

# Vestas and the Wind Turbine Market

Skriftlig eksamen efter 1. Semester/

Written re-exam after 1<sup>st</sup>. semester

Virksomhedens Salgsgrundlag/

The basis for the company's sale

5th February 2010

08.30 – 14.30

*Dette opgavesæt består af 4 opgaver, der indgår i bedømmelsen af den samlede opgavebesvarelse med følgende vejledende vægtning.*

*This exam case consist of 4 assignments carrying the following weights in the total assessment of the paper*

Opgave/Assignment 1:	15%
Opgave/Assignment 2:	40%
Opgave/Assignment 3:	25%
Opgave/Assignment 4:	20%

**You are expected to include methodological considerations in your paper/**

**I besvarelsen forventes det, at du inddrager metodemæssige overvejelser.**

## Assignments: (In Danish below)

### Assignment 1 (15%)

A Spanish tool manufacturer from Madrid has sent an offer to VESTAS A/S for nuts.

The offer was to be accepted at the latest on 30th November.

The Spanish manufacturer received an acceptance of the offer from VESTAS A/S on 15th November, but subject to a 15 % price reduction.

1.1 Has a binding agreement been made? Justify your answer legally.

The Spanish tool manufacturer in Madrid has also sent an offer to VESTAS A/S for tools with an acceptance period until 25th November.

On 17th November the tool manufacturer received a rejection of the offer from VESTAS A/S.

After further consideration VESTAS A/S, however, did regret the rejection of the offer and hurried to accept the initial offer, and the acceptance reached the Spanish tool producer on 24th November.

1.2 Has a binding agreement been made? Justify your answer legally.

VESTAS A/S is considering placing an advertisement in several European professional magazines with the following text: "Our wind turbines are cheaper as well as of better quality than the wind turbines of our competitors in Europe". The names of the competitors are mentioned later in the text.

1.3 Describe and analyze the legal problem and estimate whether the advertisement in question is in accordance with current rules.

### Assignment 2 (40%)

2.1 Please analyze and assess the current and future competitive situation on the global market for wind turbines and Vestas' position on the market

### Assignment 3 (25%)

3.1 Based on the development on the global market for wind turbines please discuss Vestas choice of Supply Chain

### Assignment 4 (20%)

Vestas has analyzed the cost of producing a huge number of wind turbines. Resources are spent on research and development, part components are being outsourced, market research is being made etc.

Before a new wind turbine model is released for sale potential revenue and costs are being examined.

For model "Conqueror" the following data has been obtained:

Market situation: market research shows that the demand is estimated at totally 7,000 turbines at a price of 3,600 EUR.

Cost situation:

Value-chain function	Total costs for Conqueror
Research and development	2.500.000 EUR
Design	950.000 EUR
Manufacturing (70% has been outsourced to sub-suppliers)	8.000.000 EUR
Marketing	1.800.000 EUR
Distribution	1.400.000 EUR
Customer service	1.950.000 EUR
<b>Total costs during product lifetime</b>	<b>16.600.000 EUR</b>

The management wants an increase of 40 % of sales. This is to cover the costs in connection with the company's other fixed costs, taxes and surplus.

Your task is to answer the following questions.

4.1 Show by means of a calculation if the new product should be released for sale.

The engineers in the production department think that the 70% in production costs may be decreased to 50% by negotiating with the sub-suppliers, alternatively by finding other sub-suppliers.

4.2 Which effects will this have on the decision in question 4.1. Show the consequences by means of calculations.

A new process technology has as a result that by investing 220.000 EUR it will be able to reduce the non-outsourced production costs by 25%.

4.3 Use calculations to show if this investment in new process technology changes the decision in question 4.2. Give reasons for your answer.

4.4 Account briefly for any other circumstances that may influence the decision.

### **Opgave 1 (15%)**

En spansk værktøjsproducent fra Madrid havde sendt et tilbud til VESTAS A/S på møtrikker.

Iflg. tilbuddet skulle det accepteres senest den 30. november.

Den spanske producent modtog den 15. november en accept af tilbuddet fra VESTAS A/S, dog under forudsætning af, at der blev givet 15 % i prisreduktion.

1.1 Er der indgået en bindende aftale mellem parterne? Besvarelsen skal begrundes juridisk.

Den spanske værktøjsproducent i Madrid fremsendte også et tilbud til VESTAS A/S på værktøj med acceptfrist den 25. november .

Den 17. november modtog værktøjsproducenten et afslag fra VESTAS A/S på dette tilbud.

Efter nærmere overvejelser fortrød VESTAS A/S imidlertid sit afslag og skyndte sig at acceptere det oprindelige tilbud, og accepten nåede frem til den spanske værktøjsproducent den 24. november.

1.2 Er der indgået en bindende aftale mellem parterne. Besvarelsen skal begrundes juridisk.

VESTAS A/S overvejer at indrykke en stor annonce i flere europæiske fagblade med bl.a. følgende tekst: "Vores vindmøller er både billigere og af bedre kvalitet end vores konkurrenters i Europa ". Konkurrenterne nævnes senere i annoncen med navn.

1.3 Du bedes redegøre for den juridiske problemstilling og vurdere om den pågældende annoncering er i overensstemmelse med gældende regler.

### **Opgave 2 (40%)**

2.1 Du bedes analysere og vurdere den nuværende og fremtidige konkurrencesituation på det globale marked for vindmøller, samt Vestas position på markedet.

### **Opgave 3 (25%)**

3.1 Du bedes diskutere Vestas valg af Supply Chain på baggrund af udviklingen på det globale vindmølle marked.

## Opgave 4 (20%)

Vestas A/S har analyseret omkostningerne ved produktion af en lang række vind turbiner. Der bruges resourcer til forskning og udvikling, delkomponenter outsources, markedsføringsundersøgelser laves etc.

Før en ny vindturbinemodel frigives til salg skal undersøges indtægts- og omkostningsforhold. For model "Conqueror" er fremskaffet følgende data.

Markedsforhold: Nogle markedsundersøgelser fastslår at efterspørgslen vurderes i alt til 7.000 stk. a 3.600 EUR.

Omkostningsforhold:

Værdikæde funktion	Omkostninger i alt for Conqueror
Forskning og udvikling	2.500.000 EUR
Design	950.000 EUR
Produktion (70% er outsourcet til underleverandører)	8.000.000 EUR
Marketing	1.800.000 EUR
Distribution	1.400.000 EUR
Kundeservice	1.950.000 EUR
<b>Total omkostningen i produktlevetiden</b>	<b>16.600.000 EUR</b>

Ledelsen ønsker en indtjening på 40% af salget. Dette skal dække omkostninger til virksomhedens øvrige faste omkostninger, skat og overskud.

Din opgave er at svare på følgende spørgsmål.

4.1 Vis ved en beregning om det nye produkt skal frigives til salg.

Ingeniørerne i produktionsafdelingen mener at de 70% i produktionsomkostninger kan nedbringes til 50% ved at forhandle med underleverandørerne alternativt finde andre underleverandører.

4.2 Hvilken indflydelse får det på beslutningen i spørgsmål 4.1? Vis konsekvens ved beregning

En ny procesteknologi medfører at ved at investere 220.000 EUR vil det kunne reducere de ikke-outsourcete produktionsomkostninger med 25%.

4.3 Vis ved beregninger om denne investering i ny procesteknologi ændrer beslutningen i spørgsmål 4.2. Begrund.

4.4 Redegør kort for hvilke andre forhold der har indflydelse på beslutningen.

## Vestas Wind Systems A/S



### Vestas – No. 1 in Modern Energy<sup>1</sup>

Vestas is the world leader in delivering Modern Energy. Vestas have already installed over 39,000 wind turbines in 63 countries on five continents. In 2008, Vestas installed a new turbine every three hours worldwide, generating more than 60 million MWh a year, enough power to provide electricity for every household in a country the size of Spain with its population of 45 million. That is why Vestas is No. 1 in Modern Energy.

