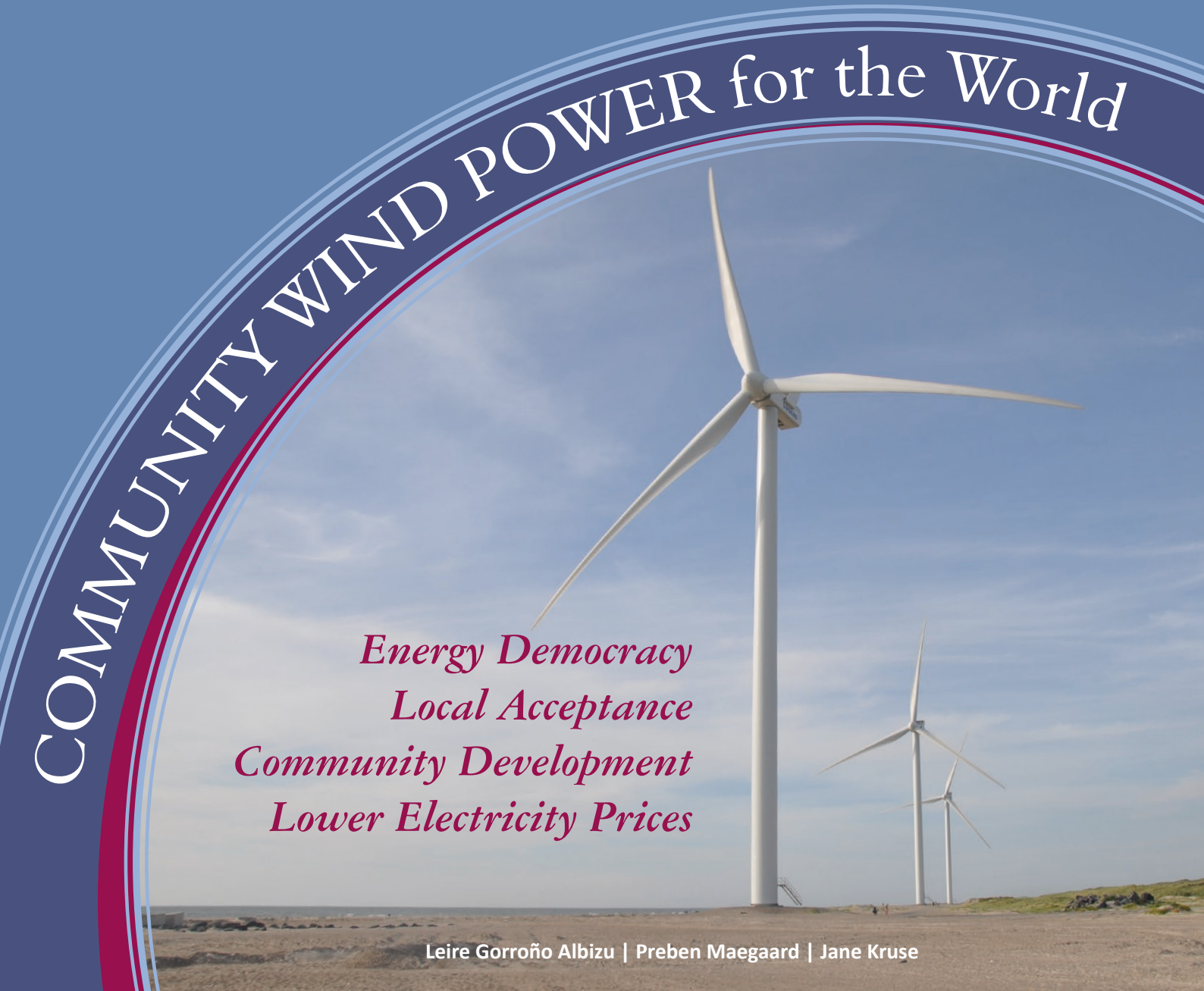
There are no longer technological or economic barriers for the quantum leap to 100% renewable energy

COMMUNITY WIND POWER for the World



Energy Democracy
Local Acceptance
Community Development
Lower Electricity Prices

Leire Gorroño Albizu | Preben Maegaard | Jane Kruse

COMMUNITY WIND POWER *for the World*

ENERGY DEMOCRACY

Renewable energy is growing fast. Technological development and support strategies have advanced promising solutions. However, to continue sustained growth it is imperative to develop community-focused organisational and support structures. Profit-driven development can be a workable procedure in the pioneering stage of implementation, but for achieving a long-lasting renewable energy society local residents must be the foundational focus of renewable energy projects.

Communities that live nearby wind turbines and other renewable energy projects too often have been left apart and their needs and interests have been neglected to maximise the benefits of investors – sometimes even when projects are part of local cooperatives – leading to strong local opposition to renewable energy.

