

Denmark: Wind Leader in Stand-By

Politically Induced Paralysis in Wind Power's Homeland and Industrial Hub

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Contemporary wind technology was born and came of age in Denmark. In the 1980s and 1990s, a dynamic research and production network evolved here, growing at an astonishing pace and resulting in the creation of a new industry. By 2001 there was 2.500 MW of wind power already installed in a country of just over 5 million inhabitants. Wind power at days with strong wind may cover half of the total need for electricity in Denmark and still normal power quality standards are maintained.

However, after the liberal-conservative government took over in 2001, the progressive renewable energy programmes which established Denmark as a world leader in this emerging sector were abolished. The extraordinary growth in installed capacity came to a standstill. A repowering programme that had been launched by the previous government resulted in a short term revitalisation of the sector in 2002, but did not make a lasting impact.

Since then, Denmark has increased its installed capacity by close to zero percent. Only 8 MW was installed in 2006, compared to around 300 MW of annual installation in the 1990s. In 2007, for the first time ever, more installed power was decommissioned than installed: 39 windmills were taken down, while only 7 new ones were connected in the whole year. This brought widespread attention to the dramatic situation of the sector.

Even with such poor records in wind power installation since 2001, Denmark is still the leading wind power country on a power percentage and per-capita basis. In 2005, wind power contributed 18,2% of Denmark's gross electricity generation; while in Spain and Germany (the other two wind power giants) it contributed 7,2% and 4,4% respectively. At the end of 2006 there were 3.136 MW installed capacity in Denmark; with a population of 5,5 million, this is equivalent to 573 Watts per person. On the same year, in Germany there were 20.622 MW and 82 million people, resulting in 251 Watts per person. On the other end of the scale, in the UK there were 1.960 MW installed, meaning 32 Watts per person.

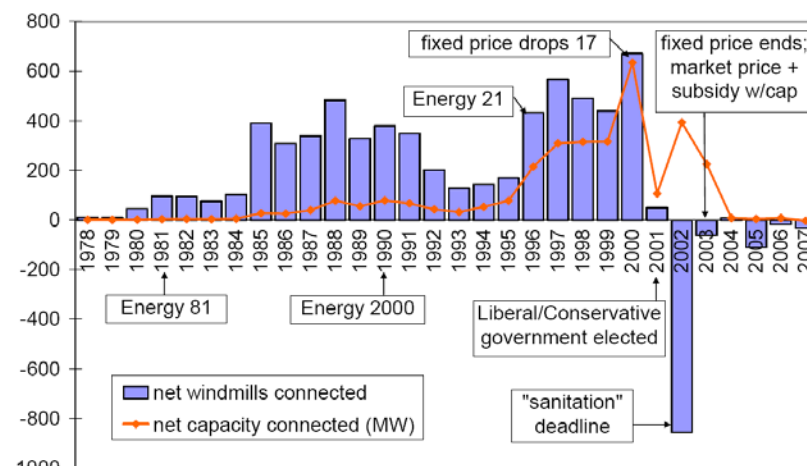


Figure 1: Net Windmills and Capacity Grid-Connected by Year in Denmark
 Source: Nordic Folkecenter for Renewable Energy (data from Danish Energy Authority Oct 2007)

