

World Wind Energy Report 2008



WWEA

World Wind Energy Association

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**8th World Wind Energy Conference & Exhibition
Wind Power for Islands – Offshore and Onshore**

**Jeju island, South Korea
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World Wind Energy Association WWEA
Date of publication: February 2009

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World Wind Energy Report 2008

– Highlights –

- Worldwide capacity reaches 121'188 MW, out of which 27'261 MW were added in 2008.



- Wind energy continued its growth in 2008 at an increased rate of 29 %.
- All wind turbines installed by the end of 2008 worldwide are generating 260 TWh per annum, equalling more than 1,5 % of the global electricity consumption.
- The wind sector became a global job generator and has created 440'000 jobs worldwide.
- The wind sector represented in 2008 a turnover of 40 billion €.
- For the first time in more than a decade, the USA took over the number one position from Germany in terms of total installations.
- China continues its role as the most dynamic wind market in the year 2008, more than doubling the installations for the third time in a row, with today more than 12 GW of wind turbines installed.
- North America and Asia catch up in terms of new installations with Europe which shows stagnation.
- Based on accelerated development and further improved policies, a global capacity of more than 1'500'000 MW is possible by the year 2020.

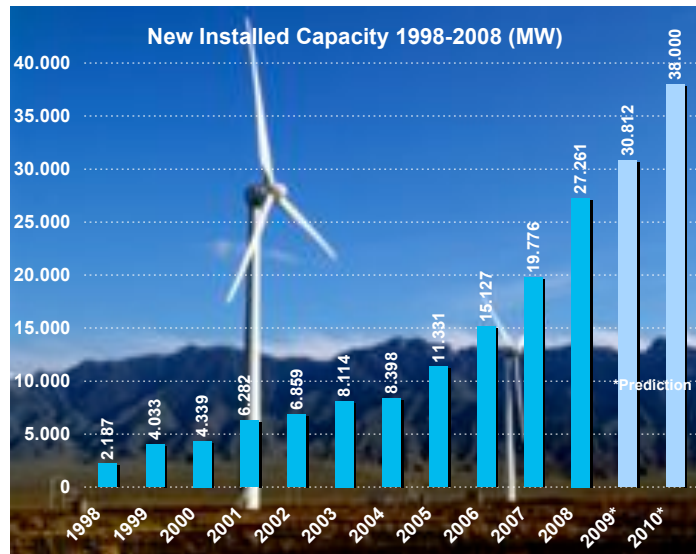
General situation

Wind energy has continued the worldwide success story as the most dynamically growing energy source again in the year 2008. Since 2005, global wind installations more than doubled.

They reached 121'188 MW, after 59'024 MW in 2005, 74'151 MW in 2006, and 93'927 MW in 2007. The turnover of the wind sector worldwide reached 40 billion € in the year 2008.

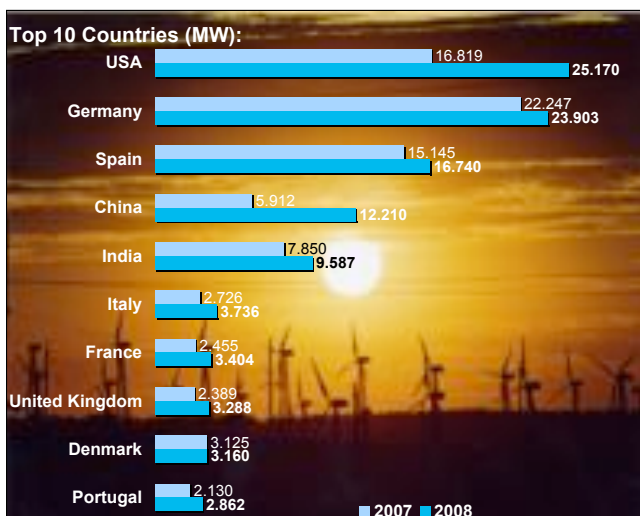
The market for new wind turbines showed a 42 % increase and reached an overall size of 27'261 MW, after 19'776 MW in 2007 and 15'127 MW in the year 2006. Ten years ago, the market for new wind turbines had a size of 2'187 MW, less than one tenth of the size in 2008.

In comparison, no new nuclear reactor started operation in 2008, according to the International Atomic Energy Agency.

