

Comprehensive Danish Energy Analysis 2020-2035

In the near future crucial decisions on the development of the Danish energy systems during the period 2020-2035 must be made. Dansk Energi (Danish Energy Association) has published the results of a comprehensive energy analysis¹ as a contribution to the debate.

The analysis is based on scenarios for the electricity and district heating sectors in Denmark. The background of the scenarios seems to be two core questions to Danish energy policy decision makers:

- Should Denmark intensify the expansion of energy production from renewable volatile electricity sources or should Denmark put more emphasis on utilising the volatile production for heating and transport?
- Should Denmark have more ambitious goals for the development of renewable energy than the rest of the European Union?

The two questions are analysed in two separate tracks. The economic calculations clearly indicate the importance of a more efficient utilization of the volatile energy production and the high cost of a more ambitious energy policy than the rest of EU. The 5 points conclusion of the report includes only an answer to the last question (my translation):

- *A continuation of the present tax and support system is decisive for the choice of technology track. It will in itself guarantee about 80% RE in the electricity and district heating systems by 2020.*
- *A separate Danish 100% RE target in the electricity and district heating systems will be expensive to Denmark and put the Danish competitiveness under pressure unless there is a considerable price of carbon quotas.*
- *After 2030 the choice between the construction of new wood pellet CHP plants and offshore wind will be sensitive to variations in the fuel prices for biomass and gas.*
- *The future amount of Danish electricity generation capacity will strongly depend on the expected available import during peak load hours.*
- *The future volatility of the electricity market price will create room for flexible demand.*

RE Expansion versus RE Utilization

In the *expansion scenario* solar cells and wind power is being expanded in Denmark and in the neighbouring countries. The electricity consumption is practically unchanged. This is a fair description of the present Danish energy policy.

In the *utilization scenario* the expansion of offshore wind is more moderate after 2020 and there are no new PV installations. A large number of electric cars, individual heat pumps and heat pumps in the district heating systems create a flexible electricity demand, both in Denmark and in its neighbouring countries.

A description of the driving forces behind the two scenarios is missing. The cost of carbon quotas is assumed to be 25 €/t in both scenarios. As for the development in Denmark it is assumed that the limitations in choice of fuel for CHP and the different energy taxes will be decisive. This leads to the Danish Parliament as the control centre for the development.

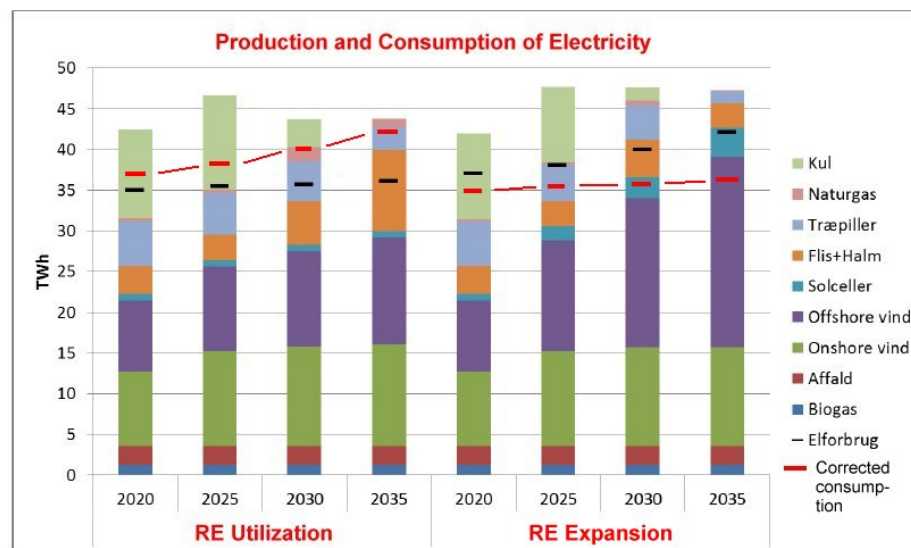
¹ Scenarier for dansk el og fjernvarme 2020 til 2035, Dansk Energi, 20 June 2013

It is a question if the two scenarios are sufficiently substantiated. The expansion scenario could be considered as a business-as-usual scenario but the utilization scenario would require substantial policy changes both in Denmark and in the leading countries around. Could such a change be realistic?

About 1000 MW new power plants have been added in Denmark by 2035. In the expansion scenario the new power plants are OCGT units (simple gas turbines) and in the utilization scenario biomass fired CHP units are used. The economic results must necessarily be very sensitive to variations in fuel prices for biomass and gas. It is impossible to predict the conditions of the biomass market after the heavily increased demand which is assumed in both scenarios. Therefore we should not attach too much importance to the calculated present values.

The political leadership can move the development towards any of the two scenarios. Which one should they prefer?

It seems to be common sense that expanding volatile and not-dispatchable power without utilizing it efficiently is wasteful. However, in order to read this from fig. 13 in the report it was unfortunately necessary to interchange the consumption symbols (black signatures) for the two scenarios (see below). The red symbols show the correct consumption figures.



In RE Expansion more than 10 TWh must be exported every year from 2025. In RE Utilization it has been possible to utilize an increasing amount of electricity within Denmark and to reduce the overflow in 2035 to an insignificant level. Besides the share of CHP in the district heating systems is much higher. It is strange that the 5 points conclusion does not recommend an RE utilization policy.

National RE Targets versus Joint European Targets

The two European scenarios are called **EU Green** and **EU Black**. In EU Green the price of carbon quotas is increasing from 25 €/t in 2020 to 65 €/t in 2035. In EU Black the price of carbon quotas is 0 €/t from 2020 to 2035.

Two Danish strategies have been analysed for EU Black: 1) no Danish RE targets and 2) 100% RE for electricity and district heating.

With two scenarios depending on foreign decisions and two strategies under Danish control the analysis begins to look like a real scenario analysis.

The most important categories of new Danish production are:

	Scenarios	
Danish strategies	EU Green	EU Black
No RE targets	-	Coal CHP
100% RE for heat and electricity	Wood pellets CHP	Off shore wind

All these cases have for every year an overflow of electricity which must be exported. For the two scenarios with 100% RE, the explanation is the share of fossil components in waste. A certain export is necessary in order to reach the 100% target.

Under such circumstances it is debatable if the 100% target makes sense.

The calculated present values (including carbon quotas) are no surprise:

	Billion DKK	Scenarios	
Danish strategies		EU Green	EU Black
No RE targets		-	91.6
100% RE for heat and electricity	115.8		102.1

This result is the background of the second point of the 5 points conclusion.

100% RE is a misleading target

The report from Dansk Energi rightly stresses the importance of a qualified background for the decisions on the development of Danish electricity and district heating systems between 2020 and 2035.

The report has asked the right questions and presented interesting observations and analyses. So far the public debate on the report has been limited. The question is if a more provocative conclusion could have drawn more public attention to the essential problems.

The Danish government has made 100% RE a target in itself. This target seems to inspire creative bookkeeping and to move the following classical virtues into the background:

- Clean, reliable and competitive energy services for the consumers
- Sustainable energy supply with minimum dependence on foreign fuel supply and energy services and maximum robustness to unexpected international developments
- Minimum environmental impact in the widest sense from energy services

The two questions from Dansk Energi deserve clear answers:

- Not-dispatchable electricity production should be balanced by efficient and useful utilizations instead of relying on electricity export
- The share of renewable energy is not a target in itself. Therefore Danish RE targets should be in balance with the targets in the neighbouring countries

Only in this way the classical virtues can be given a fair consideration.