



**EWEA**

THE EUROPEAN WIND ENERGY ASSOCIATION



# Wind Energy - The Facts: Project funding and website

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2 July 2009  
Visby, Sweden

## CONTENTS

Intelligent Energy  Europe

IEE PROGRAMME



WIND ENERGY - THE FACTS PUBLICATION

<http://www>

WEBSITE

## INTELLIGENT ENERGY EUROPE (IEE) PROGRAMME

- **Wind Energy – The Facts:** IEE financed project of 2 years (01/11/07 - 31/10/09) that delivered the publication
- **IEE:** EU's funding tool to encourage the use of renewable energy sources and energy saving
- **Operational objectives:** improve sustainability, boost investment, remove non-technological barriers

## FUNDING AREAS 2009



### Energy efficiency

- < Buildings
- < Energy-efficient products



### Renewable energy sources

- < Electricity
- < Biofuels
- < Heating + cooling
- < Small-scale in buildings



### Mobility

- < Alternative fuels and clean vehicles
- < Energy-efficient transport
- < Capacity building in agencies


## INTELLIGENT ENERGY EUROPE (IEE) PROGRAMME in figures

- Budget:  
2007-13: €730 million
- Maximum funding rate: 75%
- Projects supported to date:  
400+ projects
- Number of beneficiaries:  
> 3,000


# IEE: CONVERT POLICY INTO ACTION



EU energy efficiency and renewables objectives

Intelligent Energy  Europe

- < Creating and spreading effective methods and best practice
- < Training and education
- < Know-how transfer
- < Market intelligence
- < Inform policy development and implementation



Real changes on the ground

€730 million from 2007-13

## IEE: PROMOTION AND DISSEMINATION PROJECTS

- help deliver the key EU climate change and energy objectives
- match the priorities of the IEE Work Programme
- involve at least 3 partners from different countries
- take 2-3 years to deliver
- are NOT “hardware” type investments or research & development projects.



## EACI/IEE



More information available at:

[http://ec.europa.eu/energy/intelligent/contact/index\\_en.htm](http://ec.europa.eu/energy/intelligent/contact/index_en.htm)



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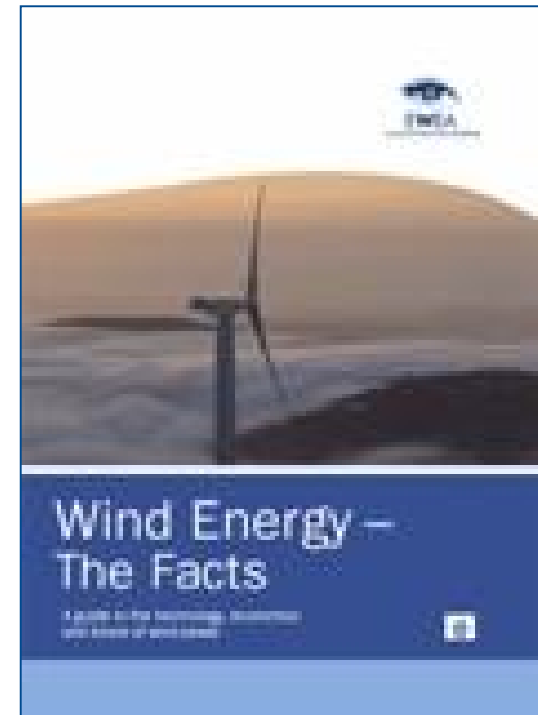


WIND FACTS WEBSITE



## WIND ENERGY – THE FACTS PUBLICATION

- The most important wind energy reference in the world
- Detailed overview of the wind energy sector
- Prepared by a consortium of leading experts from different sectors all over Europe
- 2<sup>nd</sup> year: dissemination workshops





## WIND ENERGY – THE FACTS VOLUMES

- I. Technology
- II. Grid Integration
- III. The Economics of Wind Power
- IV. Industry and Markets
- V. Environment
- VI. Scenarios and Targets

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IEE PROGRAMME



WIND ENERGY - THE FACTS PUBLICATION

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WEBSITE

WEBSITE: [WWW.WINDFACTS.EU](http://www.wind-energy-the-facts.eu)

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**THEFACTS**

Home / About the project - Windows Internet Explorer

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# Wind Energy THE FACTS

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How to order?

