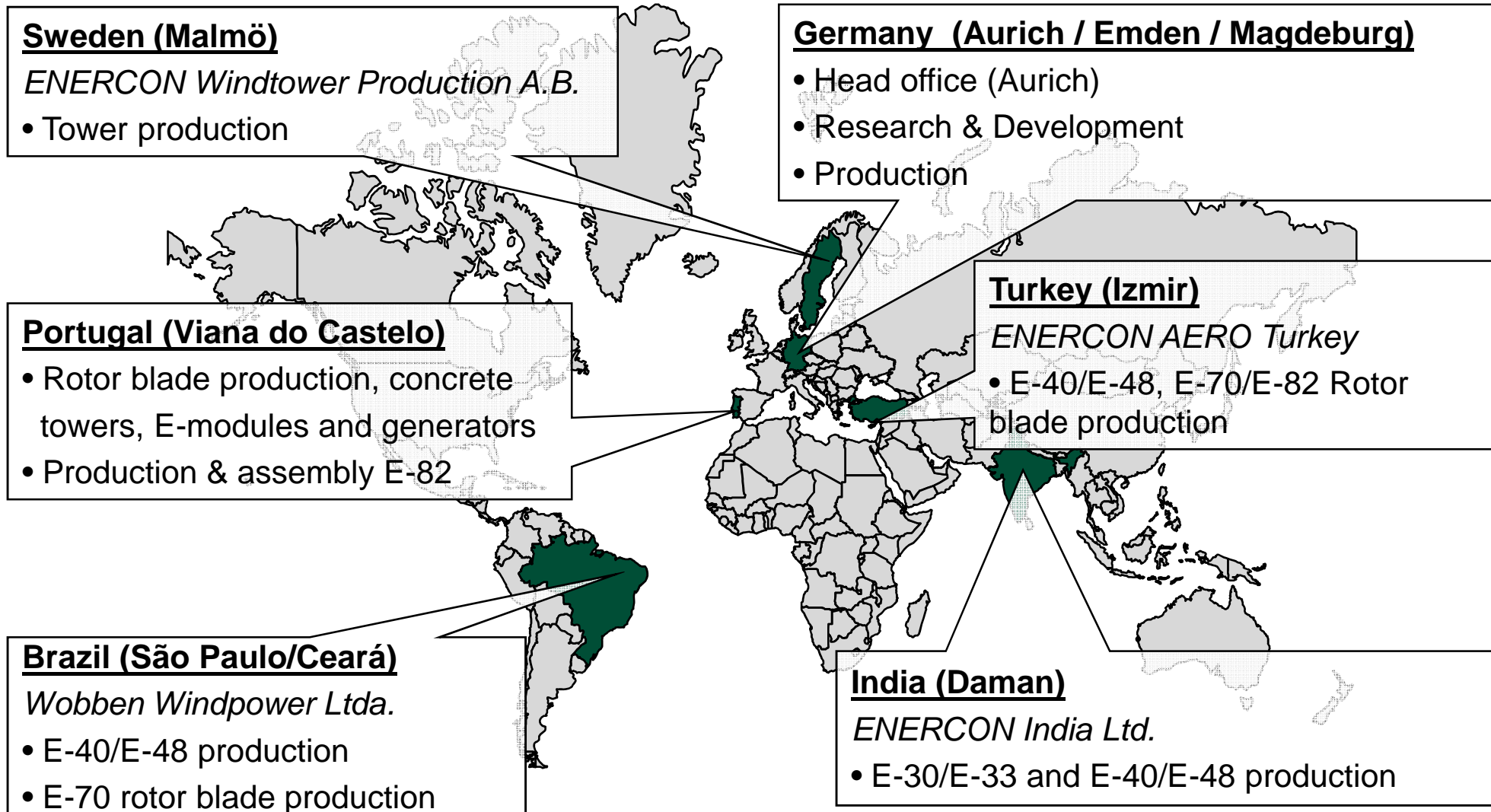


Experiences of an International Wind Turbine Manufacturer in Brazil



ENERCON GmbH

Ruth Brand-Schock, Head of Berlin Office



- Rotor blade production, 8 factories worldwide
- Generator production, 5 factories worldwide
- Electrical components, 4 factories worldwide
- Tower production, 5 factories worldwide
- Machine house assembly, 5 factories worldwide