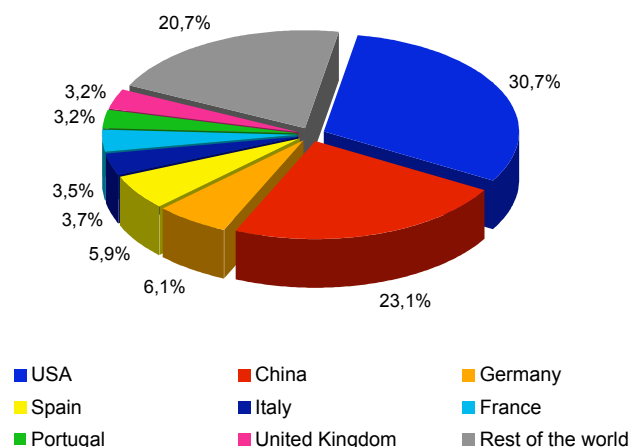


Leading wind markets 2008

The USA and China took the lead, USA taking over the global number one position from Germany and China getting ahead of India for the first time, taking the lead in Asia. The USA and China accounted for 50,8 % of the wind turbine sales in 2008 and the eight leading markets represented almost 80 % of the market for new wind turbines – one year ago, still only five markets represented 80 % of the global sales. The pioneer country Denmark fell back to rank 9 in terms of total capacity, whilst until four years ago it held the number 4 position during several years. However, with a wind power share of around 20 % of the electricity supply, Denmark is still a leading wind energy country worldwide.



Country Share of New Installed Capacity, 2008



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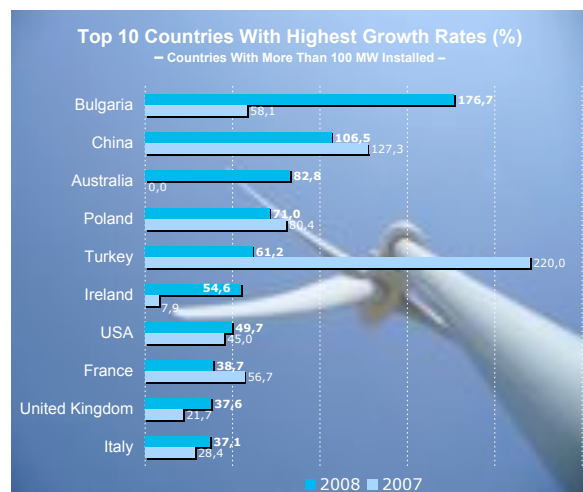
Diversification continues

This development goes hand in hand with a general diversification process which can be watched with today 16 markets having installations of more than 1'000 MW, compared with 13 countries one year ago. 32 countries have more than 100 MW installed, compared with 24 countries three years ago.

Altogether 76 countries are today using wind energy on a commercial basis. Newcomers on the list are two Asian countries, Pakistan and Mongolia, which both for the first time installed larger grid-connected wind turbines.

Increasing growth rates

An important indicator for the vitality of the wind market is the growth rate in relation to the installed capacity of the previous year. The growth rate went up steadily since the year 2004, reaching 29,0 % in 2008, after 26,6 % in 2007, 25,6 % in the year 2006 and 23,8 % in 2005. However, this increase in the average growth rate is mainly due to the fact that the two biggest markets showed growth rates far above the average: USA 50 % and China 107 %. Bulgaria showed the highest growth rate with 177 %, however, starting from a low level. Also Australia, Poland, Turkey and Ireland showed a dynamic growth far above the average.



Wind energy as an answer to the global crises

In light of the threefold global crises mankind is facing currently – the energy crisis, the finance crisis and the environment/climate crisis – it is becoming more and more obvious that wind energy offers solutions to all of these huge challenges, offering a domestic, reliable, affordable and clean energy supply.

At this point of time it is difficult to predict the short-term impacts of the credit crunch on investment in wind energy. However, currently smaller projects under stable policy frameworks like well-designed feed-in tariffs are less affected by the credit crunch than higher-risk investments e.g. in large offshore wind farms or under unstable political frameworks and in countries which are seen as not offering sufficient legal stability.

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Wind energy as a low-risk investment

In the mid to long term it is clear that wind energy investments will rather be strengthened due to their low-risk character and societal and additional economic benefits. Investment in a wind turbine today means that the electricity generation cost are fixed to the major extend over the lifetime of the wind turbine. Wind energy implies no expenses on fuel and operation and maintenance costs are usually well predictable and rather marginal, in relation to the overall investment.

