WWEA Quarterly Bulletin

Wind Energy Around the World

WWEA
World Wind Energy Association

ISSUE 2 June 2012

From The Editor

Welcome to the second edition of the WWEA Quarterly Bulletin! At first I would like to thank our readers for their feedback on the first edition of this Bulletin.

This second edition is again bringing you first-hand information and latest news about some of the most exciting developments in the worldwide wind sector:

- Wind power set a new record in Tamil Nadu, the southernmost state of India. End of May and beginning of June, wind farms generated 30-35 % of the electricity of this state, hence demonstrating that wind can also have make impressive contributions in the so called developing countries, where grid stability is a major issue.

- Encouraging news also from Europe: The EU member states are on the best way to overfulfill their 2020 targets for renewable energies. However, although the renewables sector demands long-term clarity and stability, unfortunately so far the EU has failed to take decisions for the time beyond 2030.

- A region which has only started tapping its huge wind potential are the Caribbean islands. Their big wind and other renewables potentials offer bright prospects in particular for those island states which are heavily suffering from huge expenses for imported fossil fuels. However, political frameworks need urgently to be improved.

- Groundbreaking decisions have been taken in Japan: In the aftermath of the nuclear disaster of Fukushima, the Japanese government announced recently the feed-in tariff for electricity from renewable energy. The tariffs appear to be very attractive seen from outside, however, the mid-term expectations are still modest as their are many additional hurdles to be overcome.

- The South African government has given special consideration to community benefits from wind farms but the general conditions make it still difficult for communities to make such investment, although community and cooperative ownership models are already very common in other industry sectors.

- The Danish Folkecenter for Renewable Energy, founding member of WWEA, is celebrating its 30th birthday, time to look back at a long history of achievements in its struggle for a decentralized renewable energy system that substitutes completely the old centralized fossil system.

- Offshore wind poert in Asia is ready to start especially in China, South Korea and Japan. Special technological challenges are expected to be addressed in the future.

- Amazing progress can be reported from the Chinese small wind industry: As of end of 2011, its total output has reached almost one million units, and the sector has seen growth rates of 30 % and more.

Again I would like to thank all authors and my colleagues at the editorial team for their contributions to this magazine.

May it be useful for your activities! And do not hesitate to inform us about any proposals, comments, critical or positive feedback that you may have!

Stefan Gsänger
Secretary General of WWEA

WWEA
Quarterly Bulletin
ISSUE 2 June 2012

Published by
World Wind Energy Association (WWEA)
Produced by
Chinese Wind Energy Association (CWEA)

Contact

Frank Rehmet
fr@wwindea.org
Tel. +49-228-369 40-80
Fax +49-228-369 40-84
WWEA Head Office
Charles-de-Gaulle-Str. 5 53113 Bonn, Germany
A detailed supplier listing and
other information can be found at
www.wwindea.org

Yu Guiyong
yugy@cwea.org.cn
Tel. +86-10-5979 6665
Fax +86-10-6422 8215
CWEA Secretariat
28 N. 3rd Ring Road E., Beijing, P. R. China
A detailed supplier listing and
other information can be found at
www.cwea.org.cn

Contents

Friendly Energy. Friendly World. The Best to Invest.

Fuhrländer

What started 25 years ago is today a matter of course in more and more countries: Renewable forms of energy play an ever increasing role in the energy mix.
And Fuhrländer is a pioneer in the use of the wind energy in Germany and a driving force in its development.

Open to new ideas, flexible in execution.

We are one of the few independent manufacturers world-wide. That is the basis for a flexible and customer-oriented company policy. Creative engineering spirit and expert knowledge and skills come together to develop wind power projects of all sizes – from individual turbines up to turn-key multi-megawatt wind parks.

Strong locally, secure into the future.

We prove that there is far more to wind energy than environmentally friendly energy production and security of supply. With wind energy we create secure jobs and apprenticeships around the globe and thereby provide a future for people. Friendly Energy – a new wind blows partnership and fairness throughout the world.

www.friendly-energy.de

WIND ENERGY CREATING ENERGY RECORDS IN TAMIL NADU

Prof. K. Kasthoorirangaian, Indian Wind Power Association

When Tamil Nadu (TN) State had been working with heavy shortage of energy for past 3 years, 840 MW Mettur thermal failed because of fire accident in coal conveyor belt in mid May 2012. Aged machinery at 610 MW Ennore thermal did not lend reliable support.

At this hour of need, South Westerly Trade Winds came to the rescue of Tamil Nadu with a supply of 2800 to 3500 MW dependable supply from around 7000 MW of wind mills installed capacity in the State. Information gathered from the website of Tamil Nadu State Load Dispatch Centre of Tantransco Corporation Ltd is given in the table.

The data reveals that from 25th May 2012 to 5th June 2012, the amount of wind energy supplied to state grid consistently amounts to 70 Million to 80 Million units a day which formed anywhere from 31% to 35 % of total energy used by Tamil Nadu grid during these 12 continuous days. Thankfully weekly power holidays, scheduled and unscheduled power cuts have vanished, with normal life using power has reemerged.

What is more important for power engineers is that wind energy which was being resorted to as a stepney when more thermal power was predominantly available, became the main supply source of energy and dependable supplier of power in these summer months when there is extra load. Many power engineers were of opinion that more than 20% of wind energy which was named “ infirm” cannot be accepted in a grid for safety reasons.

Wind Energy Generation in Tamil Nadu From 25th May 2012 to 5th June 2012

Date	Peak MW			Total Consumption in TN	Contribution from Wind Mills	% of Wind Power to total consumption
	Total	wind	%	(Million Units)	(Million Units)	
25-May-2012	10303	3248	32	227.296	75.002	33.00
26-May-2012	10262	3304	32	229.501	76.671	34.00
27-May-2012	10260	3228	31	221.153	69.924	32.00
28-May-2012	9849	3457	35	221.040	77.038	35.00
29-May-2012	10581	3404	32	225.857	71.242	32.00
30-May-2012	10624	3307	31	221.699	68.191	31.00
31-May-2012	10506	3286	31	234.569	79.715	34.00
1-June -2012	10395	3509	33	232.993	76.906	33.00
2-June -2012	10847	3260	30	229.906	72.668	32.00
3-June-2012	10738	3606	33	228.956	71.431	31.00
4-June-2012	10555	3713	35	229.390	76.919	33.00
5-June-2012	10764	3654	34	231.425	75.497	33.00

Last 12 days have proved that 30 % to 35 % of wind energy when accepted by a grid has done better in quenching power thirst of community and not causing any harm to the grid as such.

The only the other country in the world where up to 40 % of wind energy had been accepted as a successful working grid is Denmark. Thus Tamil Nadu has become a forerunner and record setter in India to have been successfully working with high level of wind energy penetration up to 35 %. South Westerly Trade Winds will last up to the first week of October. Peak wind season is supposed to occur from July to August during the Tamil month of Aadi. May, this year in days to come, we may witness still higher penetration.

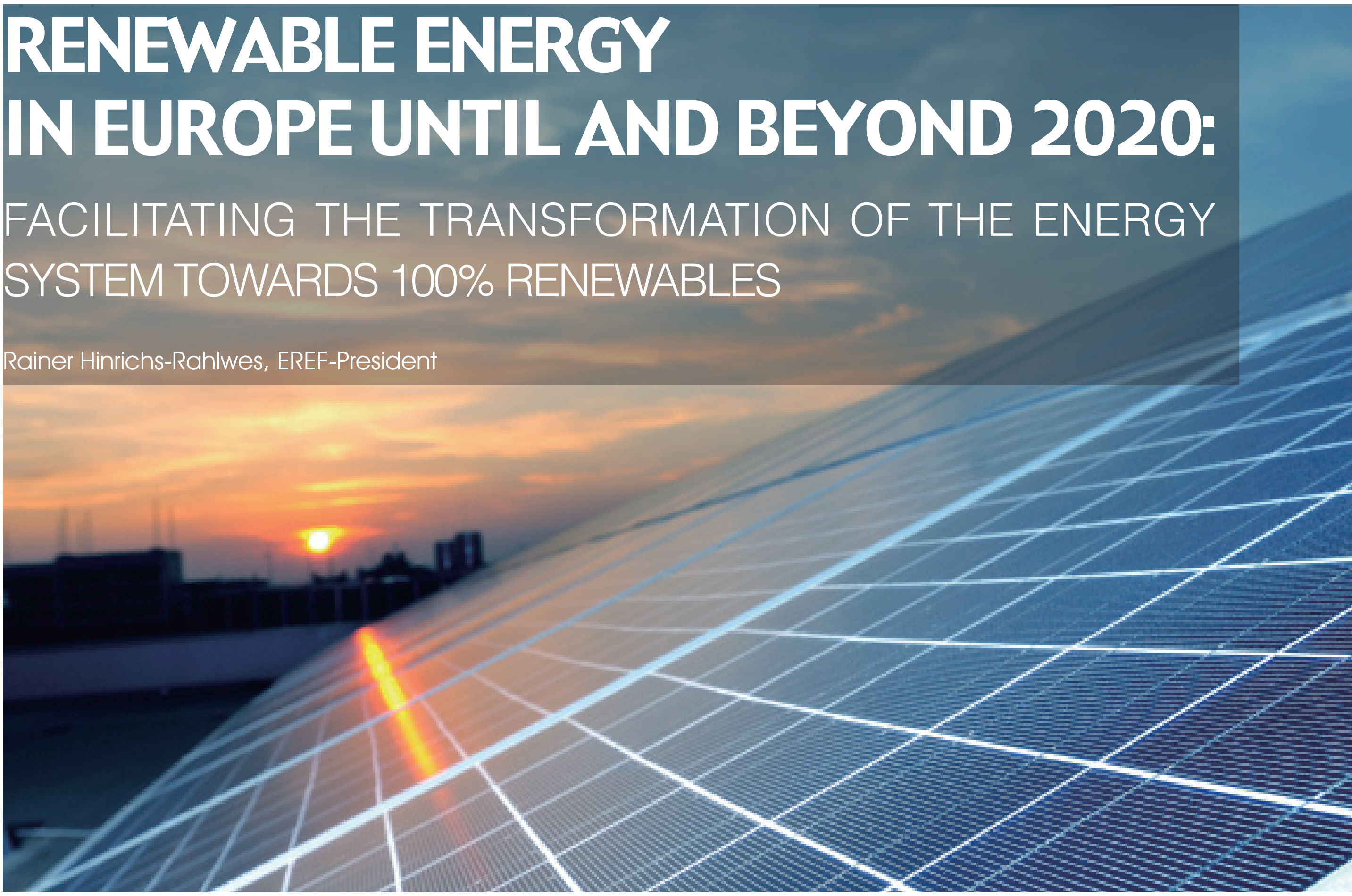
All praise must go to not only Wind Power Producing Community but also to the all engineers of TNEB and the State Chief Minister Ms J.Jayalalitha who is a great supporter of renewable, pollution free energy.

At this hour of feeling happy, Wind Power Producing Community looks to continued support in evacuating all wind energy produced during entire season and also looks for monthly payment of bills for supply energy to Tangedco without accumulating arrears. The state government should also lift Section 11 ban on export of energy to outside the State.

Ministry of Power, CEA & Power Grid Corporation of India should see to that the southern grid is adequately connected to national grid within as short a time as possible.

Ministry of Finance and Ministry of New and Renewable Energy should restore Accelerated Depreciation and Generation Based Incentive to the wind mill investing community to maintain and improve upon annual wind mills installations in the country. MNRE website shows that only 36 MW of wind mills have been installed in April 2012 against about 200 MW that had been installed in yester years. A steep fall ! Investors are hesitant and not forth coming. Earlier the above incentives are reinstalled, the good for the country. All those who had been complaining that wind mills installed have not done their part in energy production, can now see that in Tamil Nadu, it is wind energy that is in rescue mode for a fast growing state like Tamil Nadu when it is short of energy.

Wind energy can be a rescue for a fast growing state like Tamil Nadu in India



RENEWABLE ENERGY IN EUROPE UNTIL AND BEYOND 2020:

FACILITATING THE TRANSFORMATION OF THE ENERGY SYSTEM TOWARDS 100% RENEWABLES

Rainer Hinrichs-Rahlwes, EREF-President

The EU's Renewable Energies Directive of 2009 is a landmark piece of legislation for facilitating development and increasing deployment of renewable energy in all Member States and in all three sectors – electricity, heating & cooling, transport. With the mix of legally binding targets for each Member State to reach a minimum share of renewables in final energy consumption by 2020 and a trajectory towards these targets, the mix of policies and measures to be implemented and the creation of stable framework conditions for renewables to be monitored and enforced by the European Commission, the Directive is a strong tool to facilitate the next steps of the energy transition towards renewables. Building on successful national support schemes in several Member States and underlining that – despite some need for cooperation and coordination – strong national support mechanisms are key elements for achieving the envisaged high shares of renewables in the EU's energy supply the Directive is paving the way to continued growth of renewables in all sectors, until 2020 and beyond.

The "soft" parts of the Directive, requiring an enabling environment for renewables, transparent proceedings and cost bearing rules, information availability and capacity building, priority or guaranteed grid access, grid enhancement and enforcement and regular reporting and – if necessary – adaptation of the National Action Plans are providing stability of the European framework. With the design of support policies being primarily assigned to the Member States, the Directive enables focused policies for regionally and locally adapted policies and priorities. The Directive thus provides a useful instrument for smooth growth of renewables on all levels: local, regional, national and European. And with the Member States in the driver seat for ambitious implementation, the Directive provides excellent opportunities for a smart integration of more decentralized, locally rooted and community based projects in various Member States.

As can be seen from some good examples, strong local and regional involvement is a major element, if not precondition for a stable investment climate and high public acceptance for new installations, particularly if small and medium enterprises are deeply involved in local and regional development. The fact that most of the renewables installations in Germany's electricity sector are owned and operated by private persons and not by the incumbent utilities, can serve as a good example for more decentralized deployment of renewables.

Meanwhile, with some delay, the implementation of the Directive has started and the first progress reports from the Member States about achievements until 2010 had to be submitted by early 2012. From the reports available so far, it seems evident that most Member States are on track towards reaching or even overachieving their mandatory 2020-targets. And a first evaluation of the National Renewable Energy Action Plans (NREAPs – submitted in 2009/10) indicates that the 20%-target for 2020 will probably be exceeded. According to calculations done by National and European Renewable Energy Industry Associations, more than 24% could be easily achieved, if framework conditions were remaining stable or were smoothly adapted for better target achievement.

However, since the NREAPS were drafted, not all Member States have implemented the Directive at the same level of ambition. In early 2012, the European Commission even had to start official infringement procedures against three Member States for not fully implementing the Directive. This step seems to be necessary and overdue, in particular, because in 2011 and 2012, some even Member States even revised their policies and targets downwards,

The EU's Renewable Energies Directive of 2009 thus provides a useful instrument for smooth growth of renewables on all levels: local, regional, national and European

some of them even introduced retroactive changes. So far, the European Commission has always criticized these retroactive changes, but there is no effective tool to really stop such attempts which are – even more than frequent discussions and changes of policy frameworks – strongly disturbing investors' confidence and thus undermining smooth transition towards a Renewables based energy system.

It is obvious that renewable energy – particularly solar and wind – have been growing much faster in the recent past than foreseen only a few years ago. And it is becoming more and more evident that high shares of renewables provide a permanently increasing contribution to the security of energy supply and to reducing import dependency and thus price risks from volatile fossil fuels. In some parts of Europe, more and more frequently renewables are supplying close to 100% of the electricity demand at some times of the day, during several days in a row. However, instead of seizing the opportunity of rapidly increasing supply of clean and sustainable renewables, some incumbent utilities are starting to highlight some real and some alleged challenges of the energy transition. It is clear that increasing shares of variable renewables must trigger development and deployment of smart grids, storage capacities, demand response measures and also new power lines on all voltage levels. And of course, the market must be adapted to the specific qualities of most renewable energy sources in the electricity sector: high upfront technology costs, but zero costs for the energy sources – wind and sun are free. Present markets, still too often dominated by incumbent oligopolies of the fossil and nuclear age, are no longer able to provide the necessary signals for investment

in the energy sector, even more so, because a grid with high shares of wind and solar cannot economically (and even less so technically) accommodate traditional "baseload" provided by coal and nuclear. They are just too inflexible to adapt to the balancing needs of modern electricity systems (and they cannot expect a reasonable return on investment, because they can no longer be operated at high capacity factors).