Wind Energy - The Facts (WindFacts) is a European project financed by the Intelligent Energy - Europe programme of the Executive Agency for Competitiveness and Innovation that runs from November 2007 to October 2009.

The 'Wind Energy - The Facts' publication is widely considered to be the most important wind energy reference in the world. It presents a detailed overview of the wind energy sector, with the most up-to-date and in-depth information on the essential issues concerning wind power today.

This new edition (March 2009) of the 'Wind Energy - The Facts' publication includes chapters on:

- [Technology](#) (Download as PDF 3.5MB)
- [Grid integration](#) (Download as PDF 1.5MB)
- [The economics of wind](#) (Download as PDF 505KB)
- [Industry and markets](#) (Download as PDF 404KB)
- [Environmental impacts](#) (Download as PDF 1.7MB)
- [Scenarios and targets](#) (Download as PDF 1.5MB)

These have been prepared by a consortium of [leading experts](#) from different sectors all over Europe.

The second year of the project is dedicated to the updates on the website and to the organisation of a dissemination campaign through 5 [workshops](#) in [France](#), [Hungary](#), [Latvia](#), [Romania](#) and [Sweden](#).

Wind Energy - The Facts is implemented by a [consortium](#) led by the European Wind Energy Association ([EWEA](#)).

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# SUMMARIES


# WINDENERGY THEFACTS

The screenshot shows a Mozilla Firefox browser window displaying the 'Executive Summary' page of the 'Wind Energy THE FACTS' website. The browser's address bar shows the URL: <http://www.wind-energy-the-facts.org/en/executive-summary/>. The website header features a large image of a wind turbine with the text 'Wind Energy THE FACTS' overlaid. Below the header is a navigation menu with tabs for TECHNOLOGY, GRID INTEGRATION, ECONOMICS, INDUSTRY & MARKETS, ENVIRONMENT, and SCENARIOS & TARGETS. A search bar is located below the navigation menu. The main content area is divided into several sections: a 'Home' section with links to Executive Summary, Factsheets, Myths, and Satisfaction questionnaire; a 'MAIN PUBLICATION :' section with links to TECHNOLOGY, GRID INTEGRATION, ECONOMICS, INDUSTRY & MARKETS, ENVIRONMENT, and SCENARIOS & TARGETS; an 'APPENDIX' section with links to ABBREVIATIONS, GLOSSARY, REFERENCES, EVENTS, and Downloads; and a 'How to order?' section. On the right side of the main content area, there is a breadcrumb trail 'Home > Executive Summary' and a list of language flags (UK, FR, ES, DE, IT, NL, PT, PL, CZ, SK, SI, HU, RO, BG, GR, CY, EL, EN, DA, SE, NO, FI, SV, IS, LU, PT, ES, FR, DE, NL, BE, IT, UK) followed by a list of links: Executive Summary, Executive Summary, Foreword, Acknowledgements, Part I: Technology, Part II: Grid Integration, Part III: Economics, Part IV: Industry and Markets, Part V: Environment, and Part VI: Scenarios and Targets. At the bottom of the page, there are logos for 'coordinated by EWEA' and 'supported by Intelligent Energy Europe'. A disclaimer at the bottom right states: 'The sole responsibility for the content of this webpage lies with the authors. It does not necessarily reflect the opinion of the European Communities. The European Commission is not...'. The browser's status bar at the bottom left shows 'Done'.