Employment: Wind energy as job generator

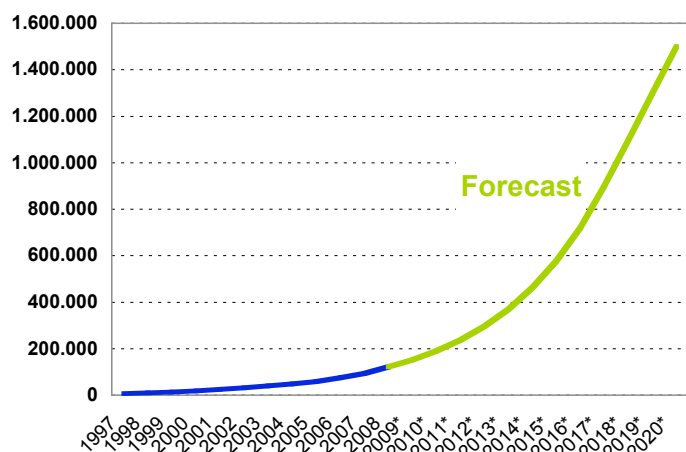
One fundamental advantage of wind energy is that it replaces expenditure on mostly imported fossil or nuclear energy resources by human capacities and labour. Wind energy utilisation creates many more jobs than centralised, non-renewable energy sources. The wind sector worldwide has become a major job generator: Within only three years, the wind sector worldwide almost doubled the number of jobs from 235'000 in 2005 to 440'000 in the year 2008. These 440'000 employees in the wind sector worldwide, most of them highly-skilled jobs, are contributing to the generation of 260 TWh of electricity.



Future prospects worldwide

Based on the experience and growth rates of the past years, WWEA expects that wind energy will continue its dynamic development also in the coming years. Although the short term impacts of the current finance crisis makes short-term predictions rather difficult, it can be expected that in the mid-term wind energy will rather attract more investors due to its low-risk character and the need for clean and reliable energy sources. More and more governments understand the manifold benefits of wind energy and are setting up favourable policies, including those that are stimulation decentralised investment by independent power producers, small and medium sized

World Wind Energy (MW)



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enterprises and community based projects, all of which will be main drivers for a more sustainable energy system also in the future.

Carefully calculating and taking into account some insecurity factors, wind energy will be able to contribute in the year 2020 at least 12 % of global electricity consumption. By the year 2020, at least 1'500'000 MW can be expected to be installed globally.

A recently published study by the Energy Watch Group reveals – as one out of four described scenarios – that by the year 2025 it is even likely to have 7'500'000 MW installed worldwide producing 16'400 TWh. All renewable energies together would exceed 50 % of the global electricity supply. As a result, wind energy, along with solar, would conquer a 50 % market share of new power plant installations worldwide by 2019. Global non-renewable power generation would peak in 2018 and could be phased out completely by 2037.

The creation of the International Renewable Energy Agency – which was founded in January 2009 – will act as a catalyst and further speed up the deployment rates of renewable energies: directly through providing know-how to its currently 76 member countries and through acting as a balancing lobby at international decision making processes such as the UN climate change negotiations.

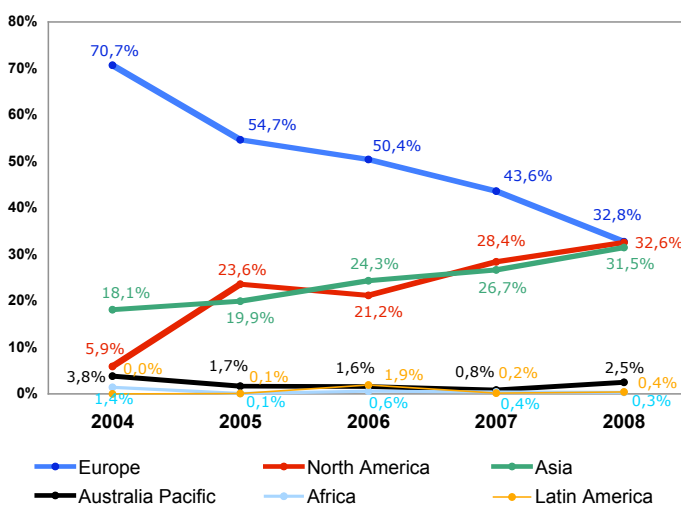
Offshore wind energy

By the end of the year 2008, 1'473 MW of wind turbines were in operation offshore, more than 99 % of it in Europe, representing slightly more than 1 % of the total installed wind turbine capacity. 350 MW were added offshore in 2008, equalling a growth rate of 30 %.

