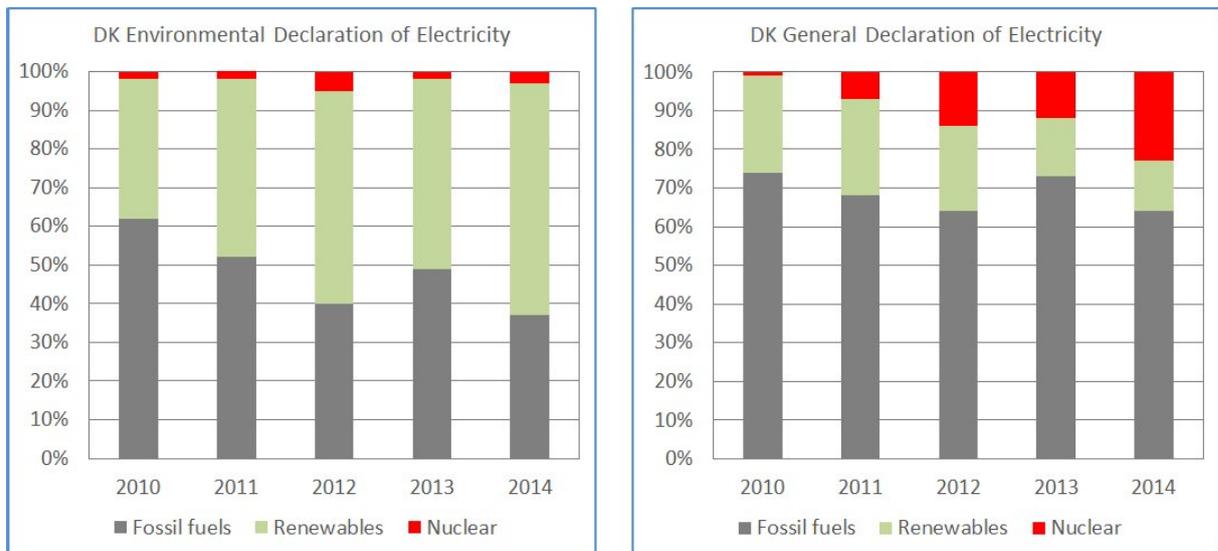


More nuclear and less renewables for Danish consumers:

Confusing Electricity Declarations

It has caused some confusion that the Danish TSO, Energinet.dk, publishes rather different declarations for the composition of electricity for Danish consumers. The declarations include emissions, residual products and fuel consumption.

The declarations have different purposes. This note will discuss fuel composition in “Environmental Declaration” and “General Declaration”. There is a third type called “Individual Declaration”.



Source: Energinet.dk

Figure 1 - Results of Environmental Declaration and General Declaration for the years 2010 to 2014

Fig. 1 demonstrates the significant difference between Environmental Declaration and General Declaration. The assumed purposes and calculation methods will be explained in the following sections, as far as it has been possible to uncover them.

Purposes of Electricity Declarations

Environmental reports for electricity have been published in Denmark since 1994. The purpose was to present transparent results for comparison with the national environmental targets.

The Environmental Declaration is a direct successor of the declaration in the first environmental report.

A different declaration has been a requirement from the European Union since 2004. Energinet.dk explains¹:

A labelling of electricity informs about the composition of fuels and the following emissions associated with the consumption of 1 kWh of electricity. Energinet.dk has made a standard model to communicate the

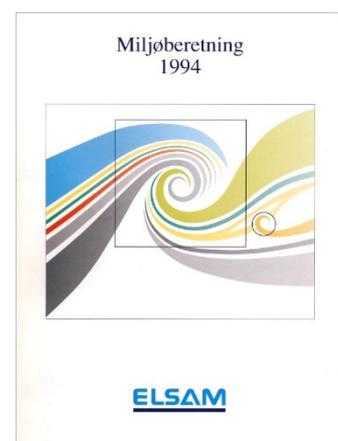


Figure 2 - Front page of the first Danish environmental report for electricity

¹ <http://energinet.dk/EN/KLIMA-OG-MILJOE/Miljoedeklarationer/Til-elhandlere/Sider/Til-elhandlere.aspx>

electricity label to the electricity consumers. The standard model is designed so the electricity supplier/trader can insert their own name, logo, address and homepage.

While the Environmental Declaration is based on physical recording, the new declaration is a result of reports from electricity traders.

Some consumers in Denmark and abroad buy green Danish electricity, presumably at an additional cost. These consumers receive an *individual declaration*. The electricity supply for all other Danish consumers is a residual mix of traded electricity. The *general declaration* specifies this mix.

