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Small Wind World Report 2013

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This is all the energy required to heat one cup of tea.
Small Wind World Market sees Strong Growth

The world market for small wind has seen further strong growth: As of the end of 2011, a cumulative total of at least 730’000 small wind turbines were installed all over the world (excluding two major markets as India and Italy), 74’000 of which were newly erected that year. During 2011, the number of installed small wind turbines grew by 11 %.\(^1\)

China continues to overshadow all other major markets, including the USA and the UK, with its cumulative installed units of over 500’000, which represents 68% of the world market in terms of total as well as new installed units. According to estimations, around half of the turbines continue to produce electricity in China given that this market started already in the early 1980s.

Figure 1: Total Cumulative Installed Small Wind Units Worldwide

![Figure 1: Total Cumulative Installed Small Wind Units Worldwide](image)

\(^1\) Some of the countries only provide rough data that contains uncertainties.
27 % Increase in Global Small Wind Capacity – Increase in Average Size

The globally installed small wind capacity has reached more than 576 MW as of the end of 2011. China accounts for 40 %, and the USA for 35 % of this capacity.

More than 120 MW of new small wind capacity was added in the year 2011, a global capacity increase of 27 %. In terms of new installed capacity, this represents almost a doubling of the market size, as the year 2010 saw only global sales of 64 MW.

Globally, an increase in the average size of small wind turbines can be observed: In 2010, the average installed size was 0,66 kW, and in 2011, it has already reached 0,77 kW. Turbines installed new in the year 2011 had an average size of 1,6 kW.

China’s average installed size increased from 0,37 kW as of the end of 2010 to 0,45 kW in 2011.

The USA yielded in average 1,31 kW per installed small wind turbine (after 1,24 kW in 2010) and the average small wind turbines in the UK had a capacity of 3,3 kW (2,0 kW in 2010).

Due to increasing fossil fuel prices and increasing electricity demand, the interest in small wind turbines is large, in industrialised as well as in developing countries.

In particular in the developing countries, off-grid and mini-grid applications prevail. Small wind, in areas without access to the national electricity grid, would often be economically competitive and poses a true rationale in substituting the existing expensive energy sources.

Figure 2: Total Cumulative Installed Small Wind Capacity Worldwide

<table>
<thead>
<tr>
<th>Total Cumulative Installed Capacity [kW]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Countries</td>
</tr>
<tr>
<td>China 1</td>
</tr>
<tr>
<td>USA 2</td>
</tr>
<tr>
<td>UK 3</td>
</tr>
<tr>
<td>Germany 4</td>
</tr>
<tr>
<td>Ukraine 5</td>
</tr>
<tr>
<td>Canada 1</td>
</tr>
<tr>
<td>Italy 2</td>
</tr>
<tr>
<td>Poland 3</td>
</tr>
<tr>
<td>Spain 4</td>
</tr>
<tr>
<td>Argentina 4</td>
</tr>
<tr>
<td>Japan 2</td>
</tr>
<tr>
<td>Ireland 2</td>
</tr>
<tr>
<td>India 4</td>
</tr>
<tr>
<td>Sweden 1</td>
</tr>
<tr>
<td>Australia 2</td>
</tr>
<tr>
<td>South Korea 1</td>
</tr>
<tr>
<td>Morocco 2</td>
</tr>
<tr>
<td>Portugal 4</td>
</tr>
<tr>
<td>Austria 5</td>
</tr>
<tr>
<td>Pakistan 3</td>
</tr>
<tr>
<td>Finland 4</td>
</tr>
</tbody>
</table>

1=2009  2=2010  3=2011  4=2012
and environmentally damaging diesel generation.

Also in the countries with good infrastructure, small wind turbines can generate electricity at affordable cost and can contribute to substitute fossil or nuclear energy sources. However, in both areas there are major regulatory and financing challenges, and in general, the small wind market remains fragile today. Still only a handful of countries offer sufficient support schemes which are necessary to bypass the main barrier for many potential small wind users: the upfront investment.