### The energy challenge

We are facing a global energy challenge: the demand for energy is rising and conventional energy resources are declining. At the same time, the use of fossil fuels threatens the climate. Therefore, the world is re-thinking its energy future. No other source of energy can match wind power – from both financial and environmental perspectives – so there is good reason to believe that wind power will be given a key role to play in the energy mix of the future.

### Why Modern Energy?

Wind power is clean, independent, it can be installed very quickly, and the price is both predictable and competitive. In other words, it is the appropriate response to the challenges we are facing. That is why we at Vestas call it Modern Energy.

### About Vestas

Vestas' core business comprises the development, manufacture, sale and maintenance of wind technology that uses the energy of the wind to generate electricity.

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<sup>1</sup> Source: [www.vesta.com](http://www.vesta.com)

Our expertise in Modern Energy covers more than just wind turbines. We specialise in planning, installation, operation and maintenance. Our competencies cover everything from site studies to service and maintenance.

As a strong, independent partner, Vestas can supply guidance to customers in connection with the development, financing and ownership of wind power projects. However, we never participate directly in these activities. On the contrary, Vestas is the independent system supplier.

Vestas is distinguished by a high degree of vertical integration. By manufacturing the principal parts of the turbine itself, we increase the flexibility of our product development, reduce dependence on suppliers, and maintain a high level of manufacturing know-how. At the same time, production and sourcing are carried out as close to the market as possible.

In 2008, Vestas opened the world's largest research and development centre for wind energy in Aarhus, Denmark which will house more than 900 employees.

Vestas' vision is Wind, Oil and Gas. With these words, we strive to make wind an energy source on a par with conventional energy sources such as oil and gas.

Wind power is modern energy because it is financially competitive, predictable, independent, fast and clean. Based on its No. 1 in Modern Energy strategy, Vestas intends to build the world's strongest energy brand. To achieve that, Vestas must, as a "pure play" spokesperson for the industry, consolidate its market leadership position, the foundation of which was established in 1979 when Vestas sold its first wind turbine. Consistent with this strategy, Vestas aims to maintain strong growth, building a far more effective and substantially more profitable organisation over the coming years. To strengthen its competitive power, Vestas is currently investing heavily in new capacity in China and the USA, as the long-term goal is to supply "North America from the USA", "Europe from Europe" and "Asia from Asia". Investments in organic growth will amount to at least EUR 2.9bn for 2005-2010.

In China, Vestas expects to open its own foundry in Xuzhou near Shanghai in November this year, whilst the US manufacturing units will be completed during the spring of 2010. Vestas will then become the only wind turbine manufacturer with its own foundry in China, and Vestas will have annual output capacity of 3,000 MW in the USA by the end of 2010, which contributes to securing Vestas' competitiveness and margin as well as securing the US customers the lowest Cost of Energy.

To Vestas, being No. 1 means being the best. Vestas should manufacture the best and most reliable turbines, Vestas should be the most effective wind turbine manufacturer, Vestas should have the greenest production, Vestas should maintain the best customer and supplier relations in the industry, and Vestas should be the most valuable wind turbine manufacturer. To ensure effective financial management and resource planning, Vestas has, since 2006, gradually rolled out the ERP system SAP in all of its sales business units, Group Staff functions, Vestas Technology R&D and Vestas People & Culture. The SAP system will be fully implemented in all of the above-mentioned units by the end of 2009.

Vestas has five core areas of focus: research and development (R&D), manufacturing, construction, sales and service.

In the late 1800s, Vestas was established as a manufacturer of agricultural equipment. In 1978, on the brink of the second oil crisis, Vestas began to explore the potential of wind turbines as an alternative, clean, renewable energy source. One year later, the company developed and sold its first wind turbine. By the 1980s, the wind industry began to flourish and Vestas built its first large wind turbine plant in Lem, Denmark.

### **Company location logic**

While Vestas helped develop the wind market in Denmark in the 1980s, the company also began to expand its market share in the U.S., eventually spurring the need for U.S. operations. Currently, Vestas has U.S. offices in Portland, Houston, Chicago, Boston, as well as Windsor, Brighton and Pueblo, Colorado. The company's U.S. operations include sales and distribution, in addition to R&D and manufacturing.

Vestas' initial U.S. office was established in Tehachapi, California. As the company started to grow in the early 1990s, Portland emerged as a logical site for relocation. Portland serves as the company's North American headquarters for sales, service and training. Roby Roberts, senior vice president of government relations at Vestas-American Wind Technology, Inc. highlights the advantages of Portland's location:

"The local and state governments are interested and supportive of the wind industry here. Utilities have also been supportive. There are many wind sales offices here, so Portland has become the hub of the Northwest wind industry. Additionally, it's easy to find the talent that we need in Portland."

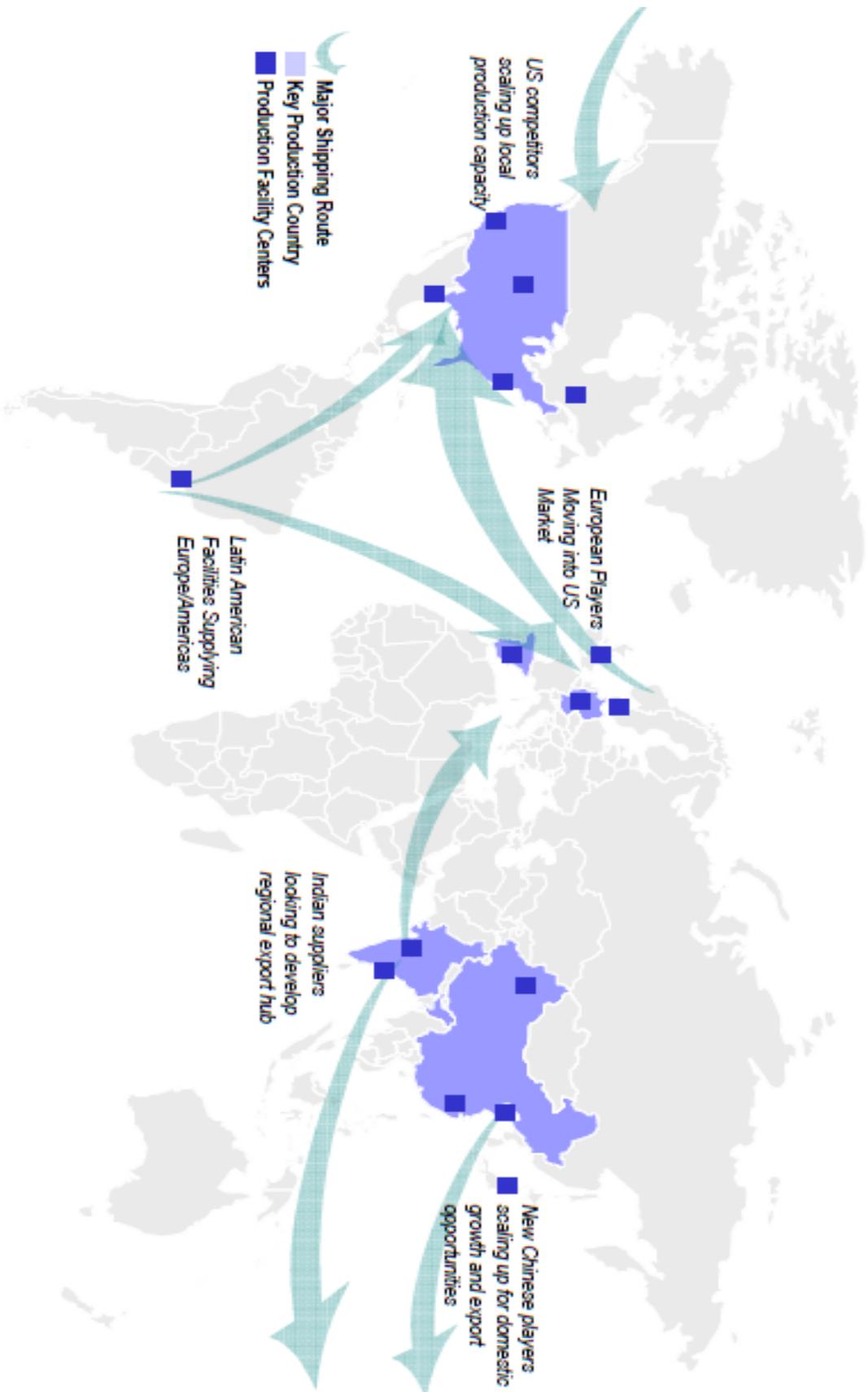
Chicago is home to the company's purchasing office, which leads the company's supply chain efforts. Roberts explains the advantage of Chicago's proximity to the manufacturing heartlands of the U.S.: "For supply chain activities, this is where you want to be. Wind is the new generation of manufacturing in this country."

