

FACTS AND FIGURES

Market statistics

Denmark is worldwide recognized for the progress brought to Wind Energy over the last 35 years. Back to 1979 Vestas started selling and installing a 30kW with a 10 meter rotor turbine. A similar turbine of what today is a husstandsvindmøller (small wind). We are all familiar of the successful story of Vestas. In very brief, it was a mix of driving-force minded people, government support and access to foreign markets driving the ascent to a worldwide market leader in the wind industry. Within the last five years the small wind industry started to grown thanks to government support (see fig. 1). In 2010 the Danish legislation established a support program (Net Metering) for household supply with solar, wind and biomass granting up to 6kW systems. The support scheme was phased out in 2012, contributing to a shocking decreasing of 41% in sales in 2013. With no framework, since 19th November 2012 all sales have been on stand-still. New legislation was prepared but delayed by disputes between Danish government and EU Commission. On February 2015 a Feed in Tariff (FiT) program was established with a significant positive support to the market (see Fig.1). On date 26th October - 2015, eight months later, an overall of 323 small wind turbines were installed. These trends are clear, the small wind industry needs financial support to be economically viable. The trends are also showing that it is needed a national market stability rather than continuously stop-n-go government support strategies. Today Danish manufactures are becoming solid market leaders and have the vision to scale up by approaching foreign markets.

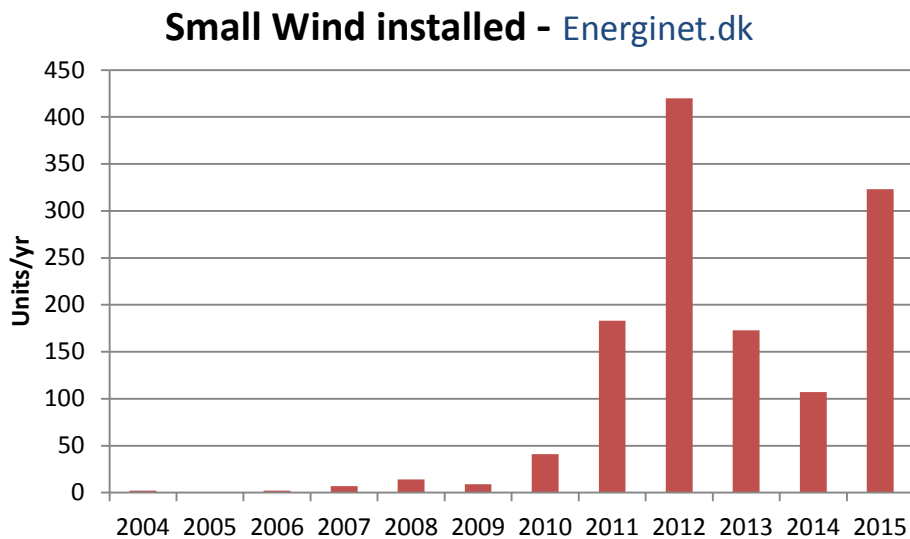


Figure 1: Market trends over the past 11 years, number of small wind installation per is shown

Currently there are 1494 small wind turbines installed in DK with rated power <25 kW, corresponding to 14.37 MW of installed capacity. Overall 66% of operating turbines are manufactured in Denmark, whereas 28% are imported from UK and about 6% from Germany and other countries.

