The monster lurking in the shadows?

How capture price reductions for wind could threaten targets for large capacity, and how the monster can be tamed.

Dr Kate Freeman, Managing Consultant, BVG Associates and Giles Hundleby, Director, BVG Associates.

- Offshore wind is now often commercially viable even without government subsidy.
- Projects without government subsidy or long term corporate PPA face revenue uncertainty – also known as merchant risk
- Strategies can be adopted by developers to mitigate this risk.
- Merchant pricing poses several potential issues for development, innovation and competition.
- Governments need to act to ensure affordable consumer prices and the lights stay on.

Price reductions in offshore wind have meant projects need less and less subsidy to be commercially viable. Prices are now so low some developers and some countries are changing their approach. Projects are now being put forward that do not require government subsidies or PPAs. This may be viable in the near future, and is certainly likely to be popular with politicians and the public, but it risks starting on an ultimately self-destructive path.

When wind farm developers choose to sell energy directly into the grid, they are operating in the merchant market. Rather than receive a fixed price per MWh they are exposed to the variations in that price on an hourly (or even half-hourly) basis. The revenue received is a weighted average of the energy supplied and the prices achieved. The annual revenue per MWh achieved by the wind farm is called the capture price.

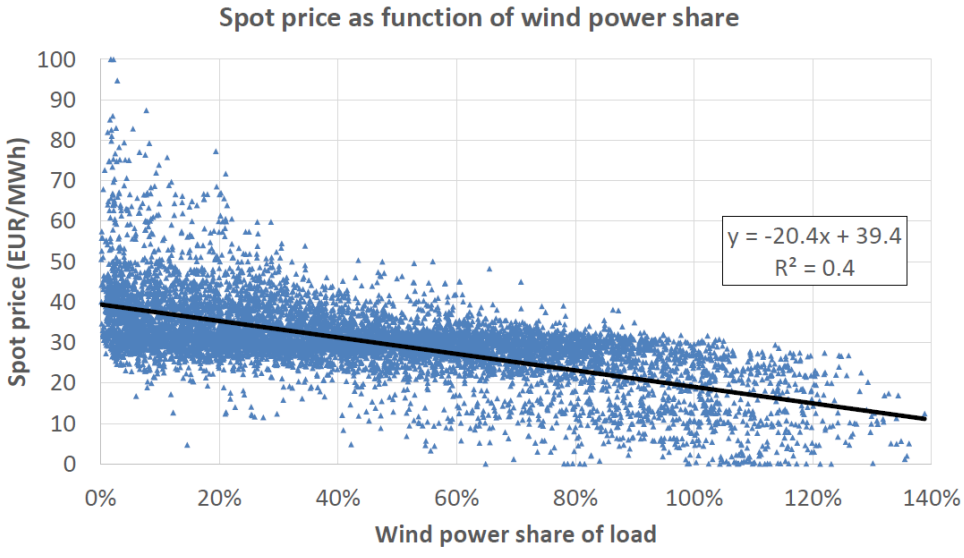
Why capture price for offshore wind could be lower than average hourly price

Hourly power price varies because:

1. Demand varies throughout the day and night; from weekdays to weekends; and from summer to winter
2. The price at which different power plants will supply energy varies from low-cost base-load suppliers to high-cost peak-power plants (when considered from lowest cost to highest this is called a merit-order), and
3. Renewables supply (which always features first in the merit order) varies with amount of sunlight (for solar power) and wind speeds (for wind farms).

In a market with negligible wind power capacity, it is likely that the capture price that wind power could achieve would be nearly the same as the annual average power price.

However, it is already clear that in some markets, wind power capacity is at a high enough level to have a significant impact on power price, as this chart created by Henrik Stiesdal for the Danish market shows.



