

Applying their expertise to new fields

As of 2017, a total of 27 doctoral students will have completed their doctoral degree in affiliation with the Norwegian Centre for Offshore Wind Energy (NORCOWE). These students are now working in positions in industry and the research community alike. They have all taken part in a top researcher training programme, but are using it in very different ways.

From petroleum to offshore wind energy



Lene Eliassen, 34, was working in the petroleum industry when the NORCOWE Centre announced funding for its first doctoral fellowships.

“I was looking for new challenges and applied for a research fellowship position in Stavanger. I was one of the first doctoral fellows at the NORCOWE Centre and I quickly got to know the other

researchers in Bergen and Grimstad (Norway) as well as Aalborg (Denmark).”

She began working on her doctoral degree in 2010 while there was still widespread interest in the petroleum industry in offshore wind energy, and she had a co-supervisor from Statoil.

Her doctoral work focused on identifying the aerodynamic loads on the rotor blades of floating wind turbines in strong winds and how these forces affect the wind turbine as a whole. The conventional method calculates for a rotor that remains stationary, i.e. does not move into and away from the wind. But Dr Eliassen was able to include the movements of the entire wind turbine in her calculations, which requires additional computational time. By using a graphics processing unit rather than a computer’s central processing unit for her calculations, she achieved a significant reduction in computational time.

As a wind turbine blade rotates, the wind forces will help to reduce the tower movement on a floating offshore wind turbine. At a certain ratio between rotation velocity and eigenfrequency of the wind turbine, however, the size of this reduction diminishes. The most common methods for calculating forces on wind turbines do not take this into account, which in turn leads to lower estimates of fatigue damage than what will actually occur.

Dr Eliassen completed her doctoral degree in 2015 and landed a post-doctoral fellowship position at the Norwegian University of Science and Technology (NTNU), where she is studying large wind turbines under the research project Dimensioning Sea Loads on Offshore Wind Turbines in Shallow to Intermediate Waters (DIMSELO). Dr Eliassen is currently on maternity leave.

From offshore wind energy to petroleum



Tore Bakka, 33, had just completed his Master's thesis at the University of Agder (UiA) when his supervisor alerted him to a coming funding announcement for doctoral fellowships in offshore wind energy at the new NORCOWE Centre.

“It was pure coincidence that I got into wind energy,” he recalls. “But it turned out to be a great period in my life, and

the pay was generous compared to doctoral fellowships in other countries. It's a bit surprising that more people don't pursue a doctoral degree.”

Dr Bakka studied how floating wind turbines can operate within the speed range in which the wind turbine generates maximal output, up until the point when excessive wind speed causes the turbine to shut itself down to avoid damage (cut-off speed).

As his starting point he used numerical models from the US National Renewable Energy Laboratory (NREL), which has developed models for different kinds of wind turbines, including Statoil's Hywind. The models enable scientists around the world to simulate wind turbines, as suppliers tend to be unwilling to reveal data on their wind turbines.

Dr Bakka tested different methods for regulating a floating wind turbine based on the wind conditions immediately surrounding the turbine, and not least how turbulence affects it. He developed regulation methods that improved on the standard versions.

Instead of continuing in the offshore wind industry, however, Dr Bakka chose to apply his expertise in the petroleum industry. He took a job at National Oilwell Varco (NOV) Norway in Kristiansand where he worked on improving the hydraulic system used on offshore cranes and making them more stable. Everything was fine until the downturn in the petroleum industry hit full force and NOV trimmed back its staff by two-thirds, including Dr Bakka. He now has a new position at Cameron.

Weather and wind



Olav Krogsæter, 44, was employed as a meteorologist at StormGeo when he saw the funding announcement for a doctoral fellowship in the newly launched NORCOWE Centre at the University of Bergen. He submitted an application, but before it was processed his employer offered him the chance to earn a doctoral degree under the Research Council of Norway's Industrial Ph.D. scheme instead.

“Doctoral work under the Industrial Ph.D. scheme is co-funded by the Research Council and industry, so I could be employed at StormGeo and at the same time work 100% on my doctoral degree at the University of Bergen,” says Dr Krogsæter.

For his doctoral project he studied how weather forecasting models can simulate wind and temperature in the atmospheric boundary layer, where offshore wind turbines are located. As it turned out, the models were poorly suited for forecasting conditions over the ocean surface; they are better for use over land with the aid of many more weather observations.

Dr Krogsæter set up different variations of the forecasting model and compared them with actual measurement data from the meteorological mast FINO-1. Located at the alpha ventus offshore wind farm off the coast of Germany in the North Sea, the mast records wind speeds and temperatures from the ocean surface up to an altitude of 100 m.

There were quite large differences between the models, but by fine-tuning the models and entering new equations for turbulence, he identified a few settings that produced reliable forecasts.

After completing his doctoral degree in 2013, Dr Krogsæter stepped into a newly established researcher position at StormGeo where he refined the forecasting models. With the decline in the petroleum industry, however, the weather forecasting service company experienced a reduction in its project contracts. In connection with cutbacks in spring 2016, Dr Krogsæter returned to his original position as a meteorologist.

StormGeo has many customers in wind energy and produces wind and wave forecasts for 50 points in North Sea wind farms. The company is also commissioned for tasks by wind farm developers in the planning phase of projects.