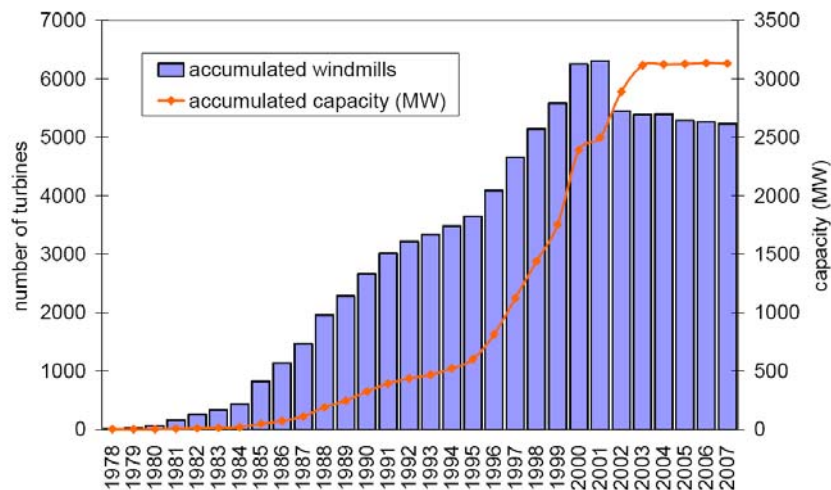


Figure 2: Accumulated Windmills and Capacity in Denmark (1978-2007)
 Source: Nordic Folkecenter for Renewable Energy (data from Danish Energy Authority Oct 2007)

The ownership model behind two decades of success

The most important reason behind such a successful take-off of wind energy in Denmark was the active support and positive involvement of the population. This participatory process started in the early 1980s and culminated in the 1990s, but it collapsed after the liberalisation of the energy sector in 1998.

Before liberalisation, the strong participation from the population was made possible by a policy based on three principles:

- All farmers had the right to install one turbine on their own land.
- Local residents had the right to become members of wind cooperatives in their municipalities or neighbouring municipalities. Exclusive local ownership was the condition to obtain planning permission for cooperative windmills, and there was a limit to the shares that each cooperative member could hold.
- Electric utilities could build large wind farms in agreement with the government.

The absence of financial investors made the wind sector in Denmark unique compared to other countries. At the turn of the century, around 150.000 households were co-owners of a local windmill. The ownership model was therefore an integral part of the success of wind energy in Denmark. It was the key factor behind the high public acceptance that wind power projects enjoyed during that time. It also enabled a much faster deployment, since large numbers of people were involved in the sector that gave a tremendous good will.

In 1992 the role of cooperatives shrank due to a change in planning procedures. In 1998, due to liberalisation in the sector, the ownership model changed dramatically. The restrictions in ownership were abolished, and everyone was allowed to own as many windmills as they could get permission for, anywhere in the country. The take-over bids began, resulting in a dramatic decrease in public involvement. At the beginning of the century, cooperatives were being offered substantial amounts by financial investors to sell off their windmills, sometimes at the price of new ones or more due to the capitalization of re-powering certificates. Investors would then trade those windmills for the right to erect larger ones. As a result, currently about 50.000 households are co-owners of windmills. Consequently, the attitude towards wind power suffered a reversal. Now the erection of every single windmill becomes a local problem, and results in bitter conflicts that lead to long delays or cancellations.

Current policies in distress

The current wind energy policy, established through a comprehensive political compromise reached by all major parties on March 29th 2004, consists of two targets to be reached by 2009. The most important target is installing two offshore wind farms, each 200 MW, which already went through a tendering process. They are supposed to provide power for 350.000-400.000 households. The policy for onshore wind power, disgracefully called “sanitation”, foresees the replacement of around 900 medium windmills (of up to 450 kW) by 150-200 new megawatt-class turbines. Around 175 MW of wind power capacity will be decommissioned while 350 MW will be installed, resulting in a net increase of 175 MW.

DONG Energy and *E.ON* won the tender for the *Nysted/Rødsand II* offshore wind farm in the Baltic Sea, but the project is shelved and no progress is likely in the foreseeable future. *DONG* stepped out first, due to lack of economic viability. However, *DONG* also announced its intention to build a 2 x 800 MW conventional coal power station in Lubmin, Germany, at the Baltic Sea. This is one out of 25 large coal power projects that are planned in Germany, which has not yet implemented a coal-stop of the kind that is in place in Denmark since 1990. The Danish coal stop has avoided the emission of millions of tons of CO₂ and (together with the refusal to nuclear power) has enabled the flourishing of wind power and of other forms of sustainable energy.

E.ON took over *Nysted/Rødsand II* and planned to continue without *DONG*, but in December 2007 announced that it preferred to allocate their investments to other countries with more profitable tariff schemes than those existing in Denmark. *E.ON* justified its decision to abandon the project on the grounds of increasing cost of new windmills and other materials. The Danish Government is currently investigating the legal aspects of this failure to comply with contractual commitments.