It is time to start developing all renewable energy projects in a democratic way to ensure local community support and the maximisation of local benefits. This report promotes a refocus of the current energy system in favour of citizens, local communities and environmental protection. To achieve a quantum leap in renewable energy, which is imperative to solve climate change, we need renewable energy ownership models that favour local communities.

LOCAL ACCEPTANCE

Most people realize the liabilities of climate change are vast and are therefore supportive of renewable energy solutions – including wind power. However, at the local level a growing movement refuses to have large wind turbines near their homes. In many areas around the world local protests are preventing the development of wind power and other renewable energy projects, which ensures that fossil fuels continue to be burnt allowing climate change to grow.

Many local residents opposing wind turbines cite impacts in their surrounding environment as a reason to stop renewable energy projects. However, evidence shows that arguments based in aesthetics, noise and other local impacts are not the main reasons for opposition. For example in Hvide Sande (Denmark), wind turbine projects faced strong local opposition and were cancelled in the past but recent projects have been fully accepted by the same residents that opposed them – even though the new wind projects use bigger machines and have similar technical characteristics to those wind projects that were originally rejected.

The key to addressing opposition and increasing community support is local ownership of wind turbines and other renewable energy initiatives using a development approach that clearly shares the benefits of projects throughout the local community. This is community ownership (for definition see page 2).

COMMUNITY DEVELOPMENT

Often when we speak about renewable energy projects supporting local development we refer to the creation of new jobs (usually related to the construction and maintenance of the installations) or, less frequently, to economic benefits for shareholders of local cooperatives. However, renewable energy projects can do much more for the development of the local communities where they are installed.

Practical experience shows that wind projects can support local development when appropriate ownership models are applied. Community ownership models reinvest the income generated from selling renewable energy to satisfy the needs of local communities –e.g. through improvement of infrastructure, creation of new jobs, finance for local schools in rural areas, to take care of elder and/or ill people, to address poverty and limited energy access, to provide support for local organisations, for environmental projects, local public e-transport, etc. In short, to provide benefits not just for a few investors but for everybody in the community so they can all see renewable energy as a local improvement.

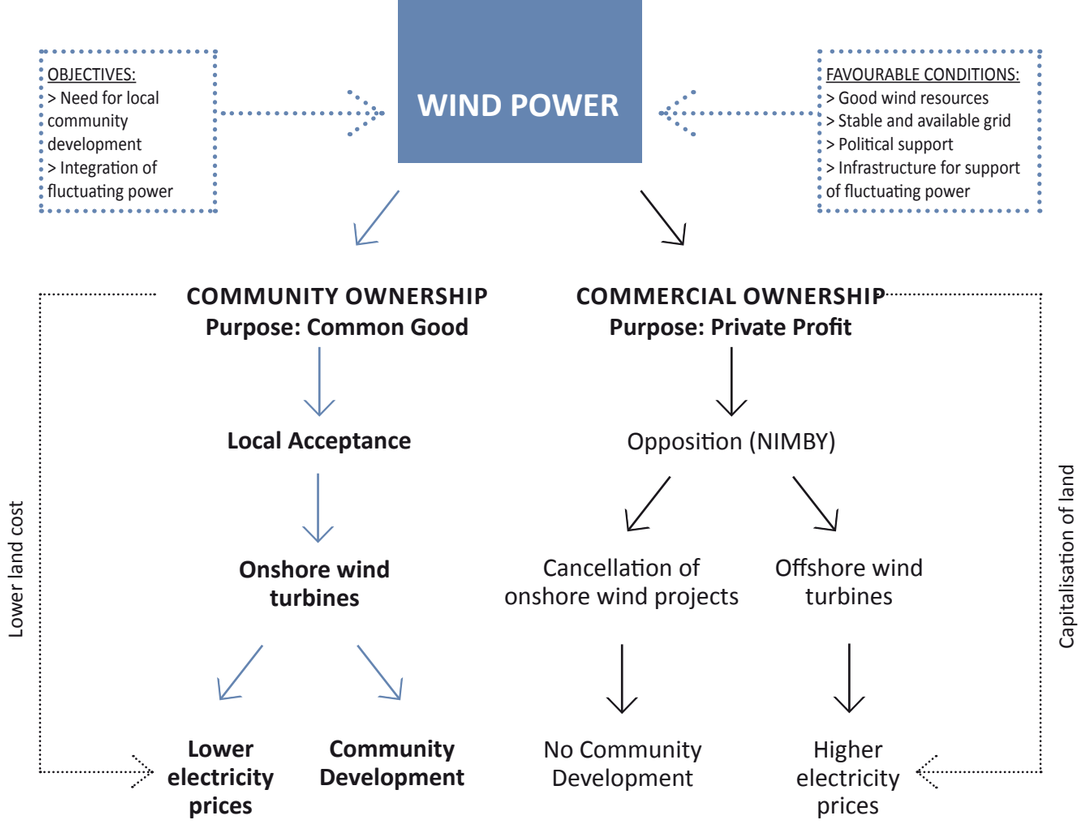
Rural regions, with the lowest per capita income and high rates of exodus to urban areas, can significantly benefit from the new income stream of renewable energies, as the case of Hvide Sande shows (for details see page 10). Strong local support of community ownership models is essential for the growth of renewable energy to its full potential worldwide.