The company has R&D offices in Houston and Boston. Roberts notes that Houston offers skilled talent with energy expertise and a university skilled in research that can support the industry. In addition, Houston is located in the middle of the wind belt.

Vestas recently completed the construction of its first blade manufacturing plant in Brighton, Colorado. The company has committed to building a wind tower factory in Pueblo, Colorado, as well as a nacelle (a structure that houses the generating components) factory, training center and second blade factory in Brighton. Roberts details why Colorado stands out as a vital location in terms of logistics:

"Colorado is a transportation hub, which is important when you're moving something so big like wind turbines. Colorado has a great location to rail as well as highway systems that are connected to major wind markets. The state has encouraging policies towards renewable energy, a well-trained workforce and supportive universities."

## Exhibit: Global Wind Turbine Flow Overview



Source: Emerging Energy Research

## Company size and structure<sup>2</sup>

Vestas has 35,000 wind turbines installed in 63 countries across five continents. The company employs 20,000 workers worldwide. More than 1,500 of the company's employees are located in the U.S, with over 1,000 workers at Vestas Americas and 650 workers employed at the Vestas Blades plant in Windsor, Colorado. Although the company is Danish at its core, Denmark currently accounts for less than one percent of the company's sales.

## Relationships with partners in the value chain

Vestas works with subsuppliers that manufacture components to the company's customized specifications and design. The company uses the components to manufacture wind turbines in their own factories. Most of the company's suppliers are based in Europe, although it also has a few U.S. suppliers. Vestas recently announced supply deals with two U.S. manufacturers including Hexcel, a Colorado-based composite manufacturer for wind turbine blades and Cardinal Fastener & Specialty Co., an Ohio-based bolt manufacturer for wind turbines. Roberts describes why the U.S. supply chain will likely develop within the next few years:

"Because of the boom and bust of the wind market, the U.S. does not have a mature supply chain. As the big wind manufacturing companies such as Vestas, GE, Mitsubishi and Gamesa start to bring more manufacturing here, you will see the supply chain become increasingly important. We are working on getting manufacturers to locate here and create components for our turbines. We have a purchasing office in Chicago that dedicated to making this a priority. The idea is to get the manufacturers as close as possible to the markets."

The company's only U.S. manufacturing presence is its Vestas Blades plant in Windsor, Colorado. Roberts explains that with the growing stability of renewable energy policies in the U.S., domestic manufacturing is likely to grow:

"The market has never been one you could really trust and hasn't been stable enough until recently. If you can't predict what the market is going to look like, how can you build manufacturing facilities?"

"The wind market in the U.S. has never really had a ten-year run. In 1999, we had 1,000 megawatts (MW) of wind energy, which dropped to 100 MW in 2001 because the Renewable Energy Production Tax Credit (PTC) expired. Last year, we had 8,500 MW, which is a third bigger than we've ever had."

"Because the current administration has important policy signals, we're not going to see a huge drop in our manufacturing. The glory days of wind are still ahead of us. Manufacturing for clean energy is the future and is what we as an industry need to mature in order to drag prices down and become competitive."

The vast majority of Vestas' customers are developers, ranging from small to large companies. The company also sells its turbines to utilities and independent power producers who buy wind energy and resell it. Vestas typically contracts out construction, gravel and road companies to assist with the production of their projects.

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<sup>2</sup> Source: Environmental Defense Fund [www.edf.org](http://www.edf.org)

## **Immediate plans**

Although sales have slowed as a result of the current economic situation, Vestas has not yet had any layoffs. If the current economic trends continue, the company will consider ramping down production and hiring. Roberts expects short-term business to be slow but believes that in the long-term, the U.S. will be one of the world's largest clean energy markets:

"Vestas has seen a slowing down due to the credit crunch. Our fuel is capital. We have to pay for everything upfront. When the capital market falls apart, things become very difficult. However, even though there's been a drop in business, the stimulus package has many of the things we need to put together a long-term energy plan."

Vestas is preparing itself for future growth and continues to build new factories and hire workers. The company is building a new blades factory in Brighton, Colorado, which will employ 650 workers by 2010, a nacelle factory to employ 700 workers, an R&D facility to employ 100 workers, and a wind tower facility in Pueblo, Colorado, with 500 workers.

## **Top opportunities for future growth**

Vestas expects that wind will account for 10 percent of the world's energy mix in the next five to ten years, up from 1.5 percent in 2009. European wind markets are already reasonably mature but are expected to continue to grow. China, India and the U.S. will be important future markets for wind energy.

Vestas sees the U.S. as a market particularly well suited for robust growth. In a May 2008 report that outlines the potential future of the wind industry, the U.S. Environmental Protection Agency found that the U.S. has the wind capabilities to provide 20 percent of electricity generation by 2030.

Roberts notes that the U.S. economy is currently based on high-carbon levels and inefficient energy use, and is shifting to a low-carbon and efficient use of energy, a shift that will change the way energy is produced. According to Roberts, all the pieces are moving in the right direction in the U.S. to develop a long-term commitment to renewable energy:

"The stimulus package includes a long-term Renewable Energy Production Tax Credit. President Obama suggested a 25 percent wind standard. Congress is working on addressing transmission issues. These steps are critical to providing insight as to what the U.S. wind market will look like in the future. Ultimately this will be a long-term driver for our industry."