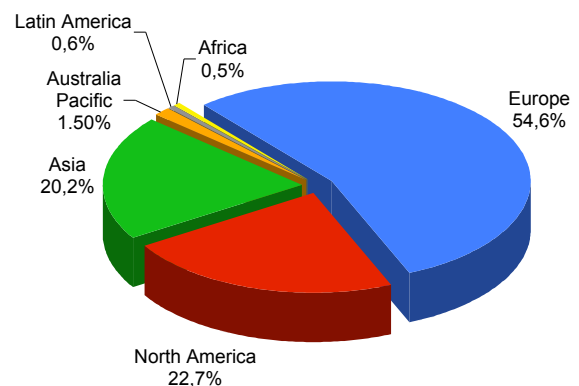
Continental distribution

In terms of continental distribution, a continuous diversification process can be watched as well: In general, the focus of the wind sector moves away from Europe to Asia and North

Continental Shares of New Installed Capacity (%)



Continental Shares of Total Installed Capacity 2008



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America. Europe decreased its share in total installed capacity from 65,5 % in 2006 to 61 % in the year 2007 further down to 54,6 % in 2008.

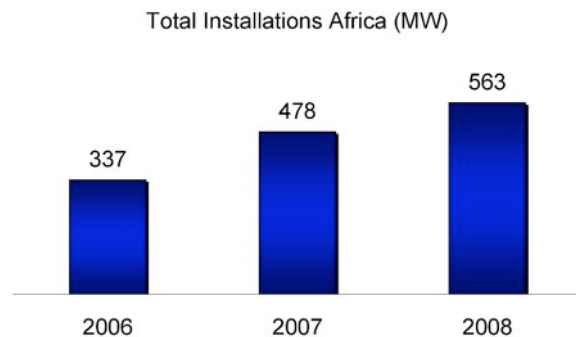
Only four years ago Europe dominated the world market with 70,7 % of the new capacity. In 2008 the continent lost this position and, for the first time, Europe (32,8 %), North America (32,6 %) and Asia (31,5 %) account for almost similar shares in new capacity. However, Europe is still the strongest continent while North America and Asia are increasing rapidly their shares.

The countries in Latin America and Africa counted for respectively only 0,6 % and 0,5 % of the total capacity and fell back in terms of new installations down to respectively only 0,4 % and 0,3 % of the additional capacity installed worldwide in the year 2008.

Africa

In spite of the huge potentials all over the continent, with world's best sites in the North and South of the continent, wind energy plays still a marginal role on the continent with 563 MW of total capacity.

Several major wind farms can be found in some of the North African countries like Morocco, Egypt or Tunisia. In the year 2009 and 2010, substantial increases can be expected from projects which are already in the development stage. However, so far, the emergence of domestic wind industry in African countries is only in a very early stage and donor organisations should put a special focus on the creation of markets which enable industries to emerge. However, it is interesting to see that companies from the region are showing an increasing interest and have started investing in the wind sector.



In Sub-Saharan Africa, the installation of the first wind farm in South Africa operated by an Independent Power Producer can be seen as a major breakthrough. The South African government prepares the introduction of a feed-in tariff which would create a real market, enable independent operators to invest and thus play a key role in tackling the country's power crisis.

In the mid-term, small, decentralised and stand-alone wind energy systems, in combination with other renewable energies, will be key technologies in rural electrification of huge parts of so far unserved areas of Africa. This process has only started at very few places and the main limiting factor is lack of access to know-how as well as financial resources.