Alternative drive train configurations - Windows Internet Explorer

http://www.wind-energy-the-facts.org/en/part-i-technology/chapter-3-wind-turbine-technology/current-developments/alternative-drive-train-configurations.html


Alternative drive train configurations



Source: Clipper

Clipper Wind (Figure 3.33) manufactures 2.5 MW wind turbines, with a hybrid drive train of very distinctive design. After initial research into systems with multiple induction generators, Clipper developed a system with an innovative gearbox with outputs to four PMGs. As with other hybrids, this again leads to a very compact drive train.

**Figure 3.34: 5 MW Multibrid Wind Turbine**



Source: Multibrid

Prokon Nord Energiesysteme GmbH, based in Leer, acquired the previous Multibrid company in 2003. The prototype M5000 (Figure 3.34) was installed in Bremerhaven, and commissioned in 2005. The Multibrid technology was subsequently acquired by Areva in June 2008.

Distinctive features of the M5000 include a highly compact integrated slow rotating drive system, comprising a single main bearing (no main shaft), a single-stage gearbox and a medium speed PMG (53 -147rpm). With a tower head mass of 310 tonnes, the M5000 is apparently the lightest wind turbine rated around 5 MW.

**OTHER DRIVE TRAIN DEVELOPMENTS**

Hydraulic components have figured in drive train design for some time in motors, brakes, fluid couplings or torque limiting systems. Hydraulic drives comprising pump(s) and motor(s) for main power transmission were employed in the unsuccessful Bendix 3 MW prototype of the early 1990s, but this design route was not pursued. Key problems were inadequate capacity

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# DOWNLOADS

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The screenshot shows a Mozilla Firefox browser window displaying the 'Downloads' page of the 'Wind Energy THE FACTS' website. The browser's address bar shows the URL: <http://www.wind-energy-the-facts.org/en/downloads.html>. The website header features a banner image of a wind turbine with the text 'Wind Energy THE FACTS'. Below the banner is a navigation menu with tabs for TECHNOLOGY, GRID INTEGRATION, ECONOMICS, INDUSTRY & MARKETS, ENVIRONMENT, and SCENARIOS & TARGETS. A search bar is located below the navigation menu. The main content area is titled 'Home » Downloads' and contains the following text: 'Under this section you can download: Full pdf version of the Executive summary (Right click the link and select "Save as")'. Below this text are two lists of links. The first list provides links for the Executive Summary in various languages: French, German, English, Hungarian, Latvian, and Romanian. The second list provides links for the full pdf version of the Wind Energy - The Facts publication, broken down into five volumes: Volume 1 (Technology), Volume 2 (Grid Integration), Volume 3 (Economics), Volume 4 (Industry & Market), and Volume 5 (Environment). The left sidebar contains a 'Home' menu with links to Executive Summary, Factsheets, Myths, and Satisfaction questionnaire. Below this is a 'MAIN PUBLICATION:' section with a list of categories: TECHNOLOGY, GRID INTEGRATION, ECONOMICS, INDUSTRY & MARKETS, ENVIRONMENT, and SCENARIOS & TARGETS. Further down is an 'APPENDIX' section with links to ABBREVIATIONS, GLOSSARY, REFERENCES, EVENTS, and Downloads. At the bottom of the sidebar is a 'How to order?' link. The footer of the website includes 'coordinated by' (EWEA logo) and 'supported by' (Intelligent Energy Europe logo). A disclaimer at the bottom right states: 'The sole responsibility for the content of this webpage lies with the authors. It does not necessarily reflect the opinion of the European Communities. The European Commission is not...'.

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# EXAMPLE VOLUME

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Home / About the project Chapter3.pdf (application/pdf Obj\_...)

17 / 62 79.7%

Source: EWIA

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Figure III.2.2: Total offshore wind power installed by the end of 2007

Country	Percentage	Power (MW)
Denmark	39%	409
United Kingdom	37%	404
Sweden	12%	133
Netherlands	10%	108
Ireland	2%	29
2006 and 2007	-	100

Source: EWIA

Investment costs per MW range from a low of €1.2 million/MW (Middelgrunden) to €2.7 million/MW (Robin Rigg) (Figure III.2.3).