New targets and reliable framework needed

As renewables are growing and the energy system is shifting towards a more intelligently designed and efficient energy market and electricity grid, agreement will soon be needed about the way forward beyond 2020. Whilst the Renewables Directive provides a solid framework for Member States to design their energy mix with their individual (or voluntarily coordinated) policy mix towards a sustainable energy future, the necessary adaptation of the market design and even more the agreement about the next steps (on European, national and regional and local levels) has to be prepared. This is why Renewable Energy Industry Associations have called for a new binding renewables target for 2030. In May 2011, they launched a campaign for a binding target of 45% renewables in the overall energy supply in 2030. Since then, the EU-Commission has only gradually moved. In their "Low Carbon Roadmap 2050" and the "Energy Roadmap 2050", they have shown that greenhouse gas reductions of up to 80-95% by 2050 can be reached in cost effective way in various scenarios with high and very high shares of renewable energy. And despite some shortcomings and flaws in these calculations, the solid message is that renewables have to be and can be the backbone of a future energy supply.

Unfortunately however, although the European has taken note of the industries demand for new, ambitious and binding 2030-targets, the process for developing these targets and reaching agreement has not yet been actively driven by the Commission. And what is more problematic, earlier this year, some of the old nuclear energy supporting countries in Europe and some of their new allies demanded to have a so called "technology neutral low carbon" target – including nuclear power. This attempt was rejected by those Member States which are actively moving forward towards renewables as the dominant energy sources. As EREF's President, I have publicly criticized the imposition of revitalizing and green-washing nuclear energy to the detriment of renewables. In a press communication I called "upon the European Council and the European Parliament to reject this demand and agree on an ambitious renewables-target and on enabling and reliable policies for renewables".

An ambitious renewables-target and enabling and reliable policies for renewables should be called upon in Europe

The development and further growth of renewable energy will certainly continue, in most European Member States and in many countries, states, provinces, cities and villages around the world. Future growth of renewables should and mostly will result in shifting the focus of energy supply and demand from large centralized to more decentralized and community based systems – with large scale power plants where for large amounts of energy are needed, and with very high shares of decentralized installations with independent producers, farmers, small and medium enterprises, communities, cooperatives, individuals and groups producing and consuming renewable energy in a smart and efficient way – to the benefit of their participation in democratic and economic development in their country and region.

WIND POWER IN CUBA AND THE CARIBBEAN

Prof. Conrado Moreno,
Center of Study for Renewable Energy Technology (CETER), Havana, Cuba

The Energy Situation in the Caribbean

The islands of the Caribbean comprise thirteen independent states, several possessions, dependences and colonial territories. The biggest islands are Cuba, Jamaica, La Española (Haiti and Dominican Republic) and Puerto Rico. The rest of the independent Caribbean islands is: Antigua and Barbuda, Bahamas, Barbados, Dominica, Grenada, St. Kitts and Nevis, St. Vincent and the Grenadines, St. Lucia and Trinidad and Tobago.

The energy situation in these islands is characterized by a high dependence on oil, which represents the energy source with a very high share in commercial energy demand. Most of this oil is imported with a great incidence in the commercial balance of the countries. The commercial consumption of energy is based on those derived of the oil in more than 97%. In the Caribbean region only Trinidad and Tobago are exporters of oil derived products; Barbados and Cuba satisfy in a partial way their own necessities of oil and natural gas, the other ones don't possess the own conventional fuels to satisfy their necessities in an appreciable way. Therefore, most of the Caribbean countries are importers of fossil fuels and their economies are highly dependent on oil prices and sensitive to the fluctuations in the international market. In some countries these resources don't exist and in others they are scarce. Derived from this, the electricity production reaches high costs and the deterioration of the environment reaches levels above the average world in more than 30%. As consequence of all the above-mentioned, the energy sector of the region of the Caribbean should direct its policies to assure the energy supply, and to reinforce the economic growth and to achieve a sustainable development. To this it is necessary to add that the Caribbean countries are exposed to the climatic changes with the consequent environmental damages such as increase of the sea level, hurricanes, floods, coralline reefs in disappearance danger among others.

On the other hand, the renewable energy resources are abundant, the region is characterized to be rich in renewable sources of energy, it possesses a great wind and solar potential and besides various type of biomass. However, until the present the use of these potentialities has been relatively worthless due to the existent barriers and to the shortage of development projects. Nevertheless, in most of the islands, the renewable energy is in exploitation in this moment. This region is running interesting initiatives related with the energy sector. Several projects are in plans to promote the use of the renewable energy in the area. The purposes of these initiatives are to contribute to the sustainable development, to mitigate the negative effects of the climatic change and to satisfy the growing demand of energy related fundamentally to the tourist industry.

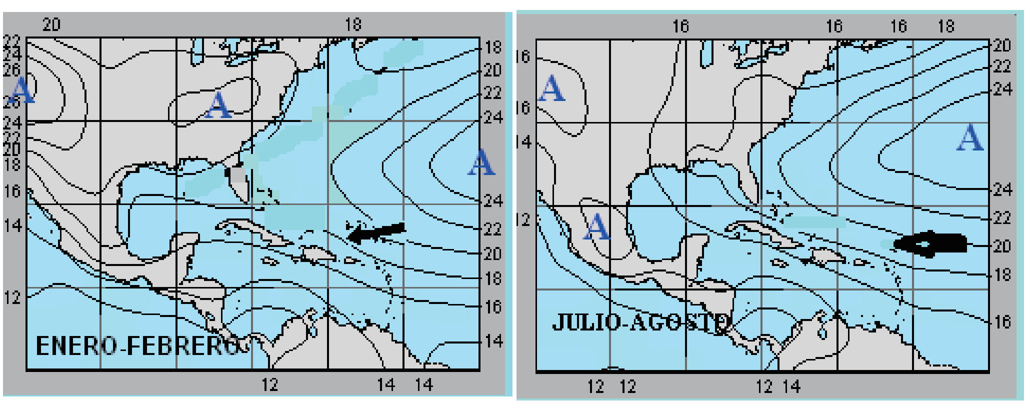
The Wind Regime in the Caribbean

Most of the countries of the Caribbean possess a good régime of wind. The wind is an attractive source of energy for the Caribbean countries. The two main causes that determine the wind régime in the Caribbean are the combined influence of local winds plus the trade winds of the east and northeast that it causes a behavior different from the winds in the coasts of the islands. In the coasts that face the predominant winds of the east and northeast the wind speeds are reinforced with the breeze during the day. This happens mainly in the eastern and northeast coast.

The Caribbean is also affected by other systems that, for their characteristics, generate winds of certain magnitude or ultimate, such as: the convergence zones, the low extra tropicals, which originate in the Gulf of Mexico and can generate strong winds of south component, the depressions, tropical storms and hurricanes that take place in the season of June to November, and they can generate winds of the order of 50 m/s, and the severe local storms that in spite of its short duration, they are presented preferably in the months of March to September, they are of electric nature, and can produce bigger winds of 25 m/s.

In the figure are presented two typical situations of the atmospheric conditions on

Most of the countries of the Caribbean possess a good régime of wind. The energy of the wind is an attractive source of energy for the Caribbean countries.



Two Typical Situations of the Atmospheric Conditions on the Caribbean

Table 1 Installed Capacity in Caribbean Islands (at the end of 2010)

Island	Total wind installed capacity in 2009 (MW)	Total wind installed capacity in 2010 (MW)
Aruba	0,00	30,00
Bonaire	0,33	10,80
Cuba	7,20	11,70
Curacao	12,00	12,00
Dominica	0,22	7,20
Dominican Republic	0,24	60,20
Grenade	0,00	0,73
Guadeloupe	20,50	20,50
Jamaica	29,7	29,70
Martinique	1,10	1,10
St. Kitts and Nevis	0,00	2,20
Total	71,29	186,13

Wind has been considered as the renewable energy source of more priority in the Cuba in the next years.

the Caribbean. The right figure corresponds to the little rainy period or winter season, in which the pattern of winds is reinforced because of the descent and influence of a cold and dry mass coming from the Continental Polar Anticyclone of North America, and the left figure corresponds to the rainy period or summer season, in which the pattern of wind weakens due to presence and influence of a humid and unstable mass of air.

In summary, the wind speeds are bigger in the eastern part of Caribbean and they are lower in the western part of Caribbean. The strongest winds occur between 9.00 am and 6.00 pm in the eastern and northeast coasts of the island. The rest of the day the speeds of the wind descend.

Wind Energy in the Caribbean and Cuba

The assessments of the wind potential show that the Caribbean countries possess important potentials of wind energy. In 2010, the region reached an installed total capacity of 186,13 MW, 161% more than in 2009 for what it is possible to assert that the wind energy is the renewable energy source of more growth in the region. This development, after several years of stagnation, is mainly due to the next markets: Dominican Republic (almost 250 times more, from 0,24 MW to 60,2 MW), Aruba (from 0 MW to 30,0 MW), Bonaire (almost 30 times more, from 0,33 MW to 10,8 MW), Dominica (from 0,225 MW to 7,2 MW), Cuba

Table2 Installed Capacity at the end of 2011 in 4 Wind Parks in Cuba

Wind Park	Capacity (MW)	Number of units
Turiguano (1999)	0.45	2
Los Canarreos (2007)	1.65	6
Gibara 1 (2008)	5.1	6
Gibara 2 (2010)	4.5	6

(from 7,2 MW to 11,7 MW) and St. Kitts and Nevis (from 0 MW to 2,2 MW).

Curacao (12,0 MW), Guadeloupe (20,5 MW), Martinique (1,1 MW) and Jamaica (29,7 MW) still remain with the same installed capacity. Antigua and Barbuda, Bahamas, Barbados, Haiti, St. Lucia, St. Vincent and Grenadines, and Trinidad and Tobago still continue without capacity installed.

In Caribbean, several projects for wind parks installation are in development phase and some of them are already in construction. As an example, in Puerto Rico is under construction a wind park of 75 MW that is expected to put in operation by 2012 and it will constitute the biggest wind park in the region.

From the beginning of Energy Revolution in Cuba in 2005, the following results have been reached in the field of the wind energy:

- Elaboration of Wind Map of Cuba
- Assessment of the wind resource
- Installations of wind parks

The total capacity installed at the end of 2011 reached 11.7 MW in 4 wind parks:

According to the last informations given by the Electric Union of Cuba , by the end of 2020 eight new wind parks will be in operation with a total capacity of 280 MW, six of 30 MW and two of 50 MW in the north coast of the country, from the province of Villa Clara to Guantánamo. These wind parks are in negotiation phase with companies of other countries trying to establish joint ventures for the installation and exploitation of these parks.

Energy Projects and Programs in the Caribbean

In the Caribbean different institutions and international organisms work for developing varied projects, programs and initiatives linked to the energy sector. The purpose of these projects is to accelerate the introduction

of the renewable sources of energy in the region and to increase the efficient use of the energy. Among these projects one of the most recognized is the project CARIBBEAN RENEWABLE ENERGY DEVELOPMENT PROGRAMME(CREDP), coordinated by the Secretariat of CARICOM, which was born in 1998 when 16 Caribbean countries decided to work together to prepare a regional project to remove the barriers to the use of renewable energy and to foster its development and commercialization. The objectives of the project are to reduce greenhouse gas emissions by removing barriers to renewable energy development, to establish the foundation for a sustainable renewable energy industry and to create a framework under which regional

12th World Wind Energy Conference & Renewable Energy Exhibition, La Havana, Cuba, May 2013, with a special focus on Wind Power in the Caribbean. More information will be available on http://www.wwindea.org/

and national renewable energy projects are mutually supportive.

Conclusion

The region is even far from becoming independent of the imported energy, the renewable energy not yet play the role that is required, its share is not appreciable to achieve the energy sovereignty that the area needs. An example to imitate in this sense is the program of energy development of the island of Bonaire which seeks to satisfy 100% of its energy necessities with renewable energy in the 2015. Equally Santa Lucía's government announced in the Summit of Sustainable Development of Johannesburg in 2002 an ambitious program that declares that the country will become a model country in the use of the renewable sources of energy in the next 10 years, seeking to be the first "Energy Sustainable Island" in the world. The wind energy sector is affected in the same way as the rest of renewable energy sources.

Today, several elements not only technical, ethical and environmental but also economics are opening the route for the massive application of some of the renewable energy sources such as wind energy. The wind energy has a great opportunity in the Caribbean due to the great potential that possesses in the area and its competitiveness with the other energy sources. The wind energy has been accepted as the source of more developing possibilities in the region because the wind energy is an attractive, clean and indigenous energy source for most of Caribbean countries that have an adequate wind regime.

Cuba possesses a wind energy developing program that allows affirming that it has been considered as the renewable energy source of more priority in the country in next years.

Background

Wind energy is an attractive, clean, indigenous energy source for those Caribbean countries that have the required wind regime. The primary regional wind systems are the NE trades that form a relatively stable wind regime. Wind speeds are greatest in the eastern Caribbean; they are lower in the western Caribbean and the Bahamas. Coastal sites on the islands tend to have strong diurnal variations in wind speed with the strongest winds occurring between 9:00 am and 4:00 pm, whilst there is little wind during the rest of the 24 hour day.

It is estimated that most of the islands have suitable wind patterns for generatingelectricity. However, actual studies have not been carried for validation, including the production of reliable data for design and positioning of equipment. Advances in material science have corrected many of the earlier problems of corrosion and gearbox failures of earlier turbines, to the extent that most manufacturing companies can now give a 15-year guarantee on their products. In addition, the design of larger units of approximately 500 kilowatts now make it possible to generate a substantial amount of energy from a wind farm utilizing a smaller area, thus increasing the efficiency.

One of the arguments put forward against wind turbines, especially by the solar energy companies, is that they are noisy. However, in the places where wind turbines are operational, the people living nearby disprove that argument by saying that they are no noisier than a hand-held boom box or loud car speakers. Another argument advanced is that wind farms utilize large amount of space, which could otherwise be used. Again, in practice, the opposite is true. In Wales, for example, farmers graze their livestock in the area of the wind farm, giving farmers another source of income in the same land area. The height of the towers necessary to support the turbines is given as another reason for the lack of support for wind as a source of energy. A factor, it is argued, that must be considered, given our geographic position within the hurricane belt. It can be argued, however, that this is a consideration for any type of structure in the region and there are ways to minimize the deleterious effects of hurricanes on buildings and structures.

Wind energy has potential for use as an energy source in the agricultural sector, specifically for irrigation. With furrow irrigation proving to be very inefficient and many water sources in the Caribbean situated in valleys, it is necessary to pump water for sprinkler or drip irrigation systems. Since most farms are outside of the area of the electricity grid, small wind turbines can be an efficient method of pumping water for irrigation purposes. The small wind turbine can also be used for pumping water for livestock use.

Wind energy can therefore be competitive since it is now possible to produce electricity at approximately 4-6 cents per kilowatt. It also offers the opportunity for cleaner electricity generation, greater versatility in use especially in the agricultural sector for irrigation, and can provide a standby source of electricity to reduce vulnerability.