LOWER ELECTRICITY PRICES

Electricity prices ought to be affordable for consumers – from households to industry. In principle, variable renewable energy sources such as wind power can lead to lower spot market prices. However, that cost reduction is not always reflected in consumers' bills. This is because renewable energy development is generally supported by subsidies that are ultimately paid by all consumers. Since benefits are often not tangible the end-result is the growth of voices against this type of energy amplified by those that benefit directly from stopping renewable energy. Broad international agreement for a world fully powered by renewable energy remains stalled due to the artificially created high cost of renewable energies. Fortunately, generalisations can be avoided as there are differences in the maturity of different RE technologies and their costs.

Onshore wind energy is the cheapest renewable source for electricity production (after large hydro) today. Onshore wind turbines already play an essential role in the cost optimisation of the transition to a low carbon energy system. They are cheaper than fossil-fuel technologies for electricity production and in most locations no longer require subsidies to ensure investment profitability.

Furthermore, the costs of electricity produced by onshore wind turbines can be lowered even further through community ownership approaches that can require lower land payments than private investments. Other profitable community examples are emerging where different renewable energy sources are combined with storage solutions to address resource variability while ensuring reliability and diverse valuable energy services at low-costs (e.g. wind combined with district energy for heating in Denmark).



Wind projects can be developed by different ownership models, which leads to vastly different results. Currently various definitions of community ownership are being used around the world. In this report, **community ownership is focused on the objective of using the income generated by renewable energy projects to benefit the residents of local communities**, i.e. the main objective is achieving the **common good**. In contrast, the main objective of commercial ownership models is to generate private profit.

According to those definitions, for-profit companies – including local cooperatives (guilds) – are categorised as commercial owners, whereas non-profit local cooperatives, municipal companies and community foundations are considered community owners. It is important to highlight that renewables for individual use are not considered as community owned.

BENEFITS OF COMMUNITY OWNERSHIP

Energy Democracy | Local Development | Local Acceptance | Lower electricity prices

COMMUNITY WIND POWER

- Community ownership of wind power projects reduces electricity prices for consumers, supports local development, promotes energy democracy and increases local acceptance.
- Onshore wind power is one of the cheapest renewable resources for electricity production. Hampering their commission may only lead to higher costs in the transition to low carbon energy systems.
- Excess power has to be handled by integration of electricity, heat/cool, gas and transportation systems in order to reduce the merit-order-effect and the use of fuels that can be stored and emit greenhouse gasses.
- Even if offshore is often considered to be a plausible solution to local protests against wind power, substituting onshore capacity by offshore capacity harms consumers' economy as offshore is 2-3 times more expensive.
- Achieving local acceptance is of extreme relevance for consumers and environment.
- Distribution of benefits of wind power projects through local development is a must to achieve local acceptance.
- National and local governments should support community ownership for onshore wind projects.
- Authorities should designate areas for wind turbines with community ownership and determine requirements of community benefits for commercial wind projects.

Community ownership would open the doors for energy democracy, finally providing citizens with the chance of designing their own energy system and the chance of achieving local energy security.

The income from renewable energy projects, such as wind power, can be harnessed to satisfy the needs of communities. Communities can decide how to invest profits for example to support local associations, schools, sport facilities, public e-mobility, new business development, or energy renovation of public buildings, etc. Each community knows best and can decide which needs are to be addressed.

SOCIAL INNOVATION LEADING TO LOCAL ACCEPTANCE

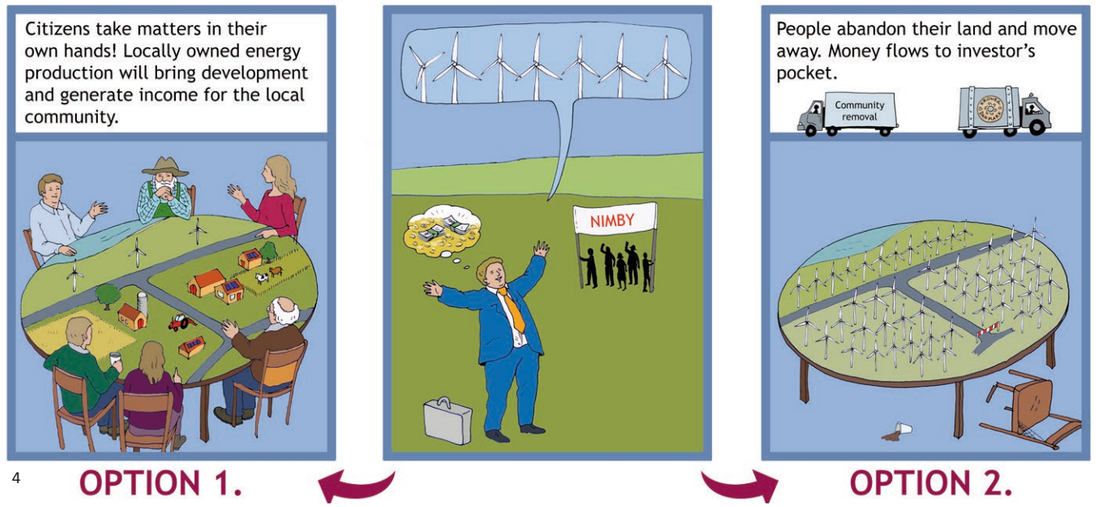
BENEFITS OF COMMUNITY OWNERSHIP
Achieving local acceptance is essential