Therefore, typical Danish electricity consumers can choose between the environmental declaration and the general declaration in accordance with their own preferences. Both declarations are correct.

However, a weightier conclusion could be that there is very little sense in specifying the content of consumed electricity.

Calculating the Environmental Declaration

Several available sources of data are used for the calculation of emissions, residual products and fuel consumption for the production of electricity and heat.

An Energinet.dk paper² describes the method.

The coproduction of electricity and heat saves energy. The traders of both products would like to sell green products. Our first problem is to decide how the two products should share the benefit of the coproduction.

The Energinet.dk paper discusses three methods, based on:

- heat efficiency
- energy content
- energy quality

Long before anybody can remember now, two heat efficiency models were developed: the 125% method and the 200% method. A hypothetical case can demonstrate what was at stake for accounting and later for environmental reports:

Efficiencies	Heat	Electricity
Separate production	90%	42%
125% method	125%	62%
200% method	200%	48%
Full benefit heat	300%	42%
Full benefit electricity	90%	92%

The two models were discussed as possible compromises. The Danish TSO, Energinet.dk, has decided to use the 125% model for environmental reports. Some users prefer the 200% model. Therefore, Energinet.dk also publishes results for this model.

This problem is another indication of the random nature of the declarations.

² Metode- og datagrundlag til miljørapport - Dok. 15/05521-4 - 21 April 2015 (only in Danish)

Another major problem is the influence of import and export of electricity. The paper refers to another paper on the calculation of electricity declarations³.

The calculation is made hour by hour for a year. There are two different situations.

- Net export: All effects of Danish electricity production are reduced by a factor to the level of electricity consumption in Denmark. The factor is the same for all types of production.
- Net import: All Danish electricity production is consumed in Denmark. After correction for transit, the net import is split up into electricity from Norway, Sweden and Germany. Different environmental data are used for these three countries.

The paper has an annex, which demonstrates the method in two cases. A copy of the illustration (in Danish) is shown as an annex to this note.

The environmental declaration has been used since 1994 and is widely accepted.

Calculating the General Declaration

The general declaration is based on traded electricity.

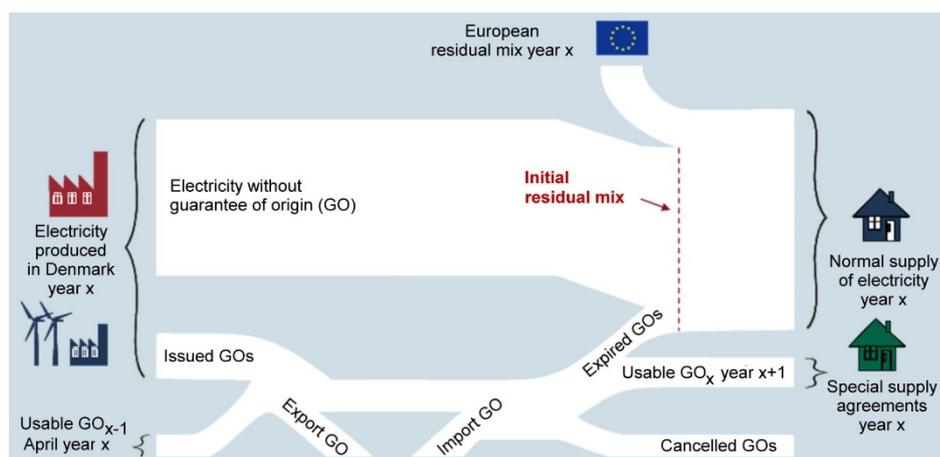


Figure 3 - The supply side has electricity with and without GO. The demand side has normal and special supply. Illustration from Dok. 13/93388-160 (my translation)

Wikipedia explains the guarantee of origin for renewable electricity:

The Guarantee of Origin (GO) is an instrument defined in European legislation that labels electricity from renewable sources to provide information to electricity customers on the source of their energy. Guarantees of origin in the meaning of Directive 2009/28/EC are the only precisely defined instruments evidencing the origin of electricity generated from renewable energy sources. In short, a GO is a 'tracker' guaranteeing that one MWh of electricity has been produced from renewable energy sources; and if the customer buys the GO, they can be certain that they have purchased green electricity, as the GO is then taken out of circulation and discarded ('cancelled'). Therefore, GOs are the instrument for making green electricity contracts reliable.

The general declaration is valid for customers with "normal supply". Customers with "special supply agreements" can get individual declarations.

