

NORCOWE's scientific a



Finn Gunnar Nielsen has a background in engineering from NTNU, with a PhD within Marine Hydrodynamics. He has for more than 30 years worked within R&D related to dynamics of offshore structures. Presently he holds a position as senior advisor in Statoil. His main activities are presently related to R&D within offshore wind. Finn Gunnar has also had

a position as adjunct Professor at NTNU, teaching marine operations. Presently he is adjunct professor at University of Bergen teaching at a master programme in energy. Finn Gunnar headed the R&D project that led to the Hywind floating offshore wind concept. He has also participated in several national and international committees related to offshore wind and marine renewable energy more generally. He is now chairing NORCOWE's scientific committee.

"Being member of the SAC I have the opportunity of early use of research results as well as challenge the researcher with industrial issues."

Finn Gunnar Nielsen

Andrea Hahmann is a senior scientist in the department of wind energy at the Danish Technical University (DTU Wind Energy). She obtained her PhD in Meteorology from the University of Utah in 1992. She has worked with atmospheric mesoscale and climate models for nearly 30 years. Before coming to the wind energy field 8 years ago, she worked in research of the influence of land cover to climate at the University of Arizona and in forecasting and atmospheric transport & dispersion problems at NCAR. She now works on atmospheric modeling applied to wind power forecasting and in regional wind energy resource assessment.



"In terms of wind energy meteorology offshore, Denmark and Norway share many similarities. But many aspects are quite unique to each region. My motivation for participating in the NORCOWE SAC is to be exposed to these similarities and contrasts, especially since I was educated in very different weather regimes in Brazil and the western USA. In addition, I am also interested in how such a large project is successfully managed."



Cecilie Kvamme is a scientist within fisheries biology at the Institute of Marine Research (IMR) in Bergen where she has been employed since 2005. At IMR she mainly works with fish (surveys, stock assessments, advice), and she is the scientist responsible for the North Sea herring and the sprat stocks. IMR has a team for giving consultative comments on wind

farm plans and applications when asked, and she has led this team for three years.

"As a biologist I am predominantly interested in the environmental effects of wind parks, which was also one of the focus areas of NORCOWE when it was established back in 2009. Being a member of SAC has also given me valuable insight into the other science fields related to wind parks, like maintenance, measuring and modeling wind, and the optimal design of wind parks."

Trond Kvamsdal is professor in Computational Mathematics at Department of Mathematical Sciences, NTNU and Chairman of the Scientific Committee (SC) of NOWITECH. His main area of interest is within the field of computational sciences and engineering, in particular the development of adaptive finite element methods for solving fluid-, and structural mechanics.



His focus related to offshore wind is within aerodynamics and fluid-structure interaction (wind-turbine blade interaction).

"As Chairman of the SC for NOWITECH it is of interest for me to be in dialogue with NORCOWE, and being a member of NORCOWE's SAC facilitates information exchange. In

advisory committee SAC

"..... Being a member of SAC has also given me valuable insight into the other science fields related to wind parks."

Cecilie Kvamme

As a member of the SAC, I enjoy learning about the cutting-edge research occurring within NORCOWE, and exchanging ideas and approaches from the US wind energy research community."

Julie Kay Lundquist

particular, participation on the annual NORCOWE meetings is very useful in order to be updated on new research and innovations done by the NORCOWE consortium. Furthermore, our collaboration on organizing the Summer School is useful for my role at NOWITECH SC."



Julie Kay Lundquist is assistant professor of boundary-layer meteorology in the Dept. of Atmospheric and Oceanic Sciences, University of Colorado, with a joint appointment at the National Renewable Energy Laboratory. Her Ph.D. is in Astrophysical, Planetary, and Atmospheric Science from CU-Boulder, as is her M.S. degree. She studied English

and Physics as an undergraduate at Trinity University, San Antonio, Texas.