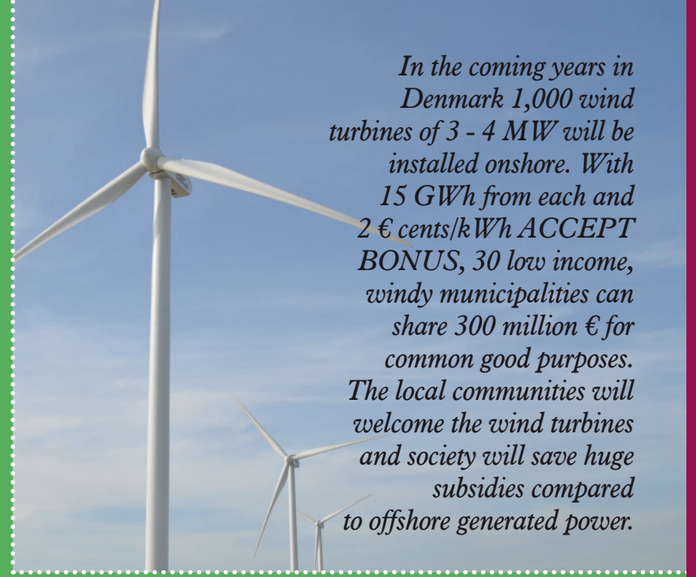
Community ownership models focus on enhancing the common good and result in firm support for renewable energy development. In Scandinavia, the prevailing form of ownership for district heating, water supply, public transportation and the public sector satisfies the common good principle. However, until now, wind turbines have been primarily owned by commercial investors as they are owned in other countries.

Faster and less costly integration of wind power in the system has been the main argument to promote the participation of commercial investors. Nevertheless, those arguments are not valid anymore in Denmark and in many other countries. First of all, wind power integration is being slowed-down as a consequence of growing local opposition to commercially-owned wind turbines. Secondly, reducing electricity prices is against the interest of any land owner and commercial investor, who will advocate for higher subsidies. In addition, competition among commercial developers is counter-productive when it comes to the acquisition of scarce resources –such as land for wind projects in highly populated Western European countries– as demand-offer market rules will inevitably increase the price of those resources. Opponents to community ownership argue that land costs should be related to potentially alternative uses of land thereby justifying their rationale using speculation principles. However, in many rural areas the only other alternative land use to wind turbines is growing crops.

In contrast to commercial and commercial ownership models, community ownership models have been proven to enjoy the full support of local residents. Community ownership models can achieve lower financial costs by avoiding costly litigation and ensuring lower land costs for project development.

COMMUNITY OWNERSHIP VS COMMERCIAL OWNERSHIP





In the coming years in Denmark 1,000 wind turbines of 3 - 4 MW will be installed onshore. With 15 GWh from each and 2 € cents/kWh ACCEPT BONUS, 30 low income, windy municipalities can share 300 million € for common good purposes. The local communities will welcome the wind turbines and society will save huge subsidies compared to offshore generated power.

NEW COMMUNITY WIND POWER ECONOMY

With bigger, higher and more efficient wind turbines as we have seen in recent years, fixed remuneration prices – like FIT – over time lead to capitalisation costs of land that can be exorbitant. It was never anticipated by the pioneers and promoters of the FIT, but it has become an onerous reality. FIT was certainly the best solution at the introductory level, however, the negative effects have become too visible and it is time to point at other mechanisms. The most effective solution is to re-tool policies so wind power becomes focused on enhancing the common good/public use. Providing monetary compensation to land owners is standard practice in Scandinavia when appointing areas for common good such as transmission towers, waterworks, roads, railways, airports or harbours and it leads to projects with lower overall costs.

In this report it is argued that the same focus should be applied to wind turbines which can be built for enhancing the common good –land and other compensation payments should be similar to those provided for transmission towers. That policy focus would result in a significant reduction in electricity generation costs and, as a result, subsidies for onshore wind power could be lowered and higher income for local development would be ensured as a result of community ownership.

It is proposed here that Municipalities should be responsible for designating areas for wind projects with a common good objective. In addition, it is important to mention that legislation should specify that expropriated areas can only be used by community projects – not for private profit by commercial owners.