³ Deklarering af el i Danmark - Dok. 13/93388-160 - 23 May 2015 (only in Danish)

According to Energinet.dk about 6% (1.9 TWh in 2013) of the Danish electricity consumption has special supply agreements. In 2013, the amount of issued GOs was 12.7 TWh. The difference indicates that most of the Danish renewable electricity was sold abroad.

The European residual mix must cover the deficit (10.9 TWh in 2013). While the initial Danish residual mix in 2013 was 19% renewables and 81% fossil fuels, the European residual mix was 7% renewables, 36% nuclear and 57% fossil fuels.

This procedure explains why there is a rather small share of renewables in the general declaration.

Conclusions

We do not know the flow of money, but assume that a special agreement in Denmark and in other EU countries implies an additional cost. Thanks to this additional payment, Danish production of renewables may be more profitable to society than generally assumed.

On the other hand, the 94% of the Danish electricity consumption contributes to developing renewable power by paying the PSO tariff. This majority of consumers pays an increasing tariff for renewables, but instead, they receive an increasing share of nuclear energy.

In the past, there have been debates about the destination of Danish renewable electricity, and particularly about the composition of the electricity export.

I have stated before that such discussions are nothing, but meaningless academic exercises. The two declarations show that it is possible to defend very different models. There is something for every taste.

