

Reducing the cost of wind energy for a renewable future

April 22 2016, by Michael Allen

A 100 percent renewable energy scenario is possible in Europe, but to achieve it, we need to make offshore wind more competitive and start redesigning our energy systems, says world expert Brian Vad Mathiesen

In 2015, Denmark produced 42 percent of its electricity from [wind turbines](#), breaking the world record of 39 percent that it set the previous year. But this is only the beginning. Researchers are looking at ways to push this figure higher and ultimately transition to 100 percent [renewable energy systems](#).

Brian Vad Mathiesen is a world-leading engineer at Aalborg University in Denmark, and an ISI Highly Cited researcher.

He spoke with youris.com about reducing the cost of offshore wind energy and the challenges of moving toward systems that generate the majority of their energy from renewables.

What can be done to make wind power more competitive with non-renewable energy?

First of all, you have to realise how competitive it actually is. If we look at the cost of onshore wind, including different measurements of balances and costs, it is competitive with the [fossil fuel alternatives](#). But that doesn't go for all onshore sites, and it certainly isn't true for offshore, which has a cost about 20 to 50 percent higher at the moment

than fossil fuel alternatives.

To make offshore turbines less costly, we need to create a market where the producers can erect a big park and get experience with the construction of offshore turbines, and also get experience shipping the turbines to the site and building the foundations for offshore turbines. If we look into the future, I would expect that by 2025, the costs from offshore can be competitive.

With regard to competitiveness, you also have to realise that if you count externality costs, both offshore wind and PV [photovoltaics] have lower societal costs than fossil fuels, due to the health cost of emissions and CO2 emissions having other adverse effects. But these things are very hard to put an actual figure on.

Researchers in Europe are developing solutions to face the higher costs of maintenance of turbines offshore and solve problems such as the erosion of blades caused by the marine environment. What other technological issues could be addressed to reduce the cost of wind energy further?

I think offshore turbines will be bigger than they are today, which will lower the production costs. But I really think it is about the foundation and installation costs. We need more experience with that.

Many people think noise is an issue with onshore wind turbines. What can be done to tackle this perceived problem? And how is it likely to affect the development of onshore wind and influence the development of offshore wind?

The key to tackling perceived visual or noise effects is local ownership

and good processes leading to the erection of wind turbines. Wind turbines were developed in Denmark and the key for such large acceptance rates and very few problems despite having several thousand turbines in our countryside is that local communities are part of the decision-making process and ownership.

Ownership is also key in some cases for offshore. I would suggest that a large part of the ownership is offered to coastal inhabitants, who may be affected visually. There are no sound issues offshore. No proven long-term effects on wildlife, either.

As you've mentioned, offshore wind is more expensive than onshore wind, but the energy yield per turbine can be higher. Where do you think the future lies—onshore or offshore?

It will be a combination. When we look into the future, what kind of renewables do we need? I see it like this: If the ambition is to go toward 100 percent renewable—so very large-scale renewable systems—then there is the easy option of burning biomass instead of coal, natural gas and oil. But the problem with that is there is not enough biomass.

So we need other resources, and then we start to look at onshore and offshore wind, PV, and maybe wave energy. When we look at the potential from those resources we quickly see that onshore wind will be a major part of the system but it will not be enough. We simply need a lot more resources than onshore wind can provide.

We need offshore wind as well, but we also need PV. The mix really depends where you are.

Last year, Denmark broke the world record for wind

power, producing 42 percent of its annual energy from turbines. How much further do you think that could be pushed?

There are a number of challenges when you have a very large quantity of renewables. Up to a certain point, the current [energy](#) system design is perfectly capable of handling this.

When you have fluctuating renewables between 20 to 30 percent, the power plants in the system are able to stop when the wind is there and the peak of the wind or the PV is not higher than the demand. Once you start going toward 40, 50 or 60 percent fluctuating renewables you really need to redesign your system if you want to utilise it. This is the next step in Denmark.

We need to redesign our system—not fundamentally, but bit by bit. We need to start considering replacing boilers with heat pumps in individual houses, but also in our district heating systems. And we need to electrify our transport, not because we have excess wind, but because we want to build more wind to replace the oil that we use in the heating and transport sector.

If we start to redesign the system I think we can easily go toward 60 to 70 percent fluctuating renewables, and before 2020 we will have 50 percent in Danish electricity.

Provided by Youris.com

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