## **Top requirements to capitalize on opportunities**

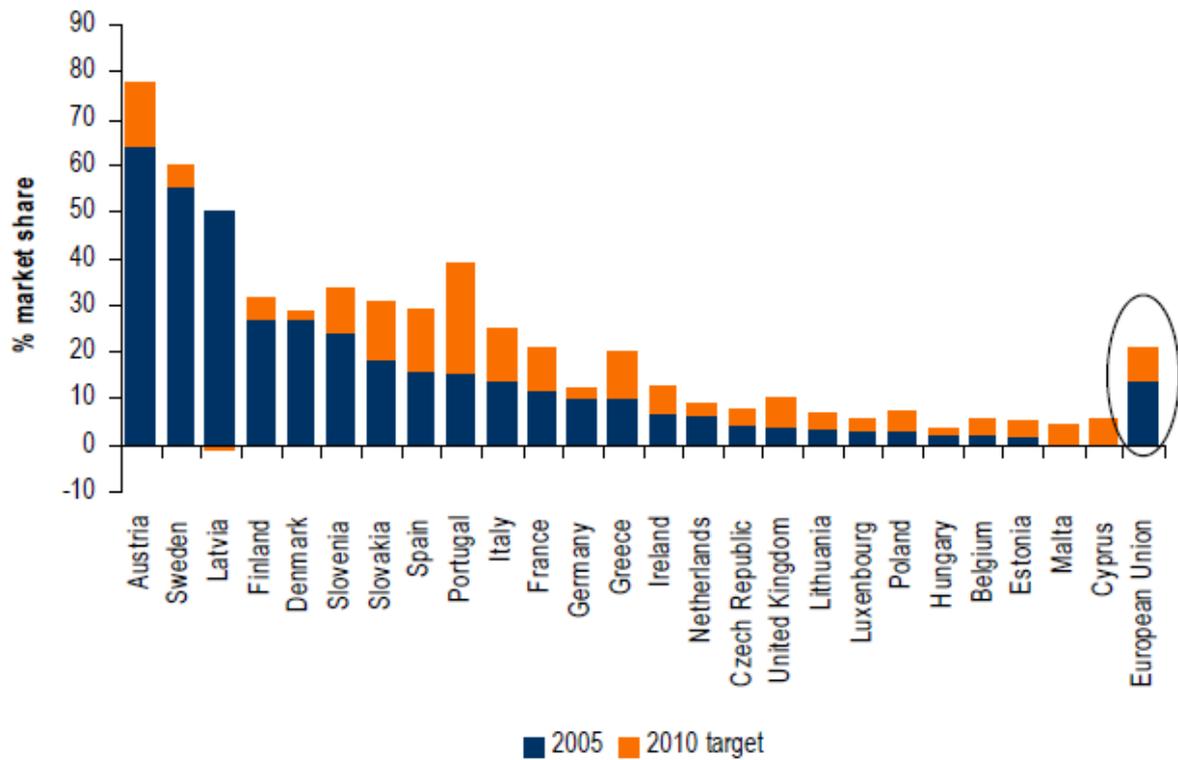
For the wind industry to grow robustly, Roberts believes that a long-term climate policy is critical. Clear economic signals will help Vestas capitalize on future opportunities for growth. In addition, the wind industry would benefit from more access to capital and an increase in government funding for clean technology R&D.

Roberts notes that with the projected growth in wind energy, there is an immediate need to improve the current infrastructure:

"We need more advanced transmission and generation systems including smart grids, the electrification of the transportation system, and battery technology. We need to quit planning and start doing. We have to get started today."

Encl. 1<sup>3</sup>

Table 1 Market Share of renewable energy as % of electricity consumption



Source: EU

<sup>3</sup> US Energy Information Administration. [www.eia.doe.gov](http://www.eia.doe.gov)

- **Availability and existing relationships**

In current tight markets, availability remains crucial and also therefore the strength of existing relationships between wind turbine manufacturers and developers. Although most developers do intensive due diligence on a list of potential turbines that are best suited to a particular wind site and regulatory regime, in the current environment what determines their choice ultimately from a list of suitable turbines is the waiting time for a new turbine. The greater incidence of framework agreements across the industry means that developers are now booking capacity out well in advance and are typically tied by a multi year agreement to one manufacturer.

**Table 9: Major turbine supply contracts and agreements (2006)**

Buyer	Manufacturer	Date	Size
Invenergy	GE Wind	24-Oct-06	600MW
HLC	Suzlon	16-Oct-06	225MW
FPL Energy	Clipper Wind	13-Oct-06	1050MW
Iberdrola	Gamesa Eolica	05-Oct-06	2700MW
China Longyuan	Gamesa Eolica	04-Oct-06	250MW
Pacific Corp	Vestas	02-Oct-06	140MW
BP Plc	Clipper Wind	14-Jul-06	2250MW
Airtricity	GE Wind	30-Jun-06	500MW
Babcock & Brown	Mitsubishi Heavy Industries	09-Jun-06	443MW
Shell Wind Energy	Gamesa Eolica	07-Jun-06	264MW
EDF EN	Repower systems	24-May-06	280MW
Hong Kong construction	Vestas	30-Mar-06	238MW

Source: New Energy finance

- **Track record on reliability and efficiency stays central**

Larger contracts with fewer and more sophisticated customers have changed the dynamics of the industry. Developers are placing large sized orders with turbine manufacturers and sharing the commissioning/installation risks but in return are insisting on far tighter commercial terms. The turbine manufacturers with strong track records and robust balance sheets are therefore best placed. One of the problems Clipper wind power has had with its turbine has been that without an established track record in different wind regimes, several developers are unwilling to take the risk particularly as its balance sheet is less robust than larger peers.

## Wind turbine generators: a very concentrated group of companies

**Vestas:** Very clearly the market leader, market share increased from 27.6% in 2005 to 28.2% in 2006. Present as a top three supplier in all ten of the largest markets and market leader in the UK and Portugal. Importantly has a strong product offering in offshore markets which should position it well in the medium-long term.

Table 10: Vestas- the leader in major markets

	Total MW installed 2006	Suppliers in leading markets		
		No 1	No 2	No 3
USA	2,454	GE Wind	Vestas	Siemens
Germany	2,233	Enercon	Vestas	REPower
India	1,840	Suzlon	Enercon	Vestas
China	1,334	Goldwind	Vestas	Gamesa
Spain	1,587	Gamesa	Acciona	Vestas
France	810	Nordex	Vestas	REPower
Canada	776	GE Wind	Vestas	Enercon
UK	631	Vestas	Siemens	REPower
Portugal	629	Vestas	Gamesa	Enercon
Italy	417	Gamesa	Vestas	Enercon

Source: BTM consult

**Gamesa:** Gamesa increased its market share from 12.8% to 15.6% of the market in 2006. It was the leading supplier in Spain with 50.6% of the market share. It was also the leading supplier in Italy and several smaller markets, Egypt, Mexico and Morocco. Gamesa is expanding capacity in the US and China which are set to be important growth markets.

**GE Wind:** GE Wind is the third largest wind turbine manufacturer in the world but its market share slipped from 17.5% to 15.5% in 2006. It is the largest supplier to the US and Canadian markets and its fortunes are very linked to these two markets. GE will face fierce competition for market share from new entrants to its markets and without a high level of vertical integration, it also looks disadvantaged in the near – medium term.

**Enercon:** Privately held German manufacturer with a market share of 15.4% in 2006 compared to 14.2% in 2005. Enercon is the number one supplier to German markets and second largest supplier to Indian markets.