EXAMPLE OF NEW COMMUNITY WIND POWER ECONOMY

- **3 MW** wind turbine
- **15 GWh/year** (West coast of Denmark)
- Costs of wind turbine installed: **€ 4 million**
- Electricity production cost: **3 € cts/kWh** with:
  - **20 years** linear depreciation
  - **4%** interest
  - O&M costs: **0,8 € cts/kWh**
  - Land costs as for other common good infrastructure

Innovative tariff model with ACCEPT BONUS leads to low electricity prices, local acceptance and development.

Total wind electricity production cost:
5 € cts/kWh

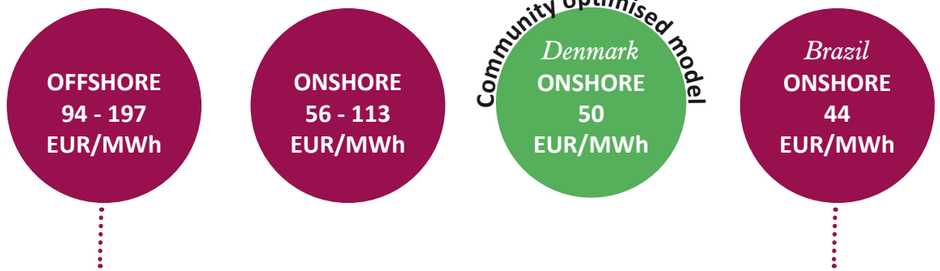
Electricity production costs:
3 € cts/kWh

ACCEPT BONUS for the community
2 € cts/kWh

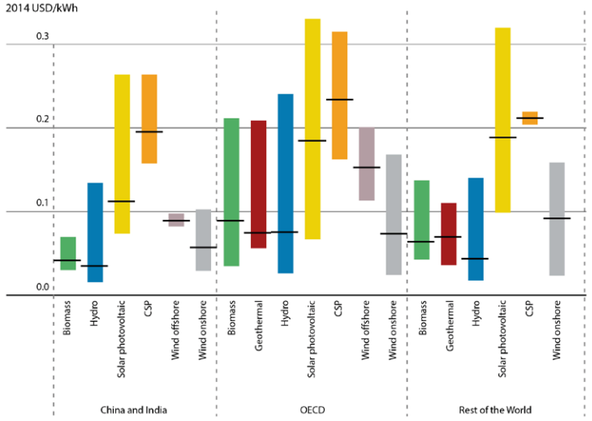
BONUS for the community:
€ 0,3 million/year per wind turbine

(15 GWh x € cts 2 /kWh) Subsidy, 50.000 full load hours, similar to offshore in Denmark, but with 5 times less total public subsidy.

WIND POWER COSTS



Offshore wind power has often been claimed to be the solution to avoid local protests while ensuring fulfilment of wind power implementation targets. However, economic figures show that substituting onshore capacity with offshore wind is not the right approach from society's perspective because electricity production by wind turbines is 2-3 times as expensive offshore than onshore.



Source: IRENA Renewable Cost Database.

The levelised cost of electricity by region and technology and their weighed averages, 2013/2014 (1 USD=0.94 EUR)

BRAZIL: TOWARDS THE 20 000 MW BY 2020

Brazil was the first country in the world to introduce auctions for wind energy. In that way, wind energy became competitive without subsidies. Wind energy is the cheapest contracted electricity in the country: **44 EUR/MWh**.

The government is considering declaring the areas for onshore wind projects for public use, i.e. similar to other types of public infrastructure development to thereby avoid inflated land prices and lengthy judicial processes that have become common due to the auction focus on private profit.

RE in Brazil	Auction price per MWh
Wind	44.7 EUR
Small Hydro	50.6 EUR
Natural Gas	52.57 EUR
Biomass	52.57 EUR
PV Solar	74.56 EUR
Big Hydro (sporadic auction) Not including long transmission lines. High environmental impact.	38.11 EUR

DENMARK: 50% ELECTRICITY SUPPLY BY 2020

Cost: 24-36 EUR/MWh (excl. land cost)
Revenues: 43-57 EUR/MWh
Benefits: 10-29 EUR/MWh

Cost of Large Onshore Wind Turbines (20 years life-time)	
Investment	1.34 million EUR/MW
Operation and Maintenance	8.05 EUR/MWh
Land cost	? (not accessible)
Loan	100% of investment 2%-4%

Revenues of Large Onshore Wind Turbines	
Annual electricity production of 3 MW wind turbines	15 000 MWh 12 000 MWh 10 000 MWh
Spot market electricity price	32.2 EUR/MWh 37.6 EUR/MWh 43.0 EUR/MWh
Feed-in tariff on top of spot market price	max. 33.6 EUR/MWh for 22 000 full load running hours (i.e. 0.74 million EUR/MW)
Balancing compensation on top of spot market price	3.1 EUR/MWh for entire lifetime

Substituting onshore power with offshore power in fact harms the economy and the competitiveness of the wind industry. Achieving local acceptance of large onshore wind turbines is essential to reduce the overall costs of the transition to a sustainable energy system.