At a Caribbean high-level workshop on renewable energy held in Saint Lucia in 1994, a model renewable energy policy was developed. Unfortunately, this document remained largely in the report and has not been studied by any administration. The document is reproduced here for ease of reference. The main focus of the policy is to encourage governments to develop energy policies designed to encourage energy efficiency and renewable energy sources. With reference to the main energy sources outlined above, the following actions are required:

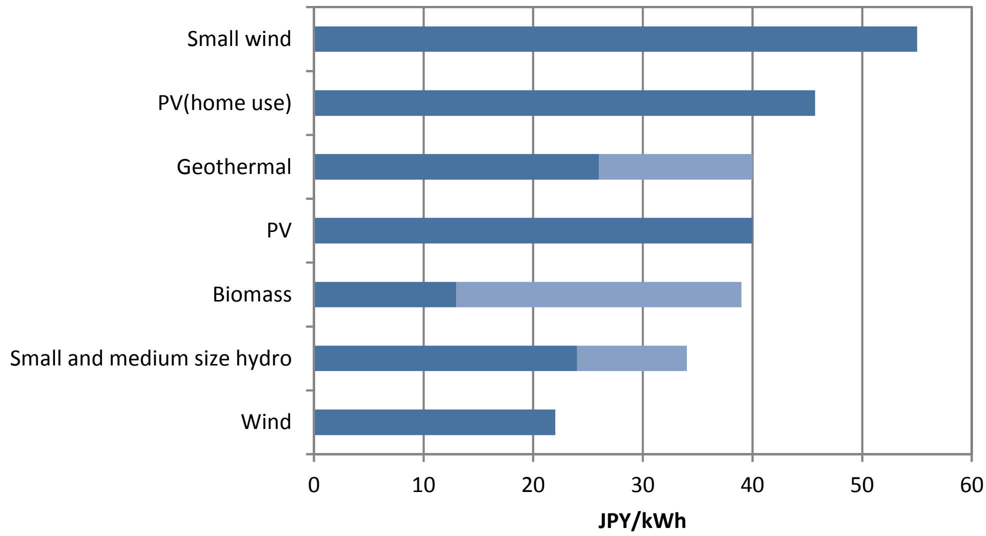
- Wind Studies on the wind regimes to determine best sites
- Decision to incorporate wind energy into a national grid
- Funding for a few trial turbines for grid connection
- Funding for a few trial turbines for irrigation purposes
- A policy decision by the utility companies to use wind energy where suitable.

PROSPECTS FOR WIND ENERGY IN JAPAN AFTER THE FIT LAW

Prof. Chuichi Arakawa, The University of Tokyo / JWEA
John Popham, Japan Wind Development Co., Ltd.

At the end of 2011 the total installed wind power capacity in Japan was just over 2.5 GW from 1832 turbines including 25.2 MW from 14 offshore turbines. This accounted for only around 0.5% of the total national electricity supply. This is even lower than the modest target of 3 GW by 2010 and the reason can be attributed to a number of issues such as strict building codes revised in 2007, the termination of the existing subsidy system in 2010 and grid constraints. The picture shows the typical Japanese wind farm of Kooriyama-

Kooriyama–Nunobiki Wind Farm of J–POWER in Fukushima prefecture (Copyright(C) 2012 J–POWER All rights reserved)



Comparison of the Proposed FIT Prices (JPY/kWh)

Nunobiki Highland Wind Farm with 33 units of 2 MW in Fukushima prefecture.

Following the Fukushima nuclear disaster in 2011, public opinion turned in favour of the utilization of renewable energy and in order to encourage diversification of Japan's energy supply, the new Renewable Energy Law introducing the idea of a feed-in-tariff (FIT) was approved by Japan's parliament in August 2011. The proposed FIT seeks to increase investment in renewable energy to compensate for the lost nuclear capacity (the last nuclear reactor was shut down on May 5th). Aside from wind, the proposed FIT also includes different price levels for small wind below 20kW, PV, geothermal and biomass as shown in the figure.

The proposed FIT price for newly commissioned wind turbines is 22 JPY/kWh (excluding 5% consumption tax) for 20 years. While this is high by international standards, there are a number of uncertainties regarding certain aspects of the final FIT law. For operational wind farms a formula has been proposed taking into account the subsidy already received, this would result in a price between 18-20 JPY/kWh(this is expected to double the income of current turbine operators and lead to a significant increase in new wind power investment). The prices are re-estimated every year. But FIT law specifies "3 years priority period for developers' profit", therefore, high prices may be maintained until 2015. It should also be noted that no mention was made of a separate FIT price for offshore wind. These issues may become clearer following the public comment stage and before the FIT law is finalized.

Further, a high FIT is needed due to the high costs, around 300,000 JPY/KW, of building wind power plants in Japan. Many wind turbines in Japan are installed at the ridge lines in the mountains and they should keep very strict building codes against typhoons and earthquakes. High construction, transportation and grid connection costs are compounded by the fact that the average size of wind farms in

The relatively high prices in the FIT law are needed given the high domestic costs. a specific FIT law for offshore development will be required.

Japan is only 5MW making it difficult to take advantage of economies of scale.

Moreover, even after the new FIT law is ratified there are two major hurdles that need to be surmounted before a significant expansion of wind power capacity can be expected. Firstly, the new "Environmental Impact Assessment Law" that comes into effect from October 2012 obliges developers with a total capacity of more than 10 MW to implement an assessment and approval process that may take 3-5 years and add considerable costs. Secondly, grid constraints have been a major obstacle to wind power development. The key regions for future development are Hokkaido and Tohoku, rural areas geographically remote from the large demand centers such as Tokyo, Osaka and Nagoya.

With insufficient grid lines and restricted inter-district connection, the research by METI indicated that the upper limit of wind power capacity based on the current grid infrastructure was only around 5GW.

Given these difficulties offshore wind is viewed as a potential solution. Thus, the JWPA proposes a target of 22.8GW installed capacity by 2030 and 50GW by 2050, or more than 10% of the total power demand, of which half, 25GW is forecast to be offshore. Offshore wind development in Japan is still in its infancy with only 25MW of installed capacity and, without a specific offshore FIT, any significant development will almost certainly be delayed until after 2015. Moreover, most of the coastal areas around Japan have deep waters and thus the majority of development is expected to have floating foundations. With the high costs involved a future offshore FIT law will be needed sooner rather than later.

In conclusion, the relatively high prices in the FIT law are needed given the high domestic costs. As such it is a welcome first step towards Japan's goal of significantly increasing investment in renewable energy. However, for this goal to be fully realised then the twin problems of overly stringent environmental approval requirements and grid constraints will need to be addressed. Further, a specific FIT law for offshore development will be required. Once a fully supportive policy framework is in place then the target of 50GW installed capacity by 2050, supplying at least 10% of Japan's power requirements, should be achievable.

The authors would like to express their gratitude to the committee of international affairs of JWEA and J-POWER for support.

WWEA Head Office
Charles-de-Gaulle-Str. 5
53113 Bonn, Germany

Tel. +49-228-369 40-80
Fax +49-228-369 40-84
secretariat@wwindea.org
www.wwindea.org

BOOKS		Price	Members	#/copies
Small Wind World Report 2012	**NEW**	60 €	45 €	
Wind Energy International 2011/2012	**Bestseller**	98 €	68 €	
Energía Eólica Internacional 2011/2012 **Spanish** edition of our Bestseller	**NEW**	78 €	55 €	
Wind Energy Market 2012 *(English)* Wind turbine market overview	**NEW**	60 €	45 €	
Wind Power Status in Russia and the CIS Countries 2012 (E-Version)	**NEW**	80 €	60 €	
WWEA Quarterly Bulletin (E-Version)	**NEW**	**Price**	**Students**	**#/copies**
Annual Subscription = Individual WWEA membership		80 €	50 €	
WORLD WIND ENERGY CONFERENCE PROCEEDINGS/PRESENTATIONS (CD-ROM)		**Price**	**Members**	**#/copies**
11th WWEC 2012, Bonn, Germany	**NEW in July 12**	200 €	120 €	
Former WWECs (Year/s:)		each 50 €	each 40 €	
MEDIA: CD-ROMs		**Price**	**Members**	**#/copies**
3rd World Summit on Small Wind Turbines Presentations, husum new energy 2012	**NEW**	200 €	100 €	
Wind Energy Technology and Planning Multimedia-CD *(English/German)*, 2006		15 €	10 €	

All shipping and handling costs **included**. 7/19 % VAT included within the EU.
Special rebates provided upon request for bulk orders, low-income countries, etc.

Surname, Given Name ____________________

Company/Organisation ____________________

Street ____________________

Postal Code, CITY ____________________

Country ____________________

Tel./Fax ____________________

E-Mail ____________________

WWEA Membership Nr. ____________________

Date and Signature __________ ____________________

COMMUNITY BENEFITS AND RISKS IN SOUTH AFRICA: POLICY FRAMEWORKS AND BUSINESS MODELS

Louise Tait, Energy Poverty and Development Energy Research Centre, University of Cape Town

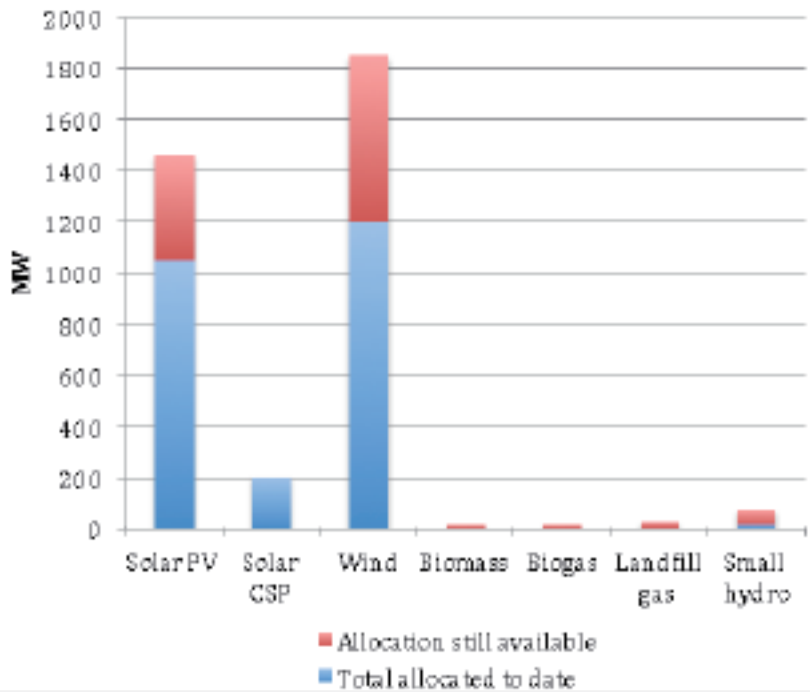
Interest in renewable energy market from investors locally and internationally has been strong with the launch of the Independent Power Producer Procurement Programme (IPPPP), in August 2011.

Growth and development of renewable energy in SA

South Africa's renewable energy sector received a boost with the launch of its renewable energy procurement programme, the Independent Power Producer Procurement Programme (IPPPP), in August 2011. The programme has seen significant delays and several surprises as it changed from a feed-in-tariff to a competitive bidding programme. Despite this, interest in this burgeoning market from investors locally and internationally has been strong. The first phase of the procurement programme to 2014 is capped at 3,725 MW Projects must submit bids in a competitive tender process. In the first two bidding rounds held to date，47 projects have been selected from 132 submissions. As seen in the table and figure, approximately 2,460 MW representing almost 70% of available capacity has been allocated so far. Wind and solar have dominated the market with no biomass, biogas or landfill gas allocated to date. The programme was designed to meet multiple national objectives including energy security, climate change but also economic development, of which

Distribution Status of Renewables Energy in SA after the Implementaion of IPPPP

Technology	Total allocated to date	Allocation still available
Solar PV	1048.63	410.47
Solar CSP	200	0
Wind	1196.39	653.6
Biomass	0	12.5
Biogas	0	12.5
Landfill gas	0	25.5
Small hydro	14.3	60.7
total MW	2459.32	1175.27



Distribution Status of Renewables Energy in SA after the Implementaion of IPPPP

benefits to local communities has been an important aspect. This requirement to meet various objectives has shaped the procurement programme in South Africa in a fairly unique fashion in many respects. This article explores how the programme has incorporated local community benefit requirements, how these will be applied and some of the challenges it raises for developers.

The concept of community power, well established in many developed countries, is a relevant and important consideration in developing country contexts, such as South Africa, which often face pervasive development challenges such as poverty and unemployment. In South Africa the private sector has long been co-opted into achieving the country's broader development goals through various acts and policies. The objectives relating to economic development and local community benefits in renewable energy procurement programme arise out of specific national legislation known as the Broad-Based Black Economic Empowerment Act. This legislation aims to support the participation of previously disadvantaged people in the mainstream economy. It applies to all sectors interacting with the government either through procurement or access to licenses, as is the case for the renewable energy sector.

Policy requirements for local community benefits

The procurement programme competitively evaluates bids based on price and economic development criteria. The economic development criteria include targets for job creation, local content, ownership and management control by those classified as previously disadvantaged, preferential

Developers are obliged to submit strategies in their bid submissions for local community development and how much they plan to contribute, on which they will be scored in their overall bid assessment.

procurement, enterprise development and socio-economic development. Within these criteria a particular focus has been placed on bringing benefits and development to local communities, defined as those within a 50km radius of the site or, if there are none, then the nearest community. The local community must hold a specified ownership portion of the project; in addition, projects must contribute a percentage of their annual revenue to enterprise development and socio-economic initiatives in communities. Socio-economic development can include a wide range of activities including programmes related to health, education, access to services, gender and youth development or arts, culture and sports programmes. Developers are obliged to submit strategies in their bid submissions for local community development and how much they plan to contribute, on which they will be scored in their overall bid assessment. The concept of community benefits from wind and other renewable energies has therefore been integrated as a mainstream concept in the South African market.

This differs from conceptualisations of *community power* in many other regions in that renewable energy projects will generally be large-scale and feed directly into the national grid. The project itself will not contribute to the energy needs of the local community. Any ownership structures are unlikely in practise to relate to the community having any interest or control in the project itself. Funds will generally be managed by some legal structure on behalf of the community.

Financing and business models for ownership

The issue of financing community ownership models in a developing country such as South Africa is not an insignificant one. The communities in question are generally impoverished and have no savings or assets of their own to leverage to make such equity investments. Community ownership schemes are not however a new concept in South Africa and there are examples of so-called 'broad-based' ownership schemes in other sectors. The financial market therefore has developed appropriate financing products experience and experience with such transactions. A number of development finance institutions have specific equity financing products that typically offer loans to communities that then can be repaid out of the dividends earned from the equity shareholding.

There is also a need to establish a legal structure that represents the community interest and will manage the disbursement of the funds. A commonly used ownership structure is a community trust whereby a board of trustees manages the funds on behalf of a community to achieve stated objectives. The trustees may for example include community representatives, local government representatives and member of a wind farm operator.

Current challenges and risks facing developers

The community development requirements pose a number of additional challenges for developers and investors. Community development is generally outside of a company's core expertise and will likely require that a company acquire additional personnel or contract with development experts to enable them to fulfil their requirements both for the competitive bidding process and for the long-term undertaking of development initiatives. Projects need to establish long-term governance structures to manage funds, engage with the community, plan and implement development initiatives. Many may choose to partner with a development organisation such as an NGO who will undertake these activities on their behalf. There is limited guidance at this stage from government to developers on the planning and implementation of their strategies including the level of detail that needs to be submitted in plans for the procurement process, the extent of local consultation required and appropriate governance structures. As such different developers are taking a multiplicity of approaches, with little real knowledge at this stage of government's preferred approach.

There is also a longer-term risk associated with implementing development initiatives. Community development is itself a complex and often challenging task. Poorly conceptualised or implemented projects that lack thorough community consultation often fail. There are challenges associated with managing significant sums of money over long time periods in local communities without the intrusion of local politics. This can be mitigated through rigorous management structures but remains a risk nonetheless. These are all challenges that now may fall within the remit of RE project companies. Renewable energy operators must report

on their initiatives on a quarterly basis and any failure to comply with results in the imposition of penalties, which could eventually result in termination of the contract between the government and the renewable energy operator.

These community development requirements are a revenue drag and do present additional risks to developers. Despite this the projected returns in the market appear adequate to address additional risk elements. Fulfilling the economic development criteria is one of the key ways projects can differentiate themselves in a highly competitive market and earn higher points in the selection process. There also appears overall to be general acceptance among developers and investors for the broader aims and intentions of these obligations, rather than viewing them as a disincentive to enter this market. As this market, still in its infancy, develops it will be interesting to see how the application of community benefits transpires and how the market and government address the challenges and opportunities it presents.

