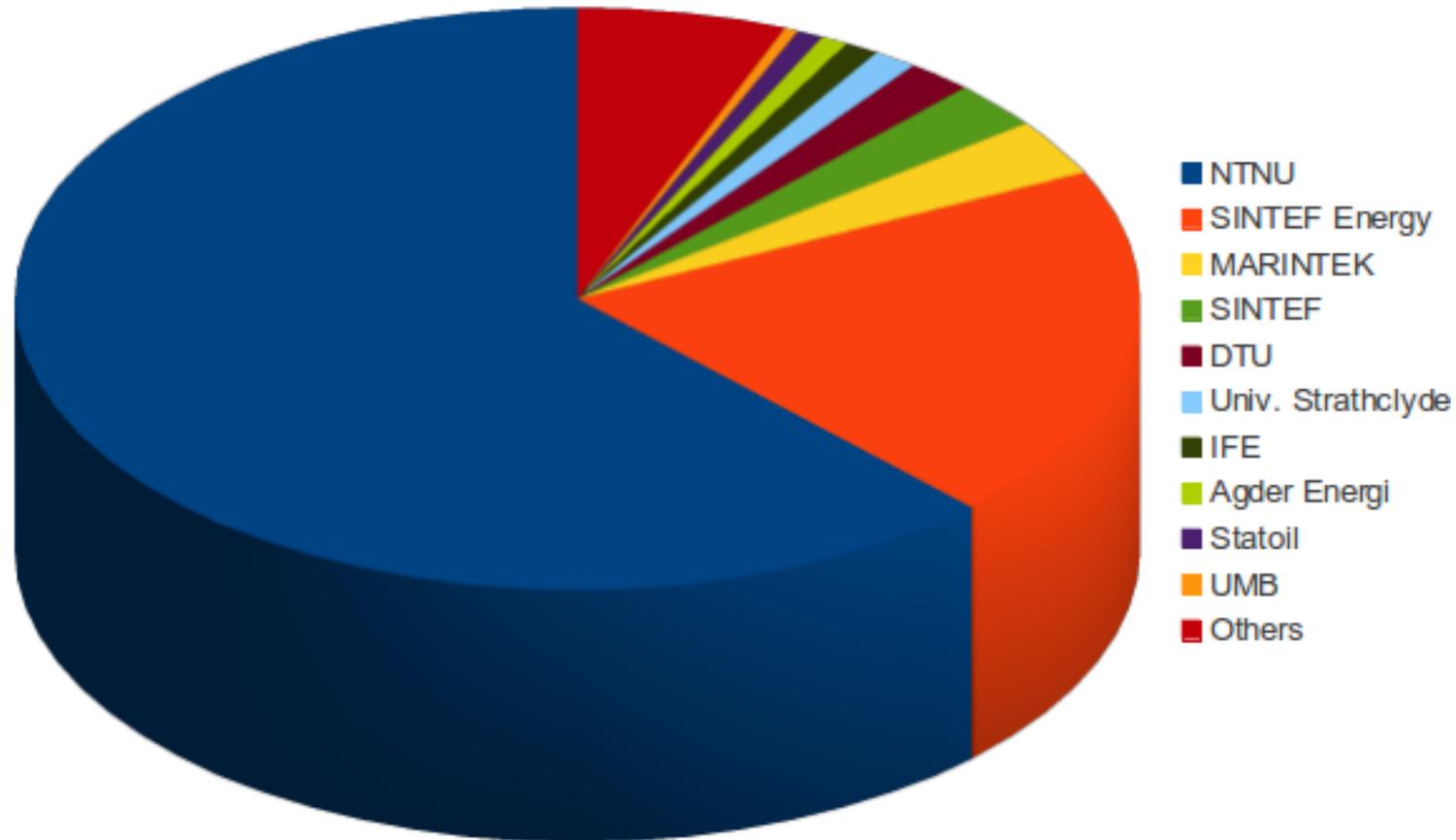
- Nominal power output 10.0 MW
- Design wind velocity 13.0 m/s
- Tip speed ratio 7.7
- Hub height 93.5 m
- Turbine diameter 141.0 m
- Design water depth 60.0 m
- Wind & waves ala Doggerbank
- **(work in progress!)**

The NOWITECH 10 MW reference turbine introduces a new generator and support structure concept

# Scientific Excellence

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# NOWITECH Publications (2009-2013): Institute based CRIS tin score