Subsidy of Offshore Wind Turbines in Denmark (million EUR/MW)

Spot market price (EUR/MWh)	Subsidy for 50 000 hours (EUR/MWh)		
	100.7	107.4	114.1
32.2	3.43	3.76	4.10
37.6	3.16	3.49	3.83
43.0	2.89	3.22	3.56

Calculation of subsidy for offshore wind turbines in Denmark depending on possible future guaranteed prices and spot market prices. The subsidy given to offshore projects is the difference between the guaranteed price and the spot market price.

Guaranteed prices for the latest Danish offshore wind farms				
Name of wind farm	Installed capacity	Year of commission	Guaranteed price (EUR/MWh)	Amount of hours with subsidy
Anholt Offshore	400 MW	2013	141.1	50 000
Horns Rev III	400 MW	2016	103.4	50 000

Source: Danish Energy Agency.

Subsidy for offshore wind turbines:

Subsidies are defined by means of tendering processes, which result in guaranteed prices for a specific amount of full load running hours.

Subsidies for offshore wind turbines can be 5 times higher than those for onshore wind turbines in EUR/MW.

The increase of fluctuating energy sources in the power system leads to lower spot market prices that often can even be negative in periods of excess power. This phenomena is known as the merit-order-effect. One of the main challenges of the future energy systems is how to ensure grid security and a profitable scenario for investment.

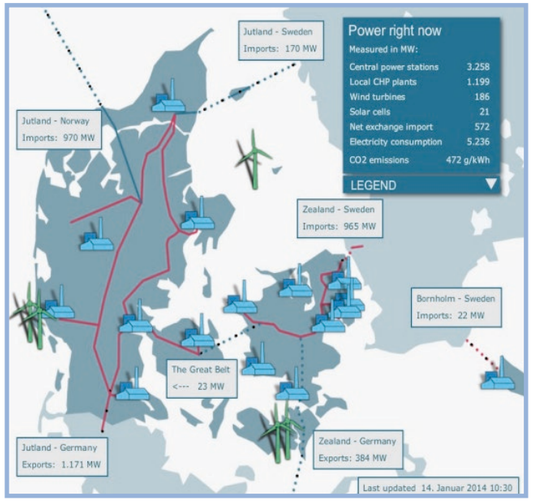
Currently, wind turbines are often shut down in periods of excess electricity which is against the “use-it-or-lose-it” nature of renewable energy sources such as wind. To avoid this problem, some argue connection capacity to neighbouring countries should be increased. However, neighbouring countries are also incrementing the share of fluctuating RE power in their systems and often have similar weather conditions. This means there will be simultaneous excess power periods and hence this solution does not avoid the decrease of electricity prices in the spot market.

26th July, 2015, 7 - 8 am

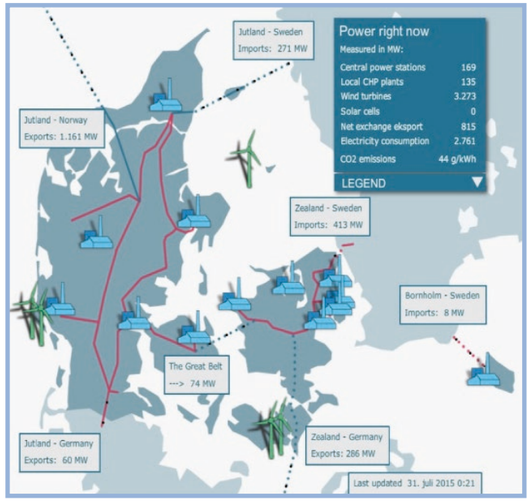
139%

of all electricity consumption of Denmark was generated by WIND on that time

DENMARK | Jan 14, 2014
Wind power share 2%
472 g CO_2/kWh



DENMARK | July 31, 2015
Wind power share 119%
44 g CO_2/kWh



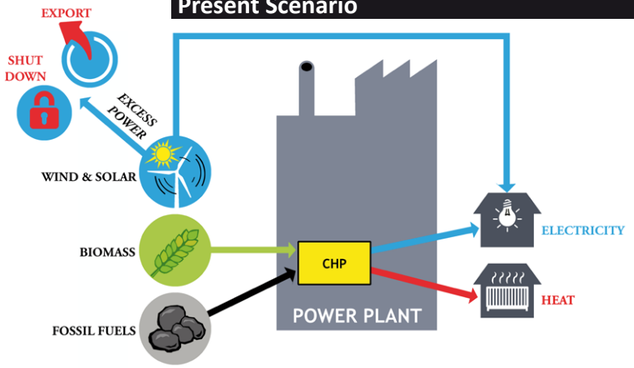
Information about the production, demand and export/imports of Denmark for specific moments. Source: Energinet.dk

In Denmark three times more energy is used for district heating than for electricity needs (105 TWH versus 25 TWH/Y). Using excess power for district heating by means of heat pumps or boilers in periods of excess power not only helps avoid shutting down wind turbines, but it also increases electricity prices potentially to the level of the substituted fuel (biomass, coal, natural gas...).

