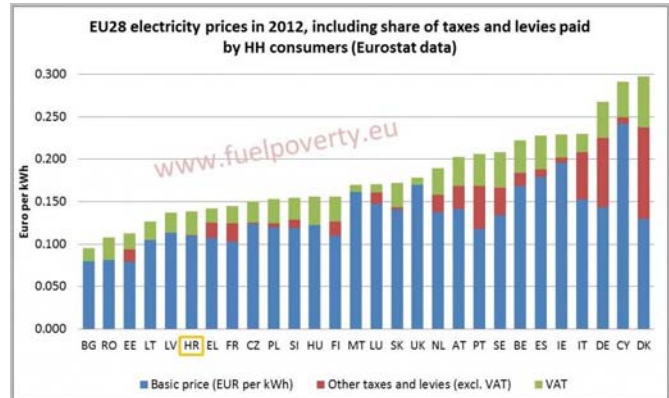


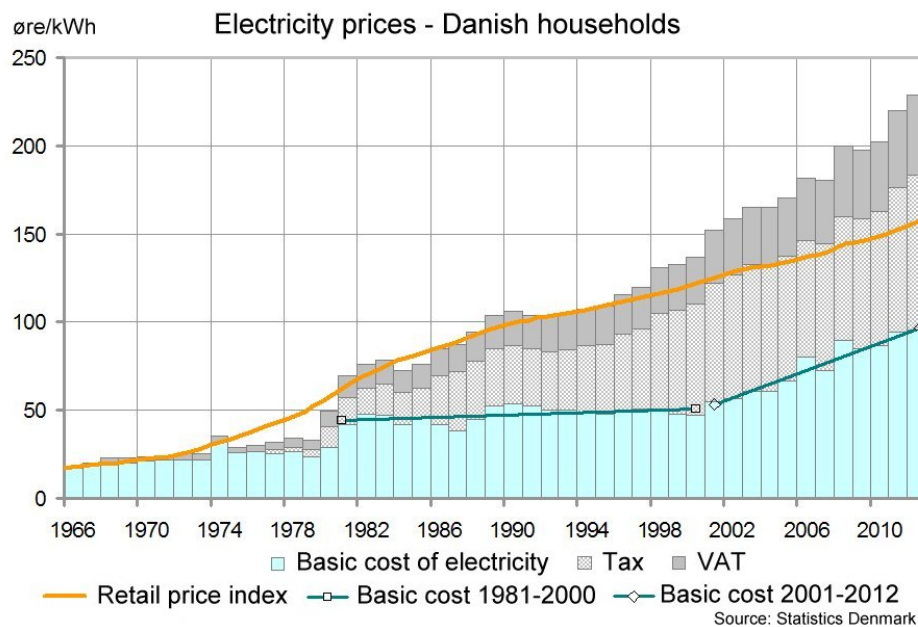
Skyrocketing Electricity Cost in Denmark

There is a lot of evidence that electricity for households is more expensive in Denmark than anywhere else in the EU.

However, most of the household price is tax and VAT. The basic Danish electricity price is close to the EU average. Therefore the cost of the Danish green transition is not considered to be alarming.



A closer look at the price development since 1966 calls for an investigation of the trend in electricity cost from 2000.



The first energy crisis in 1973 had only a limited effect, but after the second energy crisis in 1979 the basic cost of electricity took a step upwards and the state began to see electricity as an easy source of income.

For about 20 years from 1981 to 2000 the cost of electricity was rather stable. The retail price index increased by 80% during that period while the electricity cost grew by only 14% or 0.68% per year. This observation indicates that the electricity supply industry was able to contribute to the increased national wealth during these years.

A significantly different development began in 2000. From 2001 to 2012 the basic electricity cost increased by 83% while the increase of the retail price index was only 25%. During this period the cost of electricity was an increasing burden to the Danes.

The electricity cost in Denmark will probably continue its growth for several years.

What happened in 2000?

The framework for the electricity supply industry in Denmark changed so much between 1999 and 2005 that the identification and quantification of the causes of the steadily increasing cost is difficult.

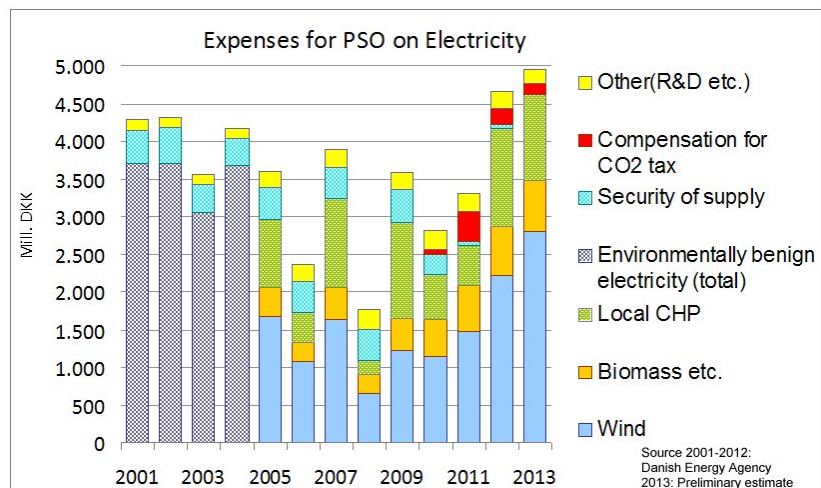
The gradual introduction of competition at all consumption levels from 1999 to 2003 was supposed to provide cheaper electricity. However, the market opening was superposed by other changes which reduced the effect of competition.

