COLUMBUS

European Parliament Event

Accelerating Blue Growth through
Marine and Maritime Knowledge Transfer

Marine Physical Resources Case Study

Jennifer Fox: Aquatera Ltd

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 652690. This output reflects the views only of the author(s), and the European Union cannot be held responsible for any use which may be made of the information contained therein.

leanwind

Logistic Efficiencies And Naval architecture for Wind Installations with Novel Developments

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KNOWLEDGE TRANSFER FOR BLUE GROWTH

UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

OBJECTIVE: to provide cost reductions across the offshore wind farm lifecycle & supply chain.

METHODS: Develop innovative technical solutions and procedures to optimise key project stages of installation, O&M, decommissioning and address the associated transport, logistics and equipment

- University College Cork - coordinator
- 31 partner organisations / 11 countries;
- €14.9m total funding; €10m EU funding
- 4 year duration (December 2013-November 2017)

Project supported within the Ocean of Tomorrow call of the European Commission Seventh Framework Programme under GA 614020

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Knowledge Output

- 8MW theoretical Reference Turbine
  - Design specifications for
    - mass distribution
    - dimensions
    - power curve
    - thrust curve
    - maximum design load
    - tower configuration

- To facilitate research into logistics and naval architecture efficiencies for future offshore wind installations.
- Design verified and validated by DNV-GL (Members of the LEANWIND Industry Advisory Group).
- Open access

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Knowledge Need

- In order to design other processes and products in relation to wind turbines

- The design specifications were not available from other companies or designers due to IP Protection.
- Two open access Reference Turbines
  - 5MW National Renewable Energy Laboratory
  - 10MW DTU

- Consultation with the LEANWIND Industry Advisory Group
  - A gap for an 8MW Reference Turbine.
  - The 10MW is expensive to install, and the 5MW is well studied and understood

- Save other researchers the time and cost

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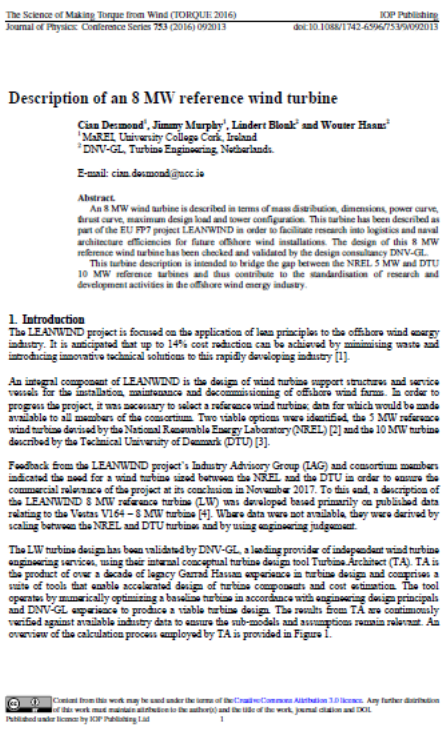
Exploitation & Dissemination Efforts

- Paper published in 2016 in Journal of Physics: Conference Series 753
- Paper presented at conferences
- Published on the LEANWIND Website
- Referenced in other publications from LEANWIND and partners



The Science of Making Torque from Wind (TORQUE 2016) IOP Publishing
Journal of Physics: Conference Series 753 (2016) 092013 doi:10.1088/1742-6596/753/9/092013

Description of an 8 MW reference wind turbine

Cian Desmond[1], Jimmy Murphy[1], Lindert Blonk[2] and Wouter Haans[2]
[1] MaREI, University College Cork, Ireland
[2] DNV-GL, Turbine Engineering, Netherlands.

E-mail: cian.desmond@ucc.ie

Abstract.
An 8 MW wind turbine is described in terms of mass distribution, dimensions, power curve, thrust curve, maximum design load and tower configuration. This turbine has been described as part of the EU FP7 project LEANWIND in order to facilitate research into logistics and naval architecture efficiencies for future offshore wind installations. The design of this 8 MW reference wind turbine has been checked and validated by the design consultancy DNV-GL.
This turbine description is intended to bridge the gap between the NREL 5 MW and DTU 10 MW reference turbines and thus contribute to the standardisation of research and development activities in the offshore wind energy industry.

1. Introduction

The LEANWIND project is focused on the application of lean principles to the offshore wind energy industry. It is anticipated that up to 14% cost reduction can be achieved by minimising waste and introducing innovative technical solutions to this rapidly developing industry [1].

