

Trinity's Distributed Wind Programme

A report on our activities during the summer period 2016.

Dr. Niall McMahon.

December 2016.

An SEAI RD&D grant part-supported the work of the Distributed Wind Energy Group from June through mid-November 2015 and June through October 2016.

During 2015, Professor Henry Rice and Dr. Niall McMahon formed a new [Distributed Wind Energy Group \(DWEG\)](#) in the [Department of Mechanical & Manufacturing Engineering](#) at [Trinity College Dublin](#). The new group brought together existing work in small wind turbine design and control and noise modelling. Niall has worked for several years in small-scale wind, building computer models that can be used in turbine design. He was the director of DkIT's Centre for Renewable Energy and was a chief engineer in industry. Henry has a long history building computer models of how blades generate sound and how the sound travels from the source to the listener. Henry's Noise and Vibration Group had started work on small wind turbine noise, as part of a European Commission Framework 7 project, [SWIP](#).

The group set out to develop Henry's noise codes as part of a small wind turbine design platform, i.e. for the design of small-scale machines. The idea was to create a straightforward design tool for the small- and medium- wind industry and research community.

Funds from EI and SEAI kick-started this coherent wind research effort at Trinity with mid-term aims of initiating a national wind research effort and to develop an [International Energy Agency \(IEA\) Wind](#) research task around wind turbine sound and noise.

In late 2015 and early 2016, the DWEG also developed a [Python](#) toolkit for the [SEAI wind atlas](#). Called [Wind/E](#), it automated data retrieval and produced useful graphics and analytics. The project was financed from a competitive tender and was rated highly for industrial relevance.

During 2016, the DWEG's objectives were to continue code development and further refinement of the noise codes, to create an IEA task around wind turbine sound and noise and lead at a national level in this area and to help develop a strong, national wind and distributed energy effort, tackling relevant social and industrial problems.

Of these, the IEA task development was a priority.

We made very good progress in each of these and on December 1st earned approval from the IEA Wind ExCo for the New Task on Quiet Wind Turbine Technology.

Ireland's wind energy capacity reached record levels last year, [with about 23% of our electricity generated by wind over 2015](#). This is remarkable and places Ireland third in the world, ranked by the contribution of wind to the grid.

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All new technologies disrupt and it can take time for society to fully adapt, especially when the deployment is rapid. Concerns about new technologies are common. The role of government is to address worries through regulation, i.e. laws. Good laws are always based on good analysis.

One particular concern that some people have is about how wind turbine sound might affect them and good, informed regulation is important. Worldwide, international standards exist for wind turbine sound measurement but there is no common international framework around how to assess and, as necessary, set limits on wind turbine sound. In many jurisdictions, limits are set by local governments that lack sufficient guidance.

A common framework is a need and this is what the IEA Wind task sets out to do.

The expected results will be an *IEA Recommended Practice* on wind turbine sound and noise, a guidance and reference for policy makers and manufacturers and an authoritative source of wind turbine sound and noise information.

The IEA Wind tasks are unique in that they are international, very democratic and tackle practical problems too broad for any one organisation address alone. The new task will be only the 38th or 39th research task for IEA Wind, which was founded in 1977, and the first task that Ireland has proposed.

There is [a useful presentation about IEA Wind at SEAI's website](#).

The DWEG worked closely with [SEAI](#) to bring this task to the approval stage. Tasks run for at least three years and we expect that the outputs of this new task will be valuable for policy makers around the world, for citizens as well as for turbine manufacturers and the wind industry generally. It is exactly the kind of work that ought to happen as an international collaboration.

For Ireland, in particular, impartial international guidance around wind turbine sound and how it ought to influence wind turbine placement will have a direct economic benefit.

The group continued to work on model code and worked, among other things to clarify underlying noise theory used in [NREL's FAST](#) code for wind turbine design. Work also continued on advanced small wind turbine control strategies. We also presented at many events and organised a workshop on the new IEA Wind task at a [Wind Europe event in Poland](#). We launched a new national network of wind researchers at the Energy Show earlier in the year and plan to have a first official meeting in the near future.

The SEAI RD&D grant allowed us to expand the work programme in Trinity and helped get the new IEA task to approval.

We look forward to building on this success.

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Events in 2016

IEA Wind Task

- Thursday Dec. 1st 2016 - task approved by IEA ExCo.
- November 2016 - Submission of draft proposal to IEA Wind ExCo.
- Friday Nov. 18th 2016 - workshop at Wind Turbine Sound 2016, Gdańsk.
- 27th - 29th September 2016 - Meetings at Wind Europe Summit, Hamburg.
- August/September 2016 - circulation of draft proposal.
- May 11th 2016 - task update to IEA ExCo, Lisbon.
- April 6th 2016 - local publication of task at Energy Show in Dublin.

Workshop

Organised a workshop at [Wind Turbine Sound 2016](#), Gdańsk, with much appreciated support from [Wind Europe](#). Friday 18th November. About 20 experts attended from across the industry including consultancies, universities, turbine manufacturers and utilities. ([Wind Europe press release](#).)

Publications

[Speaker \(N. McMahon\)](#). *Proposed IEA Wind Task on Quiet Wind Turbine Technology, IEA Wind ExCo 78*, Brussels. Thursday 1st December.

[Speaker \(N. McMahon\)](#). *New IEA Wind Task on Quiet Wind Turbine Technology, Wind Turbine Sound 2016*, Gdańsk. Friday 18th November.

[Invited guest \(N. McMahon\)](#) by [Wind Europe](#). [Wind Europe Summit](#), Hamburg. 27th - 29th September 2016.

[Invited speaker \(N. McMahon\)](#). *The Small Wind Boom and Bust of the Early 21st Century. Challenges and Opportunities for the Future*, 2. Internationale Kleinwindtagung / Small Wind Turbines 2016, 2nd International Congress, Fachhochschule Technikum Wien, Vienna. September 16th 2016.

[Invited speaker \(N. McMahon\)](#). *Reducing Mechanical Complexity with an AI-inspired Control System*, 2. Internationale Kleinwindtagung / Small Wind Turbines 2016, 2nd International Congress, Fachhochschule Technikum Wien, Vienna. September 15th 2016.

Participants. [SWIP Project Steering Committee Meeting](#), Dublin. May 18th 2016.

[Ireland deputy representative](#). New IEA Task 3X update. [IEA Wind ExCo](#), Lisbon. May 11th 2016.

[Invited speaker \(N. McMahon\)](#). *New Tools for the SEAI Wind Mapping System*, [Energy Show](#), Dublin. April 7th 2016.

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Invited speaker (N. McMahon). *New IEA Wind Task on Quiet Wind Turbine Technology, Energy Show*, Dublin. April 6th 2016.

Prepared articles for journal publication:

- Wind Turbine Noise. [Wiley WIRE Energy and Environment](#). In preparation, due March 2017.
- Small-scale Wind Power Development. [Wiley WIRE Energy and Environment](#). In preparation, due January 2017.
- Inflow Turbulence Noise - Comparing Amiet's Equation and Lawson's Equation. Prepared for submission.

Several others are in preparation.