Electricity production from wind and Local CHP was prioritized and kept beyond competition. In West Denmark the prioritized production (PP) was 43% of the consumption in 1999. At that time the cost of PP was about DKK 310 per MWh.

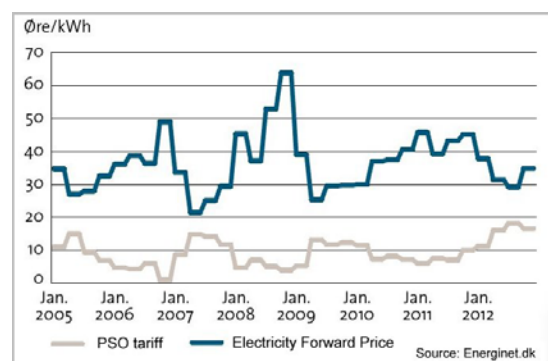
The support for wind power was paid by the Danish state until 15 August 1999. After that time the electricity consumers had to pay the more than DKK 800 million per year.

The magic word is PSO (public service obligation). The Danish Energy Agency has estimated the total support for PP for the years 2001 to 2004. From 2005 most PP was traded in the market and the support was given directly as PSO.

In order to guarantee a minimum income for wind and local CHP the PSO support was made dependent on the price level in the electricity market. This feedback has reduced the market efficiency and the competition seen from the consumers' point of view.



A steady growth of energy prices and a corresponding fall of the PSO support to nearly nothing were forecasted about 2006. However, market prices remained as unstable as always before and forecasts as wrong as they always were. The PSO support has a corresponding variation, but now with an increasing trend due to the new offshore wind parks.



The wind power support from 2000 can explain a significant upwards jump of electricity prices from that year but market conditions and PSO can only explain a part of the increase from 2001 to 2012.

The expensive decisions

The Danish Energy Association (Dansk Energi/DE) has published breakdowns of electricity prices for different consumer categories. Households consuming 4000 kWh per year have been selected for this note.

Due to changing conditions, two different sources for this note are using different keys for the breakdown. The aggregations selected for the chart are supposed to give an impression of the changes during the period.

“Supply” includes purchase of electricity in the market and cost of local connection to grid. This part had a significant growth until 2003, supporting the expectation at that time of a further steady growth until 2010.

“Supply” also includes local grid tariffs which have increased by more than 50% (to 18 øre per kWh) from 2005 to 2013. Grid reinforcements for local generation could be elements in this growth.

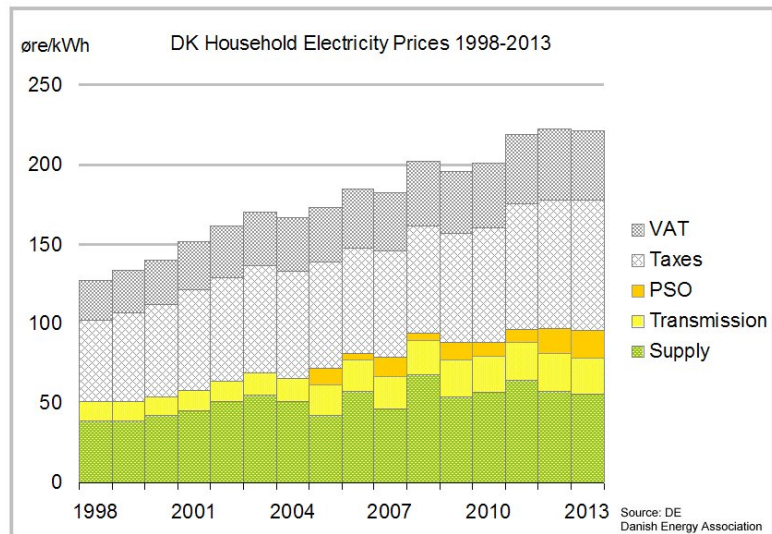
The two sources from DE meet in a discontinuity between 2004 and 2005. However, the sources seem to agree on the total electricity cost without taxes and VAT. This cost has increased by nearly 100% from 1998 to 2013. Increasing costs for transmission and PSO seem to be essential elements of the growth.