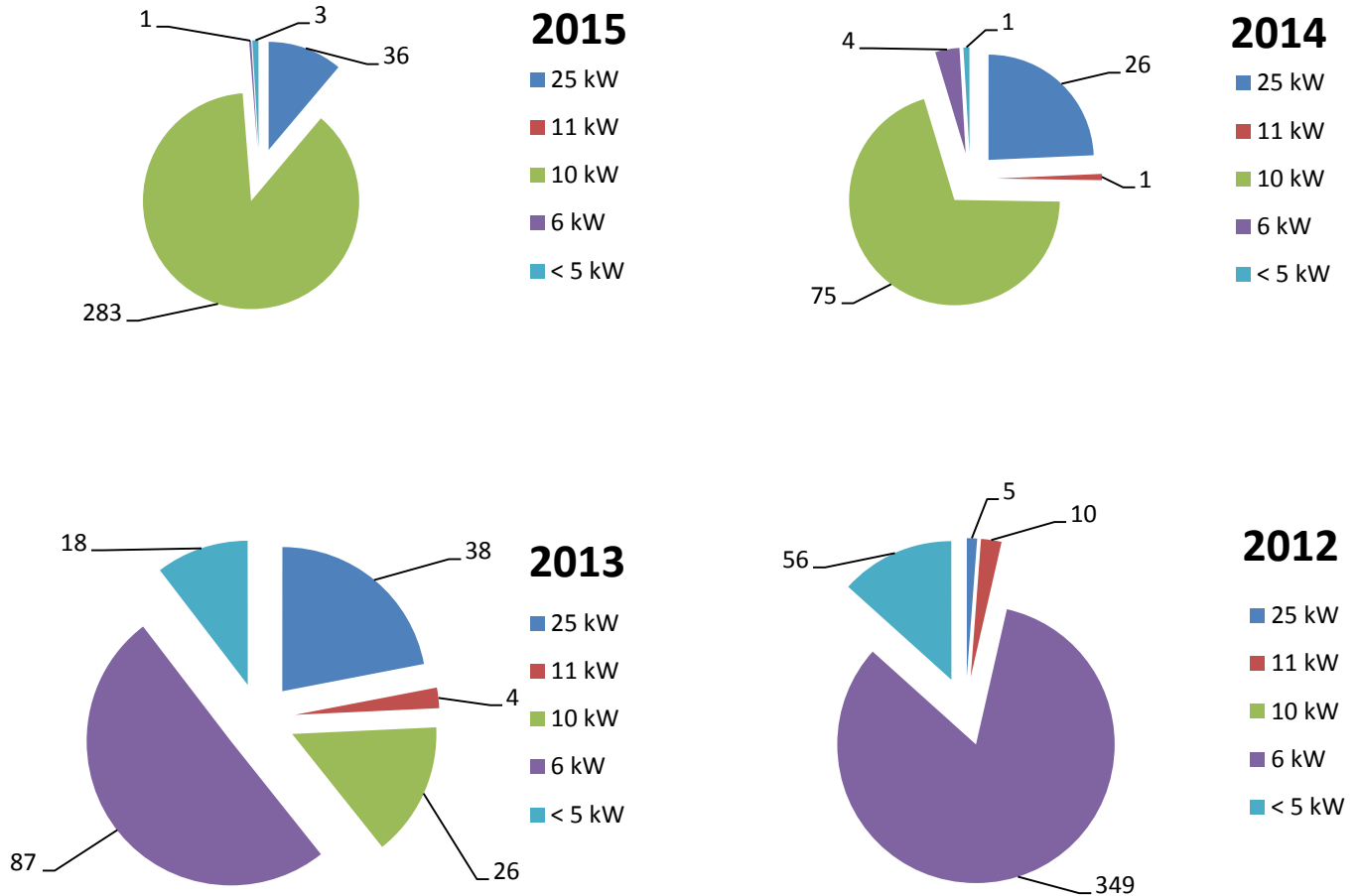


Figure 2: Yearly installation of small wind turbines classified accordingly to rated power

Benefit of small wind market

A growing market translates directly into national job creation opportunities. Not only for manufactures of wind turbines, indeed to build a small wind turbine requires a large number of suppliers providing spare components. Generally these suppliers are local small businesses. In addition operating wind turbines have to be serviced and maintained as prescribed by the certification scheme BEK 73. Therefore new service companies were born that are typically small businesses located in countryside regions of Denmark. Today there are about 10 approved Danish companies to carry out service and maintenance of small wind turbines.