Small Wind Turbine Manufacturing

Five countries (Canada, China, Germany the UK and the USA) account for over 50% of the small wind manufacturers. By the end of 2011, there are over 330 small wind manufacturers that have been identified in the world offering complete one-piece commercialised generation systems, and an estimate of over 300 additional firms supplying parts, technology, consulting and sales services.

Figure 3 Small Wind Manufacturers Map Distribution Worldwide As of the End of 2011

Based on the world distribution of turbine manufacturers, the production of small wind remains concentrated in few world regions: in China, in North America and in several European countries. Developing countries continue to play a minor role in small wind manufacturing. It is obvious that the tremendous wind resources of Africa,
Southeast Asia and Latin America, where many regions are ideally suited for small wind application, have not yet lead to the establishment of domestic small wind industries and it would be worthwhile joint efforts of these countries and the international community to set up international programmes to change this.

However, in general the small wind industry has already demonstrated remarkable growth in the past decade, as consumer interest was increasing and many new companies have entered the sector. Figure 4 illustrates the raise of the small wind industry in the past decade: More than 120 new small wind manufacturers were established between 2000 and 2010 worldwide. China alone has an exceptional manufacturing capacity of more than 180’000 units per annum (as of 2011).

This impressive size illustrates how large the small wind sector could become also in other world regions and on the global scale. Compared with its global potentials, the small wind industry outside China is still very small.

**Figure 4 Worldwide SWT Manufacturer Establishment Timeline**

![Worldwide SWT Manufacturer Establishment Timeline](image-url)
Technology and Major Applications

Actually, what is seen today as “Big Wind” started in the size which is today defined as small wind. Until the 1970s and 1980s, most wind turbines had a capacity of less than 100 kW. In rural, isolated areas e.g. in China or USA, such small wind turbines where very common for residential and farming needs, including for water-pumping stations, still a common technology in many developing countries. Today, common applications of small wind turbine include:

- Residential
- Commercial and industrial
- Fishery and recreational boats
- Hybrid systems
- Pastures, farms and remote villages
- Potable systems for leisure
- Pumping
- Desalination and purification
- Remote monitoring
- Research and education
- Telecom base stations

The early HAWT technology has dominated the market for over 30 years. Based on the study of 327 small wind manufacturers as of the end of 2011, 74 % of the commercialised one-piece small wind manufacturers invested in the horizontal axis orientation while only 18 % have adopted the vertical design. 6% of the manufactures have attempted to develop both technologies. As the majority of the vertical axis models have been developed in the past 5 to 7 years, the scale of market share remains relatively small. The average rated capacity of VAWT is estimated to be 7,4 kW with a median rated capacity of merely 2,5 kW. In comparison with the traditional horizontal axis orientation, the average and median rated capacity are much smaller. Out of the 157 models of vertical turbines catalogued in this report, 88 % of which are below 10 kW and 75 % are below 5 kW. This corresponds well with the actual market demand, as the average unit sold in 2011 had a capacity of 1,6 kW.
Despite a market trend that leans towards a grid-tied system with larger capacity, off-grid applications continue to play an important role in remote areas of developing countries. Off-grid applications include rural residential electrification, telecommunication stations, off-shore generation, and hybrid systems with diesel and solar. Over 80% of the manufacturers produce stand alone applications. In China, off-grid units comprised 97% of the market in 2009, and 2.4 million households still lack electricity. For this reason off-grid systems will continue to play a significant role, in China and in many other countries with non-electrified areas.

In recent years, the market for larger, grid-tied systems, has increased in particular in some industrialised countries, e.g. in the USA, UK or Denmark.

As of the end of 2011, 25 small wind manufacturers in the world have the capability to fabricate turbines between 50 kW and 100 kW.

**Driving Factors**

The future of the small wind industry depends on the cost of the technology, the enactment of supportive policies and economic incentives, fossil-fuel prices, investor interest, consumer awareness, certification and quality assurance, permitting processes and regulations, and wind evaluation tools. Financial, wind, and energy experts anticipate high growth rates for the production of SWTs if consumer demand increases.

**Costs**

Cost remains to be the one of the main factors and challenges in the dissemination of small wind.