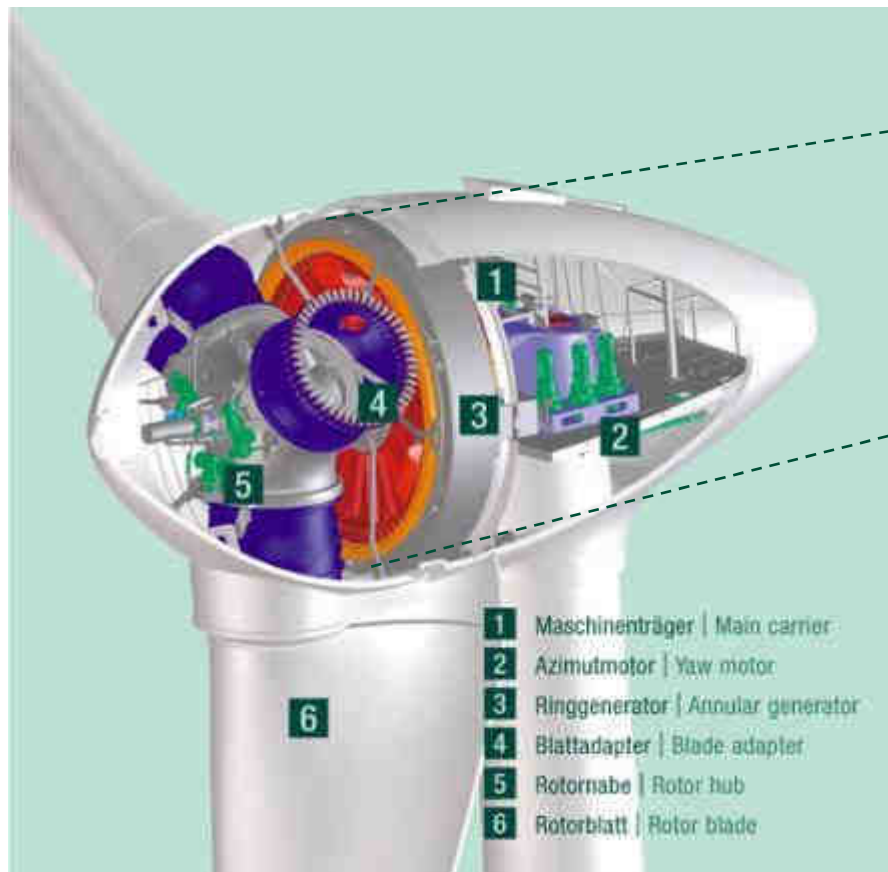
Total production area 435,000 m²

= approx. 47 football fields

When it comes to performance, ENERCON's **gearless** generator concept is superior to conventional generators.