The higher offshore capital costs are due to the larger structures and the complex logistics of installing the towers. The costs of offshore foundations, construction, installations and grid connection are significantly higher than for onshore. For example, offshore turbines are generally 20 per cent more expensive and towers and foundations cost more than 2.5 times the price of those for a similar onshore project.

In general, the costs of offshore capacity have increased in recent years, as is the case for land-based turbines, and these increases are only partly reflected in the costs shown in Figure III.2.3. As a result, the average costs of future offshore farms are expected to be higher. On average, investment costs for a new offshore wind farm are expected to be in the range of €2.0–2.2 million/MW for a near-shore, shallow-water facility.

To illustrate the economics of offshore wind turbines in more detail, the two largest Danish offshore wind farms can be taken as examples. The Horns Rev project, located approximately 15 km off the west coast of Jutland (west of Esbjerg), was finished in 2002. It is equipped with 80 machines of 2MW, with a total capacity of 160 MW. The Nysted offshore wind farm is located south of the isle of Lolland. It consists of 72 turbines of 2.3 MW and has a total capacity of 165 MW. Both wind farms have their own on-site transformer stations,

2006 and 100 MW in 2007 were added, and from Sweden with the installation of Lilgrunden in 2007.

Table III.2.7 gives information on some of the recently established offshore wind farms. As shown, the chosen turbine size for offshore wind farms ranges from 2 to 3.6 MW, with the newer wind farms being equipped with the larger turbines. The size of the wind farms also vary substantially, from the fairly small Samsø wind farm of 23 MW to Robin Rigg, the world's largest offshore wind farm, with a rated capacity of 180 MW.

Table III.2.1: Installed offshore capacity in offshore wind countries

Done

# EXAMPLE SUMMARY

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http://www.wind-energy-the-facts.org/pdf/1565\_ExSum\_ENG.pdf

Part VI: Scenarios and Targets

The European Commission's 1997 White Paper on renewable sources of energy set the goal of doubling the share of renewable energy in the EU's energy mix from 6 to 12 per cent by 2010. It included a target of 40,000 MW of wind power in the EU by 2010, producing 80 TWh of electricity and saving 72 million tonnes (Mt) of CO<sub>2</sub> emissions per year. The 40,000 MW target was reached in 2006.

Since 1990, the European Commission has changed its baseline scenario five times. Over the 17-year period, targets for wind energy in 2010 and 2020 have been increased almost tenfold, from 8000 MW to 71,000 MW (2010) and from 12,000 MW to 120,000 MW (2020) in the European Commission's latest baseline scenario from 2008.

Under the Reference (REF) case, wind energy's share of electricity demand will reach 5.2 per cent in 2010, 14.3 per cent in 2020 and 28.2 per cent in 2030 (see Table S.6).

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Figure S.10: EWEA's three wind power scenarios (in GW)

Year	Low (GW)	Reference (REF) (GW)	High (GW)	Total (GW)
2007	1.1	95.5	0.0	96.6
2010	1.1	78.5	0.0	79.6
2015	1.1	124.5	0.0	125.6
2020	1.1	180	0.0	181.1
2025	1.1	229.2	0.0	230.3
2030	1.1	300	88.9	390

Sources: EWEA (2008a)

Somewhat surprising, the baseline scenario from 2008 gives significantly lower figures for wind energy than the baseline scenario from 2006. The 71,000 MW projection for 2010 implies that the wind energy market in Europe will decrease by approximately 50 per cent over the next three years with respect to the present market. In light of the current market achievements, growth trends and independent market analyses, the European Commission's baseline scenario seems out of touch with current reality and clearly underestimates the sector's prospects in the longer

Table S.6: Wind power's share of EU electricity demand

Done

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## CONCLUSION

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