

# A day in the life of a Wind Analyst

Each morning, I arrive in the Airtricity office, greet my colleagues and switch on my indispensable laptop. First task of the day is an important one: I check that all of Airtricity's wind monitoring masts around the world have sent in their data overnight. If one hasn't, I analyse the problem, come up with the solution and arrange for it to be fixed straight away. Sometimes, I must make the trip to the mast and fix the problem. In summer, this can mean an enjoyable day-trip from the office to one of the many hills throughout the island, each with its own spectacular view. On winter days, well, let's just say you really appreciate the power of wind!

Next I turn my attention to the data that has arrived and perform some quick statistical checks to ensure the data is reliable using some software I've developed. Good computer skills are a great advantage for the modern physicist and allow me to accomplish so much more.

Why do we need this data? Surely, a hill in Ireland is windy enough? Well, the real question is how windy? We want to produce as much clean renewable electricity as possible from these graceful wind turbines, so we must find the best places to put them and know as accurately as possible how much electricity we can generate over the next 20 years. Coincidentally, the next item on my list requires me to estimate the potential 20 year energy production from what is now just a hill. I process several years of wind data and after several steps reduce it to a probability distribution representing the expected long-term wind climate. This process simplifies the next analysis, where I use sophisticated flow modeling to model the wind-flow across the hills, lakes, trees – pretty much anything really.

Once I have produced a 'digital wind map' for the site, the next step is to locate the turbines. There are many turbine models to choose from, so I select the most suitable model for this site and then maximize their future electricity production by programming our fast workstation to optimize the wind farm layout under the constraints.

This computation can take many hours, so in the meantime, I prepare my report and methodically take account of uncertainties in each step of the analysis. At the end of it all, I present a nice round 20 year energy production figure to our finance people. If the site is 'a runner', the wind farm layout goes off to the men in hard hats for construction.

When this essential work is done, I turn my attention to my various sideline projects, sometimes working with our trading, finance and engineering departments. The quantitative skills of a physicist are often called upon to solve their problems. Today, I will work on the wind power forecasting project where we want to accurately forecast our wind power several days ahead. Given the relative infancy of the industry, these projects involve a new piece of research that I can later adapt into a research paper. In the past, I have been invited to present such work at conferences in Europe where I have met many interesting people from across the world working in wind energy.

As a physicist, I enjoy the interesting and challenging opportunities in this new and growing industry. Knowing that I am part of a larger movement, to use smarter and less polluting forms of energy and help fight climate change, makes it so much more rewarding.

**Paul Hughes**

*'On winter days, well, let's just say you really appreciate the power of wind!'*



Wind turbines on the Arklow banks off the coast of Co. Wicklow.



Paul Hughes earned a joint honours degree in Experimental Physics and Biology at NUI Maynooth before researching a Master's degree in Computational Astrophysics at UCD. He is currently studying for a Master's degree in Financial Mathematics at ETH, Zurich.