

## Wind Farm Analytics Newsletter – Spring 2021

### Work with us - something your company can do to make COP26 a success?

Hey! It would be great if you could work with Wind Farm Analytics on investigating new methods to increase the output of wind turbines. Maybe we can increase your own green energy production and revenue by doing so.

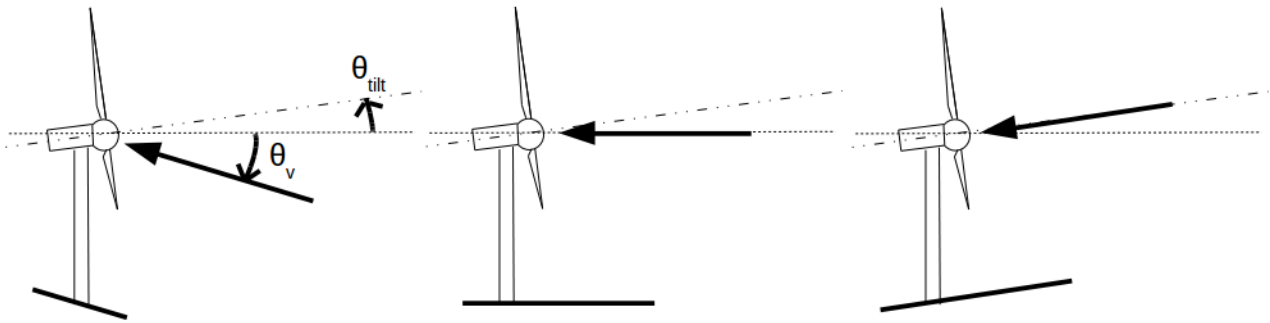
Let's evaluate together the benefits of converging beam LIDAR, and new retrofit controller options #MadeInGlasgow for improving the whole world's wind energy deployment. We can quantify the benefits from study at one of your wind farm projects whether in planning or in operation, and then present our results in papers and presentations at conferences including COP26. We can really make a positive difference and simultaneously generate new revenue streams.

At Wind Farm Analytics we recognise that we are standing on the shoulders of giants. We are honoured to have spoken and worked with many industry participants who have been developing our industry from the early days when the naysayers insisted wind turbines would come to nothing. The industrial machines of today are really beautiful pieces of engineering. However, they can still be improved further! WFA has worked out practical ways to do this through diligent study of real life operational data. The COP26 conference is a call for you to work with Wind Farm Analytics and others who offer further improvements. So please get involved – hire us to quantify what revenue gains can be obtained for your wind farms and how to do it; provide us with a letter of intent to take to investors confirming that you believe in the benefits of converging beam LIDAR, or maybe your company can invest directly in WFA as part of your contribution to COP26 year – and benefit handsomely when we succeed!

### Latest developments at WFA

- New £500k investment plan, de-risked for investors. Read more about this below and get in touch for a copy of our investor slide deck and to learn more about how we aim to turn £500k investment into a company worth £180 million in five years. Maybe your company can invest £500k for COP26 or join with others to do so?
- Wind Farm Analytics is now a member of Scottish Renewables – we attended many SR conferences over the years and decided it was high time to join up!
- We have been working for development and operational wind farm owners in the UK and in the EU towards improving the productivity of their wind turbines.
- By analysis of operational SCADA data we have quantified per turbine the value of complex flow losses. We confirmed previous findings and gathered more evidence on the wind flow characteristics which cause ~10% losses on many turbines.
- Feeding on learnings from our original data analysis we invented a new class of wind turbine controllers or controller upgrades, designed to capture more energy via retrofit or factory manufacture – correspondingly a new patent has been filed.
- A *Korean patent* has been granted covering converging beam LIDAR on turbines.
- A *Chinese patent* has been granted covering converging beam LIDAR on turbines.
- Some new investors have come on board, joining existing investors and helping develop and maintain the existing patent portfolio – new investors always welcome!
- We now have 3 UK patents granted, and international patents granted in USA, Japan, Korea and China; further patents pending in Europe, India, Brazil, Canada.

