

Fluctuating Fuel Price Forecasts

This is a continuation of my note, "Expensive Electricity from Biomass". By comparing recent fuel price forecasts, I made a disturbing observation. The expected crude oil price in 2020 was halved from 2015 to 2016. It disturbs me because these forecasts have a considerable influence on public and private investments in the energy sector.

Decisions on energy investments in Denmark were in several cases based on unrealistic future energy prices. When a project is losing money, there is nobody to take the responsibility for poor advices. The losses must be paid either by the energy consumers or by the private investors. For cooperatives in the district heating sector, consumers and investors are the same.

Public and private investors are using fuel price forecasts in order to have the best possible background for their decisions. Fuel price forecasts are published in Denmark by the Danish Energy Agency and by the transmission system operator, Energinet.dk. The forecasts are based on both advanced methods and international references¹.

However, it is necessary to realize the uncertainty in the energy business in order to make a robust planning. The purpose of this note is to demonstrate this uncertainty.

I have used the forecasts from Energinet.dk. They are published annually in uniform formats and previous forecasts are available on Energinet.dk's homepage.

2013: The Train Fund

The Train Fund DK is a political agreement from 2013. The Danish railway system is obsolete. It needs urgently improvements in order to reach a suitable European level. A national plan for fast trains in Denmark was outlined. The cost would be 28.5 billion DKK, but the money was missing. A majority in the Danish Parliament decided to reserve the revenue from an additional tax on the extraction of oil in the Danish part of the North Sea for the purpose.

The tax depends on the oil price, which was supposed to be \$135 per barrel in average for the years 2015 to 2020, starting at \$ 121 per barrel in 2015. The observed prices for the years 2009 to 2013² might justify that level, but a corresponding forecast had not been published, and a crude oil price at that level never occurred in the past.

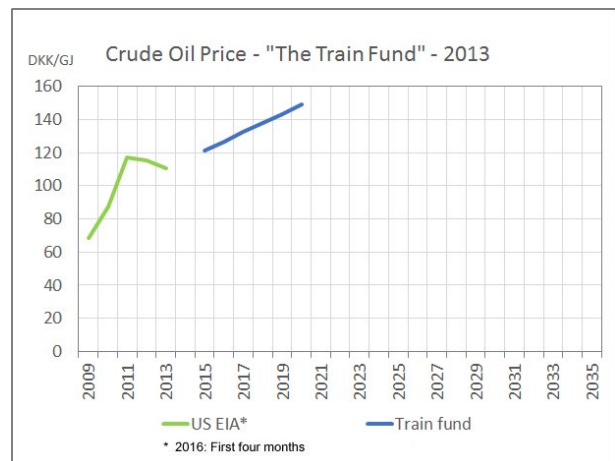


Fig. 1 - The Train Fund assumed an average crude oil price at \$135 per barrel for the years 2015 to 2020.

¹ Update of fossil fuel and CO2 price projection assumptions, Convergence pathway, EA Energy Analyses - 21-01-2014

² The source of annual crude oil prices is US Energy Information Administration (US EIA): Average landed cost of crude oil imports.

2014: Onshore wind claimed to be the cheapest source of electricity

In 2014, the price forecast was adjusted to fit the actual oil price level. The forecast was about 30 DKK/GJ lower than the Train Fund price.

In 2014, the price level of crude oil was expected to increase steadily from about 100 DKK/GJ in 2016 to 132 DKK/GJ in 2035.

High fuel prices improve the profitability of renewable energy sources. In 2014, the Danish Energy Agency analysed the cost of electricity production and announced that onshore wind is cheaper than any other source of electricity. The message was distributed by several media.

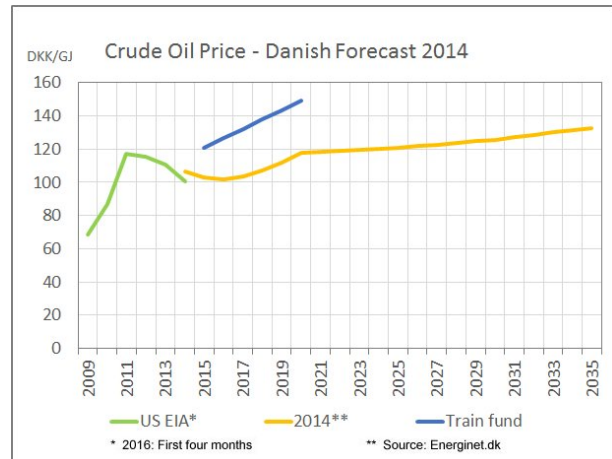


Fig. 2 - In 2014, the long-term crude oil price was expected to increase slowly from 110 to 130 DKK/GJ.

2015: Price drop assumed to be temporary

From 2014 to 2015, the average crude oil went down from \$ 88 per barrel (or 100 DKK/GJ) to \$ 45 per barrel (or 52 DKK/GJ).

The 2015 forecast has a different course from 2015 to 2020, but maintains the high level from the 2014 forecast until 2035.

This outcome has been convenient for current work on the years from 2020 to 2035. It has been possible to maintain assumptions made in 2014 and maybe to continue work on some projects, for which the fuel price forecast is essential.