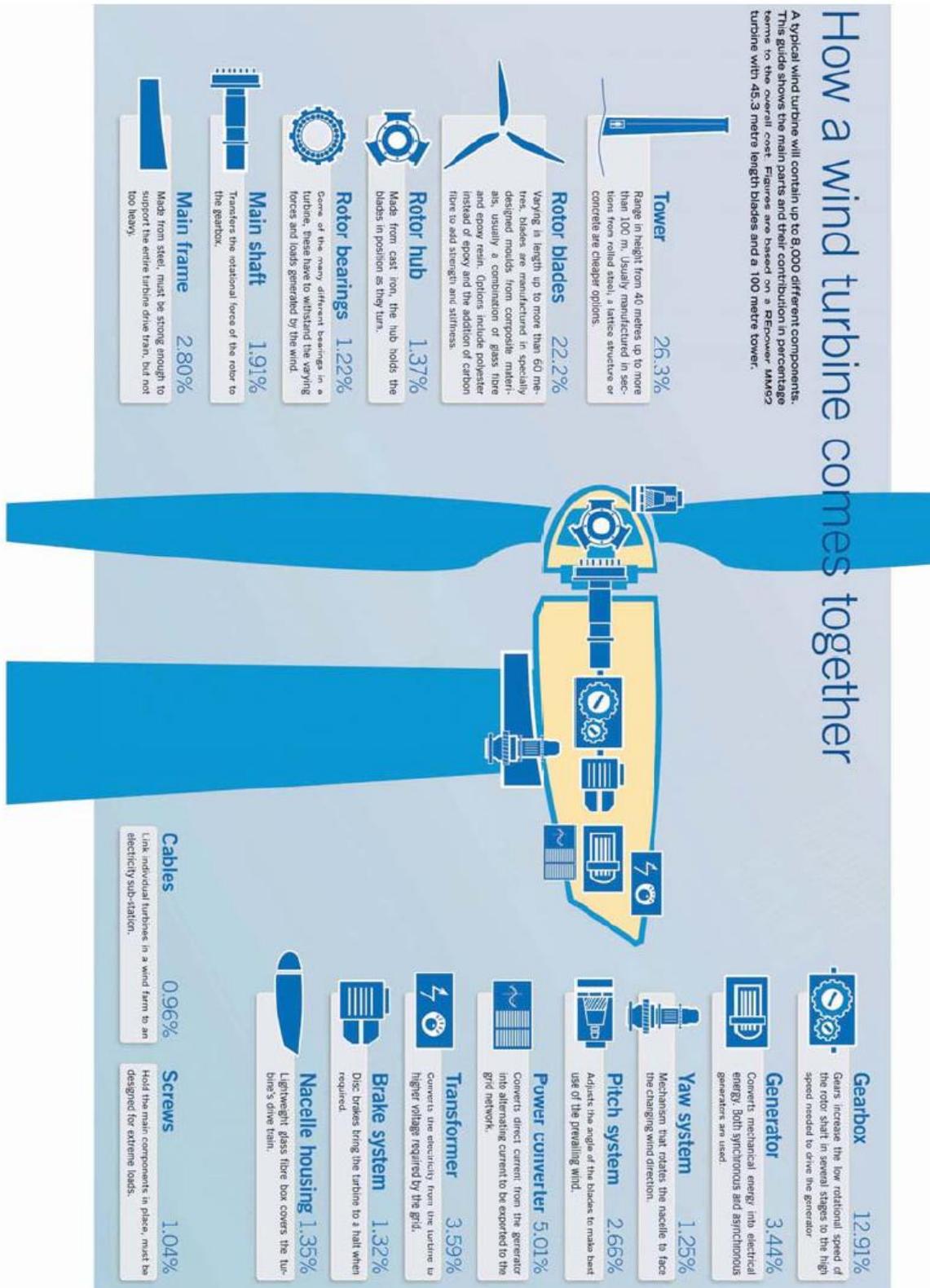
**Suzlon Energy:** In fifth position globally in 2006 with market share increasing from 6.1% to 7.7%. Suzlon has the largest market share in its home market and established footholds in the US and China. Like GE its fortunes are linked to its domestic market and we see Suzlon with a considerable advantage on its home turf. A 50% market share in India looks defensible to 2011 and in addition with the acquisition of REPower, the company now has access to new offshore and repowering markets in Europe.

**Siemens Wind:** Sixth largest manufacturer in the world with market share increasing from 5.4% to 7.3% in 2006. Strong position in burgeoning offshore markets.

**Clipper Energy:** We expect Clipper to challenge GE for market leader status in US markets by 2011.

**Nordex:** Germany remains a core market but also France, China and the UK all represent important growth markets for the company.

Encl. 2<sup>4</sup>



<sup>4</sup> www.globalwindday.org

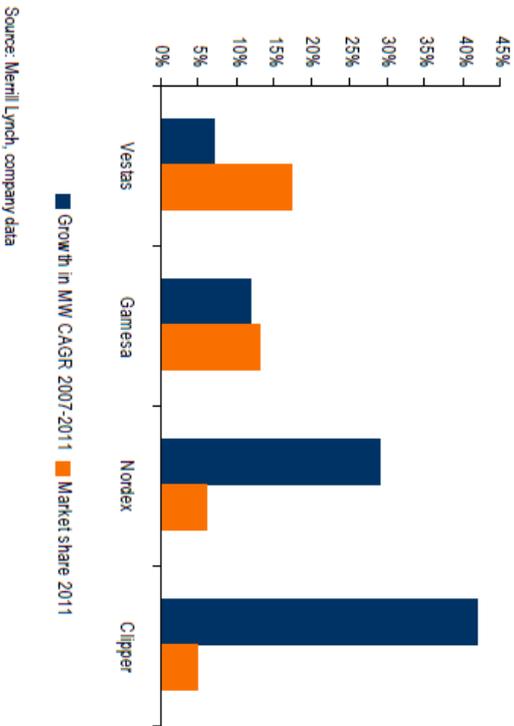
Encl. 3

Table 11: Top 10 companies supplied 95% of new turbines in 2006

	Accumulated MW 2005	Supplied MW 2006	Share 2006 %	Accumulated MW 2006	Share accumulated %
Vestas	20,766	4,239	28%	25,006	34%
Gamesa	7,912	2,346	16%	10,259	14%
GE Wind	7,370	2,326	15%	9,696	13%
Enercon	8,685	2,316	15%	11,001	15%
Suzlon	1,485	1,157	8%	2,641	4%
Siemens	4,502	1,103	7%	5,605	8%
Nordex	2,704	505	3%	3,209	4%
Repower	1,522	480	3%	2,002	3%
Acciona	372	426	3%	798	1%
Goldwind	211	416	3%	627	1%
Others	6,578	689	5%	7,267	10%
<b>Total</b>	<b>62107</b>	<b>16003</b>		<b>78111</b>	

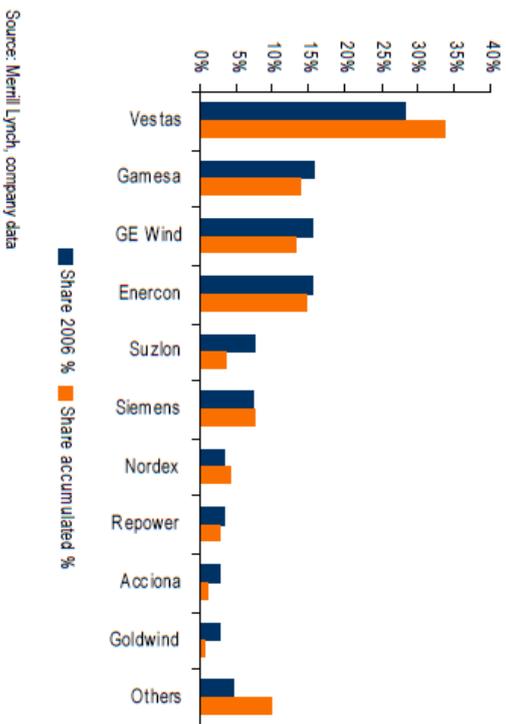
Source: Merrill Lynch, BTM consult

Chart 23: Vestas' market share will decline but should retain industry leading position



Source: Merrill Lynch, company data

Chart 24: Vestas' 2006 market share position was 12% points ahead of Gamesa



Source: Merrill Lynch, company data

Encl. 4<sup>5</sup>

## Wind Turbine Market Opportunities

For the last ten years world wide wind turbine sales have grown approximately 29% annually. Wind power is now the world's fastest growing source of energy. For the next twenty years it is expected to expand at double-digit rates. In 2008, 25,000 megawatts (MW) of turbines were installed bringing world wide capacity to 120,000 MW. Modern wind turbines are selling for around \$1.5 million per MW. At the price, over \$100 billion in wind turbine technology is expected to be sold in 2013.

The US Dept. of Energy, the American Wind Energy Association the National Renewable Energy Laboratory and President Bush's administration believe that 20% of the nation's electricity can come from renewable wind energy within the next twenty years. This would result in cumulative wind turbine sales of over \$250 billion. In Denmark, wind energy already produces 20% of its national grid. The European Wind Energy Association (EWEA) has set a target to increase electricity supplies in Europe with wind energy from 3% today to 23% by 2030 and believes that eventually 50% of the European grid can be supplied by wind energy.