The community development requirements pose a number of additional challenges for developers and investors. It will be interesting to see how the application of community benefits transpires.

WIND POWER SECTOR DEVELOPMENT IN THE RUSSIAN FEDERATION AND OTHER COUNTRIES OF THE COMMONWEALTH OF THE INDEPENDENT STATES (CIS)

Alina Prokopenko, WWEA

Wind power industry represents an impressively fast-growing sector during the last decade, however the rate of this growth is observed to be unequal across the countries and regions of the world. In the given article we will refer to one of such regions, and namely to the 12 countries of the former Soviet Union, including the Russian Federation and excluding the Baltic States (Estonia, Lithuania and Latvia).

The territory of the Commonwealth of the Independent States spans over 21 million km^2 covering 16.4% of the Earth surface with various climatic zones and distinct geomorphic structure. The member countries of the CIS are homelands for 4.4% of world population – 272.5 million people of wide range of nationalities and ethnicities. The soil occupied by the CIS countries is immensely rich in natural resources and minerals of

Figure 1 Map of the Member States of the Commonwealth of the Independent States (Source: CIA)

all kinds, including energy and renewable energy resources. As much as 20% of world oil deposits, 40% natural gas deposits and 25% of coal reserves are located within the borders of the CIS states with the latter generating 10% of world electricity. At the same time, more than 10 million people in the region are not connected to power grids and suffer from unstable electricity supply provided by the use of expensive and unreliable small gasoline or diesel generators. In comparison with the international standards, the levels of energy use intensity in the CIS remain extremely high, remarkably not only in the energy exporter countries, but also in those deprived of fossil fuels, such as Belarus and Ukraine.

Renewable energy potential of the region is large and diverse, including massive solar, tide, biomass, hydro, geothermal and wind resources, which remain almost untapped at the moment. Even though the level of technically achievable economic potential of renewable energy varies among CIS states, virtually in all the countries this potential exceeds current energy consumption. Wind potential of the region is considered to be immense as well; nevertheless the wind power capacity installed in the whole region represents only less than 1% of the world share. The table below summarises the findings on wind power installed capacity and provides an insight into the states' wind power potential as assessed for the current moment.

The current assessment of the whole region wind power potential is estimated at 486.2 GW, and this number appears so modest, that it is barely credible. The given result was calculated from approximate evaluations of local experts – in none of the 12 countries the accurate wind potential analyses were conducted, except for Kazakhstan (wind potential assessment within UNDP Kazakhstan project).

As we see, only 177.7 MW of wind power capacity is installed in the whole vast region – in practical terms that means that the

Wind potential of the region is considered to be immense, and the current wind potential remains unexploited.

Table 1 Current Estimates of Wind Power Potential and Installed Capacity in the CIS Countries. (Source: composed by the author)

Country	Wind Power Installed Capacity	Wind Power Potential	Total Installed Capacity
Ukraine	151.1 MW	16 000 MW	53 549 MW
Russia	15.4 MW	90 000 MW	223 971 MW
Armenia	2.64 MW	4 900 MW	3 203 MW
Belarus	3.5 MW	1 600 MW	8 025 MW
Azerbaijan	2.2 MW	3 000 MW	5 798 MW
Kazakhstan	2.2 MW	350 000 MW	19 128 MW
Georgia	10 kW	2 000 MW	4 538 MW
Tajikistan	5.3 kW	1 900 MW	4 426 MW
Kyrgyzstan	2 kW	1 500 MW	3 720 MW
Moldova	0 MW	1 000 MW	1 029 MW
Turkmenistan	0 MW	10 000 MW	3 106 MW
Uzbekistan	0 MW	4 300 MW	12 551 MW
TOTAL:	177.06 MW	486 200 MW	343 044 MW

current wind potential remains unexploited. Unfortunately, half of the CIS states have only negligible number of wind turbines installed, and those generators in operation are prevalently small capacity lone-standing turbines. But first let us briefly refer directly to the countries and have a look at the situation in each of them separately.

Wind power in CIS countries – an overview

As we start from the least and moving on to the most, the first two countries we will refer to are Turkmenistan and Uzbekistan. Both republics represent no evidence of wind power installation except for a negligible number of single-standing small capacity installations owned by the local separate households. The legislation base in the energy sphere is rather poor, no specific laws were adopted on renewable energy, no quantitative targets were set for the future, no national or regional programmes were launched up to 2012. Speaking about incentives for renewable and wind power exploitation, these two countries represent a suitable example of absence of such due to traditional orientation on conventional energy. Uzbekistan possesses significant deposits of fossil fuels: it has second largest oil reserves in Central Asia after Kazakhstan and third largest reserves of natural gas; Turkmenistan is even richer in terms of the latter. What is more, in Turkmenistan the population is not obliged to pay for natural gas, water, table salt, gasoline and electricity receiving a fixed amount of them monthly as a subsidy from the state. Each citizen of the country is eligible for monthly 35 KWH power consumption (next 1000 KW above this limit cost around USD 3.5) and 120 litres gasoline for car owners. Thus, it becomes clear that the internal policies of these two countries are not aimed at and do not contribute to renewable energy usage promotion.

Neither any industrial scale wind power capacity is deployed in Moldova, another former republic of the Soviet Union. The distinction between Moldova and two aforementioned states, Turkmenistan and Uzbekistan, is that the former does not possess any domestic conventional energy reserves, but it has a more developed legislation system in the field of renewable energy (including a separate law “On Renewable Energy” envisaging a share of 20% renewable energy in 2020 and 30 MW of installed wind power capacity by 2015) and a higher pronounced interest in renewable energy sector development. Moreover, Moldova has its own national Wind Energy Association and a number of local active groups and specialists.

The mountainous Kyrgyzstan with its numerous rivers and lakes possesses enormous hydropower potential, which it traditionally relies on in terms of local energy demand satisfaction and exporting electricity to its neighbouring countries. Wind energy so far has not received a proper acceptance neither among the officials, nor among the indigenous population. Apart from the documented 2KW wind generator in Talas region and a few other low capacity turbines, the wind energy potential remains unexploited.

Tajikistan is a country with a fair wind potential and unlike its rich neighbours only possesses a little amount of energy resources. Tajikistan has the highest number of rural population in the whole CIS, with many inhabitants being disconnected from the central power grid. Such a considerable territory with a low population density represents a perfectly suitable area for wind power application, especially if to take into account its fair wind potential. So far, only a 5KW wind turbine "Breeze-leader" was installed on Zarevshanski ridge, at height of 3 700 m above sea level in order to supply electricity to the GSM power station.

Georgia, located on a mountainous terrain of Caucasus, although poor in local traditional energy resources, possesses a considerable potential of almost all types of renewable energy sources, including wind. Out of those, small hydropower plants construction has been a key focus of the government for a long time, which is also reflected in the legislation concerning the hydropower plants construction and national programmes and incentives. The interest for wind power within Georgia has been also growing recently, wind potential assessments within the country have been conducted and yielded a number of 2000 MW of possible installed capacity. Georgian government has been active in launching international cooperation and attracting foreign investors to finance the construction of wind farms, such as Samgori and Tbilisi farms (which were stalled), and still ongoing Paravani project.

Being the 8th biggest country in the world, Kazakhstan with its vast territories is considered to be perfectly appropriate for wind power development with the world's highest wind potential of wind power resources per capita, but unfortunately, it does not exploit its natural advantages. Wind power energy is the most promising renewable resource in Kazakhstan, with the country being one of two leaders in the region (together with Russia) in terms of wind resource per capita. However, only a negligible number of turbines are operating in the country, comprising a number of 0,5 MW altogether, although as much as 125MW is planned to be installed by the end of 2015.

Belarus remains in a very hard political and economic situation in the moment caused by the state administration crisis; still, in spite of this fact the country has already made its first steps towards renewable energy sector expansion. Traditionally, Belarus was focusing on biomass as on the most suitable for the country's geographical and climatic conditions and landscape energy source; wind power application was considered inappropriate due to the low wind potential for a long time, which proved to be wrong though. Since then, Belarus has 3.5 MW of installed wind power capacity and quite ambitious aims of its expansion: 460 MW by 2015. The renewable energy legislation of the country is broad and intertwined, it includes a separate legislative act on alternative energy and a set-up system of feed-in tariffs, granting a coefficient of x1.3 to all renewable energy producers, including wind power.

Azerbaijan represents a specific and interesting case of a country endowed with fossil fuels (both oil and natural) but at the same time pooling its efforts to broaden the renewable energy sources usage, explicitly pronouncing its augmenting engagement in the given field. Climatic conditions favour the use of wind power in Azerbaijan, especially in the areas adjacent to the Caspian Sea. In Azerbaijan, there is currently only one operating 2.2 MW wind farm in Khizi. Further wind farms are being planned, and one of them with an envisaged capacity of 50 MW is under construction in cooperation with a German prominent company.

The Republic of Armenia is currently facing major difficulties with reorganization of its whole energy sector, for its only nuclear power plant supplying around a half of local energy demand, Metzamor, is scheduled to shut down in 2016. As the country dwells without any domestic fossil resources, investing into renewable energy could be a wise solution – and the government has acknowledged that, initiating the efforts to utilise the local renewable energy potential. Armenia has a fully operating 2.64 MW wind power plant "Lori-1" and more are planned to be built in the nearest future.

The largest country in terms of territory, the Russian Federation, does however possess a somewhat disproportionally small wind power installed capacity for its vast lands – only 15.4 MW, represented by only four fully operating wind farms with joint capacity of more than 1 MW. Being rich in oil and gas, as well in the whole range of other fossil resources, the Russian Federation does not show the signs of acknowledging and exploiting its renewable energy potential, including wind energy, the estimated value of which reaches up to 100 GW installed capacity (local preliminary assessments). However, the authorities of the country up to the present moment have not seriously considered placing the target of renewable energy development on their agenda, both due to the immense profits from conventional energy sources exports and a powerful corporate lobby of oil and gas industries.

Finally, we have approached to the absolute leader in wind power sector among the CIS countries – Ukraine. Not only it has the largest installed capacity – almost 90 MW, but the whole process of wind power development is progressing with a faster pace in this country than in 11 others. Small wind segment is the best developed too (as compared to its CIS neighbours): currently around 1200 small turbines up to 10 KW are operating in the country with a joint capacity of 12 MW. Apart from that, Ukraine has elaborated a solid legislative base for renewable energy regulation, including an enacted law "On Alternative Energy Sources", a feed-in tariff system and the rules for local content requirements. Local production of wind turbines (especially of those with low capacity) is also established in this country. Ukraine indeed can be considered a front-runner in this regard, which can, and should, stimulate its neighbouring countries' activities on advancing in the field of renewable energy, fostering healthy competition and inciting a positive breakthrough.

Now after the previous part provided us with a quick insight into the situation within wind power sector in the region, we can move on to the next consequent question: why it has been evolving in such a manner, or rather, what are the reasons for the slow pace of wind power sector development in these countries, and what obstacles and barriers prevent it from progressing as fast as it theoretically could? For the deeper understanding of these issues, let us consider them one by one.

Distorted Structure of the Energy Sectors

Very often the case in the given region is that the organisation of the energy sector is represented by vertical, highly integrated and monopolistic structure controlled fully or to a high extent by the state. Consequently, the state owned enterprises receive generous donations from state budget, in reality operating inefficiently and incurring losses. The lobby of conventional energy representatives in the sector has traditionally been powerful, pushing forward the interests of oil and gas industries. The existing infrastructure is mostly the one left from Soviet times, and therefore often damaged, outdated or worn-out. However, an interesting finding in our view was that the countries that are heavily dependent on energy imports - Armenia, Georgia and Moldova - were actually the first to reform, partly liberalise and privatise, and restructure their energy sectors, eliminating energy under-pricing, cross-subsidization, tolerance for payment arrears and huge losses in the energy transmission and distribution systems.

Unstable Political Environment

Most of the countries have passed

through uneasy times after the collapse of the Soviet Union, suffering from intra- and interstate ethnic conflicts, wars and tensions (e.g. issues of Abkhazia and South Ossetia in Georgia, Transnistria in Moldova, dispute over Nagorno Karabakh between Armenia and Azerbaijan etc.). Due to all these events the political environment in most of the CIS states remains unstable, and the political leadership is prone to constant changes. The investment climate in the region cannot be described as attractive either. Regarding the state support to renewable energy, in some countries (such as Moldova, Georgia and Armenia) the officials at the highest political levels declare commitment to RES development, whereas the leaders of other countries do not devote proper attention to this subject, especially those rich in fossil fuels (Russia, Turkmenistan, Uzbekistan). On the international level most of the countries are moderately active, although the level of their involvement could be increased even more. A number of states receive support from the international organisations and institutions, including UNDP, World Bank, USAID, GIZ, etc. Besides, all 12 countries except for Russia are participants to EU INOGATE Energy Partnership Programme, which places the increase of energy efficiency and diffusion of RES as one of its main foci.

Lack of Specialised Legislation

Underdeveloped legislative framework coupled with uncertain political and regulatory environment remains a problem in virtually all 12 countries reducing the investment into local energy sectors. Far not all of the republics have a specific law regulating renewable energy sector, with other laws covering RES regulation being declarative and fragmentary. In most of the countries Energy Strategies are adopted – comprehensive declarative documents containing the guidelines for energy sector development and setting (often ambitious) targets for the future, including a planned share or quantity of RES installed capacity. Only 7 out of 12 countries have passed specific laws

Figure 2 Wind Turbine on Poymazor Cellular Power Station, Tajikistan. (Source: RAWI. Modified by the author)

Table 2 Electricity Prices and Feed-In Tariff Rates in the CIS Countries. (Source: composed by the author)

Country	Price per kWh, EUR	Feed-in Tariff
Armenia	0.04	0.07 EUR
Azerbaijan	0.06	---
Belarus	0.02	x1.3 coefficient (first 10 years)
Georgia	0.10	---
Kazakhstan	0.01	---
Kyrgyzstan	0.04 (35 kWh for free)	---
Moldova	0.09	---
Russia	0.06	---
Tajikistan	0.01	---
Turkmenistan	0.03	---
Ukraine	0.05	0.12 EUR
Uzbekistan	0.03	---

targeted at renewable energy sector regulation. The issue of implementation of existing laws and regulations in practical terms also remains problematic.

Insufficient Funding

Inadequate financial support and lack of investment security is one of the gravest stumbling blocks of renewable energy sector development in each (with no exception) country of the Commonwealth of the Independent States. The lack of funding is observed from both public and private sectors: in case of state funding, it is often an issue that the funding allocated from the budget for renewable energy sector is insufficient to implement the targets of national programmes, not even mentioning a severe lack of funds to repair or replace the worn-out infrastructure. Among businesses and the private sector there is still a little initiative to invest in renewable energy projects due to poor legislative regulation and a relative novelty of the given investment area. In most countries, no longer terms feed-in tariffs or PPAs are available.

Low Electricity Prices

In most of the CIS republics the prices for electricity remain low, often formed artificially due to established system of heavy subsidies to conventional energy producers. As it can be seen in the table below, the price varies from 1 to 10 Euro cents per kWh (compare with prices per kWh in Europe: e.g. Spain 18 cents, Germany 24 cents and Denmark 26 cents). Under such circumstances the renewable energy producers lose the incentive to enter the energy market, as RES become uncompetitive with conventional energy under these prices, especially taking into account that the feed-in tariff system exists only in 3 countries out of 12: Armenia, Belarus and Ukraine.

Lack of Local Specialists

Generally the educational base in the countries of the CIS is fairly decent, starting with low levels of illiteracy among the population and finishing with high level school and university education programmes.

The given article is an essential summary of the report “Wind Power Status in Russia and the CIS: Regional Wind Power Market and Potential”, which is available for ordering at the official web-site of the World Wind Energy Association (www.wwindea.org).