Electricity consumers must pay PSO as their contribution to the green transition. The PSO-tariff was 17.5 øre per kWh in 2013 and is expected to exceed 20 øre per kWh in 2014 (or DKK 7 billion in 2014).

Energinet.dk has invested more than DKK 15 billion since 2005. The new assets include interconnections, feeders for offshore wind parks, new transmission lines and synchronous compensators. All these technical plant are justified by the green transition. Therefore the depreciation for technical plants (DKK 1.5 billion in 2013) should be seen as a transition cost on the top of PSO.

Furthermore an expensive programme for the replacement of several miles of 400 kV overhead lines by cables (the “beautification projects”) has been decided by a majority of Danish political parties. Due to the very high cost three of the projects have been postponed till after 2020.

“Taxes” include a number of different elements. The taxes add 100% to the basic electricity cost in 1998. The total amount has increased by 60% from 1998 to 2013. “VAT” adds 25% to all other cost elements. Taxes and VAT are paid to the Danish state.



Expensive net import in 2013

It has been claimed for several years that Denmark has been selling overflow power in windy periods at no cost while expensive power must be imported during calm periods. This observation could be made for a few hours but so far not significantly as annual average values.

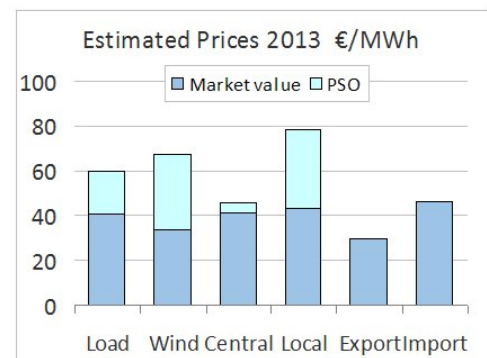
2013 is different. The wind energy production exceeded 30% of the electricity consumption and the difference between average import and export prices has become significant.

Market values have been calculated based on the Nordpool spot prices for each of the two Danish price areas.

Denmark		Market	PSO
2013		value	
Total	GWh	1000_€	1000_€
Load	33.529	1.359.926	662.094
Wind	11.126	375.922	376.138
Central	16.518	679.312	67.172
Local	4.802	207.243	171.750
Export	2.967	88.965	0
Import	4.048	186.335	0

The column with PSO money is estimated. Support for biomass has been distributed between central and local production with the same amount per MWh due to missing information.

The chart shows that the average market values are significantly different. Wind energy has a lower average market value than the consumption. Local CHP production has a slightly higher average market value than consumption because local power plants can move production to hours with high spot prices. There is a significant difference between average import and export prices.



The net import in 2013 was 1081 GWh with an average cost at € 90 per MWh.

The flow of PSO money has a significant importance. PSO adds 86% to the value of the wind energy. This result indicates that wind energy is far from competitive without support.

The surprising observation is that electricity from local CHP is significantly more expensive than electricity from wind. In 1999 the cost of electricity from local CHP was about € 40 per MWh or half the cost in 2013. An essential part of the support for local CHP¹ is planned to end in 2018. This could end an era of local CHP in Denmark.

Even the future role of the central power stations is uncertain. They have been designed for CHP and base load operation. The still increasing share of energy from wind and PV will change the demand for electricity from thermal power plants towards peak load with a much smaller volume. Several units have already been closed or mothballed.

The same trends have been observed in other countries. In order to maintain the necessary dispatchable production capacity for the peak demand several countries are considering or planning the introduction of capacity arrangements (such as a capacity market).

¹ Grundbeløbet ("The Basic Amount")

The power stations are important suppliers of electricity and heat in Denmark. This capacity is decisive for security of supply and for balancing wind power variations. Therefore Danish capacity arrangements in harmony with the neighbouring countries should be considered.

Can anybody be held responsible for the cost of electricity?

There are many speculations and myths on the cost of electricity in Denmark. There is a widespread feeling that the cost of the green transition is about to run away, but so far the authorities did not present an analysis with a breakdown of the total Danish cost of electricity in the past and in the future.

It is too easy to decide additional costs when nobody feels a responsibility for the total cost. Each well-founded idea may add only a few øre per kWh to the cost, but the steady growth of total cost which is demonstrated on the first page could be the result of many small well-meant decisions.

This is not an argument against the green transition, but an argument in favour of an efficient cost management together with a reasonable harmonization with the development in the neighbouring countries.

There is nothing wrong in setting ambitious climatic and environmental targets, but it can be hazardous to the future of the country if the cost has not been realistically estimated and compared with the potential benefits.

The estimates on the previous pages are based on incomplete sources. They are intended to create a better understanding of the cost of the green transition to electricity consumers. The indications from the observations from 2013 may not be convincing. In that case I expect that the indications will be clearer for the following years.