In the USA, the installed cost estimates of top ten small wind turbine models in 2011 ranged between $2’300/kW and $10’000/kW, and the average installed cost of all SWTs was $6’040/kW, an 11 percent increase from 2010. The Chinese small wind industry yielded, in comparison, a significantly lower average turnover of 12’000 Yuan/kW (1’900 USD – 1’500 EUR).

**Policies**

Like most other renewable energy technologies and in particular the market for “big wind”, the success of the small wind market depends on stable and appropriate support schemes. Today, feed-in tariffs, net metering, tax credits, and capital subsidies are the major energy policies geared specifically towards small wind. The small wind sector has especially benefited from the growing global trend of feed-in tariffs (FITs). Unfortunately, only few countries have yet implemented specific FIT schemes for small wind which can be seen as the best tool for grid-connected small wind. Whenever the wholesale electricity prices are sufficiently high, net-metering has also been an effective incentive, e.g. in
Denmark. Additional policies that encourage the use of renewable sources of energy also play an important role in the growth of the small wind industry.

However, tax credits and capital subsidies may not be as effective as production based incentives because they promote directly the sales of the hardware, but not the energy generation itself, and hence may not encourage sufficiently investment in efficiency.

**Standards & Certification**

Like most other renewable energy technologies and in particular the market for “big wind”, the success of the small wind market depends on stable and appropriate support schemes. Today, feed-in tariffs, net metering, tax credits, and capital subsidies are the major energy policies geared specifically towards small wind. The small wind sector has especially benefited from the growing global trend of feed-in tariffs (FITs). Unfortunately, only few countries have yet implemented specific FIT schemes for small wind which can be seen as the best tool for grid-connected small wind. Whenever the wholesale electricity prices are sufficiently high, net-metering has also been an effective incentive, e.g. in Denmark. Additional policies that encourage the use of renewable sources of energy also play an important role in the growth of the small wind industry.

However, tax credits and capital subsidies may not be as effective as production based incentives because they promote directly the sales of the hardware, but not the energy generation itself, and hence may not encourage sufficiently investment in efficiency.

**Wind Resource Assessment**

The basic condition in order to harvest wind power successfully is of course the availability of wind: Hence the accurate prediction of the wind speed is essential to calculate the electricity output of a small wind generator, representing the basis for its economic performance.

As wind assessment tools are costly in relation to the cost of a small wind turbine, this evaluation currently presents a real challenge for the small wind industry, however, it is important to underline the importance of such data at the site where the wind generator is supposed to be installed.

Special challenges can be found in urban environments: The shading and turbulence effects of surrounding obstacles may produce complex wind patterns that are difficult to predict. Traditional wind resource maps prove inadequate as wind conditions are evaluated at a greater altitude of 50 m while most SWTs do not reach above 30 m. As a result, the vast demand for inexpensive and efficient methods of predicting and collecting local wind data is another key driving factor that requires further innovation and cost reduction in the technology.
### Table 3. Small Wind Feed-in Tariff Pricing Worldwide

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Size Limit</th>
<th>EUR/kWh</th>
<th>Country/Region</th>
<th>Size Limit</th>
<th>EUR/kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese Taipei</td>
<td>1-10kW</td>
<td>0,185</td>
<td>Japan</td>
<td>&lt; 20kW</td>
<td>0,500</td>
</tr>
<tr>
<td>Canada</td>
<td>≥ 20kW</td>
<td>0,200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ontario</td>
<td>&lt; 10kW</td>
<td>0,104</td>
<td>Lithuania</td>
<td>&lt; 30kW</td>
<td>0,110</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>&lt; 50kW</td>
<td>0,386</td>
<td></td>
<td>30-350kW</td>
<td>0,100</td>
</tr>
<tr>
<td>Cyprus</td>
<td>&lt; 30kW</td>
<td>0,220</td>
<td>Portugal</td>
<td>&lt; 3,68kW</td>
<td>0,261</td>
</tr>
<tr>
<td></td>
<td>Off-grid</td>
<td>0,190</td>
<td></td>
<td>After 8th year</td>
<td>0,120</td>
</tr>
<tr>
<td>Greece</td>
<td>&lt; 50kW</td>
<td>0,250</td>
<td>Switzerland</td>
<td></td>
<td>0,180</td>
</tr>
<tr>
<td></td>
<td>&gt; 50kW</td>
<td>0,090</td>
<td>UK</td>
<td>&lt; 1,5kW</td>
<td>0,443</td>
</tr>
<tr>
<td></td>
<td>Off-grid</td>
<td>0,100</td>
<td></td>
<td>1,5-15kW</td>
<td>0,343</td>
</tr>
<tr>
<td>Italy</td>
<td>&lt; 20kW</td>
<td>0,291</td>
<td></td>
<td>15-100kW</td>
<td>0,309</td>
</tr>
<tr>
<td></td>
<td>20-200kW</td>
<td>0,268</td>
<td>USA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Israel</td>
<td>&lt; 15kW</td>
<td>0,254</td>
<td>Indiana</td>
<td>5-100kW</td>
<td>0,130</td>
</tr>
<tr>
<td></td>
<td>&lt; 50kW</td>
<td>0,326</td>
<td>Hawaii</td>
<td>&lt; 20kW</td>
<td>0,123</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20-100kW</td>
<td>0,105</td>
</tr>
<tr>
<td>Vermont</td>
<td>&lt; 100kW</td>
<td></td>
<td></td>
<td></td>
<td>0,193</td>
</tr>
</tbody>
</table>