With higher prices of the excess power when used for heating compared to export to neighboring countries the overall economy will be improved. In addition, emissions may be decreased as fossil fuels can can be replaced in periods of high wind power production.

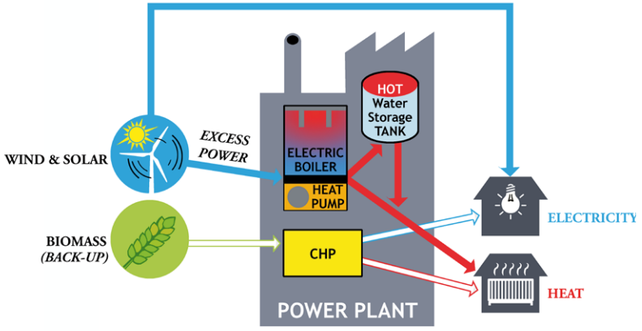
In an optimised scenario, heat pumps or boilers of district heating systems convert excess power into hot water for heating purposes. In contrast to the excess power, hot water is easy and cheap to store. By using excess power to satisfy heating needs, biomass and fossil-fuels are saved for periods with no sufficient wind or solar energy. At the same time, CO_2 emissions are reduced.

Present Scenario



In the present scenario, wind turbines and photovoltaic panels produce electricity and combined heat and power (CHP) plants connected to district heating systems electricity and heat. All together satisfy power demand. In periods of excess power, electricity is exported or wind turbines and solar panels are shut down to keep the balance between production and demand.

Optimised Model



Good Practice

Hvide Sande

Winds of Development

THE TOWN

Hvide Sande is a small fishing town with approximately 3,000 inhabitants located in Ringkøbing-Skjern, a municipality in rural Denmark. Danish rural areas have the lowest per capita income and have for many years languished due to the exodus of its people to urban areas, where most services, infrastructure and job offers, especially for highly qualified personnel, are concentrated. Therefore, revitalization of rural areas through new or improved business opportunities and job creation is indispensable to reverse the exodus and to ensure the economic sustainability of those areas. Hvide Sande's economy is mainly reliant on the harbour (owned and run by the Municipality) and on tourism.

THE HARBOUR PROJECT

Fishing vessels have become bigger and it was crucial to deepen the harbour area, to adapt the piers to allow bigger ships to come in, which forced the community to upgrade its facilities. The expansion and improvements aimed at attracting higher amounts of ships to the harbour and also provide diversification possibilities for the transport of goods and increased service possibilities for the North Sea offshore industry. It was estimated that the project could create 70 new jobs. In addition, a lively harbour is also a good attraction for tourists.

The required investment to implement the harbour project was 19.5 million EUR, of which 4.8 would be funded by the Danish government and 5.3 by the EU/EFF. To obtain a bank loan to cover the investment, it was necessary to present a project that was economically feasible, which entailed the need for an additional income source. Wind turbines brought the needed financial solution.

THE WIND TURBINE PROJECT

Hvide Sande, like the west coast of Denmark, has rich wind resources and onshore wind turbines are a safe and profitable investment in Denmark. Integration of electricity, heat, gas and transportation systems enjoy political support that will ensure proper economy for technologies using fluctuating sources for electricity production in the future. Hence, onshore wind turbine projects provide the necessary source of income for community projects.

Within that context, a group of local initiators spearheaded a wind project consisting of three Vestas V112 3MW wind turbines to be placed on the beach – on land owned by the harbour. Due to its proximity, the economy of every second or third household in Hvide Sande relies on Vestas, either because one or more family members work directly at Vestas or as Vestas' subcontractors. Therefore, the choice of wind turbine manufacturer was clear. The rent of the land for the wind turbines would generate an income of 0.64 million EUR/year over 30 years for the harbour, i.e. 19.33 million EUR. But wind turbines could contribute more than just supporting Vestas and the land rent.

Different ownership alternatives were analysed and, once having compared their capability to support the harbour and tourism in Hvide Sande, it was decided to establish a **community foundation**, similar to a trust fund. The foundation would own 80% of the wind turbine project and, following the Danish regulation, **20% of the shares were offered to local residents**. The cost of each share was 309 EUR and **they were all sold out in two days**. The project counted with the support of the entire community and, as a result, many local people were willing to get involved in it **– more than 400 people became shareholders**.

The community foundation was established by the local Tourism Association (Holmsland Klit Turistforening) in collaboration with local industry groups, unions and utilities. The Tourism Association raised the 40,300 EUR requested to start-up a foundation in Denmark. Financing required to cover 100% of the investment related to the 80% owned by the community foundation, which was obtained from two local banks – Jyske Bank (50%) and Ringkjøbing Landbobank (50%) – with the wind turbines as the only bank guarantee.