Nevertheless, there is a lack of engineers, technicians and experts specialised in the field of renewable energy, including the areas of manufacturing and production, installation, maintenance, and inspection services. Universities, mostly funded from state budgets and often experiencing lack of funding, currently do not manage to adjust the educational programmes to the needs of modern societal and economic development.

Low Level of Public Awareness

The situation in the analysed countries is often characterised by the low level of public awareness and concerns over renewable energy, its advantages and benefits, as well as by the poor public perception of energy saving issue. However, considering the historical background of the countries and relying upon public opinion surveys, the aesthetics of renewable energy power plants (solar panels, wind mills, etc.) do not represent a problem in the given region. Prevalent majority of the informed population would regard such installations as local attraction rather than claiming the distortion of the landscape view. Undoubtedly, once these barriers are acknowledged and the first steps are made for their elimination, it will signalise a huge leap towards establishing and maintaining sustainable energy supplies and efficient economic development.

Conclusion

All this said, we can conclude that the growth of wind power sector and proliferation of renewable energy as a future reliable energy source in the geographical region of the Commonwealth of Independent States is not progressing as swiftly as it could, and, presumably, should. However, this cannot prevent one from claiming with a firm assurance: there is a future for wind power in the given part of the world, both for the countries with poor hydrocarbon deposits and for the republics endowed with rich oil and gas reserves. Nevertheless, it is in the countries' own responsibility to control and advance the pace of renewable energy and wind power sector development. And only in case when sporadic evidence of wind power installations become mainstream, and successful single projects – a common practice, the states and their population will be able to benefit from a large, diverse and unrealised potential and make an important step forward towards enhancing domestic energy security and contributing to the global sustainable energy future.

30 Years of Nordic Folkecenter: Small Scale Renewable Energy will Change the World

Carlos García-Robles, The Nordic Folkecenter for Renewable Energy (FC)

There are a few places left in the world except networking, information for the general public, technology transfer, knowledge sharing, education and hands-on experience available for everyone with the interest and passion to learn and share.

One of those places is the Nordic Folkecenter for Renewable Energy (FC), located in North West Jutland, the Danish continental peninsula. Challenging the concepts of how we think about energy and its relation with society, has been one of the main purposes of the FC since the very beginning. And FC has made mang series of achievements throughout their 30 years of existence.

In a world where the knowledge has become a commodity, sharing energy knowledge from people the people and the SMEs has become a radical idea, but this is exactly the uniqueness of the FC stands, having been a key to the successful implementation of new renewable energy technologies, new renewable energy systems ideas and their implementation.

30 years of achievements: An incubator for new energy ideas

Quoting Preben Maegaard, FC´s Executive Director and Jane Kruse, FC's head of information: "Because renewable energy by nature is decentralized, we think that future forms of energy should not, as suggested by the National Climate Commission, be administered according to those central structures and ownership models used for conventional forms of energy. Big energy corporations maintain costly organizational hierarchies, which are counter-productive by nature and will incur needless cost during the transition to renewable energy and the process of installing great numbers of solar, wind and biomass units".

This is the mindset that has driven the philosophy behind FC´s 30 year work; there is another path towards a secure and clean energy future. Small business and communities can naturally implement small-scale renewable technologies, making a strong emphasis on sharing knowledge and makine correct decisions.

From its humble beginnings in 1983 and throughout the rest of the 1980s, the FC focused on design work of a range of wind turbines and biogas plants as well as testing of new innovative ideas. One of the strategies adopted in the FC to promote the development of small-scale renewable technologies, has been opening doors for energy entrepreneurs to have the opportunity to test projects, together with having first hand high quality advice available from FC´s experts, applying the concept of popularizing small-scale renewable energy which will bring security and prosperity to the people".

Second generation small scale CHP

Denmark was almost totally dependent on oil as its energy source before the 1973 oil crisis. But after the shocking wake up call sent by OPEC with the oil embargo, the impact on the Danish economy forced planners and concerned scientists to come up with new ways to produce and distribute energy. This gave way to the implementation of Combined Heat and Power (CHP) technology, becoming one of the most important decisions made in energy policy in Denmark. This made it possible for the country to become more energy independent and to have a more efficient energy system.

The original CHP plants were the result of redesigning old coal plants to work on a wide variety of resourced to integrate"waste heat", recuperating most of that "waste" and distributing it in a wide net of urban and municipal water heating system.

By the late 1980s it was clear that this system was only beneficial for big urban areas, where it only was economically feasible to invest high amounts of funding in large urban conglomerates, leaving small or isolated communities behind.

This is the time when the FC had already seen the potential of small scale technologies, and in 1988 they were determined to prove that it was possible to implement combined heat and power (CHP) in small-scale decentralized district energy station, leaving aside the economical and technical impossibilities. Preben Maegaard, knowledgeable about small scale CHP plants in the Netherlands, worked for the technology to be implemented in Denmark from 1989-1996. Today, small-scale CHP plants

Figure 1 Local CHP stations in Snedsted (left) and Vorupor (right) using gas engines and electric boilers supplied from excess wind power.

work to an extent that they can now deliver 25% of the national demand for electricity in Denmark, making it one of the most important achievements in FC history.

Wave energy

With the principals that the FC should be an incubator for new and innovative energy technology ideas, at the beginning of the 1990s the FC became a hot spot for testing an upcoming energy technology: wave energy. Another principles of the FC is to give energy enthusiasts, inventors and entrepreneurs the same opportunities to develop their own ideas. With more than 30 pilot projects on site, the FC became one of the first places in the world for wave energy testing and research, developing a test research method for such a purpose. The Wave Dragon and Wave Star projects, today widely known as wave technology innovators, started their tests at the FC.

Technology transfer

The concept of technology transfer together with knowledge sharing on renewable energy technology had never been put to practice before the FC started almost 30 years ago.

Some of the most important and recent achievemets has been Folkecenter's projects in Africa, where FC branches were inaugurated in Somalia, Uganda and Mali. In these countries, on average less than 10% of the population has access to electricity, so opening these spaces has become a crucial element for their development.

Here, energy technology transfer projects, together with specialized training of local technicians and professionals, secures the continuation of the projects at the local and national levels. The FC branch organizations have facilitated the implementation of educational programs for local enthusiasts, organizations and pioneers, ensuring the expansion of the knowledge sharing principles of the FC.

The electrification was installed in villages where there was no supply at all, giving schools, community hospitals and households electricity for the first time are some of the achievements of this small-scale technological transfer.

Figure 2 Folkecenter's test station for wave energy machines in Nissum Bredning, Denmark

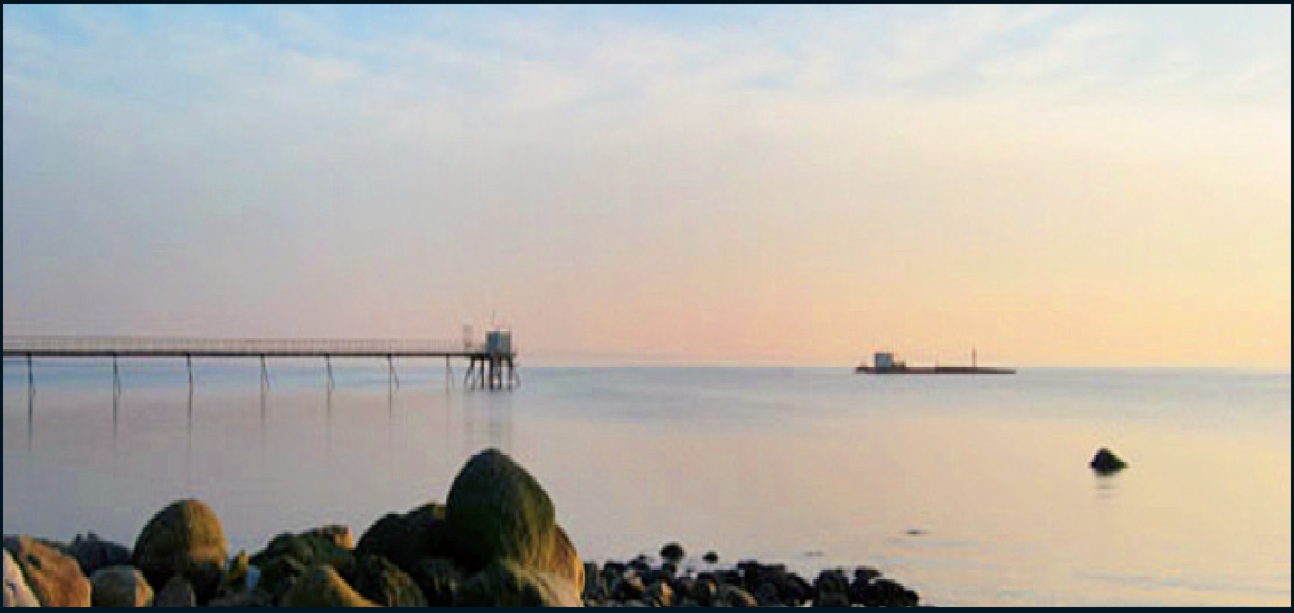


Figure 3 Installation of solar cells in village school in Mali. The community celebrated the new facitities.

Figure 4 Solar electricians receive training diploma at the Mali Folkecenterin 2004 (left). PV panels for five village schools in the Puntland region, Somalia, 2012 (right).

Figure 5 Modern farm biogas plant in Kaunas, Lithuania, 1995(left). Inauguration of Poland' s first modern wind turbine in 1991(right).

Furthermore, during the Eastern European countries opening to the West, FC also focused of technological transfer at the community level, facilitating the first renewable energy pilot programs in the Baltic region.

Finally, the first modern wind turbine in Latin America was donated to the government of Brazil for the Rio summit in 1992.

Political achievements

Even after 30 years of work, the FC has established itself as successful energy policy lobbying machine. As in June 2010, the new Danish energy legislation passed, including a key issue within it, Net Metering, a concept the FC had been advocating for years.

This gave way to the development of an unexpected surprise, the sudden rise of the solar PV industry in Denmark. Before this legislation, there were merely 10 national suppliers, two years later, in 2012, there are now more than 300 PV suppliers.

One of the FC´s most important political and social achievements has been to prove that non-profit and community owned companies can develop renewable energy projects, district heating CHP plants and local grids cheaper than private big scale entreprises.

In a world with increasing energy and technological inequality, small-scale community owned energy production is the key to solve some of the challenges of the 21st century. Small-scale and medium size community power, with wind and solar as the primary sources of supply, is not only possible and economically feasible, it also strengthens the economy of communities and enables energy security, while solving long lasting problems such as energy poverty and isolation.

Folkecenter Autonomous Energy System

At the Nordic Folkecenter for Renewable Energy a prototype autonomous renewable energy system is installed. The energy system supplies heat and electricity to 2,000 m^2 of offices, meeting rooms, laboratories, workshops, and residential facilities. Sources of energy supply are wind turbines of 75 kW and 37 kW,a 42 kWth electric boiler, 35 kW wood pellet stoker with automatic start-up and stop,8 kW/18 kW plant oil CHP unit with automatic start-up and stop, 12 kWel PV and 50 m^2 solar thermal panels. Wind and solar energy are the primary sources for heat and electricity. Biomass (wood pellets and plant oil, PPO) is used for backup.

Figure 6 Aerial view of Folkecenter's many buildings and facilities (above). Various types of PV installations for demonstration and testing (below)

The overall operational strategy is:

1. The power flow control directs excess wind electricity through the thyristors to the electric boiler.

2. When the electric boiler does not supply sufficient wind-generated heat, the wood pellet stoker is automatically activated.

3. In case of no power from solar and wind, the CHP unit using plant oil is activated.

4. Excess production of solar and wind generated heat is stored in a 10 m^3 hot water storage.The system is connected to the public grid.

The overall principle is not-to-sell/not-to-purchase from the grid. The CHP unit, however, can operate in island mode in case of a power blackout. At summer nights with no wind and sufficiently stored solar-generated heat, the CHP unit will not start up; the grid will supply the need for power only, as there is no electric storage capacity in the system and the CHP generated heat would be wasted.

In practice, excess wind power covers 60% of the annual demand for heat, with the balance coming from solar and biomass. The technology and strategy of the autonomous system was pioneered, developed and implemented by the Folkecenter in 2007. A 100% supply of power and heat/cooling from renewable energies, with the same principles and strategy can be applied at the regional and national level as well. The system delivers a realistic solution to questions often made about alternative energy sources.

The combined high CHP and wind power production causes a potentially major problem in the power sector. However, supply and demand can, as demonstrated in the Folkecenter Autonomous Energy System, be balanced by feeding on windy days the excess wind power into the electric boiler. The electric boiler makes it possible to avoid the combustion of wood pellets in the stoker and use of liquid biomass in the CHP unit at periods with excess wind and solar energy.

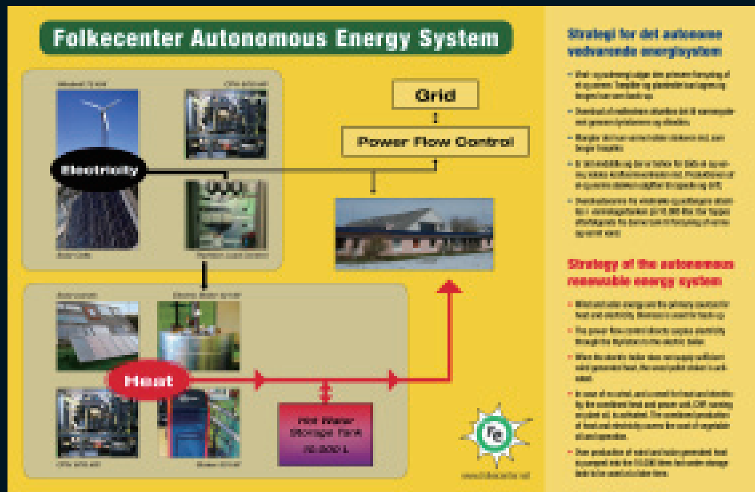


Figure 7 Autonomous integrated energy supply system at the Folkecenter for Renewable Energy (Nordic Folkecenter for Renewable Energy)

With increased renewable energy shares in the future, more and more often fluctuating solar and wind energy will be sufficient to satisfy both the need for power and heat, and can be given priority, while solid and liquid biomass is reserved for periods without sufficient wind and solar.

Conclusion

The development of a successful renewable energy sector will in the future make an important long-term contribution to diversity, security and self-sufficiency of energy supply, because in contrast to fossil fuels and atomic energy, they will not be depleted. Both in the industrialized countries and in the unserved areas with limited or no access to modern energy supply, the transition to renewable energies will create new, labor-intensive, industrial sectors. The local and national economies will become less vulnerable to international conflicts and price fluctuations of fossil fuels.

Renewable energy exists everywhere, but has a weaker concentration and density of energy than fossil and nuclear sources of energy. Using renewable energy will create

The use of renewable energy–a local resource–can contribute to the preservation of local cultures and also promote new lifestyles and new concepts of prosperity and security that can help mankind meet the challenges of the twenty-first century.

a more balanced relationship with nature. A new culture of energy efficiency can lead to a more concerned, socially responsible use of all natural resources. The use of renewable energy – a local resource – can contribute to the preservation of local cultures and also promote new lifestyles and new concepts of prosperity and security that can help mankind meet the challenges of the twenty-first century.

LOCAL CASE

Aalterna THY – a 100% renewable energy community.

In the Thy peninsular with its 46,000 inhabitants, the 225 windmills and other renewables cover 100% of the annual need for electricity. The local energy production has become an important source of income. The region is in the northwestern part of Denmark. Thisted is the main town; Folkecenter is located in the Thy peninsular.

On days with strong wind, the wind turbines may even produce four times more than the actual consumption and the power quality still lives up to the highest standards. The local utility, Thy-Mors Energi has demonstrated real-time management of such big quantities of wind energy to visitors from all parts of the world.

In the towns and villages in Thy, people get their space heating from hot water pipelines in the streets. It is environmentally and economically the best solution to use the excess wind power for the current supply and storage in big hot water reservoirs at the local district heating suppliers.

