

Regulation framework for CHP and wind power integration

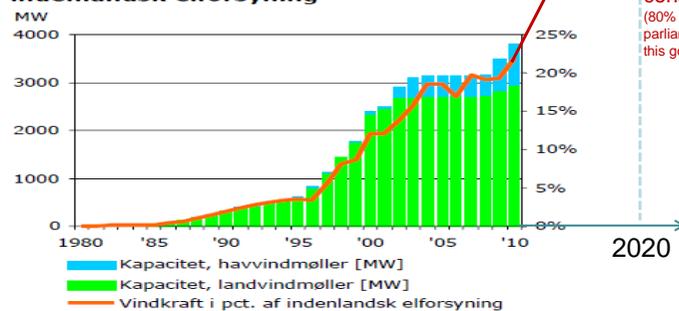
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2020 Wind power plan for DK. (ens.dk annual statistics)

Vindkraftkapacitet og vindkrafts andel af indenlandsk elforsyning



Two needs

1. Cheaper wind power and lower PSO payment.
2. Integration of wind power and heat.
(W)CHPs. And lower heat prices.

This integration is necessary for the development of future district heating wind power systems.



Prognoses for PSO costs in 2020 with present policy.

	Offshore	Near coast wind turbines	Onshore wind turbines	Sum PSO payment
Anholt (2012-2014)	400 MW			
Ny	1000 MW	500 MW	1800 (netto growth 500 MW)	
Mvh production	5.320.000 (3800kWh/kW)	1.650.000 (3300 kWh/kW)	3.900.000 (2200 kWh/kW)	
PSO payment in Dkr per MWh	750	375	250	
Sum PSO payment in million Dkr.	3.990	619	975	5.584 (Or 16 øre/kWh, with an electricity consumption of 35 TWh I 2020)

Assumptions: Nordpool marketprice in 2020, 30 øre/kWh
Offshore: 1.05 Dkr/kWh, Near Coast turbines 0,75 Dkr/kWh, onshore turbines 0,55 Dkr/kWh.
If the Nordpool price is 10 øre/kWh higher, the PSO payment is reduced to 13 øre/kWh.



This is an economic and therefore also a political problem

The PSO payment linked to wind power will increase from 6,5 øre/kWh in 2012 to between 13 and 16 øre/kWh in 2020.

This can politically stop wind power expansion.



1. First step: More onshore, less offshore wind power. Local and regional ownership.



**By replacing some offshore with onshore wind power in the plans for 2020
(eksempel forslag)**

1. 550 MW offshore instead of 1000 MW new capacity.
2. 500 MW ny kystmølle kapacitet.
3. 2580 MW onshore instead of 1800 MW (Plus 780 MW)

In this way society saves **855 millioner Dkr annually** in PSO.



How can this be implemented?

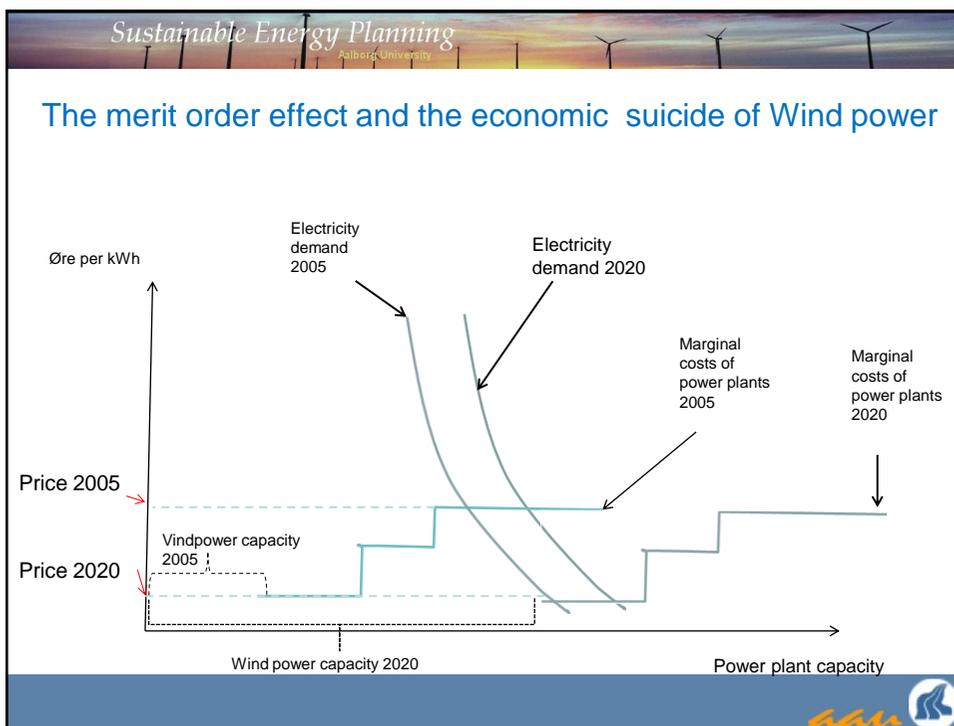
By increasing local and regional ownership
which increases local accept.

CHP ownership of wind power is here
important!



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Second step: Increasing the value of wind power by integrating heat and electricity

Ownership, and the need for integration of heat and electricity

The technical flexibility infrastructure is mainly locally owned and consists of:

- a) Keeping the present CHP units alive, and develop them further.
- b) Establishment of heat pumps and heat storage capacity.
- c) Co-ordination with energy conservation.