The Government had expected *Nysted/Rødsand II* to become one of the flagships for the *2009 Climate Summit Conference* in Copenhagen. Therefore, there is strong political pressure to save the project and see it realised in time for the 2009 Conference.

The other offshore project is *Horns Rev II*. It will be located 13 km north of the existing *Horns Rev I*. The tender for this project was won by *DONG Energy*. It will include 95 turbines of 2,3 MW supplied by *Siemens*, plus three experimental turbines of up to 5 MW. The total investment is estimated to be 3,5 billion DKK (470 Mio EUR) and the annual production is expected to be around 800 GWh. Construction should begin in 2008 and the farm should be commissioned in 2009, in time for the Climate Summit.

The onshore “sanitation” programme was justified on the basis of an arguable improvement of the landscape and planning situation. The controversial idea behind this concept is that it is preferable to have a small number of very large windmills than a large number of small and medium size ones. However, there is considerable social debate about whether the new megawatt-class windmills, with total heights of up to 150 meters, result in an improvement or worsening of the landscape. The medium windmills are seen by many as an integral part of the Danish landscape, while the large ones lack acceptance and are provoking local resistance.

The “sanitation” programme was supposed to be accomplished by 2009, but this timeline is now considered to be unrealistic. Only a small fraction of the programme will be

delivered by then, due to constraints and delays in local planning and to growing local protests.

Another step backward in the policy defined in 2004 was the abolition of the purchasing obligation for wind power beyond the minimum amount of full-load hours that receive a guaranteed price. Wind policy in Denmark, the cradle of the successful feed-in system, now establishes that the market should determine everything beyond the minimum full-load hours guaranteed by the law. “*Wind power now has to prove that it can compete*” the Minister in charge, *Bendt Bendtsen*, declared in 2002. To blame him might be unfair, as various Danish wind energy experts often claimed in public that wind power would soon be competitive with conventional fossil energy forms.

An appalling tariff structure with disastrous consequences

The tariff structure in Denmark depends on several variables: on which year the turbine went into operation, how many full-load hours they already delivered, and whether they are offshore or onshore. The tariff comprises a market power price element and a government subsidy.

Under the present government, a general principle for the tariff scheme has been that the combined tariff for wind energy should not exceed 0,36 DKK (0,048 EUR) per kWh for existing onshore windmills. In the onshore repowering programme the price is up to 0,48 DKK (0,065 EUR) per kWh for a maximum of 12.000 full load hours. The tariff conditions for offshore are better: although the price paid, at 0,518 DKK (0,07 EUR), is not so high, at least it is guaranteed for 50.000 full load hours.