Small wind has played a key role in raising social acceptancy of wind turbine installation within the last four years. Market numbers are clear (see fig.1), whether the investment is cost-effective (through incentives) households and farmers are intentioned to install a small scale turbine at their place. Locally-owned small turbines contribute more to local economic development than conventional wind farms. Small wind is an attractive solution for grid connected customers to reduce their energy bills in the long term and for government achieving ambitious carbon neutral targets.

Achievements to date

The technical certification scheme for wind turbine - BEK 73 of January 2013, has adopted the IEC 61400-2 standard for design requirement of small wind turbines with rotor area 200m^2 . The BEK 73 also provides an alternative simplified and cost-effective certification procedure, for small wind turbines with rotor area less 40m^2 . Safety of turbine is ensured at first, whereas the simpler requirements are beneficial for those small businesses which design and manufacture turbines in order to access the market with typically limited resources. The BEK 73 and Danish regulation for small wind has received international credit from representative of China, U.S., Germany and Netherlands etc. through different international contests including IEA Annex 27 committee meeting (promoting recommendation of siting of small wind turbines), the International conference for small wind in Wien-2015; the Husum energy conference March – 2015. Denmark is an ideal market for further development and deployment of the small wind technology. It is overall a windy country; there are plenty of potential ideal sites; the certification scheme ensure only reliable, high quality, low noisy and performant turbine to get access to the market; current Feed in Tariff (FIT) ensures a cost-effective investment. National manufactures have shown reliability and ability to satisfy the market demand. This is firmly important as unregulated markets such as China, Germany, Italy, France, Canada have seen in the past years the advent of new manufactures gaining easy access to the market and selling turbines which under-performed and broke down in the early stage of the lifetime. These countries are looking into the Danish experience to be followed as a novel model for certification scheme implementation.

The Small wind Danish committee at CanWEA-2015. From 5th to 7th October 2015, a historical milestone was achieved by Danish small wind delegation of manufactures, blade producers and software consultancy companies in the small wind segment. These “natural” competitors in the national market, have partnered together to identify market potential for small wind in foreign markets (U.S., Canada, Brazil, Japan) and realized in collaboration with DTU Wind Energy an export campaign in Canada, seen as a promising market. Approaching foreign market is needed for manufactures to increase volume of sales. The exporting of turbines

represents the opportunity to seek for stable markets, where government supports with long-term policies the small wind industry. Today Danish small wind turbines manufactures and blades components have shown to have the vision to become solid market leaders in the world arena.

DTU Wind is a national leading research center with +35 years track record of pioneering the development of the wind energy industry. Danish small wind turbines manufactures and blade producers have been collaborating with the research centre in several projects. On date 1st November it will be released state-of-art online software developed exclusively for optimizing siting of small wind turbines in the vicinity of obstacles, including buildings and trees characterizing most of the small wind installation sites. This tool is expected to facilitate and guide owners and relevant stakeholders with energy, financial and environmental calculations. DTU Wind has also conducted measurements campaign to study and predict the wind flow and the structural loading of small wind installed in these typical sites. All the research is conducted to boost national markets and local technologies to be competitive worldwide and driving innovation.

Driving factors

Facts and figures have demonstrated the vitality of government support for the small wind industry. The market has clearly spoken, without subsidy the small wind industry is force to decline instead of growing. The small industry has contributed to job creation, raising awareness and customer satisfaction and reduced fossil fuel dependency. Denmark is worldwide renown for wind energy. Danish small wind turbines are synonymous of quality, reliability, safety and performance. Leading small wind markets (e.g. U.S., China and UK) see the Danish certification scheme BEK 73 as a model to follow and as a driving factor to boost reliable turbines. Danish manufactures have shown maturity and vision to innovate and have approached as united delegation foreign markets. However a stable national market is still needed as foundation for incentivizes and supporting the industry to scale-up. The current proposal from the Danish Energy Agency of an annual pool of 1MW capacity installed with gradual decrease of the incentives has no influence and support to the sector. With current trends 1 MW will be mostly reached in less than one month. Denmark is a role-model in the small wind world and we must preserve it. Long-term government support strategies are needed for the technology to mature and become independently of financial incentives.

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