Energy Data,Thisted Municipality:

- 225 windmills
- 124,600 kW installed wind power capacity
- 35,800 kWel installed CHP capacity
- Power from wind energy 265 GWh
- Power consumption of 340 GWh
- 80% from wind
- 20% from biogas and CHP waste
- A small amount of PV

The further development of wind power will make it the primary source of electricity and heating, Whan an planned 80 MW new additional wind power in Thy, peaks will be more frequent. The strong local support is crucial and is obtained by local ownership of windmills and biogas plants by several farmers.

All the CHP plants and the district heating are not-for-profit consumer owned. Local surplus of wind electricity is used in combined heating and power plants and periodically

Figure 8 Three sizes and types of electric boilers for power down regulation. 20 MW, 10 kV (left); 3 _ 300 kW, 400 V (middle); 45 kW, 400 V (right) (Nordic Folkecenter for Renewable Energy)

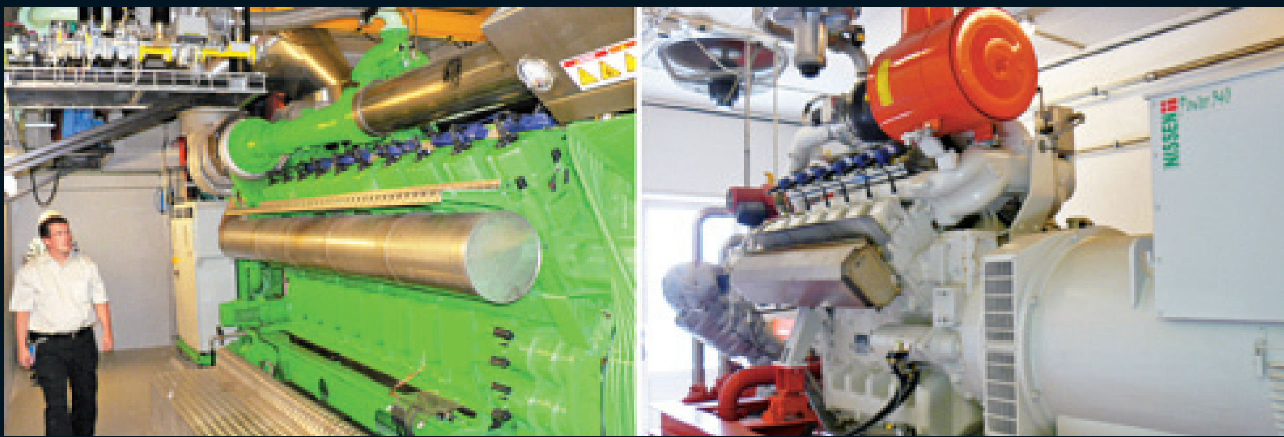


Figure 9 Snedsted CHP (left) with GE Jenbacher V20 3,500 KWel gas motor. Farm CHP (right) with MAN V12 375 kWel motor using biogas (Nordic Folkecenter for Renewable Energy)

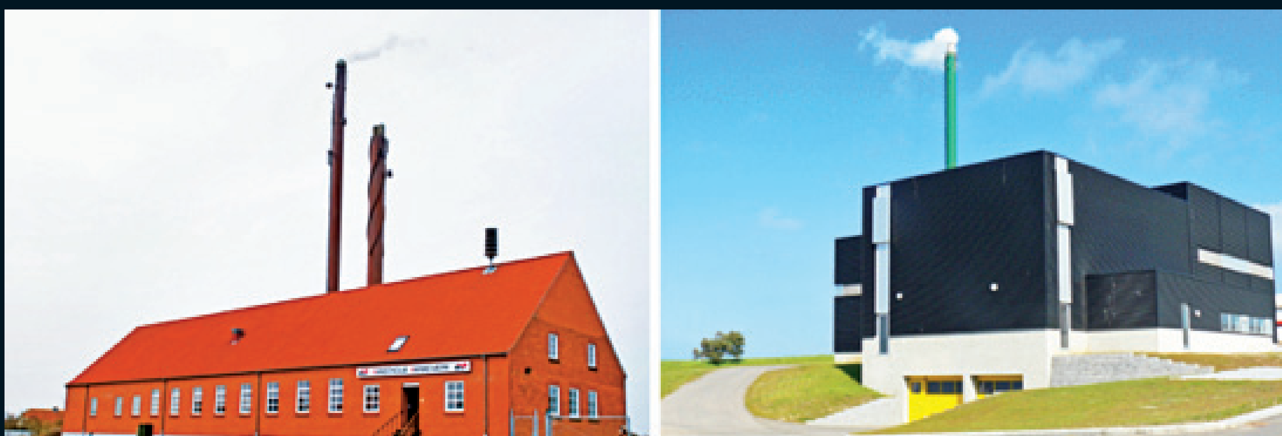


Figure 10 Hanstholm (left) and Hurup (right) district heating plants without CHP. Both are located in regions with high density of wind power. Hanstholm has installed 12 MW electric boiler to substitute the present fuels with excess power from local wind energy (Nordic Folkecenter for Renewable Energy)

replace natural gas and biomass. Biomass will function as backup storage when wind and solar energy is not sufficient to cover the need for electricity and heating. Solid and liquid biomass is easy and cheap to store. Biomass will only be used when solar and wind is not sufficient to cover the needs for heat and power.

In the peninsular of Thy, the local community owns/installs/operates the green power producing infrastructure; therefore the benefits from the infrastructure are reaped by the community. Local pollution and CO_2 reduction, job creation, business development, economic diversification, and skill building are of general interest for the community. Once a community has experience with community power, that skill can be transferred to other communities.

In 2007, the Thisted Municipality received the prestigious European Solar Prize. At the award ceremony in Berlin, mayor Erik Hove Olesen stated:"I am very proud and grateful that we today receive this award. Not us as authorities have the honor. Our 46,000 citizens, the Folkecenter, and our 1,700 local companies made the change. The many windmill owners, the farmers that have biogas plants and the community utilities, they have together made Thy self-sufficient with energy".

It is possible to see pictures from Folkecenter's activities at Panoramio. http://www.panoramio.com/map/?user=6855050

THE CURRENT STATUS AND PROSPECTS OF OFFSHORE WIND POWER IN ASIA

Prof. Choong-Yul Son, Korean Wind Energy Association (KWEA)

As the technology matures, it is expected that wind turbines will continue to grow in size and the average size of offshore wind farms has been increased steadily. This trend is expected also in Asia.

1 China

The offshore wind potential is estimated by China Meteorological Administration to be more than 750 GW. These offshore wind resources are in close proximity to coastal settlements and developments.

China is encouraging the manufacturers of large wind turbines and offshore wind turbines, indicating its intent to be a leader in the development of offshore wind power. However, the construction of offshore electricity grid infrastructure is needed.

Meanwhile, the construction on Longyuan Power's intertidal wind farm is going smoothly in Rudong County, East China's Jiangsu Province. This farm is currently China's largest, with an installed capacity of 150 MW, and the

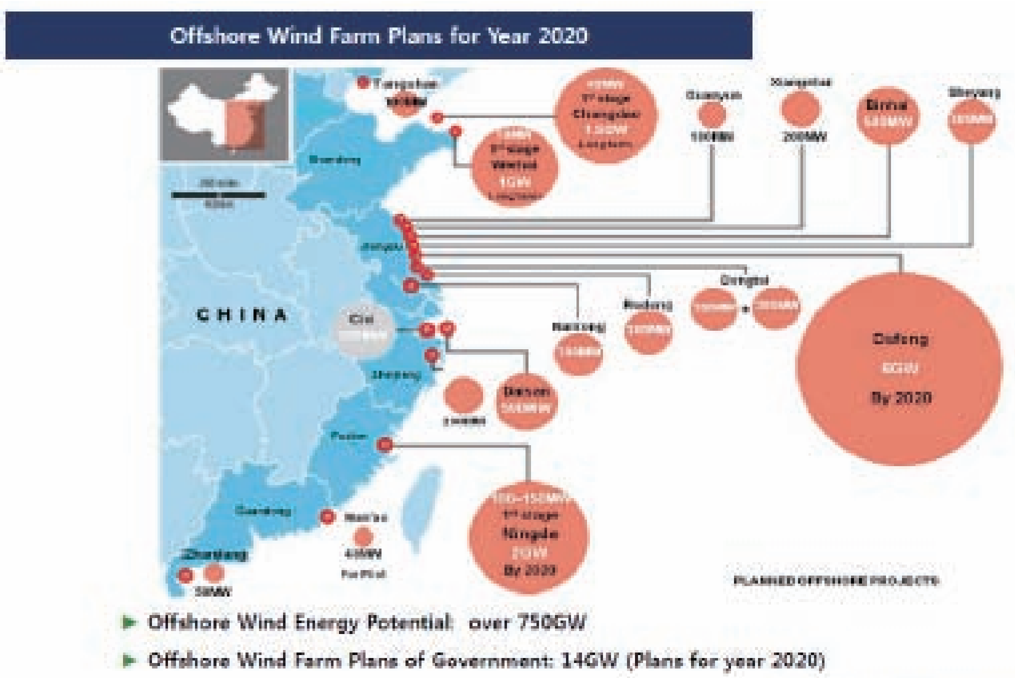


Figure 1 Offshore Wind Farm Plans for Year 2020 in China(Source: Windpower Monthly)

project is expected to be completed in early 2012.

In 2010, China awarded four contracts, through public tender, to power companies to construct 1 GW offshore and inter-tidal concession wind power projects. They are scheduled to be completed in four years. Industry officials say that China might issue a second request for tenders for offshore concession projects, totaling 2GW, in the first half of 2012.

According to the NEB, China will construct 5 GW of offshore wind projects by 2015, or five percent of its total installed wind capacity. They will create market opportunities worth 80 billion Yuan.

First Offshore Wind Turbine – Bohai Bay

On Nov. 8, 2007, China National Offshore Oil Corporation (CNOOC) constructed the first offshore wind turbine located in the Bohai Bay of Bohai Gulf, 70km away from CNOOC's Suizhong 36-1 platform. This offshore wind station transmits the electricity to the oil field's independent grid attached through a 5km submarine cable, and it complements the energy produced by the 4 generators. The project was approved, developed, and constructed within 7 months and was successfully connected to the grid in Nov. 2007. The 1.5MW turbine, adapted for offshore use, was jointly developed by Goldwind Science & Technology and CNOOC.

First Offshore Wind Farm: Project Donghai Bridge

China's first offshore wind farm located near the Donghai Bridge was built, managed, and maintained by a group of four companies including China Power International New Energy Holding Ltd., China Datang Corporation, CNG Wind Power Co., Ltd., and Shanghai Donghai Wind Power Ltd. This wind farm is located 1km away from the Donghai Bridge,

According to the NEB, China will construct 5 GW of offshore wind projects by 2015, or five percent of its total installed wind capacity. They will create market opportunities worth 80 billion Yuan.

Table 1 Part of China's Offshore Wind Project Plan

Project Name	Location	Installed Capacity (10,000kW)
Chang Dao Offshore Wind Farm	Shandong Chang Dao	150
CNOOC Wei Hai Offshore Wind Farm	Shandong Wei Hai	100
Bin Hai Offshore Wind Farm	Shandong Wei Fang	180
Hua Neng Rong Cheng Offshore Wind Farm	Shandong Wei Hai	10.2
Dong Hai Bridge Offshore Wind Farm	Shanghai Donghai Bridge	10
Feng Xian Offshore Wind Farm	Shanghai Feng Xian	10
Feng Xian Large Offshore Wind Farm	Shanghai Feng Xian	30
Nan Hui Large Offshore Wind Farm	Shanghai Nan Hui	40
Heng Sha Large Offshore Wind Farm	Shanghai Chong Ming	20
Ci Xi Offshore Wind Farm	Hang Zhou Bay	20(1st Phase 4.95)
Pu Tuo Liu Heng Offshore Wind Farm	Pu Tuo Liu Heng	20
Zhejiang Lvneng Kao Men Offshore Wind Farm	Dai Shan	20
Gan Yu Offshore Wind Farm	Jiangsu Lian Yun Gang	80(1st phase 45)
Xiang Shui Offshore Wind Farm	Jiangsu Yan Cheng	50(1st phase 20)
Bin Hai Offshore Wind Farm(Jiangsu)	Jiangsu Yan Cheng	30
She Yang Offshore Wind Farm	Jiangsu Yan Cheng	30(1st phase 20)
Da Feng Offshore Wind Farm	Jiangsu Yan Cheng	20
Dong Tai Offshore Wind Farm	Jiangsu Yan Cheng	100 (1st phase 20)
Ru Dong Offshore Wind Farm	Jiangsu Nan Tong	30 (1st phase 20)
Qi Dong Offshore Wind Farm	Jiangsu Nan Tong	50 (1st phase 20)
Han Gu Offshore Wind Farm	Tianjin Bin Hai	20

Figure 2 China's First Offshore Wind Farm (102MW) Constructed Near Donghai Bridge in Shanghai in 2009 (Source: Sinovel)

which connects the Lingang Xincheng and Yangshan deep-water ports. The wind farm falls within the borders of Shanghai, lying south of Nanhui district, the northern edge is 8km from the coast and the southern edge is 13km from coast. In March 2009, the first offshore wind turbine developed and operated by Sinovel Wind Corp. was installed (Figure 2). To date, all 34 units of Sinovel 3MW turbines (total of 102MW) have been installed and the first three are in operation. The project was completed before the opening of the Shanghai EXPO in May 2010. The annual on-grid generated electricity is forecasted to be 2.6TWH, an amount that could meet the electricity needs of approximate 200,000 households. The total project cost was 3 billion RMB.

2 Japan

Installed Capacity

Kamisu Wind Farm

Kamisu Wind Farm in Kamisu City, Ibaraki Prefecture, started operating in July as an offshore wind farm in Japan. The installed capacity is 14 MW (seven wind turbines) and can produce enough electricity for 7,000 households.

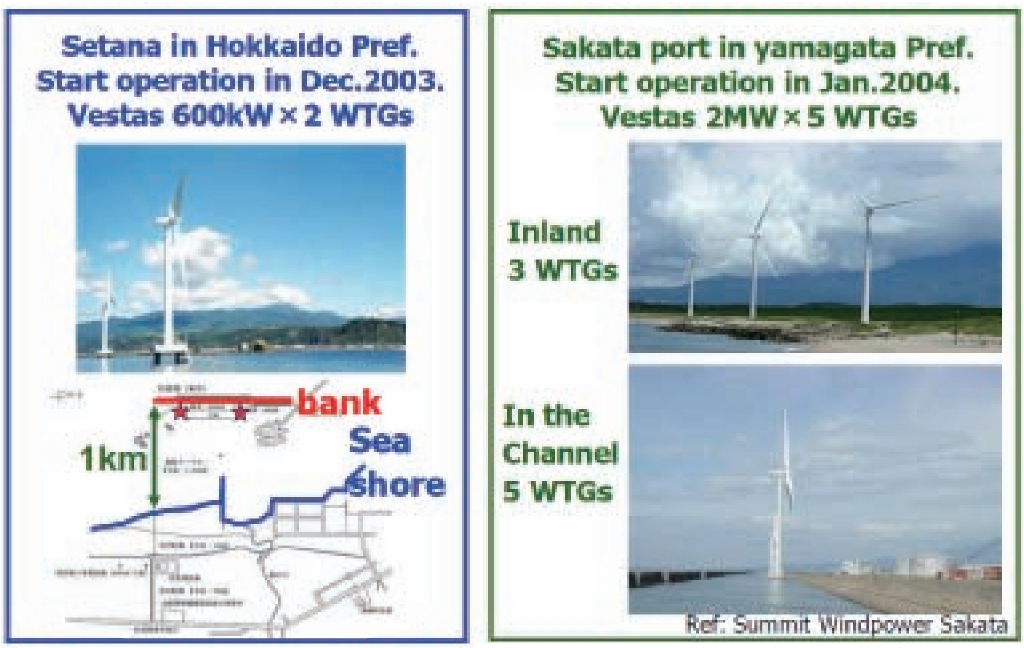


Figure 3 Offshore Windpower in Japan

The project developed by Hitachi and Fuji Heavy Industries is located about 50 m from the shoreline. The wind farm is operated by Wind Power Ibaraki and the power generated is being sold to Tokyo Electric Power. This system is designed with the wind turbine on the downwind side of the tower. In addition to being able to withstand typhoons and other strong winds, this design efficiently captures energy from updraft winds.