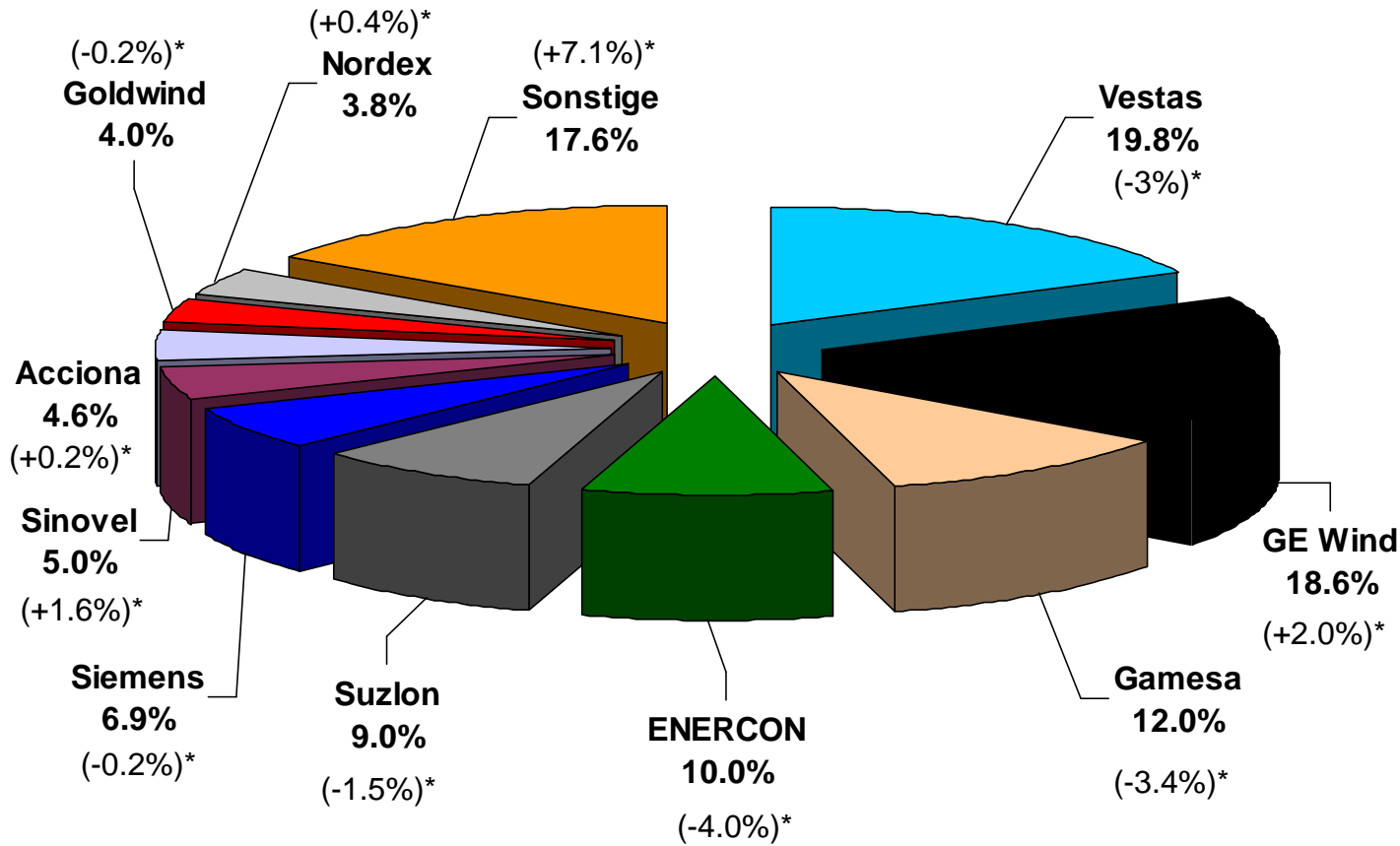
ENERCON annular generator



Advantages:

- Less wear due to slower rotation
- Very little machine stress due to high level of speed variability
- Yield optimized control system
High grid compatibility

Market share worldwide 2008



Compared to 2007	
Vestas	22.8 %
GE Wind	16.6 %
Gamesa	15.4 %
ENERCON	14.0%
Suzlon	10.5 %
Siemens Wind	7.1 %
Acciona	4.4 %
Goldwind	4.2 %
Nordex	3.4 %
Sinovel	3.4 %
Sonstige	10.5 %

* = Difference compared to previous year

Wobben Windpower

Wobben Windpower is a Brazilian Manufacturer, with German Capital of ENERCON GmbH Group, one of the biggest world-wide manufacturers of wind energy converters and other systems of clean and renewable energy.

The company is the first Brazilian Manufacturer of large size wind energy converters from 800 to 2300 kW.

Wobben Windpower has 1000 direct employees in two manufacturing plants in Sorocaba – São Paulo and Pecém – Ceará.

Wobben Windpower provides projecting, construction, assembly, operation and maintenance of windfarms.



Production Facilities: Sorocaba – SP



Wind energy converter production – Generators

E-44 900 kW, E-48 800 kW and E-70 2300 kW

Sorocaba - São Paulo State

Nationalization index above 70 %



Production Facilities: Sorocaba – SP

Wind energy converter production - Blades

E-44 900 kW, E-48 800 kW and E-70 2300 kW

Sorocaba - São Paulo State

Nationalization index above 70 %



**Blades Production
E-70 2300 kW**



Wind energy converter production - Blades

E-44 900 kW, E-48 800 kW and E-70 2300 kW

Sorocaba - São Paulo State

Nationalization index above 70 %



Blades Production

E-44 900 kW and E-48 800 kW



Concrete Towers Production

75m height for E-48 800 kW



Wobben Windpower, founded in Brazil in 1996 and offers additional advantages to the Brazilian wind market development, such as:



- Supply Agreement executed in Brazilian currency (Reais)
- Possibility of Financings in Reais by being a Brazilian product
- WEC standards from 800 to 2300 kW for all wind classes.
- Brazilian teams for operation, maintenance and technical assistance.
- WECs with complete and evidenced compatibility with networks requirements.