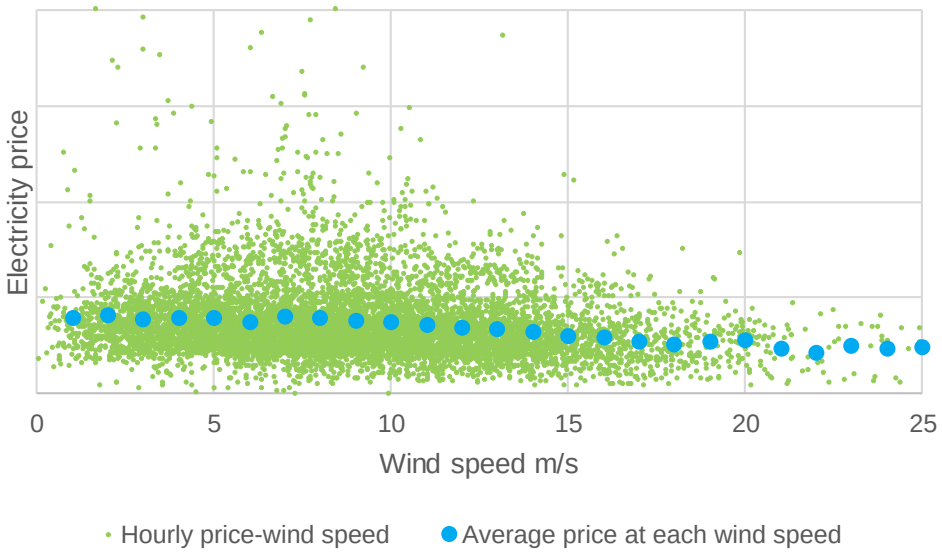
Source: Energinet.dk

This chart shows that when wind power has a high share of the load demand, energy prices are low. This is because most of the higher-cost suppliers in the merit-order are not needed and the energy demand remaining to be met comes from the suppliers at the lowest cost end of the merit order. Unfortunately for wind farm owners, this high share of the demand happens most when wind speeds are high and the wind farms are producing at or close to maximum output. Conversely, power prices are higher when wind speeds are lower, and wind farms are producing less or even zero output. This

is shown in the next figure for another market with lower (but still significant) wind power capacity.

The capture price when there is significant wind capacity in the system is clearly less than the annual average of the market price. The more wind power capacity that there is on the system the steeper this relationship will be, and the lower the capture price for wind power.

It has been estimated for the UK that capture prices would below £30/MWh (vs CfD strike prices of £57.5/MWh in the UK 2017 auction – all at 2012 prices) by 2030 if the planned 40GW of offshore wind capacity is achieved by then. This is in the context of forecast average annual electricity demand in 2030 around 40GW, with a peak demand of 60-65GW.



Mitigation and optimisation:

Wind farm developers can look at optimisation actions to increase capture prices as shown in the table below. The first three actions increase the amount of energy supplied at lower wind speeds and/or when prices are higher. Storage and power to gas actions aim to use energy when prices are low and convert it to other vectors or store it for sale when prices are high.

Regulators can also use some of the same actions and others to mitigate the impacts at a national or international scale, keeping the grid stable and the lights on.

Action	Mitigation	Wind farm optimisation
Overplanting		Y
Large rotors		Y
Control strategies		Y
Storage	Y	Y
Interconnectors	Y	
Spatial separation of wind farms	Y	
Power to gas	Y	Y
Smart networks	Y	

So what?

The other action that regulators could take is to move away from ‘zero subsidy’ for wind power. In the zero-subsidy approach it is more difficult to drive competition between projects being developed. It is hard to select between competing projects if they are not bidding for a government PPA at the lowest price. If energy prices are generally high, the consumer could end-up paying too much for the wind energy delivered. Conversely, if future energy prices are forecast to be low, the business case for new projects could be undermined and projects not developed.

A move to contract for difference (CfD) could work, by setting projects in direct competition for a fixed price PPA, While this will ensure lowest prices for the end consumer, it will contribute to lowering capture prices, meaning the regulator could be providing top-up payments to the operator. This could add up to significant cost to the regulator unless this was clawed-back from the market generally.

The magic solution is not clear, but international co-ordination of interconnectors and power to gas scale-up will certainly help whatever the approach.