The Danish Energy shift, the Costs and Benefits for Society and who Bears the Costs

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BAU is not cost effective

- RLIMAKOMMISSIONEN Green enerav the road to a Danish energy system without fossil fuels
- A report from the Danish Climate Commission in 2010 states that costs of going fossil free in 2050 was slightly higher than BAU
- Adding the health benefits etc. will make the fossil free transition more cost efficient than BAU – health economists said



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Energy Consumption must go down



Blue: Current level Red: Cost efficient level in 2050

Source: The Danish Climate Commission 2010



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Energy Consumption per Home

Туре	Number of homes	Electricity use per home	Heat use per home
Multi Family Homes	1,001,125	2.4 MWh/year	11.5 MWh/year
One Family Homes	1,516,986	4.1 MWh/year	21.9 MWh/year

Sources: Electricity Consumption from Energy Statistics 2010 – Danish EA Data about Homes from Danish Statistics 2010





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Electricity costs for Consumers



Source: The Danish Energy Regulatory Authority: Electricity Prices Statistics 4. Quarter 2012. (Average prices and tariffs)

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"Our Energy" – The Government 2011



- The Danish Central-left government presented their proposal "Our Energy" for a broad political energy agreement in 2011 – and cost calculation was included
- All calculations were based on a financing of investment/costs of 5.6 Billion DKK in 2020
- The final calculated costs for the Energy Agreement in 2012 with 95 % political support in the Parliament were calculated to be 3.5 Billion DKK in 2020



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"Our Energy" - Extra costs in 2020



Red: Average extra costs per householdGreen: Average extra costs per employee in business



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The Danish Energy Agreement

- Additional 1,000MW from offshore wind, 500 MW from inshore wind, and 500 MW more onshore in 2020
- Energy-saving obligations by energy companies increased by 75 per cent from 2013-2014, and by 100 per cent from 2015-2020 compared to 2010-2012
- An actual cap on extra costs / investment in 2020 of 3,500 mio. DKK was accepted – <u>before</u> deducting savings from less energy use and calculating the benefits for society of more jobs etc.



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The Energy Transition



"Electricity production from different sources (corrected for import/export)" Source: "Our Energy" the Government 2011

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Loss of Energy Tax Revenues is "Costs"

- Shifting from coal to biomass in central cogeneration plants will mean that the revenue from energy tax on coal will decrease
- A new "Security of Supply" tax will be phased in from 2014 to 2018 on all fuels used for heating purposes including biomass
- This will of course increase costs for heating the buildings
- Reduced energy consumption reduces revenue from energy taxes – mostly being part of the State budget



Costs for The Danish Energy Agreement

Mio. DKK		2012	2013	2014	2015	2016	2017	2018	2019	2020
SoS Tax	(0	600	1.400	1.700	1.900	2.200	2.400	2.500	2.800
PSO	-	100	100	200	200	300	800	1.100	1.500	1.400
Tariffs	-	-300	100	-200	-100	-300	-400	-500	-600	-600
All in all	-	-300	700	1.400	1.800	1.800	2.500	2.900	3.400	3.500

- "Costs" was heavily debated in the political process
- "Costs" do not include savings from reduced energy use
- "Security of Supply Tax" is only on heating and the figures here is after compensation for industry is deducted



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Savings must be done

- Huge energy savings are essential for the Danish Energy shift
- Energy savings in industry is very cost effective
- Energy savings in buildings gives a mixed picture in profitability
- Additional improvement for building quality, in-door comfort and health etc. gives improvement for all users
- 1. Normal households can pay extra for those improvements
- 2. Poor households have to depend on the "income" from reduced costs for buying energy = subsidies required



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Fuel Poverty in Denmark ???

- Buildings are pretty energy efficient renovations have been done several times from the 70th
- Social security systems includes fuel costs for vulnerable groups
- Poverty exists, but "fuel poverty" is not an issue
- New definition of being "poor" in Denmark being debated
- Some 45 50,000 people (including children) considered to be poor



Lessons to be Learned

- There will be investment costs needed households will bear part of these costs, but:
- There will be a net income for the Danish Society in the long run doing the Energy "Revolution" instead of just doing BAU



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Lessons to be Learned

- Reducing energy consumption is the easiest and cheapest way forward – creating jobs and better indoor climate as well
- Normal households can pay for the extra costs themselves
- Poor and vulnerable people must be helped to cover the extra costs with subsidies and/or using the social welfare systems
- Basically the distribution of costs and benefits amongst different actors are set in political decisions



