

# Danish Energy Agency: Wind is cheapest

Misleading Information in report on cost of electricity from new power plants.



The Danish Climate Minister is happy with the result of a new report<sup>1</sup> from the Danish Energy Agency (DEA). "I am pleased that the analysis shows that wind is the right way forward, also regarding economy," he says.

The report acknowledges the uncertainty for a calculation of production costs from new power plants to be commissioned in 2016, but one important source of error has been played down:

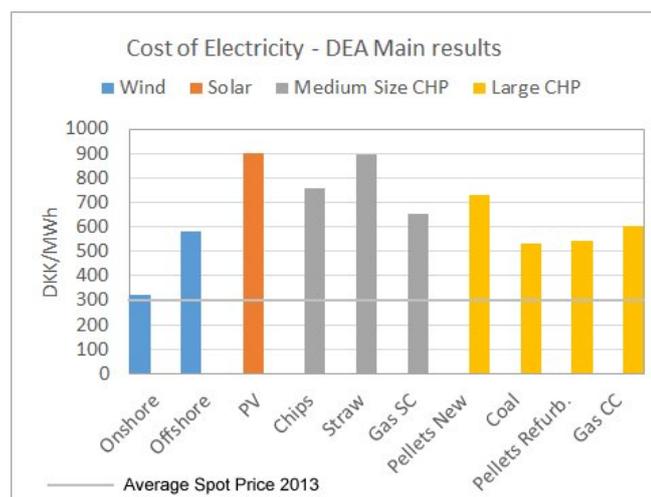
One MWh wind energy has a significantly lower market value<sup>2</sup> than one MWh from a dispatchable unit.

Based on observations since 2006 a footnote on page three in the report says that the average market value of wind energy has been 5% lower than the market value of the electricity consumption. The report does not discuss the perspectives of this observation. For 2013 the difference was 17% and it will probably be increasing in Denmark for the next few years.

This note will present observations for 2012 and 2013.

## DEA Main Results

It is a main result of the DEA report that electricity from onshore wind turbines is far cheaper than electricity from the nine other technologies which have been analysed. Even offshore wind turbines seem to be competitive in comparison with most other options.



<sup>1</sup> Energistyrelsen: "Elproduktionsomkostninger for 10 udvalgte teknologier", 1. juli 2014 (not yet available in English)

<sup>2</sup> Based on Nordpool spot prices

The cost calculation includes capital cost, fixed O&M, variable O&M, fuel cost, CO<sub>2</sub>-cost, other emissions and balancing cost. Cost reductions for the estimated revenue from heat production have been made.

The balancing cost is 15 DKK/MWh for wind and 7.50 DKK/MWh for photovoltaics (PV). According to Energinet.dk the CO<sub>2</sub>-costs for calculations are DKK 39 per ton in 2014 increasing to DKK 239 per ton in 2035.

DEA emphasizes that no new production facility can be financed only by income from the spot market at the current price level.

## Two Types of Balancing Costs

It is widely assumed that it offsets the lack of dispatchability for wind and solar power when balancing costs are included in the calculation. However, the 15 DKK/MWh for wind includes only the cost of forecast errors.

The natural fluctuations from wind and PV must also be equalized by other technologies. It is difficult to calculate the cost of this equalization, but the market will reveal the cost when the share of wind energy is high enough.

Danish observations for 2013 indicate the magnitude of this second balancing cost for a 33% wind energy penetration.

## Wind Energy is losing Market Value

The average value of Danish wind energy based on Nordpool spot prices was 83.3% of the market value of the electricity consumption in 2013.

This means that the insignificant 5% loss of market value mentioned in the DEA report has increased to 16.7% in 2013.

2013		Value		
Total	GWh	1000_€	€/MWh	Load:100%
Load	33.529	1.359.926	40,56	
Wind	11.126	375.922	33,79	83,3%
Central	16.518	679.312	41,13	101,4%
Local	4.802	207.243	43,16	106,4%
Export	2.967	88.965	29,99	73,9%
Import	4.048	186.335	46,03	113,5%

The different market values for different technologies should cause a corresponding correction of production costs used for a cost comparison. Preliminary calculations for first half of 2014 indicate a 4% difference between the market values of onshore wind and offshore wind. The average value of PV is about 5% above the consumption value.

For the 2013 conditions the cost corrections could be approximately:

- Onshore wind: +18%
- Offshore wind: +14%
- PV: -5%
- Large CHP: -1%
- Local CHP: -6%

This is still a limited correction, but it reduces the differences and it changes the merit order so electricity from large coal and gas fired power plants is cheaper than offshore wind energy, even including CO<sub>2</sub>-cost.