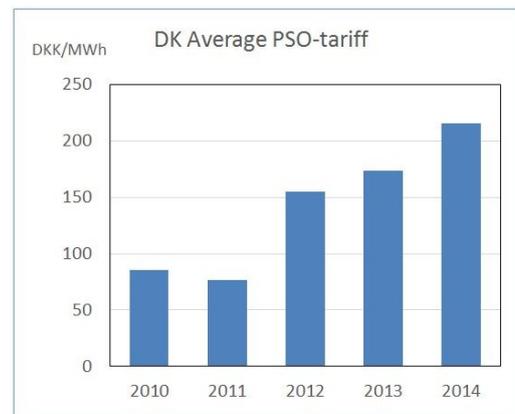
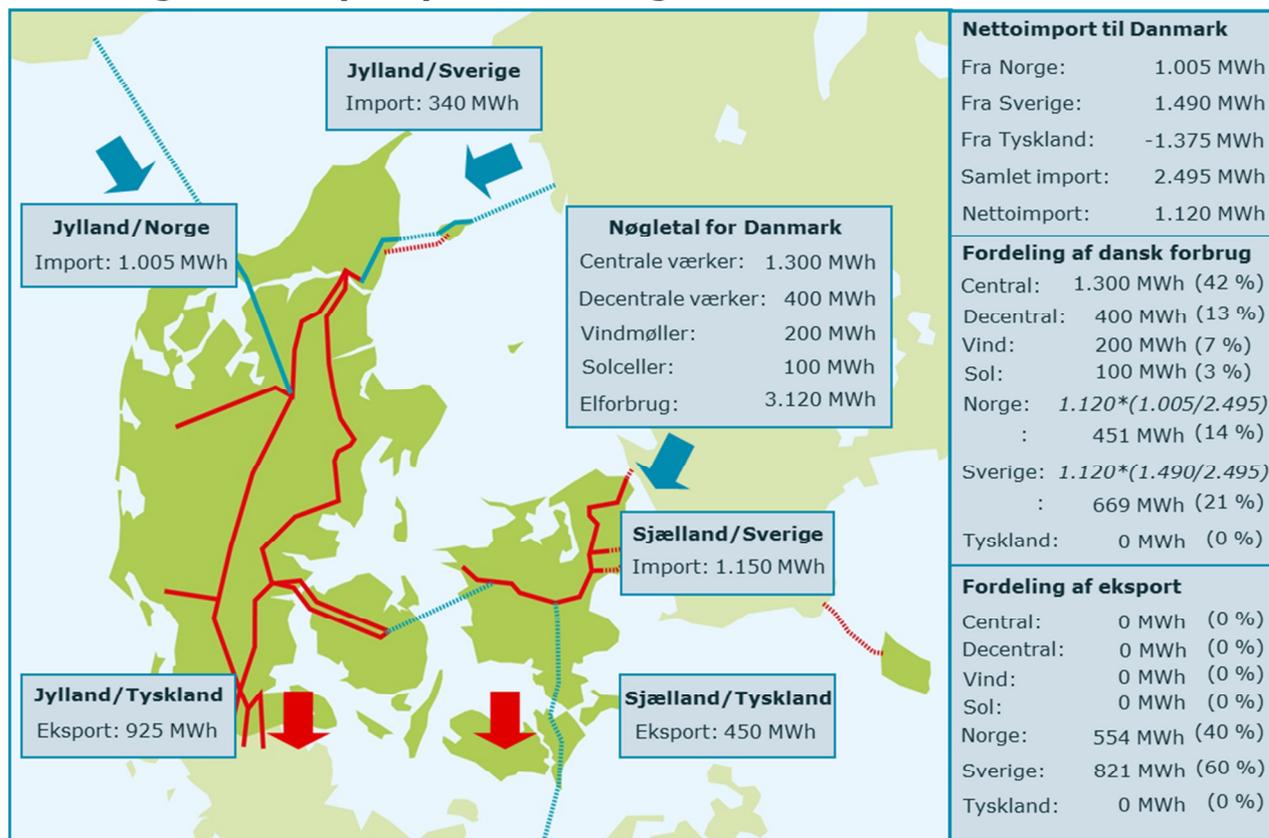
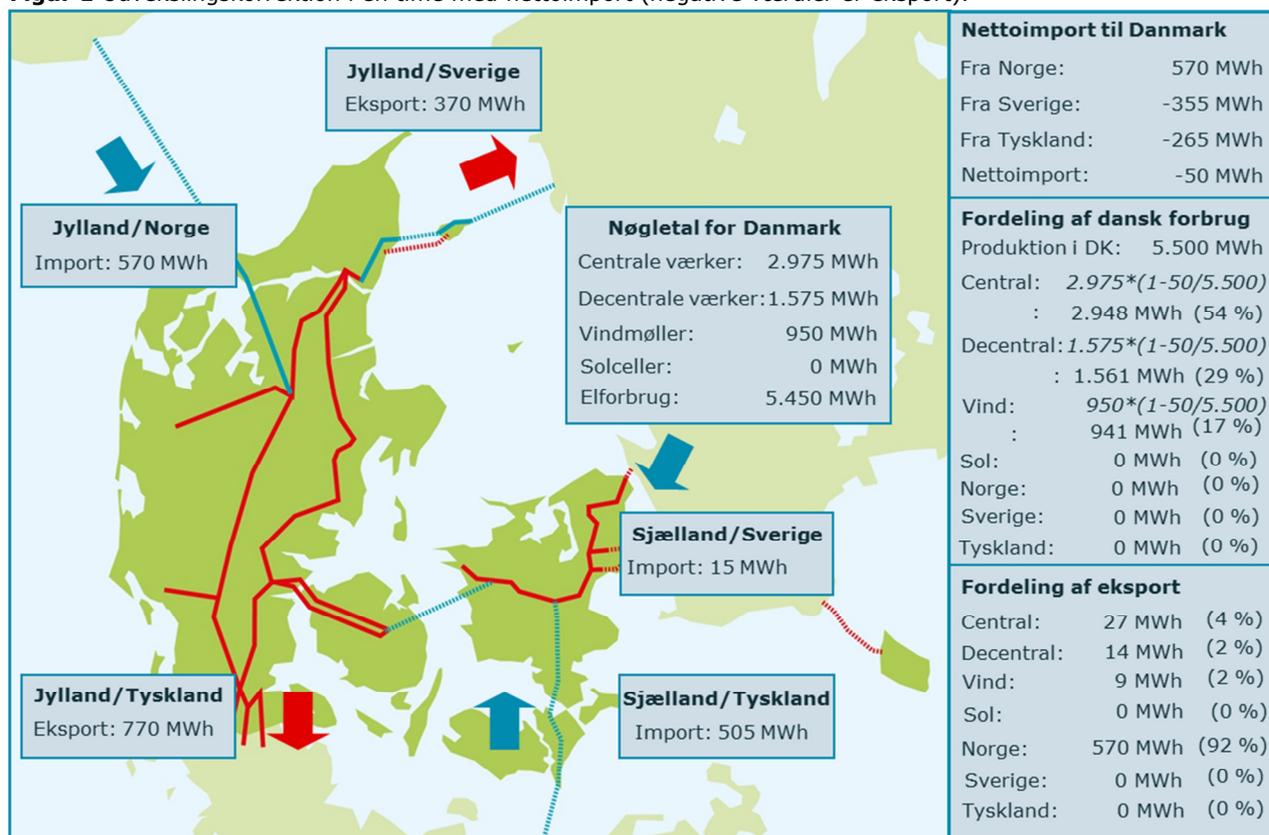


Figure 4 - Danish PSO tariffs

3. Bilag 1 Eksempler på udvekslingskorrektion



Figur 1 Udvekslingskorrektion i en time med nettoimport (negative værdier er eksport).



Figur 2 Udvekslingskorrektion i en time med nettoeksport (negative værdier er eksport).