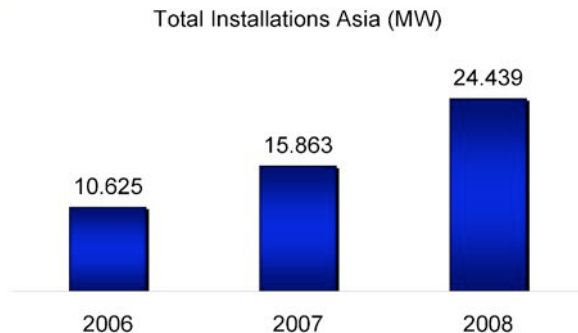
Asia

Asia – with the two leading wind countries China and India and 24'439 MW of installed capacity – is in a position of becoming the worldwide locomotive for the wind industry. China has again doubled its installations and Chinese domestic wind turbine manufacturers have started for the first time to export their products. It can be expected

that in the foreseeable future Chinese and Indian wind turbine manufacturers will be among the international top suppliers.

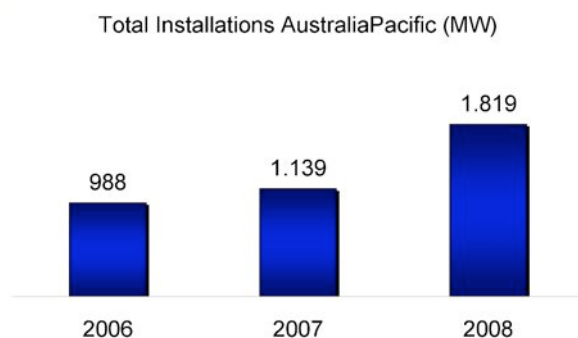
The Indian market has shown robust and stable growth in the year 2008. It has already a well-established wind industry which already plays a significant and increasing role on the world markets.

Further countries like South Korea (already with 45 % growth rate in 2008) start investing on a larger scale in wind energy and it can be observed that more and more companies are developing wind turbines and installing first prototypes. In parallel with the market growth in the country, it can be expected that also new manufacturers will be able to establish themselves. The World Wind Energy Conference held on Jeju island in June 2009 is expected to push the development in the region. Pakistan installed its first wind farm in the year 2008 and the Government of the country aims at further wind farms in the near future.



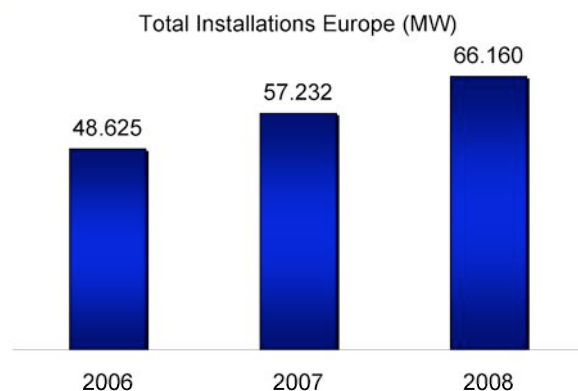
Australia and Oceania

The region showed encouraging growth rates, reaching 1'819 MW by the end of 2008, most of it thanks to Australia. Commitments made by the Australian government to increase their efforts in climate change mitigation and expansion of renewable energies create the expectation that the Australian wind energy market will show further robust growth also in the coming years. New Zealand, after a change in government, may, however, face major delay in its switch to renewable energy.



Europe

Europe lost its dominating role as new market but kept its leading position in terms of total installation with 66'160 MW. Germany and Spain maintained as leading markets, both showing stable growth. The most dynamic European markets were Ireland (adding 440 MW, 55 % growth) and Poland (196 MW added, 71 % growth), the first Eastern European country with a substantial wind deployment. All in all, the European wind sector showed almost stagnation with a very small increase in added capacity from 8'607 MW to 8'928 MW.



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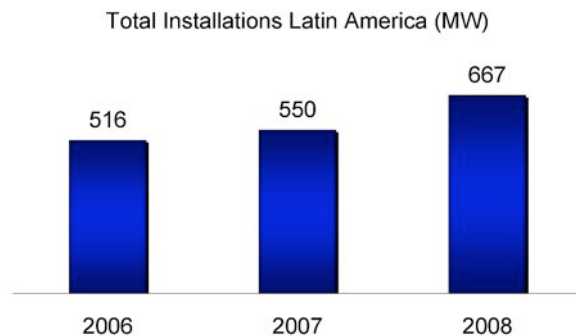
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The biggest market Germany is expected, after the amendment of the renewable energy law EEG, to show bigger market growth in 2009. An encouraging change happened in the UK where the government announced the introduction of a feed-in tariff for community based renewable energy projects. However, the cap of 5 MW represents a major hurdle so that the UK wind market will still grow at moderate rates. However, without additional incentives for wind power in more EU member states, such as improved feed-in legislation, the European Union may not be able to achieve its 2020 targets for renewable energy.