The Kamisu wind Farm survived the Tsunami very well (figure 4).

R&D Offshore Projects

New Energy Development and Industrial Technology Organization (NEDO) offshore R&D projects in Japan are:

Offshore wind turbine demonstration Project: 2.4MW at Choshi, 2MW at Hibikinada in 2012.

Offshore wind farm feasibility study: 4 districts are chosen in 2011.

Super large wind turbine development.

Ocean energy potential study.

Floating offshore wind turbine basic study.

Potential

The report of investigation for Renewable Energy by the Ministry of Environment in 2011 showed 280GW for onshore and 1600GW for offshore as potential. Also, under some conditions / scenarios a potential of 273GW onshore and 141 GW for offshore was analysed.

Paradoxically, one of the obstacles to the development of wind energy in Japan is the wind. The archipelago is regularly swept by typhoons whose power can damage the turbines. The frequent earthquakes, the significant risks of tsunami waves, and the presence of steep seabed along the coasts make wind turbines at sea even more difficult. Yet the quality of wind, stronger and more regular in sea and on land, provides better energy efficiencies. Furthermore, offshore wind turbines can not monopolize the space that is

Figure 4 Kamisu WF Become the first Survior of tsunami

lacking in Japan. This means so much to catch up the industry by developing economically viable systems that can withstand severe weather conditions.

In 2009, the New Energy Development and Industrial Technology Organization (NEDO) launched a project to finance the construction of systems to study the winds at sea. Tepco in

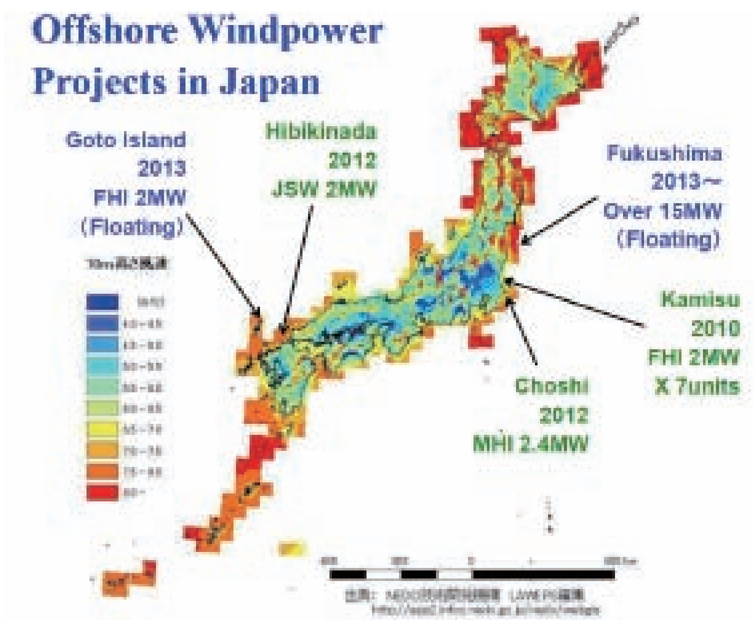


Figure 5 Offshore Windpower Projects in Japan

Figure 6 2MW OWT in Weoljung Offshore Wind farm in Jeju

The New Energy Development and Industrial Technology Organization (NEDO) and The Japanese Environmental Ministry launched offshore windpwer projects.

collaboration with the University of Tokyo had built a buoy tower to collect data on weather conditions. The company will install a wind turbine near the tower.

The wind turbine is 130m high and the diameter of the blades is 90m. It will rest on the seabed 11m below the sea level having power of 2 MW. It will be grounded by an underwater electrical cable. The tests will last until March 2014. The operational budget is approximately 3.5 billion Yen (30 million EUR), two-thirds is funded by NEDO, the remaining third by Tepco

The Japanese Environmental Ministry is also planning to conduct trails for floating wind turbine off Kabashima Island in Nagasaki Prefecture.

First, the ministry is going to test a small 100kW model with three 11m-blades. After the completion of the test, the ministry will present a bigger 2MW model with 40m-long blades. The ministry plans to install offshore wind turbines by 2016 and to achieve an output of 5.6 million kWh by 2030.

3 Republic of Korea (South Korea)

“South Korea is a latecomer to wind energy and is coming in at a very difficult time for the industry, where severe competition and falling turbine prices are squeezing the profits of the entire supply chain,” said Bloomberg analyst Justin Wu.

“Offshore wind is probably the best entry point for Korean companies into this sector, given their extensive shipbuilding and marine engineering experience as well as the country’s excellent offshore wind resources.”

The first Korean offshore wind farm opened near Jeju Island: In the first phase the 2MW offshore wind turbine (Figure 6) in the waters off eastern Jeju Island was completed in July. Next to it, a 3MW offshore wind turbine is scheduled to begin operations. It was built using Korean technology by Doosan Heavy Industries and Construction.

Although production started later in Korea than in Europe and the U.S., and the scale of turbines is smaller, it is important as the wind turbines have secured a bridgehead to enter the offshore wind energy generation industry.

Korea Southern Power plans to build 100 offshore wind turbines of each 5MW in four locations near Jeju Island, Daejong, Hangyeong, Gujwa, and Udo. Jeju, which is known for being windy, is beginning to take-off as a leader in offshore wind energy.

The analysis of the Korean wind power generation facility market has indicated that shipbuilding technology, offshore platform construction know-how, generators and heavy industry-based technologies are the most promising (competitive) factors for entering the global wind power market. The two specialist ships designed for the construction of offshore wind farms were recently developed by Daewoo Engineering. The following order from Germanys utility RWE Innogy showed the potential of interconnection between the

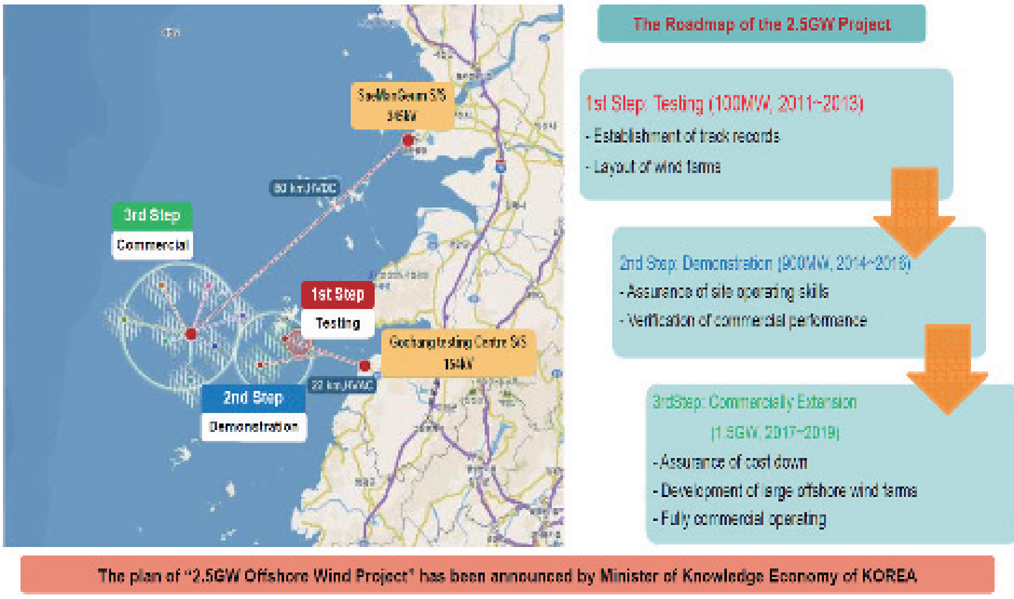


Figure 7 The Roadmap of the 250MW Project

shipbuilding and wind power industries.

Promising Sites for Wind Farms

The local government of Shinan, S. Jeolla Province has been highly active in developing a large-scale wind energy cluster in Shinan-gun.

Shinan-gun, situated in the southwest coastal area of Korea, is well known for favorable wind conditions. The construction of a large 5GW wind generation cluster with both onshore and offshore wind turbines is scheduled for completion by 2033.

As regards the '5GW wind power generation project,' there are plans to invest 17 trillion KRW from Korea and from international in the construction of a large-scale wind farm with more than 5GW of wind energy capacity (generated by both onshore and offshore wind turbines) in the southwest coastal area and nearby waters.

Policy

In Korea, the feed-in tariff, which was too low to support wind power development, was recently replaced by a Renewable Portfolio Standard (RPS) that will become effective in 2012. Following a new regulatory policy, the Korean government has announced a strategy to promote investment in offshore wind farms with a total capacity of 2.5GW over the next eight years, an initiative that is expected to change costs and benefits.

The government-led project, set to become the largest offshore wind farm in South Korea, will be created under the supervision of the country's biggest power generator, the Korea Electric Power Corp (see figure 7).

When completed in 2019, the power generated form the project will be able to meet the energy demands of a city of 5.56 million inhabitants or the equivalent of 10 % of South Korea's entire population.

The Government Project, to be completed in three stages, will be located off the country's southwest coast in the provinces of Jeollabukdo and Jeollanamdo. The first is a 100MW demonstration phase to be completed by 2014. Wind turbines with capacities ranging from 3MW to 7MW will be erected mainly off the coast and a second 400MW phase is scheduled for completion in 2016.

In Korea, a Renewable Portfolio Standard (RPS) will become effective in 2012. Following a new regulatory policy, the Korean government has announced a strategy to promote investment in offshore wind farms with a total capacity of 2.5GW over the next eight years.

CHINESE SMALL AND MEDIUM WIND REPORT 2011

Li Defu, Wind Energy Equipment Branch, China Agricultural Machinery Association

Small and medium wind power industry maintains a stable development thanks to the wide use of new energy and the demand for small and medium wind turbines in domestic and international markets.

In the past year, despite the lack of national policy supports, small and medium wind power industry maintains a stable development thanks to the wide use of new energy and the demand for small and medium wind turbines in domestic and international markets. This report introduces off-grid wind turbine industry development with the single capacity of less than 100 kW.

1 Small and Medium Wind Power Industry Production and Sales

1.1 Industry Development

The statistics based on 34 manufacturers released by Wind Power Equipment Branch, China Agricultural Machinery Industry Association. According to the statistics, in 2011, the total production of small and medium wind turbines reached 182,600 units, increasing 25.6%; the total sales reached 165,000 units, growing 22.9%; the gross output was 1.588 billion yuan, denoting a 29% growth; the sales was 1.46 billion yuan, with a an increase of 33.7% compared to previous year; the production capacity was 147 MW, increasing19.5%; Sales capacity was 127.4 MW, exhibiting a 13% increase.

The registered capital of the 34 enterprises reached 755 million yuan, with fixed assets of 766 million yuan and net value

Table 1 The Overall Indicator of Statistics Reported by 34 Enterprises

Indicator	data	Yearly growth	Indicator	data	Yearly growth	Indicator	data	Yearly Growth
Gross production (10,000 sets)	18.3	25.6%	Production capacity(MW)	147	19.5%	Foreign exchange earnings (10,000$)	7800	12.3%
Gross output (10,000 yuan)	15.9	29%	Sales capacity(MW)	127	13.0%	Proportion of exports in total sales		31.1%
The total sales volume (10,000 sets)	165.5	22.9%	Exports (10,000 sets)	52	23.80%	Proportion of export capacity in total sales		47.7%
The total sales (10.000 yuan)	14.6	33.7%	Export capacity(MW)	61	-2.2%			

of 510 million yuan; the total staff was 3278, including 907 technicians, accounting for 27.7%.

The data reported by 25 enterprises with export business shows that in 2011, the total export of small and medium wind power products was more than 51,500 sets, increasing 23.8%, accounting for 31.1% of the total sales; Export capacity reached 60.8 MW, 2.2% less than that of last year, accounting for 47.7% of the total sales capacity.

Some enterprises had good performance in production and sales, while others showed stability or decrease compared with last year. 4 enterprises' output value surpassed 0.1 billion; more than 6 enterprises achieved production of ten thousand units; 3 enterprises' production capacity reached over 10MW; 5 enterprises had sales volume of over ten thousand sets, with 3 enterprises' sales capacity over 10MW and 4 enterprises' sales over 0.1 billion.

1.2 Production

In 2011, 21 models (15 basic models) in the 34 enterprises were produced by 34 enterprises, adding three sizes of 10 W, 1.2 kW and 1.5 kW, reducing the 800 W model. The 10W-model was mainly exported to other counties for courtyard lighting. In 2010, 6 enterprises produced 30 kW model, compared with 9 enterprises in 2011; 3 enterprises produced 50 kW model, compared with 7 in 2011;one enterprise produced 100 kW model, the same with 2011. This change indicates the tendency to produce larger turbines. The production of various models of small and medium wind power equipments is shown in figure 1, of which 300 W model production has the maximum share of 41.7%, 600 W model reaches 20.1%.

Figure 2 shows the share of production capacity of various models in total production capacity. 300 W and 600 W models capacity