As it was specified in its by-laws, ***"the foundation has the purpose of running three wind turbines at Hvide Sande North Harbour on an area belonging to Hvide Sande Harbour and thereby support the development of Hvide Sande harbour and the tourism in Ringkøbing/Skjern municipality by production of renewable energy"***. After having paid back the loan (expected pay-back period: 6 years after project commission), the foundation will generate 0.67-1.34 million EUR/year (i.e. 16.11-32.22 million EUR) exclusively to be used for the purpose defined in the by-laws.

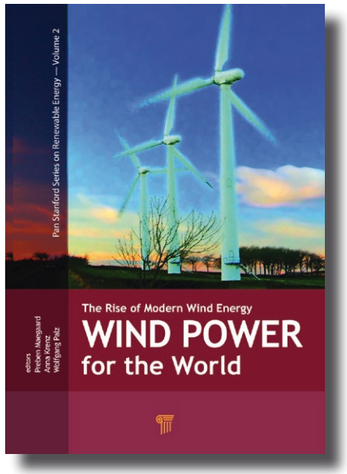
The project was first introduced to the harbour company (which is also Municipally-owned) in August 2009. The wind turbines were commissioned in December 2011. Since March 2012, each of the three wind turbines has produced an average of 16 GWh/year. At the end, the harbour got the loan needed to implement the harbour project thanks to the stable annual income from the wind turbines. **The initial results of the harbour project are already visible as the activity in the harbour has incremented significantly due to the increase in ships going there. This has led to creation of many jobs** and increased tourism to the town – even more new jobs are expected for the future.

INHABITANTS' PERCEPTION OF THEIR WIND PROJECT

Due to the good wind conditions at the west coast of Denmark, private investors had tried earlier to implement projects in Hvide Sande. However, those projects were stopped because of local protests. In contrast, the project described above achieved broad local acceptance because it was – and is – different from other wind projects. It was designed and developed with the objective of local economic stability, local development and self-sufficiency. This is why the three wind turbines that can be seen from almost everywhere in Hvide Sande are not just accepted, but they are warmly welcomed by local inhabitants. **The previously experienced NIMBY effect (Not In My Backyard) turned into POOL (Please On Our Land) and local inhabitants today feel proud of their three turbines.**

Ownership	80 % community foundation
	20 % local residents
Wind turbines	3 (3 MW each)
Yearly production	16 GWh/turbine
Commission	December 2011
Production start	March 2012
Planning cost	0.16 million EUR
Investment	12.08 million EUR
Land rent per year	0.64 million EUR (30 years)
Operation and maintenance	8.05 EUR/MWh
Average annual electricity price (2012-2015)	32.8 EUR/MWh
Subsidy	33.6 EUR/MWh for the first 22 000 full-load hours (i.e. 66 GWh) 3.1 EUR/MWh for the entire lifetime
Loan	100% of the investment (with wind turbines as the only bank guarantee)
Interest rate	5%
Expected pay-back period	6 years (2018)
Income for the harbour and for sustainable tourism in Hvide Sande	19.33 million EUR (land rent)
	16.11-32.22 million EUR (grants from the foundation)

Hvide Sande is an excellent example of local development and community involvement as well as a great source of inspiration for other communities.



WIND POWER for the World: The Rise of Modern Wind Energy

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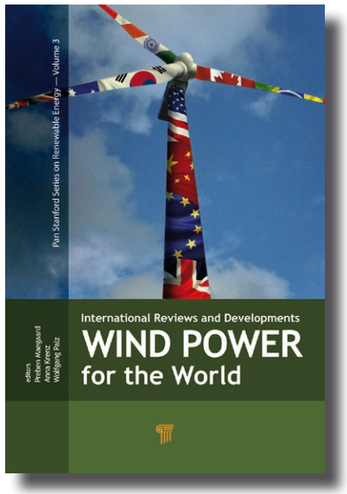

WIND POWER for the World: International Reviews and Developments

PREBEN MAEGAARD
ANNA KRENZ
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Pan Stanford
ISBN 9789814411899

NORDIC FOLKECENTER
for RENEWABLE ENERGY

In 2010, in order to demonstrate that power from wind turbines should be as economical as possible, the Nordic Folkecenter for Renewable Energy launched a project **"TIME FOR ENERGY DEMOCRACY"**. Objectives are that wind turbines for collective supply should:

- Be installed onshore to ensure low-kWh prices;
- Be run by local consumer-owned companies in the same way as for the supply of district heating, power distribution etc;
- Ensure that the profit would go to a public green trust to benefit the entire local community;
- Impose a change in the planning laws in order to define wind power as a source of energy for supply rather than an investment.

www.folkecenter.net

series
OPEN KNOWLEDGE

2.

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