

# Wind power job creation in Sweden

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26 May 2009

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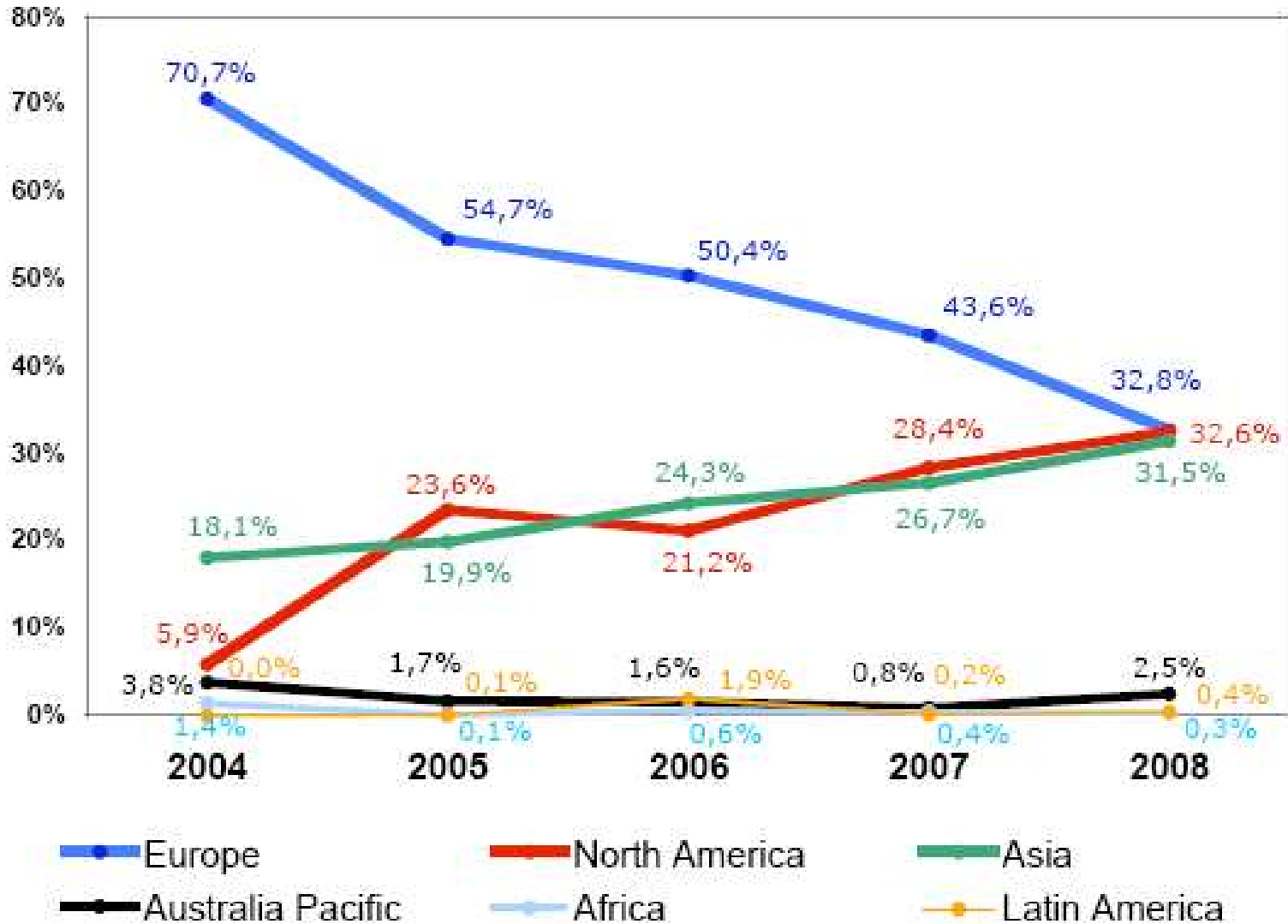


Swedish   
Wind Energy

The report contains an executive summary in English and can be downloaded from [www.svenskvindenergi.org](http://www.svenskvindenergi.org)



# Annual growth – geographical spread



## Important prerequisites

- Broad consensus on volume target
- Effective support system
- Effective permitting system
- Adequate electricity grids including interconnectors
- Adequate balancing power