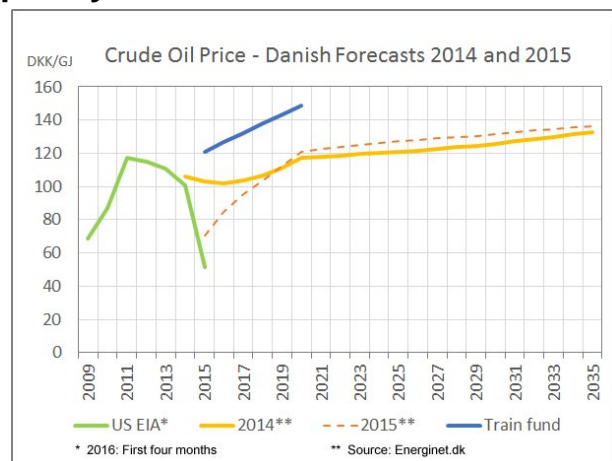


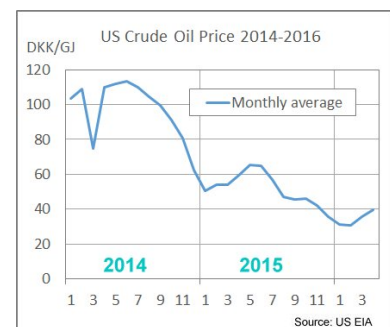
Fig. 3 - The 2015 forecast had a lower start level, but was back at the previous level from 2020.

The underlying assumption seems to have been that a fair and stable level for the future crude oil price would be around 120 DKK/GJ.

2016: Now a longer price drop is expected

The average crude oil price for the first four months of 2016 was 34 DKK/GJ and slightly increasing from February to April. While the decrease from 2014 to 2015 was 49%, it was only 35% from 2014 to the first four months of 2016.

However, the forecasted crude oil price was reduced much more dramatically than in the previous forecast. One reason is that prices from the futures market were given a dominating influence for the years 2016 to 2018, followed by a gradual transition to IEA forecasts (International Energy Agency).



Figur 4 - Will 2016 be the bottom?

The 2016 forecast starts at 48 DKK/GJ, but does not reach the 120 DKK/GJ level until 2030.

If the new forecast becomes a reality, the Train Fund will have lost about 60% of the expected revenue.

Planning for 2020

Most planners in the energy sector need an idea of the future fuel costs.

For some time, planners have been preparing analyses, provisions and projects for the year 2020. From 2011 to 2016, the expected crude oil price for 2020 fluctuated between 120 DKK/GJ and 49 DKK/GJ with the most dramatic change from 2015 to 2016.

Choosing a planning strategy

In spite of advanced studies and calculations, the resulting estimate is very unreliable. Unfortunately, this reservation is not always made when the forecasts are used.

The range of sensitivity analyses is usually too narrow. Historically, the crude oil prices had rather long waves with large variations. There has been a peak about 1980 and 2 peaks around 2010.

The Danish Energy Agency publishes (in Danish) assumptions for socioeconomic analyses in the energy sector³. The document mentions the volatility of the estimated prices, but does not quantify the uncertainty (except for CO₂ quota). If the forecasts were presented as confidence intervals, planners would have to consider the consequences of both extreme cases.

It is a matter of strategy, if a project should be robust or risky. The Train Fund demonstrates the dilemma, but to private investors the consequences of forecast errors can be quite serious.

For its own analyses, the Danish Energy Agency is still using a fuel price forecast from 2014⁴.

Look at fig. 7 and consider if the average crude oil price for the next decade will be 30, 60 or 90 \$ per barrel. None of these levels can be excluded. Recent Danish forecasts have been aiming at the 120 DKK/GJ level (about 110 \$ per barrel). This level seems to be less likely. It is a mystery why this corner of the confidence interval is used as a central estimate.

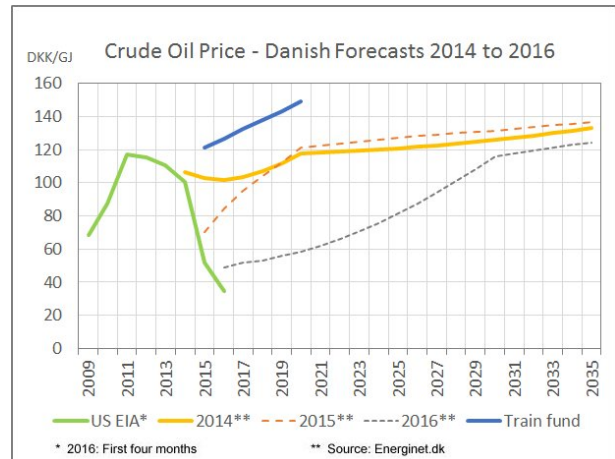


Fig. 5 - The long-term target is maintained.

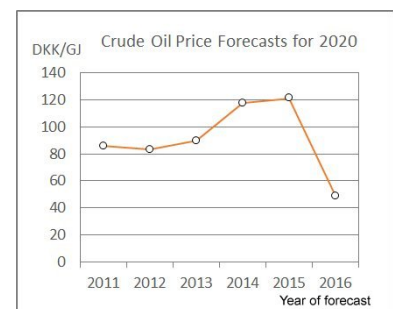


Fig. 6 - Expected fuel prices in 2020 by year of forecast

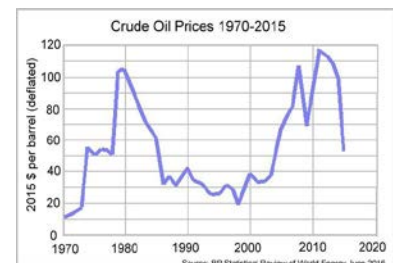


Fig. 7 - Historic crude oil prices in real terms (2015 \$)

³ Forudsætninger for samfundsøkonomiske analyser på energiområdet - Energistyrelsen - April 2016

⁴ <http://www.ens.dk/info/tal-kort/fremskrivninger-analyser-modeller/beregning-elproduktionsomkostning>