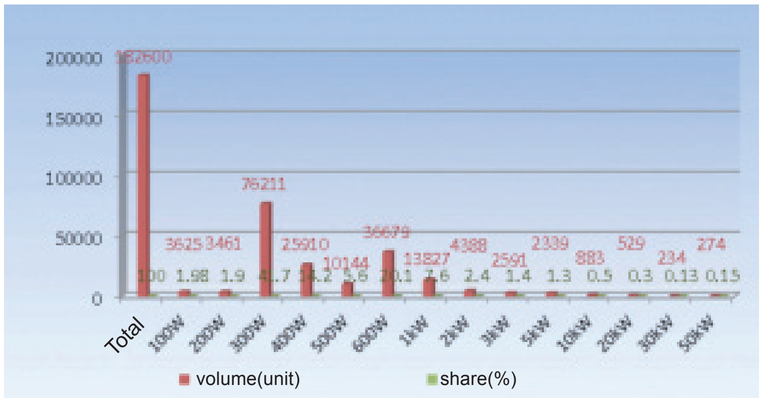


Figure 1 The Share of Various Models Production

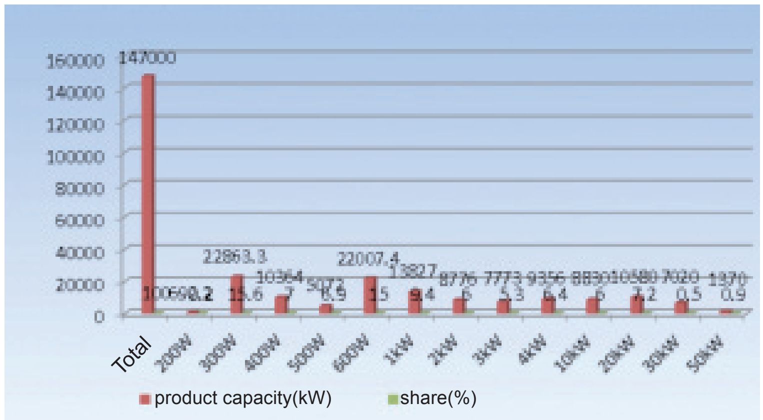


Figure 2 The Share of Production Capacity of Various Models

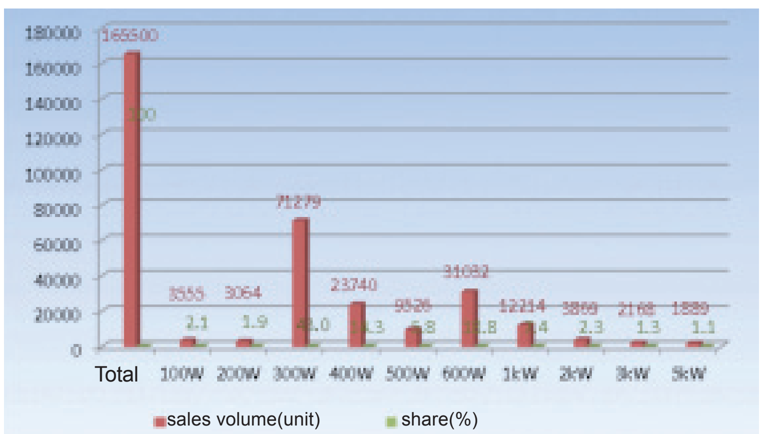


Figure 3 The Share of Sales Volume of Various Models

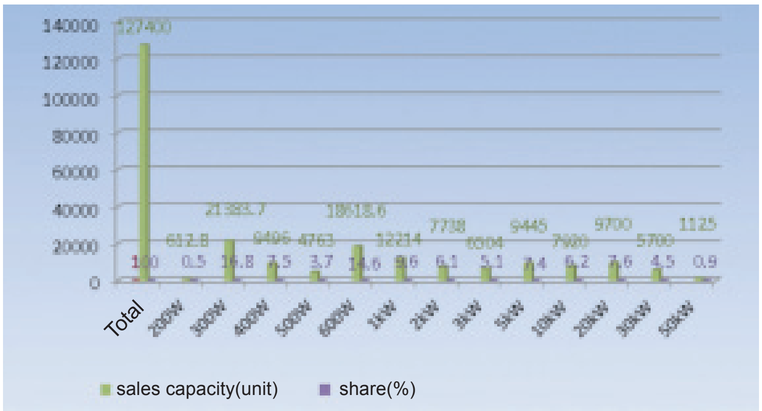


Figure 4 The Share of Sales Capacity of Various Models

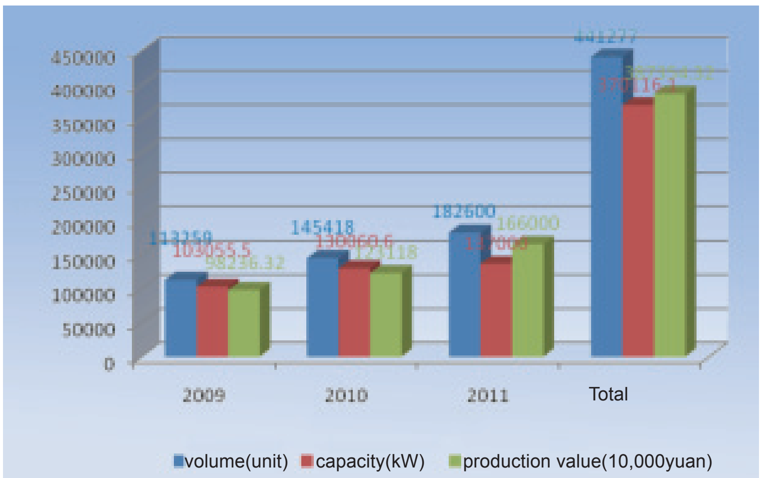


Figure 5 2009-2011 Production Volume, Capacity and Value

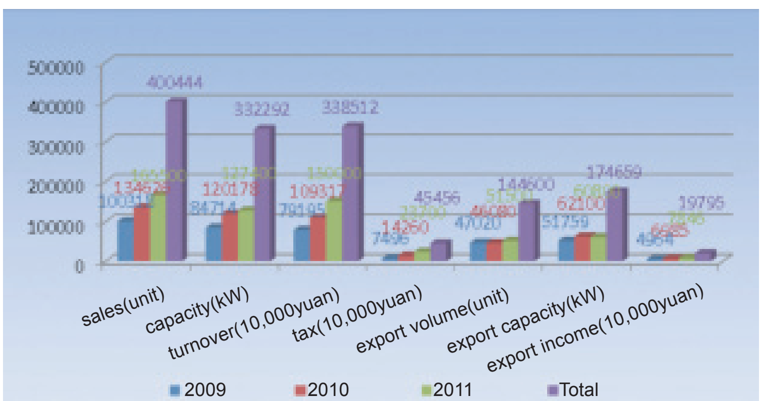


Figure 6 2009-2011 Sales Volumn, Capacity, Turnover, Tax and Export Capacity

accounts for the highest share.

1.3 Sales

In 2011, the sales volume of small and medium wind power equipments reached 165,500 sets, a 22.9% increase compared to 2010; the installed capacity reached 127.4 MW, increased 13.0%. 300 W model was the best seller of 71279 sets, accounting for 43.0%; 600 W model reached 31032 sets, accounting for 18.8%. 10 kW ~ 100 kW model reached 1710 sets, accounting for 1.0% of the total sales, the same to last year. The installed capacity was 17.8 MW; the export was over 1124 sets, accounting for 65.7% of the total exports, with an installed capacity of 16.2MW. 35.3% of the products were sold in China, with an installed capacity of 5.7 MW.

1.4 The development path of small and medium wind power products over years

Based on the data above, now we can see the development route of small and medium wind power equipments in the past three years. The overall situation is illustrated in figure 5 and figure 6.

1.5 The production of China's small and medium wind turbines over years

From 1983, we began to collect statistics of production of the 34 enterprises. Until 2011, the accumulative production of small and medium wind power turbines in China achieved 955,963 units, see table 2:

2 The statistics of import & export released by General Administration of Customs of China

2.1 Export

The statistics of import and export released by General Administration of Customs is the record of real situation of import and export, so it is a reliable reference. The Wind Energy Equipment Branch, China Agricultural

Table 2 The Accumulative Production of Small and Medium Wind Turbines in China

Year	before 1983	1984	1985	1986	1987	1988
Production (units)	3632	13470	12989	19151	20847	25575
Year	1989	1990	1991	1992	1993	1994
Production (units)	16649	7458	4988	5537	6100	6481
Year	1995	1996	1997	1998	1999	2000
Production (units)	8190	7500	6123	13884	7096	12170
Year	2001	2002	2003	2004	2005	2006
Production (units)	20879	29758	19920	24756	33253	50052
Year	2007	2008	2009	2010	2011	Total
Production (units)	54843	78411	113259	145418	187574	955963

Machinery Association obtains the data of small and medium wind turbines for 2009 to 2011 from the General Administration of Customs. In 2009, small and medium wind turbines were exported to over 98 countries and regions, with sales of $15.826 million; in 2010, the wind turbines were exported to 107 countries and regions, with sales of $18.377 million, a 16.1% increase compared to 2009. In 2011, wind turbines were exported to over 106 countries and regions, about 15830 units with sales of more than $24.9 million, increasing 30.7% compared to 2010, $1,573 per unit in average.

The countries/regions exported to:

Asia: Bangladesh, Cyprus, Korea, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Lebanon, Malaysia, Nepal, Pakistan, Philippines, Saudi Arabia, Singapore, South Korea, Syria, Thailand, Turkey, the United Arab Emirates, Yemen, Vietnam, Kazakhstan, Tajikistan and

Table 3 2009-2011 Export of Small and Medium Wind Turbines

Year	Country/Region	Exports (10,000 $)	Increase(%)
2009	98	1,582.6	—
2010	107	1,837.7	16.1
2011	106	2,490.0	30.7

Table 4 2009-2011 Small and Medium Wind Turbines Export Data to Six Continents

	2009			2010			2011		
	Regions	Total exports (10,000$)	Share (%)	Regions	Total exports (10,000$)	Share (%)	Regions	Total exports (10,000 $)	Share (%)
Asia	27	242	15.3	31	281	14.8	29	230	9.2
Africa	14	130	8.2	15	80	4.2	19	5160	2.1
Europe	33	766	48.4	34	509	26.9	30	1170	46.9
South America	18	60	3.8	22	70	3.7	20	134	5.4
North America	2	313	19.8	2	845	44.6	2	784	31.5
Australia	4	71	4.5	4	109	5.8	6	122	4.9

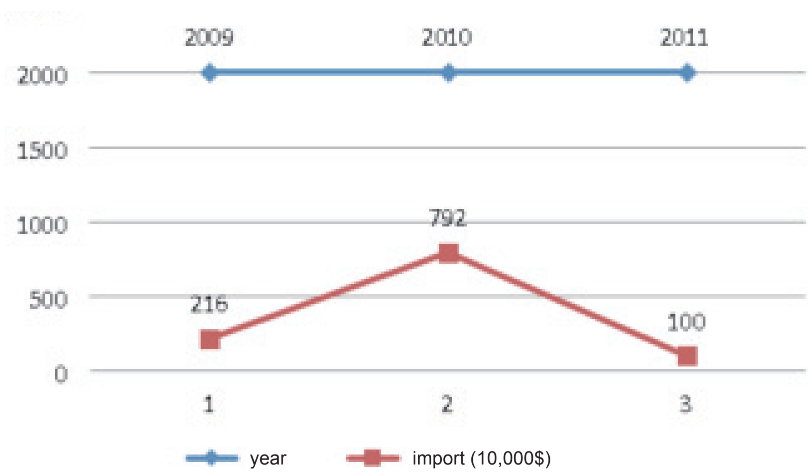


Figure 7 2009–2011 Imports of Small and Medium Wind Power Equipments

Uzbekistan;

Europe: Ukraine, Slovenia, Czech republic, Slovakia, Serbia, Belgium, Denmark, Britain, Germany, France, Ireland, Italy, the Netherlands, Greece, Portugal, Spain, Austria, Hungary, Bulgaria, Finland, Norway, Poland, Romania, Sweden, Switzerland, Estonia, Latvia, Lithuania, Belarus, Russia;

Africa: Ann Gladys, Cameroon, Cape Verde, Egypt, Ethiopia, Kenya, Liberia, Madagascar, Mauritius, Morocco, Mozambique, Namibia, South Africa, Nigeria, Reunion, Tanzania, Tunisia, Democratic Republic of Congo, Zambia.

2.2. Import

In 2009, the imported products came from 12 countries and regions such as India, Japan, South Korea, Denmark, Britain, Germany, Finland, Norway, Canada, the US, Australia and China Taiwan.

In 2010, the imported products were from 12 countries or regions of Japan, South Korea, Taiwan, South Africa, Denmark, Britain, Germany, France, Finland, Russia, Canada and China Hong Kong.

In 2011, the imported products were from 7 countries or regions, including Japan, South Korea, Germany, Sweden, Canada, the US and China Taiwan.

Table 5 Top 10 Self-support Manufacturing Enterprises in 2009

	Self-support export enterprise	Export sales (10,000 $)	Share(%)
1	Yangzhou Shenzhou Wind-driven Generator Co., Ltd	264	16.73
2	Anhui Hummer Dynamo Co.,Ltd	167	10.56
3	Shanghai SIIC E&A International Trade Co, Ltd.	104	6.58
4	Foshan Ouyad Electronic Co.,Ltd	92	5.84
5	Guangzhou Hongying Energy Technology Co.,Ltd	60	3.78
6	Shanghai Ghrepower Green Energy Co., Ltd. (Ghrepower)	60	3.53
7	Zhejiang Huaying Wind Power Generator Co., Ltd	32	2.02
8	Urban Green Energy Inc.	29	1.85
9	Jiangsu Nantong Zi lang Wind trubine Co.,Ltd	21	1.33
10	ZKEnergy Science & Technology Co., Ltd	13	0.82

Table 6 Top 10 Importing Countries in Terms of Sales in 2009

	Country	Export sales(10,000 $)	Share(%)
1	America	285	18.01
2	France	152	9.60
3	Italy	96	6.04
4	Nigeria	95	6.03
5	Philippines	78	4.91
6	Germany	70	4.42
7	England	67	4.23
8	Australia	66	4.20
9	Poland	55	3.51
10	Belgium	54	3.47

2.3 2009-2011 Export analysis

Generally, the small and medium wind power products in Mainland China are exported by self-support manufacturers, entrusted agency of import & export companies, or directly by import & export companies.

(1) In 2009, the small and medium wind turbines in mainland China were exported to 98 countries and regions, with sales of $15.826 million. There are 25 self-support manufacturers. Table 5 shows the top 10 self-support manufacturers and table 6 is the top 10 destination countries in terms of export sales.

(2) In 2010, according to the statistics from the General Administration of Customs, the small and medium wind power products were exported to over 107 countries and regions, with a total export of $18.94 million, a 19.7% increase compared to 2009. The sales of top 10 self-support enterprises achieved $8.15 billion, accounting for 43% of total export sales. The rankings of top 10 is little different from 2009, as shown in table 7.

(3) In 2011, the products in Mainland China were exported to over 106 countries and regions, about 15,800 units with export sales of more than $24.90 million, an increase of 30.7% compared to 2010, $1573 per unit in average.

Table 7 Top 10 Self-support Export Enterprises in 2010

	Enterprises	Export sales(10,000 $)	Share(%)	Compared to 2009(%)
1	Yangzhou Shenzhou Wind-driven Generator co., Ltd	197	10.42	-25.4
2	Urban Green Energy Inc.	134	7.08	357.5
3	Zhejiang Huaying Wind Power Generator Co., Ltd	128	6.74	298.6
4	Anhui Hummer Dynamo Co.,Ltd	105	5.53	-58.3
5	Guangzhou Hongying Energy Technology Co.,Ltd	66	3.48	10.4
6	Foshan Ouyad Electronic Co.,Ltd	56	2.94	-39.6
7	Suzhou Greatwatt Energy Co., Ltd	47	2.47	1961.7
8	Qingdao Aeolos Wind Energy Co., Ltd	31	1.62	100
9	Qingdao Anhua New Energy EquipmentCo., Ltd	28	1.46	100
10	Ningbo Windpower Group Co., Ltd	23	1.21	564.3

The domestic top 10 manufacturers in terms of independent exports show in table 9.

In 2011, the export sales of the top 10 countries accounted for 71.5% of the total exports, with the United States taking up 26.4%.

Table 8 Top 10 Importing Countries in Terms of Sales in 2010

	Sales(10,000$)	Increase compared to 2009(%)	Share(%)
America	683	139.8	37.2
Australia	116	75.2	6.1
Italy	108	16	5.9
Canada	66	135.9	3.5
Philippines	65	-16	3.4
England	62	-19.9	3.3
Poland	47	-15.3	2.5
Germany	46	-34.8	2.4
Russia	43	25.3	2.3
Denmark	33	557.7	1.7

Table 9 Top 10 Self-support Export Enterprises in 2011

	Enterprises	Sales (10,000 $)	Export units at average price	Share (%)
	Total	1281	8,161	51.50
1	Kunshan Jufeng Windpower Co.,Ltd	241	1,532	9.65
2	Urban Green Energy Inc.	224	1,432	9.02
3	Yangzhou Shenzhou Wind-driven Generator co., Ltd	212	1,347	8.59
4	Anhui Hummer Dynamo Co.,Ltd	148	946	5.96
5	Foshan Ouyad Electronic Co.,Ltd	132	838	5.28
6	Zhejiang Huaying Wind Power Generator Co., Ltd	111	709	4.47
7	Qingdao Anhua New Energy EquipmentCo., Ltd	69	441	2.78
8	Guangzhou Hongying Energy Technology Co.,Ltd	58	367	2.31
9	Qingdao Aeolos Wind Energy Co., Ltd	49	315	1.98
10	Suzhou Greatwatt Energy Co., Ltd	37	234	1.47

Table 10 Top 10 Importing Countries in Terms of Sales in 2011

	Country	Volume(units)	Sales (10,000 $)	Share(%)	Compared to 2010(%)
1	America	3507	658	26.4	-3.7
2	Bulgaria	14	243	9.75	13209.7
3	Germany	1339	170	6.81	271.8
4	Italy	741	160	6.43	44.6
5	England	717	135	5.42	119.2
6	Canada	100	127	5.1	92.5
7	Australia	936	110	4.43	-5.2
8	France	1228	95	3.81	308.3
9	Russia	154	45	1.81	4.2
10	Poland	717	38	1.51	-20.2