Lessons to be Learned

- Some industry (not having large saving potentials) will probably face (small) increases in energy costs
- Industry will probably need to be compensated to ensure competitiveness – politicians are in a situation where this is hard to ignore
- This compensation can come from:
- 1. Households paying more in PSO (for the renewables)
- 2. Lower energy taxation will mean lost energy tax revenue that can be covered in the State budget
- 3. Subsidy schemes covered by new tax revenues or savings



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A Shift in Production





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Production of Electricity



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Electricity Prices for Households



Source: The Danish Energy Agency – Energy Statistics 2012

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Energy Consumption per Person

Туре	Persons per Home	Average electricity use per Person	Average heat use per person
Multi Family Homes	1.68	1,450 kWh/year	6,836 kWh/year
One Family Homes	2.45	1,668 kWh/year	8,944 kWh/year

Sources: Electricity Consumption from Energy Statistics 2010 – Danish EA Data about Homes from Danish Statistics 2010



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Cost Calculations in "Our Energy" (OE)

		2011	2020	2020	2020	2020
Annual Costs DKK			Business as usual	Our Energy	* OE + heat savings 9%	Coal to biomass
House 130 m ²	District Heating	12,200	12,800	14,800	14,200	13,800
	Oil Heating	19,600	21,600	23,600	22,300	** 14,600
	Electricity	8,300	8,900	9,200	9,200	9,200

* Investment cost for achieving 9 % heat savings are included

** Own Energy and a heat pump instead of an oil burner – net costs

Source: "Our Energy", Danish Government 2011

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Cost Calculations in "Our Energy" (OE)

		2011	2020	2020	2020	2020
Annual Costs DKK			Business as usual	Our Energy	* OE + heat savings 9%	Coal to biomass
Apartment 75 m ²	District Heating	7,200	7,500	8,700	8,400	8,200
	Electricity	5,200	5,600	5,800	5,800	5,800

* Investment cost for achieving 9 % heat savings are included

Source: "Our Energy", Danish Government 2011



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Cost Calculations in "Our Energy"

Fully Phased in in 2020	Energy costs BAU	Energy Costs "Our Energy"	Change between BAU and "Our Energy
Medium sized office, 250 employees	0.65 Mio. DKK	0.71 Mio. DKK	+ 9.1 %
Large energy intensive industry, 400 employees	100 Mio. DKK	103 Mio. DKK	+ 3.0 %

Source: "Our Energy", The Danish Government 2011



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Electricity Price Trends

	Euro/kWh 1. half 2012 incl. tax	Changes from 1. half 2011 to 1. half 2012
EU	0.197	+ 6.6 %
Italy	0.230	+ 11.2 %
Germany	0.268	+ 5.7 %
Holland	0.190	+ 3.1 %
Denmark	0.297	- 0.0 %
Sweden	0.208	- 4.7 %

Source: Eurostat 27.3. 2013



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Expenses for public service obligations (PSO) in the electricity area



Billion DKK, current prices

PSO (Public Service Obligations)

- More wind decreases the electricity prices in the Nordic market
- A decrease in electricity prices makes wind turbines more costly
- For each 1 DKK the electricity price pr. MWh is reduced, the PSO costs increases by 0,4 DKK
- Introduction of new wind turbines especially off shore and PV's will increase the PSO payment
- PSO is paid by all customers potential rebates for energy intensive industry have to be paid by households and SMV's



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PSO (Public Service Obligations)

PSO costs	2011 – Our Energy	2012 realized	2013 foreseen
Billion DKK	3,0	4.7	5.8

- The PSO costs has increased a lot because of cheap electricity prices
- This corresponds to a decrease in electricity prices
- Companies use the forward market and will not see the reduction in electricity price immediately as with the increase in the PSO
- PSO costs in Germany is much higher, but rebates for especially heavy industry are also much higher



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Information about Electricity Prices

- The Official webpage "The Electricity Price Information Site" shows the costs for Electricity products, and gives some possibilities to compare
- It is far too easy to get on top of the price list with offers
- The Site does not give proper information about the electricity products that do have a large or small effect for climate and more renewables
- The DEC did set up a Information site to rank these products



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Information about Electricity Prices



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Information about Climate Effects





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Flexibility Markets Needed

- For Denmark being "fuelled" by fluctuating renewable energy, flexibility and storage possibilities are needed
- This can (partly) be delivered by international grid connections especially to Norwegian hydro power
- But a national market for "selling" smaller flexibilities must be created in order to increase the value of especially electricity production for all costumers, when the wind blows



Capacity Markets must be Capped

- There might be a need for new capacity payment markets in the transition periods, where existing power plants may be economically inefficient long before they can be taken out of the energy system
- This capacity market must be done in a way that innovation is still spurred
- The possible capacity market payments must be capped as strong as possible and restricted in years of functioning



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