Her research group uses observational and computational approaches to understand atmospheric influences on turbine productivity, turbine wake dynamics, and downwind impacts of wind energy. At present, she is involved in field campaigns to improve wind energy forecasting capabilities in complex terrain, to develop improved simulations of stable boundary layer dynamics in complex terrain, and to assess wind turbine and wind farm wake behaviour.

Jan Willem Wagenaar is employed at the wind energy department of the Dutch renewable energy research center ECN. He is a trained physicist with a Master of Science degree from the University of Groningen and a PhD degree from the University of Nijmegen, both on theoretical particle physics. He joined ECN to work on wind energy straight after graduation. Within ECN he is responsible for the R&D line 'Facilities and Experiments'. In addition, he is a project manager and researcher in measurement related projects. He is particularly interested in LiDAR technology, power performance and wakes.



"I have been asked to join the Scientific Advisory Committee of NORCOWE and I have been delighted to do so. In my view NORCOWE is a significant and relevant research center comprising a balanced partnership between the research community and industry. For sure, NORCOWE is internationally orientated and I am glad to be part of it. I hope my input helps shaping the scientific content of the NORCOWE research."

"... For sure, NORCOWE is internationally orientated and I am glad to be part of it."

Jan Willem Wagenaar

Norcowe summer school

Trygve Toft Eriksen, Acting Centre Coordinator (2015), Christian Michelsen Research



NORCOWE's summer school 2015 was hosted in cooperation with NOWITECH at Hardingasete, Hardanger, Norway. The group of participants had a rich diversity, both in terms of background and nationality. The 26 participants from 15 countries represented 10 different universities, 2 R&D institutions and 1 Industry Company. In the sixth edition of the NORCOWE summer school non-NORCOWE members counted more than half of the participants. From 17th to 21st of August, we had seven lecture sessions, group work and networking in beautiful surroundings.

The mixture of people with different backgrounds gave fruitful interaction and discussions in both the lectures and the group work. Throughout the week, groups worked on tasks related to the lectures adding up to the main task: to make an outline of an offshore wind park addressing the different challenges covered by the lectures.

During the week, the participants were introduced to a broader perspective of the challenges related to offshore wind. We believe this is an important task in helping the PhD students to put their work into a wider context. Besides lectures and group work the participants got new acquaintances and shared their knowledge and experiences with each other. In addition, many of the lecturers stayed most of the week, which gave an opportunity to the participants to exchange knowledge and experiences in a smaller setting. The group as a whole had a great time together during both lectures and discussions, as well as enjoying the magnificent weather at the pier in the evening.

On behalf of the NORCOWE administration, we want to say thanks to our hosts, all participants and lecturers for a great Summer School! Particularly we want to thank Finn Gunnar Nielsen for chairing the Summer School committee and for arranging the lectures and the group work.

The presentations from the summer school are available at www.norcowe.no.





Lectures at the summer school:

Kari Lurås, Statoil: Early Phase Development of a wind farm

Birgitte Furevik, MET Norway: Environmental data for planning & design

Trond Kvamsdal, NTNU: Harvesting the wind energy

Jørgen Krokstad, Statkraft: The design challenges

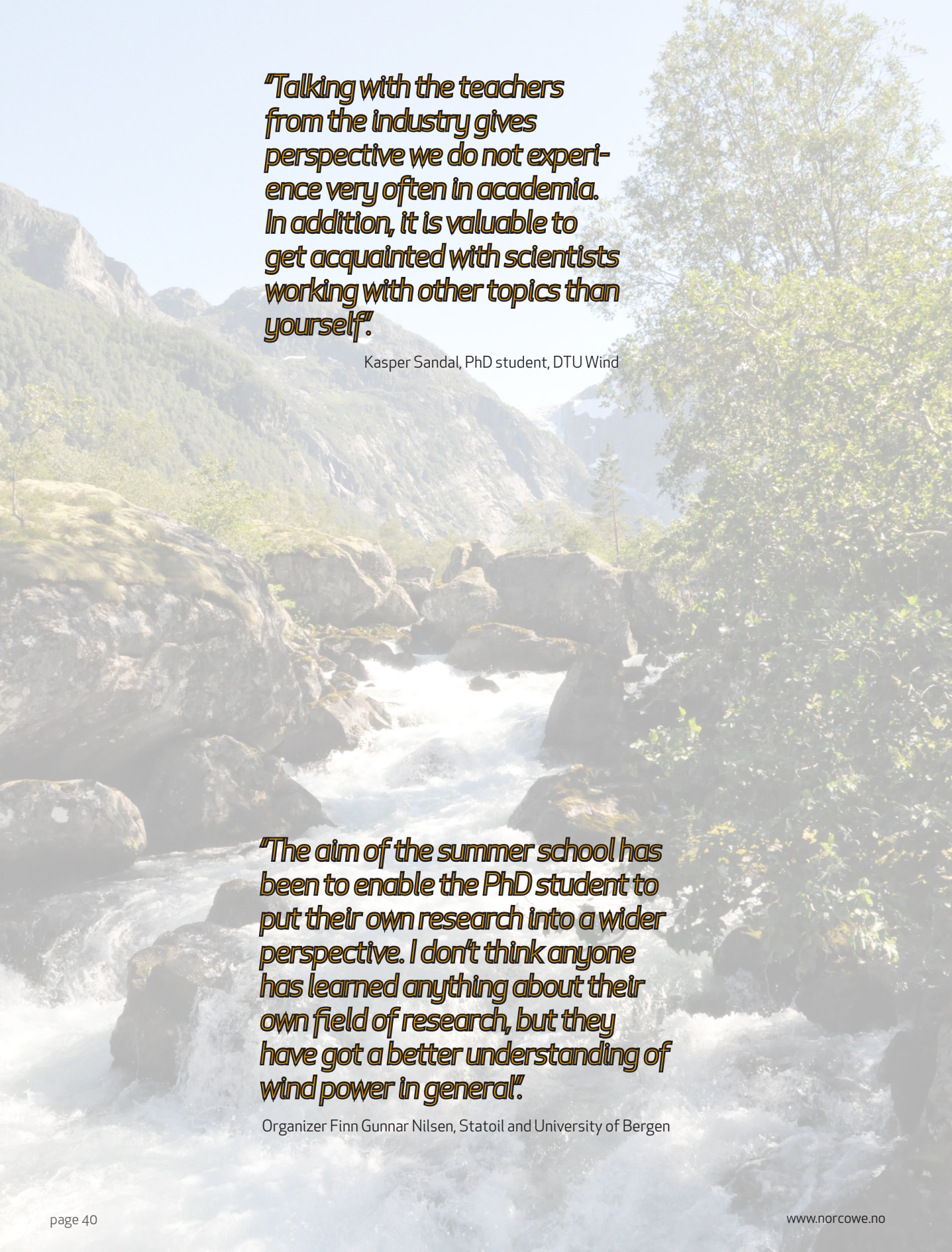
Torben Knudsen, Aalborg University: Control of wind turbines & wind farms

Jan-Fredrik Stadaas, Statoil: Execution of a wind farm project

Jørgen Krokstad, Statkraft: The economics of wind power

Lene Eliassen, NTNU / Statkraft, assisted.



A scenic view of a river flowing through a rocky valley with mountains in the background. The river is white with foam as it flows over large, dark rocks. The surrounding landscape is lush with green trees and vegetation. The sky is clear and blue.

"Talking with the teachers from the industry gives perspective we do not experience very often in academia. In addition, it is valuable to get acquainted with scientists working with other topics than yourself."

Kasper Sandal, PhD student, DTU Wind

"The aim of the summer school has been to enable the PhD student to put their own research into a wider perspective. I don't think anyone has learned anything about their own field of research, but they have got a better understanding of wind power in general."