# CRIStin score vs. Budget (Institute's)

Company name	Budget 2009-2013 (MNOK)	CRIStin score	CRIStin score/ MNOK	CRIStin score (submitted)	CRIStin score (submitted)/MN OK
NTNU	52.86	301.01	5.69	317.43	6.00
SINTEF Energy	38.19	95.62	2.50	163.16	4.27
SINTEF	26.01	12.62	0.49	41.36	1.59
MARINTEK	34.17	15.29	0.45	54.57	1.60
IFE	19.31	4.75	0.25	18.62	0.96
industry partners	13.31	53.64	4.03	74.33	5.58
sum incl joint pub.	183.85	482.93	2.63	669.47	3.64

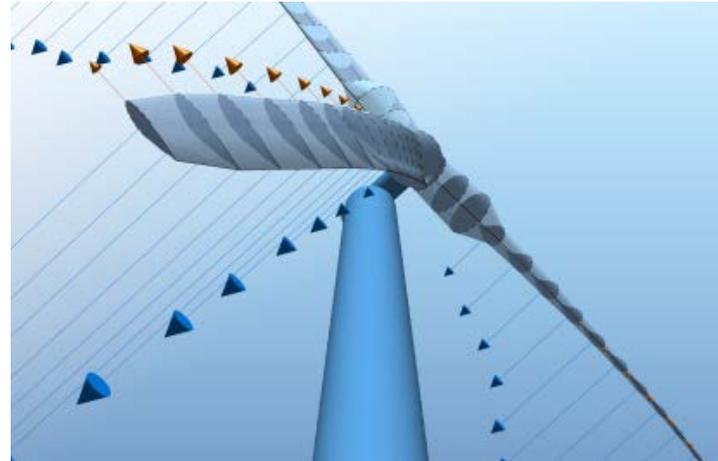
# Three commercial spin-offs are established

## Seram Coatings AS



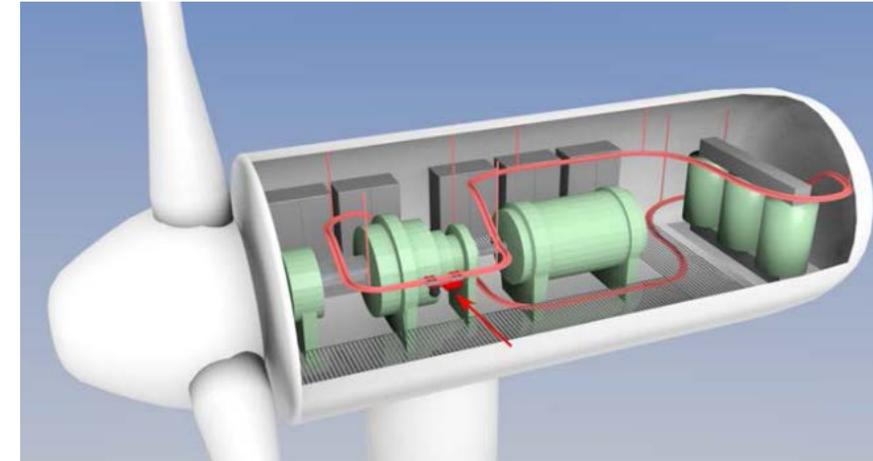
- **Thermasic** – an innovative method for thermal spraying of silicon carbide (SiC).
- Generic technology with a potential large range of future application areas.
- **Based on NOWITECH PhD work**
- [www.seramcoatings.com](http://www.seramcoatings.com)

## SIMIS AS



- **Ashes** – wind turbine simulation software
- Integrated simulation of e.g. wind loads, sea waves, gravity, buoyancy, and generator loads
- **Based on post.doc in association with NOWITECH**
- [www.simis.io](http://www.simis.io)

## EMIP AS



- **REACT** – technology for remote inspection and maintenance of offshore turbines
- **Technology assessed by NOWITECH PhD work**
- IP owned by Norsk Automatisering AS
- Continued development through RCN and EU projects.
- [www.emip.no](http://www.emip.no)

# Transfer of Expertise

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# Positions after NOWITECH

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- Universities
  - NTNU (2 Faculty, 4 Postdoc), UMB (Adjoint-position)
  - College of Charleston (SC, USA), U. of Tsukuba (Japan)
- Research Institutes
  - CMR, MARINTEK, SINTEF
- Industry
  - ABB, Aker Engineering and Technology, DNVGL, FEDEM, 4Subsea, Greenway Energy, IKM Ocean Design, Kverva, Kværner, Rolls Royce.

## **Notice:**

100+ MSc-students into Norwegian industry

# Female Researchers in Academia

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- PhD **Tania Bracchi**, Associate Professor at NTNU
- PhD **Marit Kvittem**, Adjunct Associate Professor at UMB
- PhD **Erin Elizabeth Bachynski**, Onsager Associate Professor at NTNU



# Quo Vadis

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