Wind energy growth is being driven by numerous factors; not least of which is the realization that oil and natural gas supplies are peaking while demand continues to rise. The reality of global warming and pollution caused by the use of oil and coal will continue to drive higher the price of these supply options as governments lessen the subsidies hidden in their use. Most hydropower locations were fully exploited long ago. Nuclear power is a very expensive way to produce power. The supply of uranium is limited, and it has widespread opposition because of its risk for terrorist attack or use, and its radioactive pollution problems. So the world's focus is on clean renewable resources, of which wind energy is the most competitive.

One of the most compelling reasons why wind turbines are expected to continue their strong growth rate for decades to come is that their cost per kWh of energy produced is expected to be the cheapest source of energy. Already wind energy is cheaper than new sources of conventional sources such as coal in a growing number of regions. In the future, as costs rise for carbon based energy sources and efficiencies improve, wind energy will not need subsidies to compete.

WHI's Windstar turbines promise to be among the lowest cost wind energy producers. They are the only turbine that can be mass manufactured from blades to gearboxes to the steel rotor. They can be made in existing fabrication facilities in most countries around the world. They use off-the-shelf components. They are shipped in forty foot land-sea containers. They can be installed for half the cost of horizontal axis turbines. They are cheaper to maintain and repair because their key parts are at ground level and easy to obtain. They should last 30 plus years.

Around the world, governments are taking action to advance renewable energy, especially wind. Many states in the US have adopted a Renewable Energy Portfolio requirement that forces utilities to increase the percentage of their electrical power supply that comes from renewable resources. Wind energy is the cheapest of the options. More and more governments are providing incentives such as the 1.9 cents per kilowatt-hour Production Tax Credit in the U.S. An international trading program has begun on carbon and renewable energy credits, providing another source of support for wind energy. As natural gas, oil and coal prices increase and as the impacts of global warming drive political will, governments will find more ways to help shift energy supplies to renewable sources,

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<sup>5</sup> [www.windarvest.com](http://www.windarvest.com)

with wind being the most advanced and least expensive alternative.

Businesses are realizing that their customers care about global warming, pollution and renewable energy. Many "green" businesses, even major corporations, are investing in wind energy through the purchase of carbon and renewable energy credits (RECs). Some are buying wind turbines or photovoltaics themselves, both for the marketing benefits and the long-term financial returns. As energy prices rise, green businesses will find it profitable to invest directly into the ownership of Windstar turbines either within wind farms or on their own properties, especially as this increases customer loyalty and sales. The biggest driving force in this market will be that ownership of Windstar turbines can realize the purchaser a reasonable profit as well as providing them a source of RECs.

More investments by government and business are being made in improving the storage of energy provided by intermittent wind and solar-based sources. Hydrogen fuel cells, pump storage projects, compressed air generators, ultracapacitor batteries, new transmission grid connectivity, integration with hydropower and gas turbines and other efforts increase the availability and reliability of wind energy and will expand the its use where and when it is needed. Present technological trends will likely lead to a long-term future where wind provides 40% or more of the primary power resources for the world. Windstar turbines could be instrumental in providing a significant percentage of that output.

**2009 is shaping up to be the global wind turbine industry's most challenging year.** Never has there been more at stake as more players than ever vie for orders in a market that has quickly turned from a seller's to a buyer's market. While global wind installations in 2009 will struggle to match 2008's record, a strong rebound is anticipated after 2010 with wind plant investment expected to reach \$50 billion annually by 2015. Strategic decisions made now—from sales tactics to new product rollouts—will have far-reaching implications as recovery pushes the market to almost 40 GW added in 2011 and 60 GW by 2020. Intense market share competition will ensue in the near-term as oversupply and increasing global competition shift market power to the buyers.

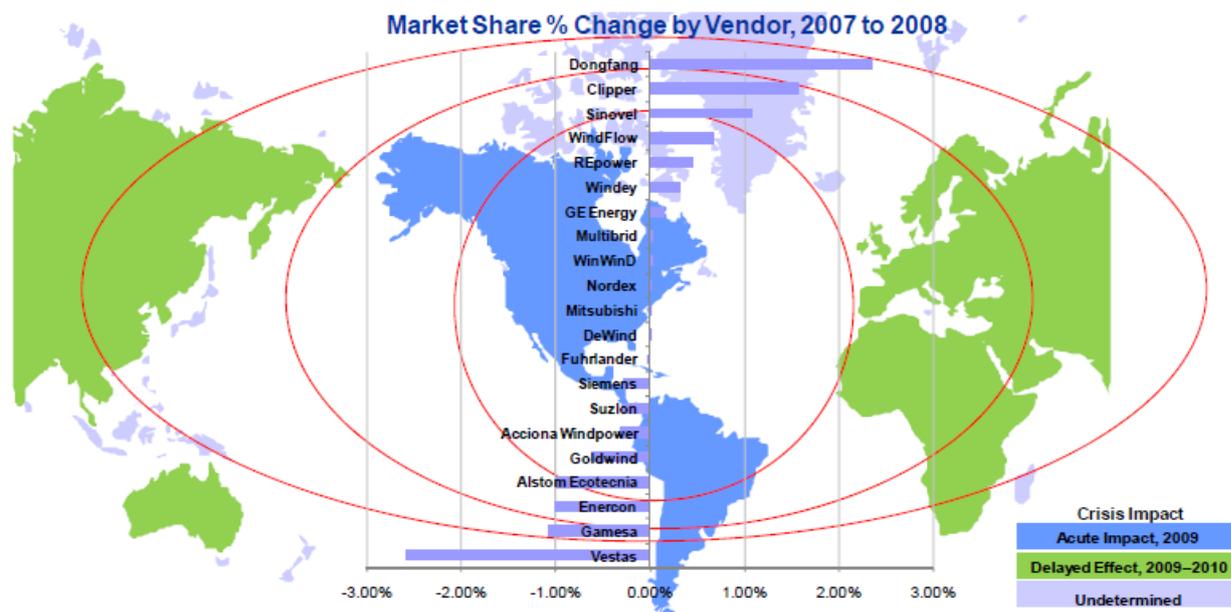
EER's new market study, *Global Wind Turbine Markets and Strategies, 2009-2020*, provides the most comprehensive analysis available of global wind turbine markets, including the strategies of leading turbine manufacturers, the competitive positioning of these players in the global market, and the challenges they face going forward.

*How are wind turbine OEM's handling the shift from a buyer's to a seller's market? How has the market changed, how will it change, and what are the strategies to navigate these uncharted waters. Who will challenge the top six and who will be well-positioned for recovery?*

Key trends highlighted in EER's study include:

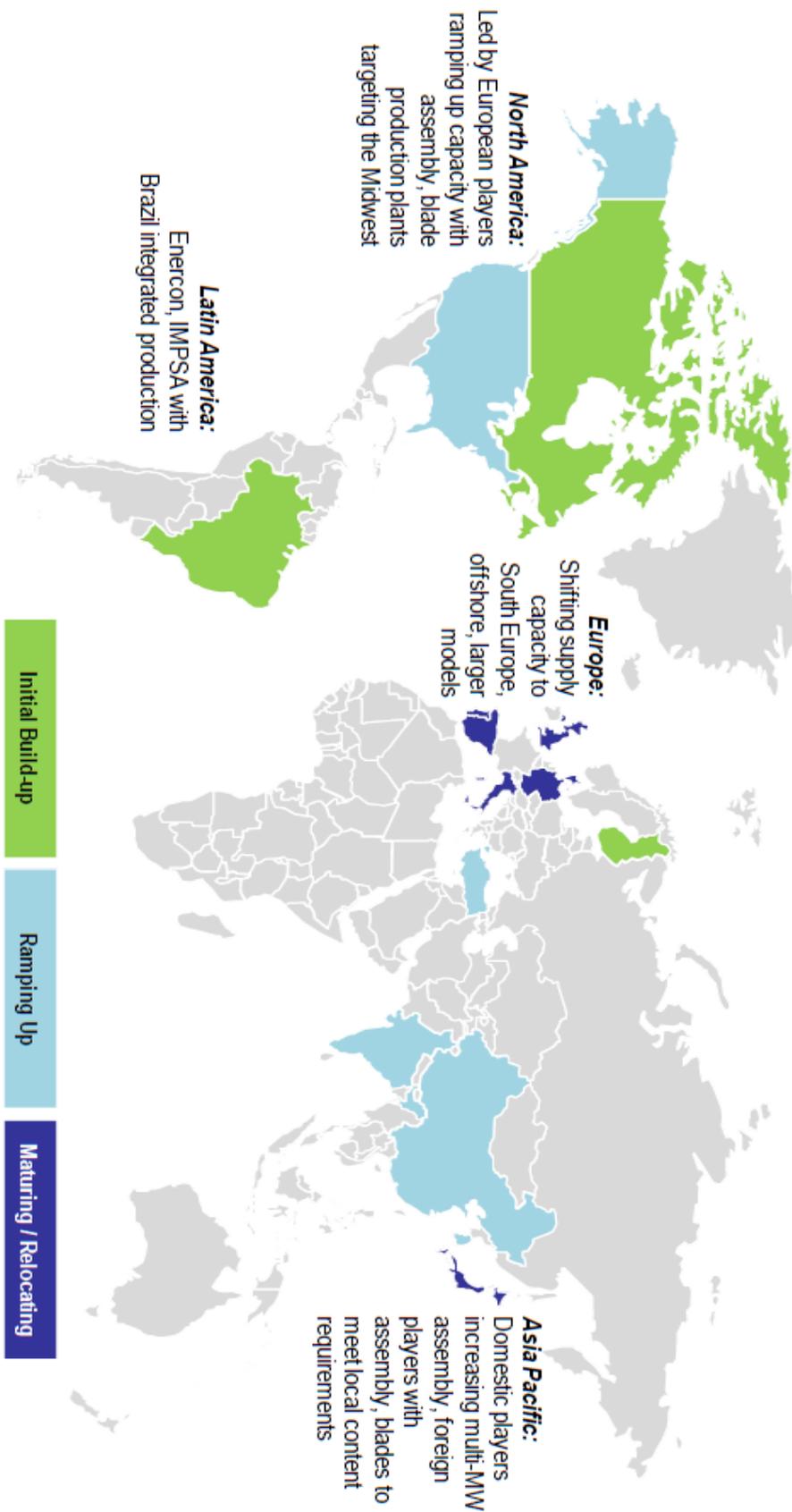
- **Suppliers positioning long term, post-crisis:** Global vendors continue to invest in new capacity in key growth centers such as the US and China, despite near term drops in utilization, signaling confidence in steady order intake from 2010 onward.
- **Ensuing dogfight for market share to shape supplier strategies.** Putting component shortages in the past, an increase in new entrants and a consolidating developer market points to a tight market for landing strategic frame agreements, and steady order flow.
- **Competition shifts to 2.5 – 4 MW segment:** Multi-megawatt competition to further intensify as Vestas, Siemens, Enercon, GE, Repower battle it out in developed European, North American, and offshore markets with increasingly proven, larger turbines.

**Exhibit: Wind Turbine Market Share, 2007 to 2008**



Source: Emerging Energy Research

*Exhibit: Global Turbine Manufacturing Trends Overview by Region*



Source: Emerging Energy Research

Encl. 5<sup>7</sup> Article from the Danish news paper Berlingske Tidende;

## **China increases the pressure on Vestas**

**The Chinese upstarts in the windmill industry are now going directly for the throats of Vestas and Ditlev Engel.**

By Søren Springborg

Chinese windmill producers have in obscurity developed offshore windmills, which in capacity clearly surpass the newest mills from Vestas and Siemens Wind Power.

Consequently the Chinese have a strong position in the technological race having been triggered off after the Prime Minister of Great Britain last week put names to the energy companies that are to be in charge of the erection of nine offshore parks in Great Britain towards 2020. Offshore parks, that amount to aggregate capital expenditure of more than 800 billion DKK.

With the prospect of offshore projects in Great Britain of 3 digit billion amounts - and a number of other huge offshore projects in the melting pot in Europe, China and the US, the forecast is for competition storms for the windmill companies in the years ahead.

»So far the case has been that there have in actual fact only been two windmill producers of huge offshore mills - i.e. Vestas and Siemens. But there can be no doubt at all that now there will be even more focus on the off-shore market. Also from the Chinese who have the will to go very far. Neither Vestas nor Siemens have succeeded in erecting offshore mills in China. Only Chinese producers have.

They really do have a very big home market at which they can gain experience«, says Birger T. Madsen, managing director in BTM Consult - one of the world's leading consultancies within the windmill sector.

### **Giga mill in record time**

The Chinese windmill producer Dongfang Turbine has indeed developed an offshore mill of five megawatt in record time. The company published this information in a press release last week. The mill, which surpasses the biggest Vestas mill by more than one third in capacity, will be developed in co-operation with American companies and be ready for erection already in 2012: »Dongfang has aggressive plans of entering the global market for windmills with front line technologies«, were the

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<sup>7</sup>Berlingske Tidende 130110

words from Dongfang's chief engineer, Wang Wei Min, in a press release last week.

At Vestas, that so far has been in charge of app.50 per cent of the offshore mills, erected in the global market, they keep an eye on the development in Asia: »We should not underestimate what comes from among others China, but also from South Korea, where huge industrial companies such as Hyundai, Samsung and Daewoo have their focus on the offshore market. However, we have been participating from the very start and we find that this experience speaks in our favour«, says Michael Holm, communications manager in Vestas.

### **Buying experience**

Experience is, however, also something that you can buy. Indian Suzlon with global headquarters in Århus, in 2009 took over the full control of German Repower. Not least Repower's newly developed 5MW offshore mills - the largest fully developed mill at a global level - were attractive for Suzlon to get hold of.

China's largest windmill producer, Sinovel, is going to erect an offshore windmill park at half a billion DKK near Shanghai.

A windmill park with three megawatt mills to be erected in partnership with the American technology company Superconductor.

»Of course the competition in the offshore area will be keener in the years to come. It would be naïve to think otherwise. But since we have been among the first comers to the market, we have experience and it is our firm impression that this experience is being appreciated among the operators«, says Henrik Stiesdal, head of technology in Siemens Wind Power.

Encl. 6 <sup>9</sup> Article from the Danish news paper Jyllands Posten;

## **The challenges are piling up for Vestas in 2010**

Already before Vestas has presented the 2009 figures, there is focus on the 2010 results. The reason is that Vestas needs orders – many orders, Sydbank points out.

By MICHAEL STENVEI

2009 was in no way a year of jubilee for the windmill industry and 2010 does not look to become an easy year either.

Especially not for Vestas, that has to storm over the steppes in order to reach all goals.

»It is a fact that Vestas lacks orders. That is apparent to every body. Vestas must have many orders in 2010 in order to fulfil their own expectations«, says Jacob Pedersen, senior analyst in Sydbank.

### **Awaited in Suspense**

Just like thousands of investors, people within the industry, experts and analysts he is anxiously awaiting the publication of the 2009 accounts, which Vestas' managing director Ditlev Engel will present in four weeks in London.

Even though it is still uncertain whether Vestas has come ashore with a record turnover of 54 billion DKK in 2009, the clock is already ticking alarmingly highly.

Sydbank has calculated on the 2010 challenge for Vestas in light of the volume of orders most recently disclosed, the 2009 expectations, and the goal of selling windmills in the current year at, at best 60 billion DKK.

The result is that Vestas just about has to carpet bomb the Stock Exchange with information of new orders in order for the exercise to be successful.