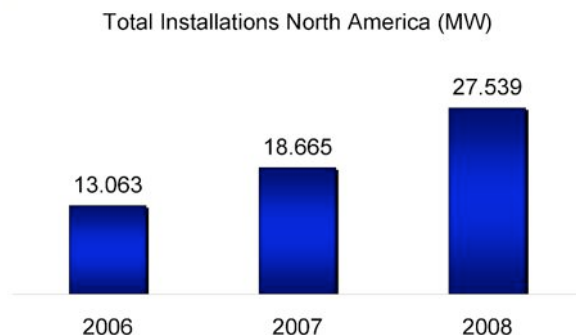
Latin America

Many Latin American markets still showed stagnation in the year 2008 and the overall installed capacity (667 MW) in the region accounts for only 0,5 % of the global capacity. Only Brazil and Uruguay installed major wind farms in the year 2008. This slow wind deployment is especially dangerous for the economic and social prospects of the region as in many countries people are already suffering from power shortages and sometimes do not have access to modern energy services at all. However, in some countries like Argentina, Brazil, Chile, Costa Rica or Mexico many projects are under construction thus putting lights in the forecast for 2009.



North America

North America showed very strong growth in the year 2008, more than doubling its capacity since 2006 to 27'539 MW. Breaking two world records, the USA became the new number one worldwide in terms of added as well as in terms of total capacity. More and more US states are establishing favourable legal frameworks for wind energy and try to attract investors in manufacturing facilities. It can be expected that the new Obama administration will improve substantially the political frameworks for wind power in the country, especially for those type of investors that have practically been excluded from the production tax credit scheme, like farmers, smaller companies or community based projects. The credit crunch, however, may lead to delays in project development in the short term.



The Canadian government has rather been hesitating. However, among the Canadian provinces Quebec and Ontario are showing increasing commitment towards an accelerated deployment of wind energy. During and after the World Wind Energy Conference *Community Power* held in Kingston/Ontario in June 2008, the Government of Ontario showed strong commitment to rapid expansion of renewable energy and is expected to present soon a proposal for a Green Energy Act, including feed-in tariffs for the different renewable energies including wind. In Quebec, contracts for new projects were signed for a total of 2'000 MW, the first to be operational by 2011.