Central Geradora Eólica Millennium, Paraíba State
13 x E-48/800 kW = 10,4 MW, 75m concrete tower
Owner: Pacific Hydro
Customer: Eletrobrás/SAELPA (energy supply)

- First step: PROINFA Law (1.4GW) up to December 2010;
- Second step: Wind Auction of December 14th
 - Around 440 projects and 13 GW subscribed.
 - The government will fix the maximum tariff, but the projects with the lowest tariff will be selected.
 - The windfarms must start delivering energy into the grid until July 1st 2012, which means the investors have the possibility of anticipating their windfarms conclusion;
- Next steps: Auctions are expected for the following years



Osório Windfarm, Rio Grande do Sul State
75 x E-70/2000 kW = 150 MW,
98m concrete towers
Owner: Ventos do Sul/Enerfin/Elecnor
Customer: Eletrobrás/CEEE (energy supply)

Total of installed and under construction Windfarms by WOBLEN until 2009

	Installed Capacity	Wind Energy Converters	Number of Windfarms
Windfarms installed until 2005	27,1 MW	35 x E-40 / 500 kW 16 x E-40 / 600 kW	7
Windfarms installed under PROINFA (after 2005)	310,6 MW	15 x E-40 / 600 kW 20 x E-44 / 900 kW 167 x E-48 / 800 kW 75 x E-70 / 2000 kW	9
Supply of Windfarms abroad until 2009	69 MW	4 x E-40 / 600 kW 74 x E-44 / 900 kW	4
	406,7 MW	406 WEC's	20 Windfarms

PROINFA

Installed Windfarms in South America

WOBHEN WINDPOWER

- 16 Windfarms operating in Brazil, 9 under PROINFA Law, 1 in Argentina and 3 under construction.
- More than 500 WEC's manufactured, totalizing approx. 340 MW installed in Brazil and 340 MW abroad.



The windfarms installed by Wobben in Brazil produce a total of 1,000,000 MWh/year, equivalent to the average consumption of 4,000,000 people, helping to reduce approx. 600,000 tons of CO₂ every year.

Mucuripe Windfarm, Ceará State

4 x E-40/600 kW = 2.4 MW

Owner: WWP

Customer: COELCE (energy supply)

Logistic and transport:

- Brazil is a BIG country. The infrastructure and the long distances are a permanent challenge.
- Road transport instead of coastal shipping. Analysis: where is the production – where is the market?
- Just a few big cranes available in Brazil, which means: high costs due to monopoly situation.



→ **Improvement of infrastructure:** state highways, shipping, equipment

Problems and Solutions

Tax

- federal tax, regional tax etc., varies in states.

Customs duty

- 20 – 55 % import duty for different components, materials and raw material, but only 14 % for entire turbines

Nationalization Index

- 60 % of the production had to be manufactured in Brazil according to the PROINFA Law – for the auction this nationalization index is limited to turbines up to 1500 kW

Unclear volume and frequency of the auctions

- Yearly auctions are expected but not guaranteed



Horizonte Windfarm, Santa Catarina State
8 x E-40/600 kW = 4.8 MW
Owner: CENAEEL
Customer: CELESC (energy supply)

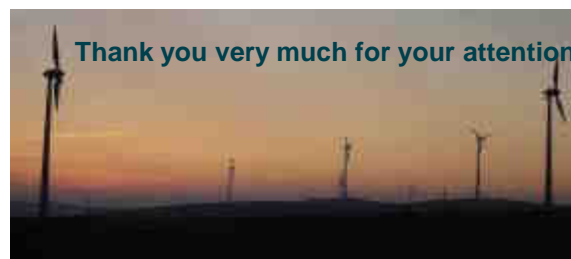


Macau Windfarm, Rio Grande do Norte State
3 x E-40/600 kW = 1.8 MW
Owner: PETROBRAS
Customer: Self-Generation

Grid infrastructure

- The grid infrastructure is an integrated system, but still very different to the European system. It is extremely important to analyse very detailed every grid connection point (loads, grid code, lines available, etc).
- No “buy WEC – plug-in” possible!
- The Grid code changed and new technology is necessary. That causes higher investment costs.
- The developers prefer bigger wind farms for better balance of their plant. But for bigger wind farms, there are less suitable connection points available.

→ **Improvement of grid infrastructure in some areas and to offer technical solutions/flexibility**



Água Doce Windfarm, Santa Catarina State

15 x E-40/600 kW = 9 MW

Owner: CENAEEL

Customer: Eletrobrás/CELESC (energy supply)