### **100 megawatt a week**

According to Jacob Pedersen's calculations Vestas will have to inform the Stock Exchange of orders for 100 megawatt (MW) every week.

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<sup>9</sup> JyllandsPosten 150110

At the same time the company has to execute minor windmill orders that the Stock Exchange is not being informed about, through the year of a total of 15 billion DKK. If they succeed Vestas will in all probability leave 2010 with sales of app. 56 billion DKK, which lies within the expectations.

»But then the Vestas' management has a wide open and empty order book at the end of 2010«, says Jacob Pedersen.

This should be compared to the fact that at the start of 2009 Vestas had orders booked of totally 39 billion DKK.

Since then it has been downhill and culminated at the presentation of the latest quarterly financial statement in October, showing that the order book had shrunk to 26 billion DKK.

»It is a fact that Vestas lacks orders.

That is apparent to everybody. Vestas must receive many orders in 2010 in order to be able to fulfil their own expectations«.

Encl. 7<sup>11</sup>

## Dongfang Turbine. (One of Vestas competitors.)

Relying on its own technological strength and wide co-operation with international partners, Dongfang Turbine Works has become one of the leading power equipment producers in China. Located in Deyang, Sichuan Province, the company is one of the top three turbine manufacturers in China. It is also one of the top 100 machinery builders in the country and a key equipment provider in Sichuan Province. The company was founded in 1966. After nearly four decades of development, Dongfang has now grown into a large enterprise with total assets of more than 8 billion yuan (US\$960 million), 7,000 employees and land area of 1.37 square kilometres. Possessing 2,400 sets of manufacturing equipment, including 400 sets of precision machine tools, and nationally advanced technologies, Dongfang Steam Turbine Works now can develop, design and produce thermal power and nuclear power turbines, ranging from 200 to 1,000 megawatts. Since the 1960s, Dongfang Steam Turbine Works has produced more than 620 sets of turbines with a total output of 87,900 megawatts, shared over 20% domestic market. Its products have been sold nationwide and exported to countries such as Malaysia, Indonesia, Iran, Bangladesh and Pakistan. Dongfang brand turbines have been widely praised by domestic and overseas clients for their high quality, good performance and excellent service. In recent years, Dongfang Steam Turbine Works has implemented a strategy that stresses both its own technological innovation and co-operation with overseas partners. To date, the company has developed 10 generations of 300-megawatt turbines with its own property rights. The 10th-generation of such products was awarded the famous brand by provincial and national industrial authorities. Dongfang Steam Turbine Works has co-operated with Hitachi Corp to develop the 600-megawatt supercritical turbines, with over 80% localization. At present, the company is forging technological partnerships with famous multinational companies including General Electric in the United States, Alstom in France and Hitachi, Mitsubishi and Toshiba in Japan to develop supercritical and ultra-supercritical large-capacity turbines, nuclear power turbines and heavy-duty gas turbines. The partnerships are expected to make Dongfang one of the largest power equipment producers in the world and an important member of the world nuclear power club. In addition, Dongfang Steam Turbine Works signed the Technology Transfer Agreement with REpower Company from Germany for Wind Power, which means Dongfang Steam Turbine Works has entered into Wind Power industry. In the mean time, Dongfang Steam Turbine Works takes the strategy of multiple business development focusing on its main business. Dongfang Steam Turbine Works has expanded its business to military industry, chemical Industry, Environment protection, auto control industry, surface engineering, construction and transportation etc. With the rapid development of information technology (IT), the company has strengthened IT applications in all operational processes ranging from finance, purchasing, research and development, manufacturing and management. Such technologies as CAD (computer-aided design) and CAM (computer-aided manufacturing) have been used in the design and production of products to improve work efficiency. In addition, the company has developed a PDM (product data management) system with its own intellectual property rights. This, plus such management systems as MRPII. The upgraded version from the MRP (manufacturing resource planning), and ERP (enterprise resource planning), have greatly optimized the company management. The innovations in technology and operations offer a solid foundation for the company sustainable development. In the recent years, DFSTW continues its innovation, guided by the market demand, focus on development and creation, has reached great achievement on product development, technology improvement, business and management etc. DFSTW has established a solid foundation for its continuous development. By the year of 2005,

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<sup>11</sup> [www.dongfang.com](http://www.dongfang.com)

DFSTW has reached its annual manufacturing capacity to 20,560MW historically, which means Dust's comprehensive competitiveness and manufacturing capability have reached new steps, DFSTW is capable to offer every efforts for the development of power generation industry of PR China.

Encl. 8<sup>12</sup>

## Siemens Wind Power (One of Vestas competitors.)

We're steadily expanding our position in the dynamic renewables market – with innovative wind turbines that rank among the most reliable in the world, with major photovoltaic projects and with the most advanced technologies for solar-thermal power plants.



We're a leading provider of wind turbines worldwide. With an installed capacity of around 9,000 megawatts, our more than 7,800 turbines are generating a major share of the world's carbon-free wind power. We're also participating in the Desertec industry initiative, which will leverage the enormous potential of solar-thermal power plants in the Sahara and of wind farms in the Mediterranean region to produce carbon-free electricity. And we have the best portfolio for the challenge: it now includes a new 2.3-megawatt wind turbine, which – equipped with a rotor 101 meters in diameter – is ideally suited for operation in medium to low winds. In the field of solar-thermal power, we also offer an innovative technology that employs salt as a thermal medium to store heat for nighttime power generation.

We manufacture complete wind turbines and provide a full range of turbine-related services. Innovations like our gearless turbine drives and our floating turbines, which can operate in high winds on the open sea, are taking wind power technology to new levels. In the field of photovoltaics, we supply solar farms on a turnkey basis. We also provide all major components for solar-thermal power plants. Our acquisition of a stake in Italy's solar specialist Archimede has added yet another innovative technology to our solar-thermal offerings. An equity stake in Voith Hydro – a supplier to the hydroelectric market – rounds out our portfolio.

We're well-positioned to take advantage of anticipated growth in the renewable energy market. Climate change and soaring energy demand worldwide will transform energy systems: an ever-larger share of energy needs will be covered by renewable sources. Developments in electromobility, for example, will further stimulate demand for carbon-free power generation. The market for renewable energies is expected to grow 12 percent a year for the next decade. The market for offshore wind farms alone is expected to grow by more than 20 percent a year for the next five years. Growth in the demand for solar power is also expected to be substantial.

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<sup>12</sup> [http://w1.siemens.com/about/en/businesses/energy/renewable\\_energy.htm](http://w1.siemens.com/about/en/businesses/energy/renewable_energy.htm)

## Facts about Siemens cooperation.

Siemens (Berlin and Munich) is a global powerhouse in electrical engineering and electronics. The company has 427,000 (as of September 30, 2008) working to develop and manufacture products, design and install complex systems and projects, and tailor a wide range of services for individual requirements.

Year of foundation	1847
Employees 2008 (as of September 30, 2008)	Global: 427,000 employees (continuing operations) Germany: 132,000 Outside Germany: 295,000
Listings	Deutsche Börse: 08.03.1899 London Stock Exchange: 21.06.1990 Swiss Exchange: 16.08.1999 New York Stock Exchange: 12.03. 2001
Sector	capital goods
Industry	electrical engineering and electronics
Listing segment	prime standard / regulated market
Currency	Euro (EUR)
Capital stock (30.09.2008)	EUR 2,742,610,263
	<b>Key figures (in million of euros)</b>
New orders 2008	93,495
Sales 2008	77,327
Net income 2008	5,886
Research and development 2008	3,784
Employee costs 2008	25,646
Shareholders' equity (September 30, 2008)	27,380
Dividend per share 2008 (in EUR)	1.60
Total assets 2008	94,463
Common stock, no par value 2008	2,743