| Position 2008 | Country | Total Capacity installed end 2008 | Added Capacity 2008 | Growth Rate 2008 | Position 2007 | Total Capacity installed end 2007 | Total Capacity installed end 2006 | Total Capacity installed end 2005 |
|---------------|-----------------|-----------------------------------|---------------------|------------------|---------------|-----------------------------------|-----------------------------------|-----------------------------------|
| | | [MW] | [MW] | [%] | | [MW] | [MW] | [MW] |
| 1 | USA | 25170,0 | 8351,2 | 49,7 | 2 | 16818,8 | 11603,0 | 9149,0 |
| 2 | Germany | 23902,8 | 1655,4 | 7,4 | 1 | 22247,4 | 20622,0 | 18427,5 |
| 3 | Spain | 16740,3 | 1595,2 | 10,5 | 3 | 15145,1 | 11630,0 | 10027,9 |
| 4 | China | 12210,0 | 6298,0 | 106,5 | 5 | 5912,0 | 2599,0 | 1266,0 |
| 5 | India | 9587,0 | 1737,0 | 22,1 | 4 | 7850,0 | 6270,0 | 4430,0 |
| 6 | Italy | 3736,0 | 1009,9 | 37,0 | 7 | 2726,1 | 2123,4 | 1718,3 |
| 7 | France | 3404,0 | 949,0 | 38,7 | 8 | 2455,0 | 1567,0 | 757,2 |
| 8 | United Kingdom | 3287,9 | 898,9 | 37,6 | 9 | 2389,0 | 1962,9 | 1353,0 |
| 9 | Denmark | 3160,0 | 35,0 | 1,1 | 6 | 3125,0 | 3136,0 | 3128,0 |
| 10 | Portugal | 2862,0 | 732,0 | 34,4 | 10 | 2130,0 | 1716,0 | 1022,0 |
| 11 | Canada | 2369,0 | 523,0 | 28,3 | 11 | 1846,0 | 1460,0 | 683,0 |
| 12 | The Netherlands | 2225,0 | 478,0 | 27,4 | 12 | 1747,0 | 1559,0 | 1224,0 |
| 13 | Japan | 1880,0 | 352,0 | 23,0 | 13 | 1528,0 | 1309,0 | 1040,0 |
| 14 | Australia | 1494,0 | 676,7 | 82,8 | 16 | 817,3 | 817,3 | 579,0 |
| 15 | Ireland | 1244,7 | 439,7 | 54,6 | 17 | 805,0 | 746,0 | 495,2 |
| 16 | Sweden | 1066,9 | 235,9 | 28,4 | 18 | 831,0 | 571,2 | 509,1 |
| 17 | Austria | 994,9 | 13,4 | 1,4 | 14 | 981,5 | 964,5 | 819,0 |
| 18 | Greece | 989,7 | 116,5 | 13,3 | 15 | 873,3 | 757,6 | 573,3 |
| 19 | Poland | 472,0 | 196,0 | 71,0 | 24 | 276,0 | 153,0 | 73,0 |
| 20 | Norway | 428,0 | 95,1 | 28,5 | 19 | 333,0 | 325,0 | 268,0 |
| 21 | Egypt | 390,0 | 80,0 | 25,8 | 21 | 310,0 | 230,0 | 145,0 |
| 22 | Belgium | 383,6 | 96,7 | 33,7 | 22 | 286,9 | 194,3 | 167,4 |
| 23 | Chinese Taipei | 358,2 | 78,3 | 28,0 | 23 | 279,9 | 187,7 | 103,7 |
| 24 | Brazil | 338,5 | 91,5 | 37,0 | 25 | 247,1 | 236,9 | 28,6 |
| 25 | Turkey | 333,4 | 126,6 | 61,2 | 26 | 206,8 | 64,6 | 20,1 |
| 26 | New Zealand | 325,3 | 3,5 | 1,1 | 20 | 321,8 | 171,0 | 168,2 |
| 27 | Korea (South) | 278,0 | 85,9 | 44,7 | 27 | 192,1 | 176,3 | 119,1 |
| 28 | Bulgaria | 157,5 | 100,6 | 176,7 | 33 | 56,9 | 36,0 | 14,0 |
| 29 | Czech Republic | 150,0 | 34,0 | 29,3 | 28 | 116,0 | 56,5 | 29,5 |
| 30 | Finland | 140,0 | 30,0 | 27,3 | 29 | 110,0 | 86,0 | 82,0 |
| 31 | Hungary | 127,0 | 62,0 | 95,4 | 35 | 65,0 | 60,9 | 17,5 |
| 32 | Morocco | 125,2 | 0,0 | 0,0 | 36 | 125,2 | 64,0 | 64,0 |
| 33 | Ukraine | 90,0 | 1,0 | 1,1 | 30 | 89,0 | 85,6 | 77,3 |
| 34 | Mexico | 85,0 | 0,0 | 0,0 | 31 | 85,0 | 84,0 | 2,2 |
| 35 | Iran | 82,0 | 15,5 | 23,3 | 34 | 66,5 | 47,4 | 31,6 |
| 36 | Estonia | 78,3 | 19,7 | 33,6 | 37 | 58,6 | 33,0 | 33,0 |
| 37 | Costa Rica | 74,0 | 0,0 | 0,0 | 32 | 74,0 | 74,0 | 71,0 |
| 38 | Lithuania | 54,4 | 2,1 | 4,0 | 38 | 52,3 | 55,0 | 7,0 |
| 39 | Luxembourg | 35,3 | 0,0 | 0,0 | 39 | 35,3 | 35,3 | 35,3 |
| 40 | Latvia | 30,0 | 2,6 | 9,5 | 41 | 27,4 | 27,4 | 27,4 |
| 41 | Argentina | 29,8 | 0,0 | 0,0 | 40 | 29,8 | 27,8 | 26,8 |
| 42 | Philippines | 25,2 | 0,0 | 0,0 | 42 | 25,2 | 25,2 | 25,2 |
| 43 | South Africa | 21,8 | 5,2 | 31,4 | 49 | 16,6 | 16,6 | 16,6 |
| 44 | Jamaica | 20,7 | 0,0 | 0,0 | 43 | 20,7 | 20,7 | 20,7 |
| 45 | Guadeloupe | 20,5 | 0,0 | 0,0 | 44 | 20,5 | 20,5 | 20,5 |
| 46 | Uruguay | 20,5 | 19,9 | 3308,3 | 68 | 0,6 | 0,2 | 0,2 |