## Wind energy jobs today

- World total 329 000
- Europe total 154 000
- Germany 84 000
- Spain 37 700
- Denmark 23 500
- Sweden 2 000

Source: Wind at Work, EWEA 2009

## Industrial prerequisites

- Sweden has strong subcontractors with extensive wind power knowledge
- Already today, Swedish companies have important market shares as subcontractors to international WTG suppliers

# JEDI-WIND, Job and Economic Development Impact Model, DEO 2008

Man years/MW

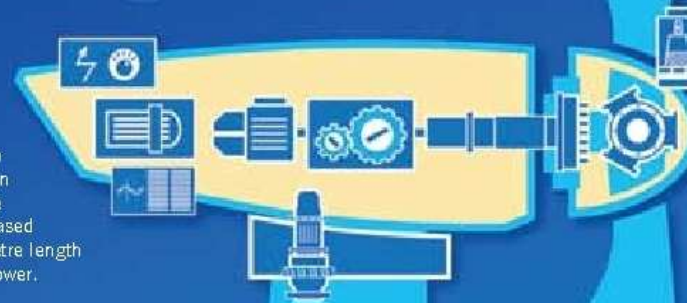
• Turbine & generator	4,5
• Tower & foundation	1,5
• Erection work	2,0
• Other direct effects	1,5
• Secondary effects	2,5
• Multiplication effects	3,0
• Sum	15,0

## Swedish content (%)

		Onshore	Offshore	Export
Turbines and generators	2009	3	3	3
Turbines and generators	2020	30	30	10
Towers and foundations	2009	3	3	3
Towers and foundations	2020	40	30	5
Erection work	2009	80	80	
Erection work	2020	90	90	

# How a wind turbine comes together?

A typical wind turbine will contain up to 8,000 different components. This guide shows the main parts and their contribution in percentage terms to the overall cost. Figures are based on a turbine with 45.3 metre length blades and a 100 metre tower.



**Tower** 26.3%

Range in height from 40 metres up to more than 100 m. Usually manufactured in sections from rolled steel; a lattice structure or concrete are cheaper options.

**Rotor blades** 22.2%

Varying in length up to more than 60 metres, blades are manufactured in specially designed moulds from composite materials, usually a combination of glass fibre and epoxy resin. Options include polyester instead of epoxy and the addition of carbon fibre to add strength and stiffness.

**Rotor hub** 1.37%

Made from cast iron, the hub holds the blades in position as they turn.

**Rotor bearings** 1.22%

Some of the many different bearings in a turbine, these have to withstand the varying forces and loads generated by the wind.

**Main shaft** 1.91%

Transfers the rotational force of the rotor to the gearbox.

**Main frame** 2.80%

Made from steel, must be strong enough to support the entire turbine drive train, but not too heavy.

**Gearbox** 12.91%

Gears increase the low rotational speed of the rotor shaft in several stages to the high speed needed to drive the generator.

**Generator** 3.44%

Converts mechanical energy into electrical energy. Both synchronous and asynchronous generators are used.

**Yaw system** 1.25%

Mechanism that rotates the nacelle to face the changing wind direction.

**Pitch system** 2.66%

Adjusts the angle of the blades to make best use of the prevailing wind.

**Power converter** 5.01%

Converts direct current from the generator into alternating current to be exported to the grid network.

**Transformer** 3.59%

Converts the electricity from the turbine to higher voltage required by the grid.

**Brake system** 1.32%

Disc brakes bring the turbine to a halt when required.

**Nacelle housing** 1.35%

Lightweight glass fibre box covers the turbine's drive train.

**Cables** 0.96%

Link individual turbines in a wind farm to an electricity sub-station.

**Screws** 1.04%

Hold the main components in place, must be designed for extreme loads.

This detail alone will generate a revenue of about one billion SEK!!