## Wind turbines are axial flow turbines!



It may seem an obvious observation but an axial flow turbine responds best to an axial flow. So-called “horizontal” axis wind turbines usually incorporate a rotor axis tilt of around 5 degrees in order to reduce the risk of collision between a flexing blade and the tower. This means that even in horizontal flow there is an angular misalignment of the flow due to the tilt angle.

When the wind is approaching the turbine up a slope (roughly following the land form) then this vertical flow misalignment is exacerbated by the tilt angle. If the flow is coming down a slope from above then the tilt angle can reduce the flow misalignment with regard to the rotor axis.

### New opportunities for retrofit controllers – seeking partners

It should be noted that wind turbines have yaw control which actively works to minimise angular misalignment in the horizontal plane (yaw misalignment) but there is no such control system applied to minimise angular misalignment in the vertical plane.

Wind Farm Analytics Ltd has devised new control systems (patent pending) which can be incorporated within factory manufacture, or can be retrofitted at a cost estimated within £30k per turbine. These are expected to eliminate the vast bulk of the 10% complex flow losses experienced by turbines in hilly terrain, as quantified per individual turbine in our Spring 2020 customer case study of operational data analysis from a Scottish wind farm.

During the last year we have been repeating our customer case study analysis for many more turbines in hilly terrain and we see repeatability on many turbines. This suggests we can recover around £1 million per turbine at a retrofit cost of around £30k – asset owners in hilly terrain please get in touch to discuss options for your own turbines.

Further opportunities are offered by many possible control variants (also patent pending) with great potential also for those on flat terrain/offshore – covering all turbines in the world!

Converging beam LIDAR wind measurement services do not need to be employed in order to benefit from the aforementioned retrofit controllers. However, there are additional gains when doing so. Therefore our work with converging beam LIDAR is strongly aligned with reaping further related benefits. Hire us to quantify and explain the benefits for your own wind turbines and learn about many new options to increase your bottom line!

## **Listening to investors – new investment plan**

Some of us can have a tendency to operate in broadcast (“transmit mode”) only. When you have something to say then it makes sense to say it, right? However, we have also been working on our listening skills too (“receive mode”). Self awareness - we can all improve!

Previously we sought £3 million investment for bringing to market 3 products simultaneously - (i) the ground based converging beam LIDAR for onshore planning and operational diagnostics, (ii) the floating product for offshore, (iii) the rotor-integrated version for enhancing control of all operational turbines onshore and offshore, including floating.

Although having completed ~£2 million of InnovateUK projects to design, build and test our prototypes we still need investment to bring products to market. Therefore we are seen by investors as “early stage pre-sales”. £3 million was seen as too risky for a first investment. And whilst founder, friends and family investors so far invested amounts between £1k - £30k or more, we learnt that for early stage or angel investors £500k is a typical limit.

We also learnt investors are very focused on the bottom line and eliminating risk – they don’t want new product R&D unless well justified. In short no one wants to take risk. Significant revenue is required from an initial product before further product development.

In response to this investor feedback we have devised a new de-risked £500k investment plan focusing on quickest-to-market ground based converging beam LIDAR rental sales (3d wind data as a service), out-sourcing the initial manufacturing. We believe that investors will be especially interested in clean tech like ours during this COP26 year here in Glasgow, so investors big or small please get involved quick before you miss this green boat to billions!!!

## **New investor approach – industry colleagues join us and get some!**

In the last year we added further new investors. Everyone is welcome but we are especially keen to invite wind industry professionals to join us. We know that many of you appreciate the value of our technologies better than non-industry investors, simply because of your understanding of wind turbines physics and engineering, aerodynamics of blades, as well as an appreciation of our industry growth. A great thing about industry investors is that you can help spread the word and other investors can see that there is appreciation of our product from the wind industry target market. If you believe in what we are doing and understand that all investments include risk then get involved, we want you!



 **Join us on our journey**

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