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- Plant Load Factor

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PLF@Click generates reports on different parameters depending on the options chosen by the member. It can generate reports on mean annual wind speeds at any height above ground, expected monthly profile of wind speeds, Wind Power Density (WPD), Annual Energy Output (AEO) and Plant Load Factor (PLF) for various wind turbine models.

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The increasing demand for clean and affordable energy all over the world will without doubt lead to an increasing demand for small wind. In particular in the developing countries, small wind can easily and fast contribute to electrify millions of people in rural areas. Governments and international organisations such as IRENA have started to understand this potential and are now more and more including small wind in their renewable energy programmes. Also several industrialised countries have ambitious small wind targets and corresponding policies in place. In general, political support can be expected to increase the installed capacity of small wind in the upcoming years further.

Increasing fossil fuel prices, global warming and the ever-growing electricity demand will continue to be the three long-term drivers of the small wind industry. In order for the small wind technology to mature, however, the industry must be driven by supportive policies and standards.

The forecast is based on opinions of industry experts, growth pattern of the large wind industry, and the historical growth trend of the solar PV renewable industry for the past decade that shares many characteristics in common with the small wind industry. Accordingly, the small wind industry can be expected to follow similar growth patterns of the large wind and solar industry until 2020.

Recent trend of the small wind industry has shown an aggressive annual 35% increase in the new installed capacity for the past years. The rate of growth is anticipated to continue until 2015, reaching an annual installation of 400 MW of SWTs. Within this time frame, individual countries and the international small wind community will be able to establish more rigorous and structured standards and policies to regulate the market and support investments. Based on a conservative assumption, the market could subsequently see a steady compound growth rate of 20% from 2015 to 2020. The industry is forecasted to reach approximately 1’000 MW of newly installed capacity added annually in 2020 and achieves a cumulative installed capacity of 5 GW by 2020.

**Figure 6 SWT Installed Capacity World Market Forecast 2020**
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**Definition of Small Wind**

There is still no globally unified definition of small wind. Originally, small wind was defined by its characteristics to produce small amount of electricity for house appliances or to cover various household-based electricity demand. However, this definition does not make sense on a universal level as energy consumption patterns are very different in the different parts of the world: While an American family would need a 10 kW turbine to cover its full consumption, a European household demands a 4 kW turbine while an average Chinese household requires as small as a 1 kW turbine.