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Membership Application

To join simply fill in and return this form by fax
+49 228 369 4084, or sign up online at www.wwindea.org

We/I agree to the five WWEA principles* and join WWEA as

* Available at www.wwindea.org

Ordinary member (association)

Membership fee: 1 % of the wind energy related annual budget based on the preceding year. The minimum fee is 100 €, the maximum 15'000 €

Scientific member (scientific institutions)

Membership fee: If headquartered in a non-OECD country 100 €; in an OECD country 500 €

Corporate member (commercial enterprise, public/governmental body)

Membership fee: Corporate members have to pay 0,1 % of their wind energy related annual turnover based on the preceding year. The minimum fee is 100 € (if headquartered in a non-OECD country); in an OECD country 1'000 €. The maximum fee is 15'000 €. Public bodies and similar organisations might apply for special regulations.

Individual member

Membership fee: 80 €**

** Does not apply to individuals related to wind energy organisations.

Membership fee = _____ €

Name/Organisation: _____

Address: _____

E-Mail: _____ Website: _____

Tel.: _____ Fax: _____

Place, Date: _____ Signature: _____

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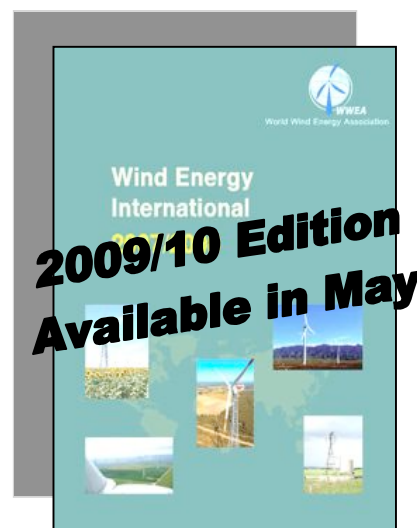
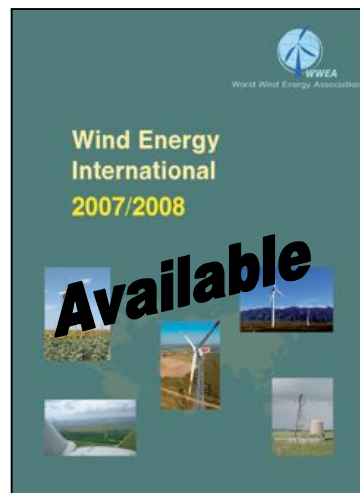
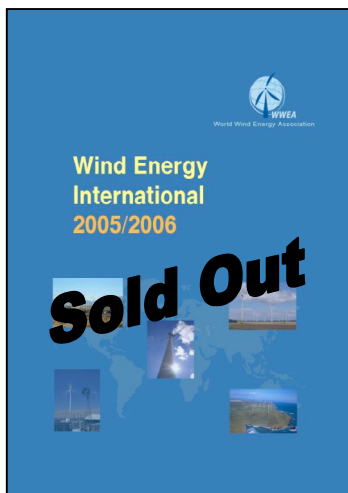
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Uniting the World of Wind Energy

For more in depth information on the use of wind energy internationally, WWEA will publish in May the third edition of the WWEA yearbook:

Wind Energy International 2009/2010

The book will provide latest information in two sections:

- 1) **Country Reports:** Examination of the wind energy situation in more than 80 countries around the world. Each Country Report covers the up-to-date status of wind energy in this country. This includes some basic information like wind conditions and the political and legal frameworks as well as the latest wind power capacity reckoned data.
- 2) **Special Reports:** The second section will contain more than 25 articles contributed by experts in their respective fields of wind energy. This section will cover
 - ⇒ **Policies**
 - ⇒ **Economies and Markets, Offshore**
 - ⇒ **Financing Issues**
 - ⇒ **Education and Training**
 - ⇒ **Integrating Renewable Energies**
 - ⇒ **Small Scaled Wind and Hybrid Systems**
 - ⇒ **Grid connected Systems and Wind Farms**
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