Organizer Finn Gunnar Nilsen, Statoil and University of Bergen

Centre management



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Hans-Georg Beyer
University of Agder



Charlotte Obhrai
University of Stavanger

To successfully run a project with a large number of partners spread over a large geographical area takes some effort. NORCOWE's Center Management Group has monthly video

meetings in order to discuss and plan upcoming events and activities as well as to provide a regular forum for sharing ideas.

Dissemination and public outreach

Internal

The annual work package meetings in NORCOWE take place in May. The 2015 meetings were hosted by University of Stavanger and more than 50 persons were present. A major goal is to coordinate the work between the subtasks and to pave the ground for new joint projects among the partners. Thus long coffee breaks and informal meals are important ingredients besides the scientific presentations and discussions!

NORCOWE day takes place in September and serves as a preparation for the board meeting the following day. At NORCOWE day the current status of the centre is presented and major challenges to be addressed by NORCOWE are identified. The board and SAC attend at NORCOWE day together with the centre management committee, the PhD students and senior scientists.

In 2015 the workshop "Development of wind-farm power-prediction tools - Prospects from Uni Research's work and use of data from Sheringham Shoal" .was held at Statkraft in Oslo. The workshop was fully booked and the presentations made available to the NORCOWE partners. Internal workshops addressing a specific topic is considered an effective dissemination method in the centre. Thus two workshops have already taken place in 2016. The first dealt with data from OBLEX-F1, and the second dealt with turbulence and its impact on offshore wind turbines.