Technically, there are several definitions of small wind turbines: The most important international standardisation body, the IEC, defines SWTs in standard IEC 61400-2 as having a rotor swept area of less than 200 m², equating to a rated power of approximately 50 kW generating at a voltage below 1’000 V AC or 1’500 V DC. In addition to this standard, several countries have set up their own definition of small wind. The discrepancy of the upper capacity limit of small wind ranges between 15 kW to 100 kW for the five largest small wind countries. The major pattern of today’s upper limit capacity leans towards 100 kW. This is largely caused by the leading role of the North American and European market. Over the past decades, a growing average size of the small wind capacity has been observed. This pattern is largely caused by the increasing interest in larger grid-connected systems and a comparatively diminishing market of standalone systems. Nevertheless, in order to create a standardised and healthy small wind market share, an agreeable definition of small wind should be agreed upon. This report intends to bring forward the discussion on the definition of small wind and aims to create eventually a unanimous international classification system of small wind accepted by all parties of the industry. For the purpose of generating comparable graphs, figures and charts in this report, 100 kW is chosen as the temporary reference point. The definition, however, requires further discussion until a globally harmonised agreement is reached. In practise, the major pattern of today’s upper limit capacity leans towards 100 kW, although the IEC defines a limit of equivalent to 50 kW. In order to create a standardised and healthy small wind market share, an agreeable definition of small wind should be agreed upon. This report intends to bring forward the discussion on the definition of small wind and aims to create eventually a unanimous international classification system of small wind accepted by all parties of the industry. For the purpose of generating comparable graphs, figures and charts in this report, 100 kW is chosen as the temporary reference point. The definition, however, requires further discussion, until a globally harmonised agreement is reached.
### Table 4 Small Wind Definition of Canada, China, Germany, UK and USA

<table>
<thead>
<tr>
<th>Department/Association</th>
<th>Turbine Classification</th>
<th>Rated Cap.kW</th>
<th>Additional Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>International</td>
<td>Small Wind Turbines</td>
<td>≈50</td>
<td>IEC 61400-2 defines SWTs as having a rotor swept area of less than 200 m², equating to a rated power of approximately 50 kW generating at a voltage below 1’000 V AC or 1’500 V DC</td>
</tr>
<tr>
<td>Natural Resources Canada (NRCan)</td>
<td>Mini Wind Turbine</td>
<td>0.3 - 1</td>
<td>Adopted in the Survey of the Small Wind by Marbek Resource Consultants</td>
</tr>
<tr>
<td>Canadian Wind Energy Association (CanWEA)</td>
<td>Small Wind Turbine</td>
<td>1 - 30</td>
<td></td>
</tr>
<tr>
<td>Renewable Energy &amp; Energy Efficiency Partnership (REEEP)</td>
<td>Small Wind Turbine</td>
<td>&lt; 100</td>
<td>Adopted in the recent National Policy, Strategy and Roadmap Study for China Small Wind Power Industry Development</td>
</tr>
<tr>
<td>Bundesverband WindEnergie (BWE)</td>
<td>Small Wind Turbine</td>
<td>&lt; 75</td>
<td>Adopted in the recent BWE-Marktübersicht spezial – Kleinwindanlagen</td>
</tr>
<tr>
<td>RenewableUK</td>
<td>Micro wind</td>
<td>0 - 1,5</td>
<td>0,5 - 5 m Height / Up to 1’000 kWh Annual Energy Production</td>
</tr>
<tr>
<td></td>
<td>Small wind</td>
<td>1,5 - 15</td>
<td>2 - 50 m Height / Up to 50’000 kWh Annual Energy Production</td>
</tr>
<tr>
<td></td>
<td>Small-medium wind</td>
<td>15 - 100</td>
<td>50 - 250 m Height / Up to 200’000 kWh Annual Production</td>
</tr>
<tr>
<td></td>
<td>Micro &amp; Small Wind Turbine</td>
<td>&lt; 50</td>
<td>Only turbines smaller than 50 kW qualify for the MCS feed-in tariff programme in UK</td>
</tr>
<tr>
<td>American Wind Energy Association (AWEA)</td>
<td>Small Wind Turbine</td>
<td>&lt; 100</td>
<td>Adopted in the most recent AWEA Small Wind Report 2010 and the AWEA Small Wind Turbine Global Market Study</td>
</tr>
</tbody>
</table>
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Li Defu, wind Energy Equipment Branch, China Agricultural Machinery Association

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.

### Small and Medium Wind Power Industry Production and Sales

**Industry Development**

A 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, increasing 19,5%; 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 of 510 million yuan; the total staff was 3'278, including 907 technicians, accounting for 27,7%.