The loss of market value will probably increase further as the wind energy penetration approaches 50% in 2020.

### Loss of Market Value was Considered by DEA's Consultant

The calculations in the DEA report was made by EA Energianalyse<sup>3</sup> on behalf of DEA. The wind energy loss of market value is discussed in chapter 5 on "Not valued effects".

The EA report clearly states that for use in decision-making it is necessary to consider not only the production cost per kWh, but also the value of the produced electricity. As a rough estimate the EA report expects that the loss of market value for wind energy will be 10% in 2015, 15% in 2020 and 20% in 2030, while the additional market value for dispatchable power will be 5% in 2015, 7.5% in 2020 and 10% in 2030.

It is negligent or at worst deliberately misleading that the DEA report plays down this clear message.

### Observations for 2012 and 2013

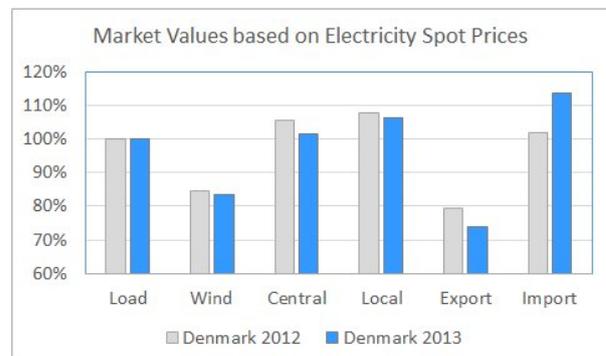
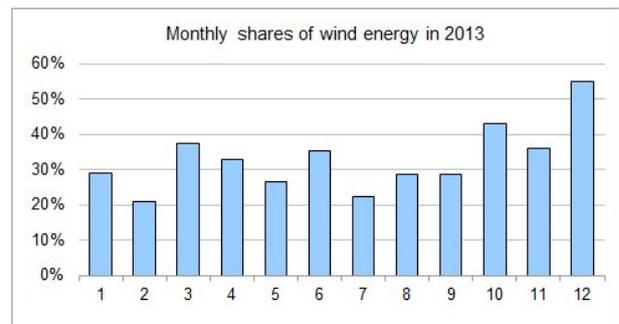
Market values have been calculated for 2012 and 2013. The average wind energy share was 30% of the load in 2012 and 33% in 2013. New capacity was added at the end of 2013.

The market values were similar in 2012 and 2013, but with a common trend reflecting the increasing wind power penetration.

It will be interesting to examine the market values for the next few years. It will be particularly interesting to see how the average values of export and import will develop.

Now Energinet.dk also publishes hourly time series for PV, onshore wind and offshore wind. 2014 will be the first full year with public access to this important information.

Since the euphoric announcements of a 62% wind energy penetration in January 2014 the wind energy share has been steadily decreasing to 25% in June 2014. The reason is unknown. The information channels are silent.



<sup>3</sup> EA Energianalyse: "Elproduktionsomkostninger, Samfundsoekonomiske langsigtede marginalomkostninger for udvalgte teknologier", 08-04-2014 (not available in English)

## Wind is not cheapest

The Danish Energy Agency (DEA) has used a biased presentation of calculated costs for electricity from 10 selected technologies for delivering the message: "Wind is cheapest".

DEA has ignored the message from its consultant that the decreasing market values for non-dispatchable power are important for the cost comparison.

After a correction based on spot market conditions in 2013 offshore wind will be among the most expensive technologies.

DEA's purpose could be to remove any doubt that the continued large investments in new wind power will be profitable.

Due to the subsidies for wind power large coal fired units are being closed down in Denmark. Most of these units are efficient, environmentally updated and with several years remaining technical lifetime. In a comparison the capital cost (DKK 198 per MWh) could be excluded or considerably reduced for these existing units. Their production will be cheaper than for any of the alternatives mentioned in the report, even including the CO<sub>2</sub>-cost.

Unfortunately, the perfect dispatchable replacement of this fine generation of power plants has not yet been invented.

It has become an unreflective political target to remove the use of coal from the Danish energy systems as soon as possible. The carbon emission and the global climate is the main argument. There is no doubt that this view is predominant regardless of the result of any calculation. This must lead to the conclusion that the CO<sub>2</sub>-costs used in the calculations are too low. The real CO<sub>2</sub>-cost is higher. The cost of the Danish Energiewende is higher than realized so far.

The future market response to more wind and PV will depend on the development in other European countries. Therefore, the development of the loss of market value for non-dispatchable power is very uncertain. It would be a wise Danish strategy to be more reluctant with the installation of new offshore wind parks in the next few years and to make careful market observations for supporting the necessary decisions on future new Danish power plants.