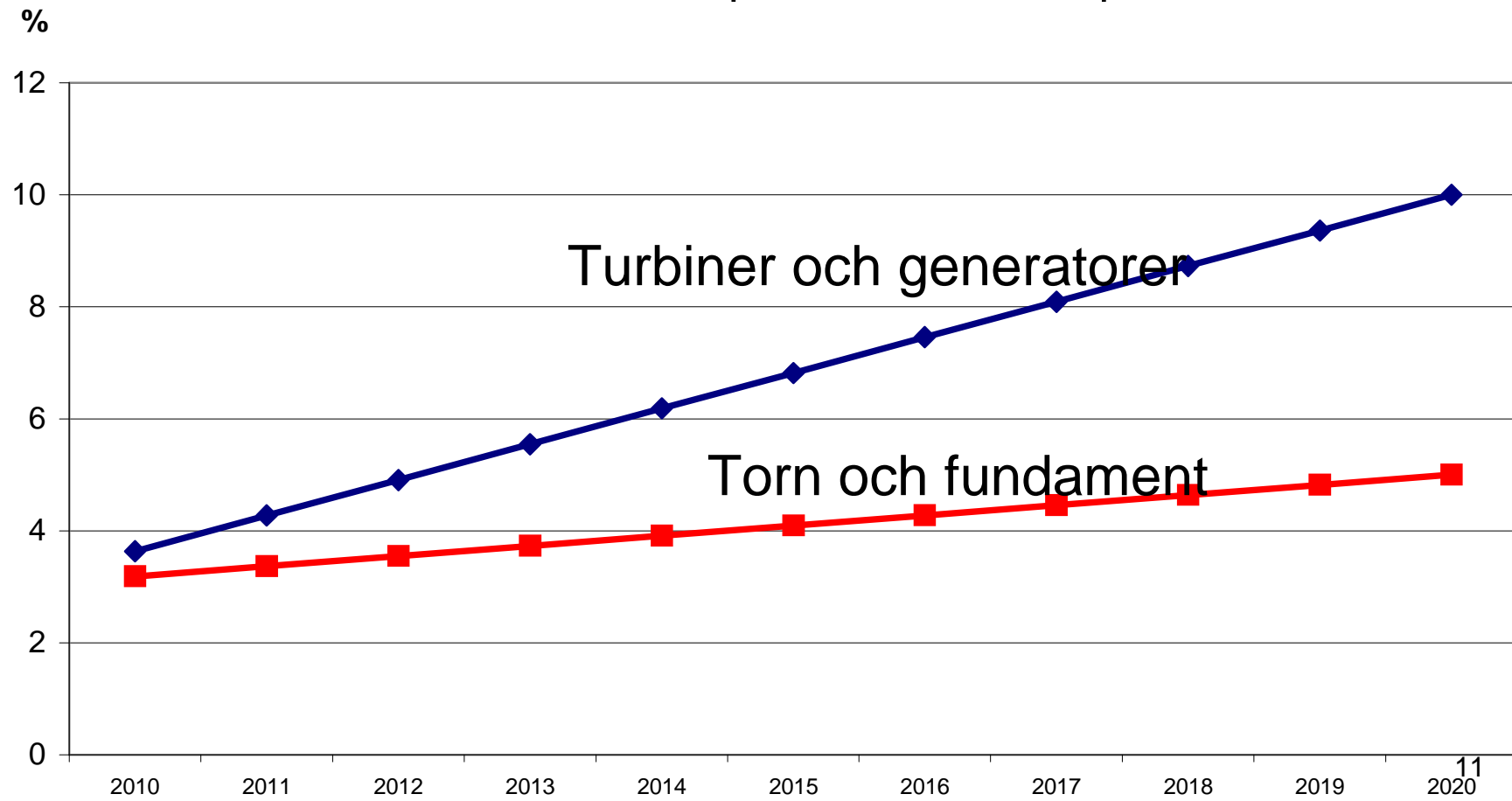


## Productivity improvement (%/yr)

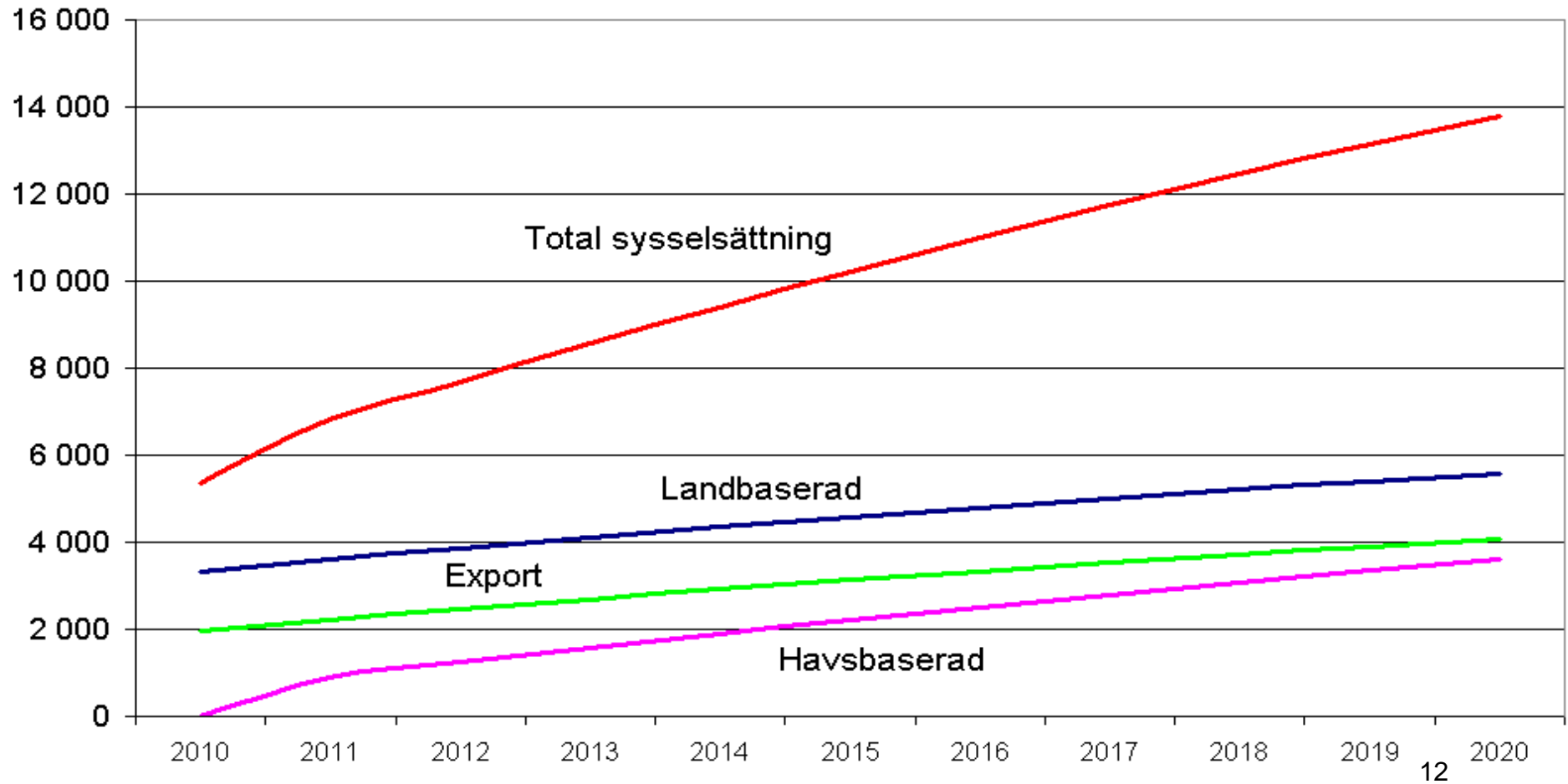
	onsh.	offsh.	export
Turbines and generators	4,5	4,5	4,5
Towers and foundations	4,5	4,5	4,5
Erection work	3,0	3,0	3,0

# Export share (%)

Swedish export share in Europe



# Job creation in Sweden 2020



# Job creation in Sweden 2020 - conclusions

- 12 000 new jobs in manufacturing and O&M would be created
- Strengthening of the high voltage grid
- Further potential in wave technology and motor industry (electrical hybrids)
- For offshore wind power - important synergy effects between Swedish manufacturing and Norwegian offshore industries

## Further conclusions

- Good possibilities to create a viable Swedish wind power industry with excellent export opportunities
- Expansion of wind energy with good regional distribution
- Challenges and opportunities:  
Forrests  
Cold climate  
Offshore

Thank you  
for your  
attention!