The data reported by 25 enterprises with export business shows that in 2011, the total exports 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.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Yeargrowth</th>
<th></th>
<th>Indicator</th>
<th>Yearly Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross production (units)</td>
<td>183'000</td>
<td>25,6%</td>
<td>Production Capacity (MW)</td>
<td>147</td>
</tr>
<tr>
<td>Gross output (yuan)</td>
<td>159'000</td>
<td>29,0%</td>
<td>Sales Capacity (MW)</td>
<td>127</td>
</tr>
<tr>
<td>The total sales volume (units)</td>
<td>1'655'000</td>
<td>22,9%</td>
<td>Exports (units)</td>
<td>520'000</td>
</tr>
<tr>
<td>The total sales (units)</td>
<td>146'000</td>
<td>33,7%</td>
<td>Export Capacity (MW)</td>
<td>61</td>
</tr>
</tbody>
</table>
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 GW; 5 enterprises had sales volume of over ten thousand sets, with 3 enterprises’ sales capacity over 1GW and 4 enterprises’ sales over 0,1 billion.

**Production**

In 2011, 21 models (15 basic models) were produced in the 34 enterprises, adding three varieties 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 a 30 kW model, compared with 9 enterprises in 2011; 3 enterprises produced a 50 kW model, compared with 7 in 2011; one enterprise produced a 100 kW model, the same with 2011. This change indicates the tendency to produce larger turbines. The 300 W model production has the maximum share of 41,7%, 600 W model reaches 20,1%.

**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 31’032 sets, accounting for 18,8%. 10 kW ~ 100 kW model reached 1’710 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 1’124 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.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Yearly Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign exchange earnings (million $)</td>
<td>78</td>
</tr>
<tr>
<td>Proportion of Exports in total sales</td>
<td>31,1%</td>
</tr>
<tr>
<td>Proportion of Total Exports capacity</td>
<td>47,7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales (units)</td>
<td>100'318</td>
<td>134'626</td>
<td>165'500</td>
</tr>
<tr>
<td>Capacity (MW)</td>
<td>84,7</td>
<td>120,1</td>
<td>127,4</td>
</tr>
<tr>
<td>Turnover (million yuan)</td>
<td>791,9</td>
<td>1'093</td>
<td>1'506</td>
</tr>
<tr>
<td>Tax (million yuan)</td>
<td>74,9</td>
<td>142,6</td>
<td>237,0</td>
</tr>
<tr>
<td>Export Volume (units)</td>
<td>47'020</td>
<td>46'080</td>
<td>51'500</td>
</tr>
<tr>
<td>Export Capacity (MW)</td>
<td>51,7</td>
<td>62,1</td>
<td>60,8</td>
</tr>
<tr>
<td>Export Income (million yuan)</td>
<td>49,6</td>
<td>69,8</td>
<td>78,4</td>
</tr>
</tbody>
</table>
Exports

The statistics of import and export released by General Administration of Customs is the record of the real situation of imports and exports, so it is a reliable reference. The Wind Energy Equipment Branch, China Agricultural 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 $15,82 million; in 2010, the wind turbines were exported to 107 countries and regions, with sales of $18,37 million, a 16,1% increase compared to 2009. In 2011, wind turbines were exported to over 106 countries and regions, about 15'830 units with sales of more than $24,9 million, increasing 30,7% compared to 2010, $1'573 per unit in average.

<table>
<thead>
<tr>
<th>Year</th>
<th># Countries/Regions</th>
<th>Exports (million $)</th>
<th>Increase (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>98</td>
<td>15,8</td>
<td>-</td>
</tr>
<tr>
<td>2010</td>
<td>107</td>
<td>18,3</td>
<td>16,1</td>
</tr>
<tr>
<td>2011</td>
<td>106</td>
<td>24,9</td>
<td>30,7</td>
</tr>
</tbody>
</table>

Imports

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.
**Kliux Energies**

**Products type:** VAWT  
**Products size (kW):** 1.8/3.6  
**Applications:** GC/HB  
**Presence:** Spain

Kliux Energies is a Spanish company, with international presence, that specializes in DISTRIBUTED ENERGY SOLUTIONS based on renewable sources. Kliux has worldwide exclusivity rights to manufacture and sell the GEO1800 VERTICAL AXIS WIND TURBINE, developed by Geolica Innovations which also integrate into hybrid system with solar photovoltaic technology. Its unique aerodynamic design results in a noiseless, energy generating turbine that also performs extremely good in architectural integration and visual impact. THE TRULY URBAN WIND TURBINE.