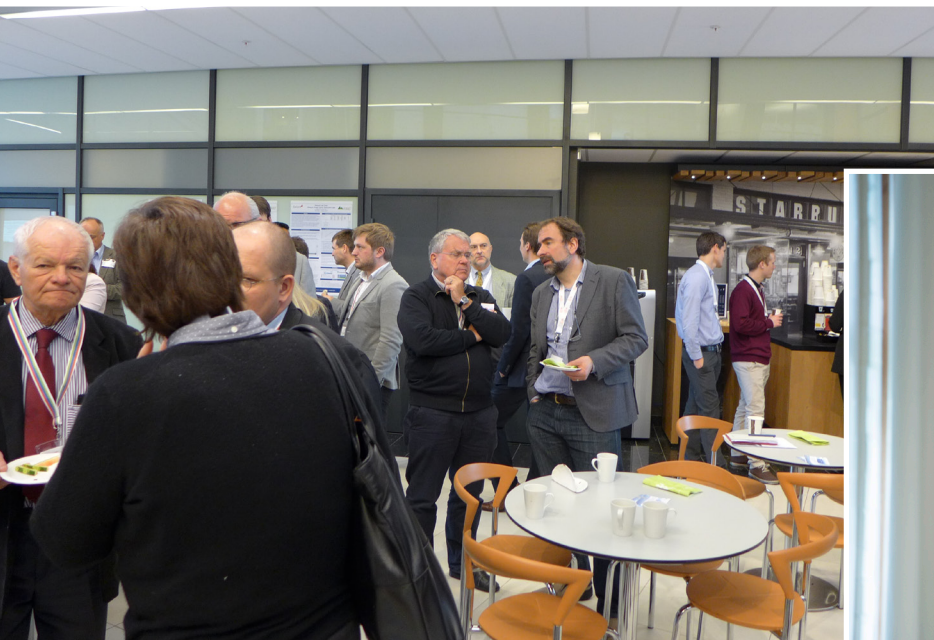
Public outreach

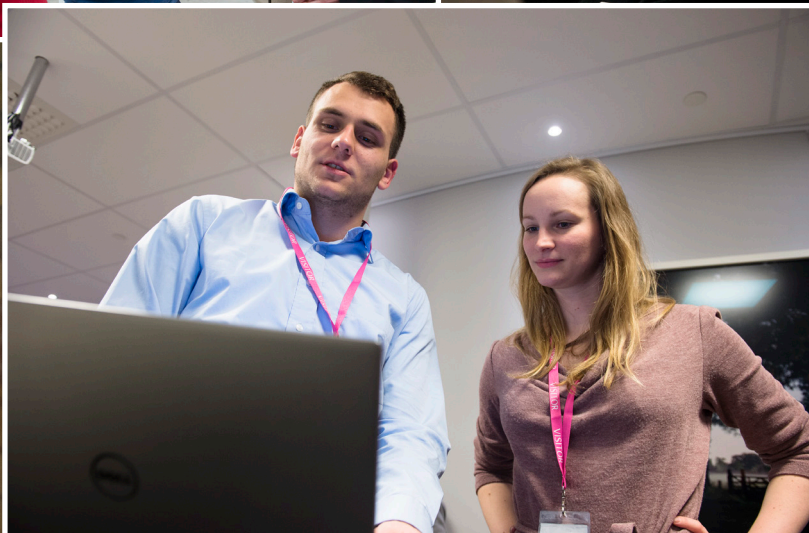
The annual report, our newsletter and our website are the main channels for information to the general public. The yearly conference SMI Stavanger is held in collaboration with Greater Stavanger. Last year the number of participants were 65 with presentations from both NORCOWE and external companies, national and international. Presentations and posters can be found on NORCOWE's homepage. The 2016 SMI Stavanger conference will be held on April 6th.

The yearly conference SMI Bergen gathered in 2015 more than a hundred persons from research institutions and the industry. Presentations from the conference can be found on NORCOWE's homepage. The 2016 SMI Bergen conference will be held on November 8th.

NORCOWE collaborates with the Centre for Science Education at the University of Bergen, giving a yearly lecture for their students who are teachers in science and mathematics.

The online magazine Sysla Grønn (Green Business in Norwegian) has had several stories and articles from NORCOWE in 2015.





National and international cooperation



International cooperation

The NORCOWE brand has been strengthened during 2015 and the brand is now recognized in the Norwegian and international offshore wind energy community.

Two large joint projects have been carried in NORCOWE last year, namely the OBLEX-F1 campaign and the definition of NORCOWE Reference Wind Farm (NRWF). Several NORCOWE partners have been involved in OBLEX-F1 together with German governmental institutions and research institutions. The first preliminary analyses have been done. We foresee that these data will be used by the international offshore wind community for many years.

NRWF has been set up by Aalborg University and Uni Research.

The effort to define baseline versions of the RWF, up to the point at which annualised costs of energy were obtained, took place within Uni Research and Aalborg University during 2014-15. A website is set up, where you find information about site characterisation, layouts, wakes & loads, farm management, operations and costs.

NORCOWE is member in IEA Wind task 32 (Wind Lidar Systems for Wind Energy Deployment), task 36 (Forecasting for Wind Energy) and task 37 (Wind Energy Systems Engineering: Integrated RD&D).

NRWF will be used in the development of IEA Wind task 37



“Wind Energy Systems Engineering: Integrated RD&D”. Using NRWF as one of the reference wind farms is a good way of enhancing cooperation between NORCOWE partners and major players in the international wind energy community. It is an efficient way to disseminate results from the centre. Taking part in IEA Wind tasks, EERA JP Wind, Horizon 2020 and international standardization committees is the core of NORCOWE’s international commitment.

We have MoU with DTU Wind, Fraunhofer IWES, ECN (the Netherlands) and NREL (USA). The majority of our international partners come from Europa, but we have also cooperation with institutions in USA, South Africa and Japan.

National cooperation

NORCOWE has cooperated with NOWITECH on the summer school. NORCOWE and NOWITECH have also appointed a member to the sister center’s scientific advisory committee. Finn Gunnar Nielsen is representing NORCOWE in NOWITECH’s committee.

A new FME application (COWIND) was submitted in November 2015 with partners from the two current FME centres.

NORCOWE has also worked together with local public and private bodies like Greater Stavanger, NODE and Bergen Chamber of Commerce and Industry in order to promote offshore wind energy.