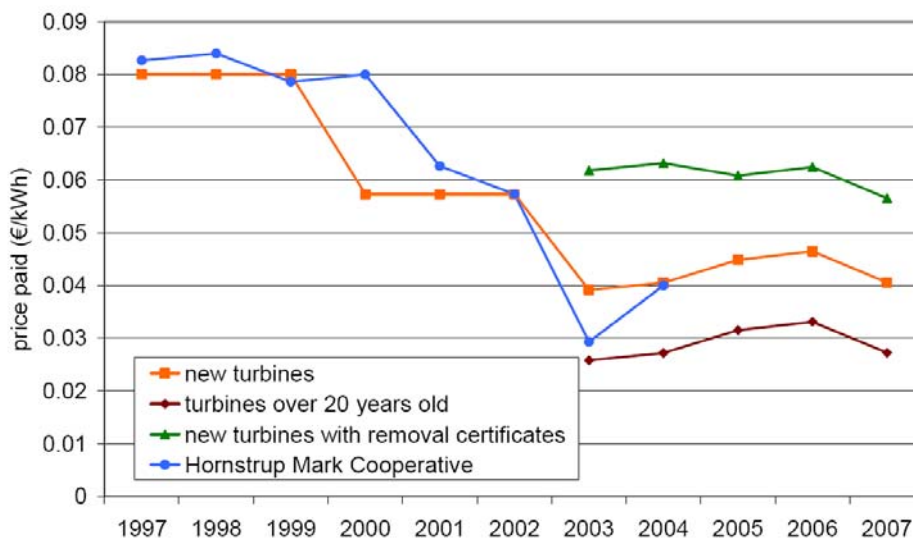


Figure 3: Prices Paid for Wind Power in Denmark (1997-2007)
 Source: Nordic Folkecenter for Renewable Energy (data from Danish Energy Authority, Danmarks Vindmølleförening & Hornstrup Mark Cooperative)

Due to the low prices, some windmill owners have installed brand new megawatt-class turbines but refuse to put them in operation. They are not interested in connecting them at the existing tariff level, and hope that current negotiations about wind power policy that are taking place in Danish Parliament will result in improved prices for wind power. These negotiations have been going on since February 2007 without coming to any conclusion. It is not possible to know long it will still take for politicians to reach an agreement on the future wind energy policy. The *Social Democrats* have declared that they will not endorse

any new policy unless the objectives agreed in 2004 are fulfilled. The government has by February 2008 not presented an acceptable solution, so the situation is at standstill. Newly installed windmills are stalled and their potential contribution to the power supply wasted.

Some wind turbine owners have even declared that they are ready to take down their new turbines and sell them to other countries. They claim that they would obtain a better return doing so than commissioning the windmills, due to the increased prices of new windmills and the low price they would get for electricity. Their arguments have still made no impression on Danish energy politicians.

Offshore projects have been saved from this crisis due a very good performance based on high capacity factors with 4.500 full load hours per year.. However, the price paid for the electricity is significantly lower than in any other countries.

Continued industrial success

Despite all these problems, the Danish wind industry remains in a leading position, even though it must export virtually all its production. Vestas and Siemens (former Bonus) in 2006 supplied 27 % and 7 % of the global windmill production. More than one third of the global market is therefore supplied by companies based in Denmark. This is not surprising, since back in the 1990s Denmark controlled 60% of the manufacturing. The decline in the market share will certainly continue as growing numbers of countries develop their own manufacturing capacity in a rapidly expanding market with long delivery times from the leading manufacturers.

Vestas recently suffered a setback in profits and reputation due to the problems experienced by its V80 turbines in the first Horns Rev wind farm and the newer V90 windmills in British offshore installations. However, Vestas remains the global market leader and so far no competitor has been able to seriously challenge its position.

The two Danish manufacturers, located in the Western part of Jutland, face an acute shortage of skilled labour and engineers. Scarcity of labour and skills constitutes the main constraint for future expansion of production and motivates them to locate additional production in other countries. They have installed fully integrated production in countries such as India and China.

In addition to these two leading turbine manufacturers, Denmark has a large number of highly specialised component manufacturers, especially power controls, brake systems and not least blades. The Danish company LM is the leading independent blade supplier, with factories in Denmark and 10 other locations in the most important wind power countries.

While the two main Danish turbine manufacturers have in-sourced the manufacturing of blades and other components, many newcomers in the wind industry acquire the components from specialised Danish sub-suppliers in order to assure the quality and reputation of their products. In total, the Danish wind energy sector employs 26.000 people. In Germany, with a population 15 times larger, 60.000 people are employed in the sector.

The need for news policies and framework

Windmill manufacturing, one of the fastest international growth sectors, makes a very substantial contribution to the Danish economy. Denmark used to be well-known for its export of bacon, butter and other agricultural products. Now wind equipment has for several years been the main single export item.

This is the main legacy of the progressive wind energy policies applied in the 1980s and 1990s. It is high time for the Danish political class to realise their mistake and to put adequate policies back in place. Denmark has hundreds of consumer-owned local energy supply companies for combined heat and power, district heating and power distribution. New organisational structures and non-profit ownership models to the direct benefit of the involved municipalities may prove to be the most realistic long term solution for community wind power as well.