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**Montanari Energy**

**Products type:** HAWT  
**Products size (kW):** 1/2.5  
**Applications:** GC/SA  
**Presence:** Italy

We at Montanari Energy believe in the value of wind and our objective is to develop the finest technology in order to allow everyone to generate all the energy they need from this free, clean and endless resource.

Designed by some of the finest Italian engineers operating in the small-wind sector, our turbines are excellent products incorporating Italian design at its best.

We at Montanari Energy believe that everyone can one day be pioneers of the world again. It will be a freer and richer world, a world that deserves our full attention.
PhonoWind  
**www.phonowind.com**

**Products type:** HAWT  
**Products size (kW):** 0.3/1/2/3/5  
**Applications:** GC/SA/PP  
**Presence:** China, Germany, UK, USA

Phono Wind manufactures high quality, competitively priced photovoltaic small wind turbines. Since 2004, Phono Wind turbines have been used widely throughout the world – in Germany, Spain, Italy, Japan, Czech Republic, Slovakia, Israel and the United States.

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ShenZhen Effsun Wind Power  
**www.effsun.com**

**Products type:** HAWT  
**Products size (kW):** 0.3/0.4/0.5/1/2/3/5/10/20  
**Applications:** GC/SA/HB  
**Presence:** China

ShenZhen Effsun Wind Power CO., LTD is a High-tech Enterprise of the wind power industry in China. Our company owns a strong technical force, we have build a long term technical cooperation with South China university of technology and Central South University. Our company is a manufacturer integrating R&D, manufacturing, sales, after-sales service. Our annual production capacity is over 20’000 units, most of them are sold to domestic market, and exported to over 40 countries, such as the United Kingdom, France, the United States, Canada, New Zealand, Australia, Argentina and India.

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Windspire Energy  
**www.windspireenergy.com**

**Products type:** VAWT  
**Products size (kW):** 1.2  
**Applications:** GC/SA  
**Presence:** USA, Australia, Belgium, Canada Costa Rica, Denmark, France, Ireland, Italy

Affordable, attractive, and ultra quiet, Windspire® wind turbines give you the power to create clean energy from the natural wind just outside your door. At only 30 feet tall and four feet wide Windspire wind turbines are appropriate for urban, suburban and rural environments. Elegantly engineered, scalable and made in America, Windspires come as a complete system. Designed for use where you live and work, Windspires are currently powering homes, small businesses, schools, museums, parks, vineyards, and commercial buildings. Join hundreds of Windspire owners and start generating your own clean energy today.
Zhejiang Huaying Wind  
www.huayingwindpower.com

Products type: HAWT  
Products size (kW): 2/5/10/30  
Applications: GC/SA/DH/PP  
Presence: China

Zhejiang Huaying Wind Power Generator Co., Ltd., a member of Tongkun group—China’s leading industrial conglomerate, is a high tech startup company specialized in research, production and marketing of small and middle sized wind turbine system. Located 120km away from Shanghai, the company enjoys excellent traffic convenience. The company has made a pioneering step in the development of a brand new series of downwind- variable blade pitch wind turbines. ISO9001 quality system established and CERoHs certified, the company has a complete series of strict testing and quality guarantee methods for all of the wind turbine and system.

ZKEnergy Technology  
www.zkenergy.com

Products type: HAWT  
Products size (kW): 0.4/0.6/1  
Applications: GC/SA/HB  
Presence: China

In ZKEnergy Technology Co., Ltd. is a professional high-tech enterprise engaged in the development, production and application in the field of clean energy, small and medium-sized wind power and solar integrated application systems. Innovation, cooperation, responsibility and integrity are our core values.

Are you in the small wind sector?

Be part of the broadest network of wind energy specialists worldwide and enjoy all the benefits of being a WWEA member.

Visit small-wind.org/membership for more information