An integral component of LEANWIND is the design of wind turbine support structures and service vessels for the installation, maintenance and decommissioning of offshore wind farms. In order to progress the project, it was necessary to select a reference wind turbine; data for which would be made available to all members of the consortium. Two viable options were identified, the 5 MW reference wind turbine devised by the National Renewable Energy Laboratory (NREL) [2] and the 10 MW turbine described by the Technical University of Denmark (DTU) [3].

Feedback from the LEANWIND project's Industry Advisory Group (IAG) and consortium members indicated the need for a wind turbine sized between the NREL and the DTU in order to ensure the commercial relevance of the project at its conclusion in November 2017. To this end, a description of the LEANWIND 8 MW reference turbine (LW) was developed based primarily on published data relating to the Vestas V164 – 8 MW turbine [4]. Where data were not available, they were derived by scaling between the NREL and DTU turbines and by using engineering judgement.

The LW turbine design has been validated by DNV-GL, a leading provider of independent wind turbine engineering services, using their internal conceptual turbine design tool Turbine Architect (TA). TA is the product of over a decade of legacy Garrad Hassan experience in turbine design and comprises a suite of tools that enable accelerated design of turbine components and cost estimation. The tool operates by numerically optimising a baseline turbine in accordance with engineering design principals and DNV-GL experience to produce a viable turbine design. The results from TA are continuously verified against available industry data to ensure the sub-models and assumptions remain relevant. An overview of the calculation process employed by TA is provided in Figure 1.

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COLUMBUS Knowledge Transfer Plan

1. Identification of potential End Users through analysis
2. Transfer KO to potential End Users
   - Through individual meetings with Knowledge Fellow, Knowledge Owner and Potential End User
   - Gather feedback, answer questions and gain understanding of potential for uptake during KT
3. Monitor uptake and impact of KO by End Users
   - Through continued correspondence/ follow up meetings
4. Measure impact on Knowledge Owner
   - Value of his involvement in KT Process

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Impact Summary

- 4 potential End Users identified in Analysis
- 2 additional End Users identified at KT stage

- None had existing knowledge of the KO
- 2 End Users were not interested- KO was not relevant to their work
- 4 End Users are using or planning to use the KO with positive impact on their research
- Positive impact also to the KO Owner

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Impact Measured

- Prof Zhen Gao (Dept. of Marine Technology), NTNU;
  - Two PhD students are working with the KO on their study of using a floating installation vessel (rather than a traditional jack-up vessel) to install large-scale wind turbine blades.
  - This KO also allows to compare the installation possibility and required vessel performance for different turbine sizes (including also the NREL 5MW and the DTU 10MW).

- Joerund Moseid, Head of Commercial Design, Floating Power Plant
  - Planning to use the turbine data in the update of their commercial turbine design
  - Side impact- through the KT meeting, learned of the MARINET2 Funding opportunity (Managed by UCC); applied and won funding to test their device in France

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Impact Measured

- Johan Slaette, Senior Consultant for Renewable Energy at DNV-GL,
  - "DNV-GL …aims to look into the [Knowledge Output] very shortly, when our project has reached a stage where it can be a very relevant source of information …. We believe this will provide further confidence in the system we are looking at …. Hence, we very much appreciate the access to the 8 MW reference turbine and consider that it is essential for the industry development."

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Impact Measured

- Dr Cian Desmond, University College Cork, LEANWIND project.
  - "The COLUMBUS project has given me the unique opportunity to speak in detail with six individual experts in my field specifically about the '8MW Reference Turbine' Knowledge Output from the LEANWIND project. The discussion we had and the feedback received over the course of these meetings was invaluable to my continuing work with the LEANWIND project and beyond. It has been extremely useful to engage with these experts and to learn more about the knowledge gaps and requirements in this field."

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aquatera
environmental services and products

Thank You

Jennifer Fox

Aquatera Ltd

Jennifer.fox@aquatera.co.uk

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Impact Indicators

- Minutes of meetings taken noting:
  - understanding of potential End User
  - Engagement of potential End User
  - Commitment to uptake and application made

- Ongoing correspondence & follow up meetings with End User
  - Specific questions to the End User
    - Did they fully understand the KO?
    - Do they have any follow up questions for the Knowledge Owner?
    - *Have they used/ Do they intend to use* the KO in their work?
    - What *is/ will be* the impact of the KO on their work?
  - Recording of application or intended application of the KO
  - Recording of impact or potential impact of the KO from the point of view of the End User

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