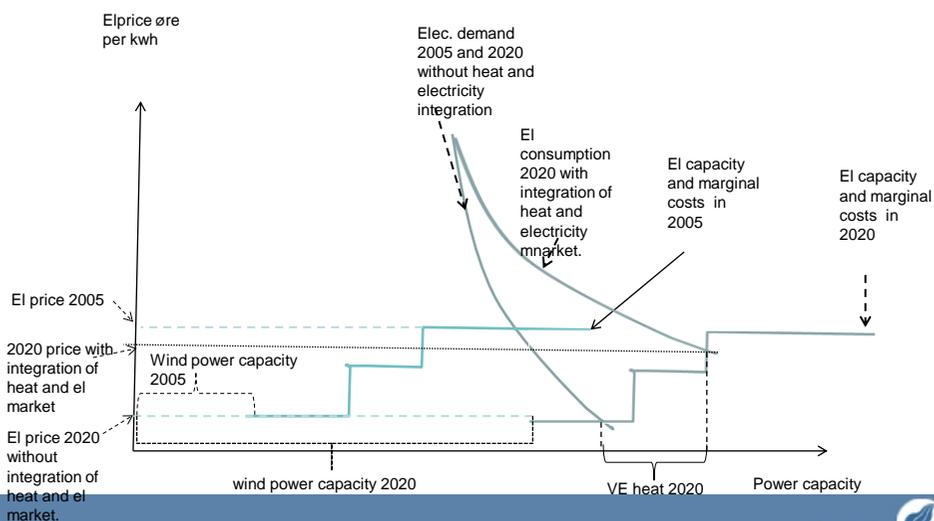
Giving wind turbine **ownership priority** to local and regional households and CHP organisations.

They **already own this infrastructure** and should just develop it further.

This may reduce transaction costs linked to the introduction of this infrastructure.



Integration of electricity and heat market will increase the value of wind power.



Increase in wind power value by integrating heat and electricity

1. First it is important to underline: If wind power is sold to the electricity market for at lower price than the most expensive heat price, the market does not function in an optimal way. This is the case today!
2. Based on calculations by H.Lund and E. Münster (2004), the value of wind power electricity will increase by 10-12 øre/kWh if the right integration of electricity and heat markets is made.

These 10-12 øre/kWh are included in next table!



PSO payment 2020 with new plan plus integration of heat and electricity.

	1. Offshore	2. Coast wind turbines	3. Onshore wind turbines	4. Sum
1. Anholt (2012-2014)	400 MW			
2. New capacity	450 MW	500	2,580 (net increase from 1,100 MW today)	
3. Production in MWh	3,230,000 (3,800 MWh/MW/year)	1,650,000 (3,300 MWh/KW/year)	5,700,000 (2,200 MWh/MW/year)	
4. PSO payment in Dkroner per MWh	630	255	130	
5. Sum PSO payment in million Dkr per year	2.035	420	740	3.195 (or around 9 øre/kWh.)



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Dont forget: Prognoses for PSO costs in 2020 with present policy.

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2,4 billion Dkr more annually

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PSO savings with new policies

The combination of less offshore and more onshore wind power + integration of heat and electricity markets, results in annual savings of more than a billion every year from 2015 and onwards, and for instance in 2020 a PSO saving of **2.5 Billion Dkr. And annual savings at the same level in the years after.**

But to realize these savings requires new poliicy measures:



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Energy prices and taxes in Dkr per MWh

	1. N-Gas	3. Heat gasoil	3. Electricity	4. El for heat incl. WP
1. Electricity price excl. Tax			265,0	265,0
2. CO2 costs Nordpool			3,5	3,5
3. Distribution plus transmission			245,0	245,0
4. Energy price at consumer level excl. Tax.	256,0	380,0	513,5	513,5
5. Energy tax	251,0	212,0	688,0	413,0
6. PSO(Public Service Obligation)			160,0	160,0
7. CO2 tax	33,5	46,8		
8. Energy price incl. tax excl. VAT	540,5	638,8	1361,5	1086,5
9. VAT	135,1	159,7	340,4	271,6
10. Energy price incl. tax and VAT.	675,6	798,5	1701,9	1358,1
11. All taxes before conversion incl. VAT	419,6	418,5	1191,9	848,1



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Changing the regulative framework for integrating heat and wind power electricity

- Change tax from 850 Dkr to 128 Dkr/MWh (same as for direct electricity heating (elpatron) On following conditions:
- Obligation to buy wind power shares equivalent to the annual use of electricity for heat. Plus first priority right to buy wind power capacity equivalent to 2 times electricity for heat consumption.
- Obligation to keep the present cogeneration capacity alive.
- Obligation to establish a heat pump and hot water storage system at a specified size.

The aim of these requirements are:

- That the lowered tax should not be used for fossil fuel based electricity heating.
- That the transaction costs linked to the establishment of a flexibility infrastructure should be kept low.
- That a learning proces between owners of wind turbines and flexibility infrastructure should be established.

Consequence: a household with an annual consumption of 8000 kWh will get an annual heat bill reduction of 5760 Dkr. To some extend to be used for the amortization of the needed new investments.



Result

1. Local/regional ownership furthers local acceptance and thus makes more onshore wind power possible
2. Local/regional ownership of wind turbines by district heating companies and heat consumers, facilitates the integration of heat and electricity market.
3. Integration of the electricity and heat market with heat pumps and heat storage systems keeps the value of wind power relatively high (above the cost of the most expensive heat fuel).
4. Local/regional ownership reduces wind power costs and increases wind power value.
5. As a result, heat prices can be lowered, and the economy of wind power improved considerably, which again may increase the political support.

