



New Challenges for the Renewable Energy Industry – Perspectives for Financing Offshore Wind

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The Investitionsbank Schleswig-Holstein

Introduction

**Development of onshore wind energy
technology**

The viewpoint of a bank

Experiences onshore

Offshore requirements

Conclusions and outlook

Co-financier of more than 45 wind farms in the region

Schleswig-Holstein's main development bank

Member of the Federation of German Windpower

Balance Sheet total 9.0 Bill. €

- Political Mandate (State government of Schleswig-Holstein)
- Cost-Covering-Principle (non-profit-making)

Neutral in effect of competition

New Business Volume 1.41 Bill. € in 2004

390 Employees

60 Products and Services

Member of EWEA

Energy agency and Project management with technical expertise

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Schleswig-Holstein: Pioneer in Wind Energy



**30% wind power
from more than 2,600 WEC
in 2004 on 1% surface**

**50% of power from
renewables until 2010**

**Home to
Vestas Germany,
REpower, Nordex,
Windtest, aerodyn**

**Husum Wind Fair:
500 exhibitors
20.000 visitors
22.000 square meters**



Technological developments



Then...



...and now



Source: IAA 2005

Technological developments



Then...



...and now

Technological developments



Then...



Source: PixelQuelle

...and now



Source: Wintershall AG

Technological developments

Then...



Source: REpower Systems AG

Horns Rev (DK)



Middelgrunden (DK)



...and now

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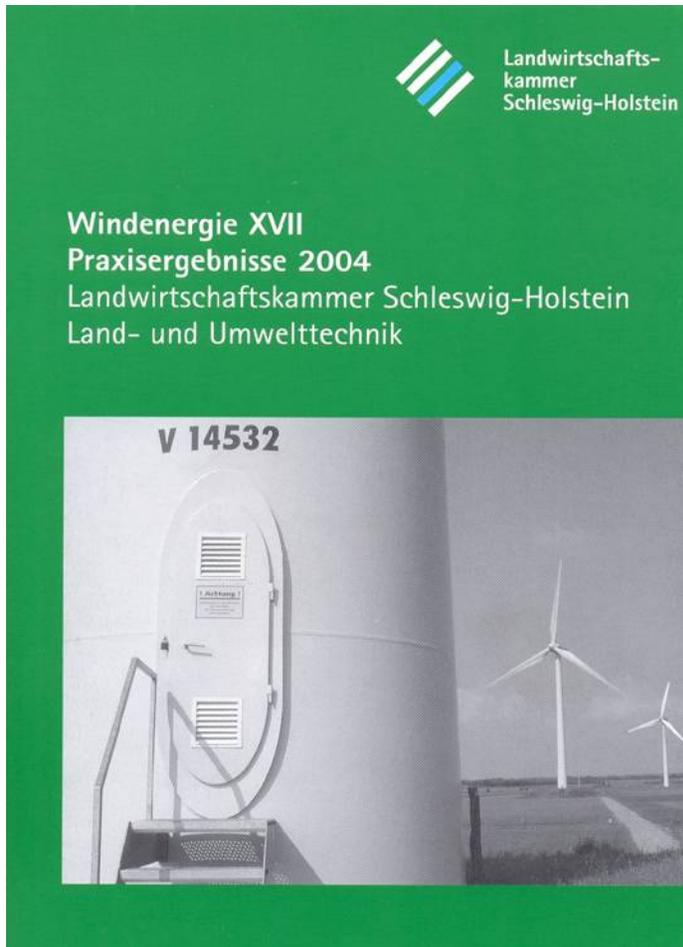
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Facts and Figures



<u>Year/Factor</u> Technology	1980	2005	Factor
Rotor size	15 m	126 m	8.4
Installed power largest wind turbine	55 kW	5.000 kW	90
Wind energy plant capacity	100 kW	200.000 kW	2.000
Installed power (world)	100 MW	50.000 MW	500
Contribution to electricity supply (Europe)	0.001%	3%	> 10.000



- **Schleswig-Holstein: perfectly surveyed as site for WEC**
- **Basis: annual report from the chamber of agriculture Schleswig-Holstein**
- **2004: Report No. XVII**
 - **Surveying for 17 years**
- **2004: 2.609 WEC documented**
 - 2.106 MW**
 - 3.900 GWh**
- **Over 30% of power for Schleswig-Holstein**
- **High reliability even though 2004 was the 4th wind year below average in a row**

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The viewpoint of a bank

Experiences onshore

Offshore requirements

Conclusions and outlook

The viewpoint of a bank on wind energy projects

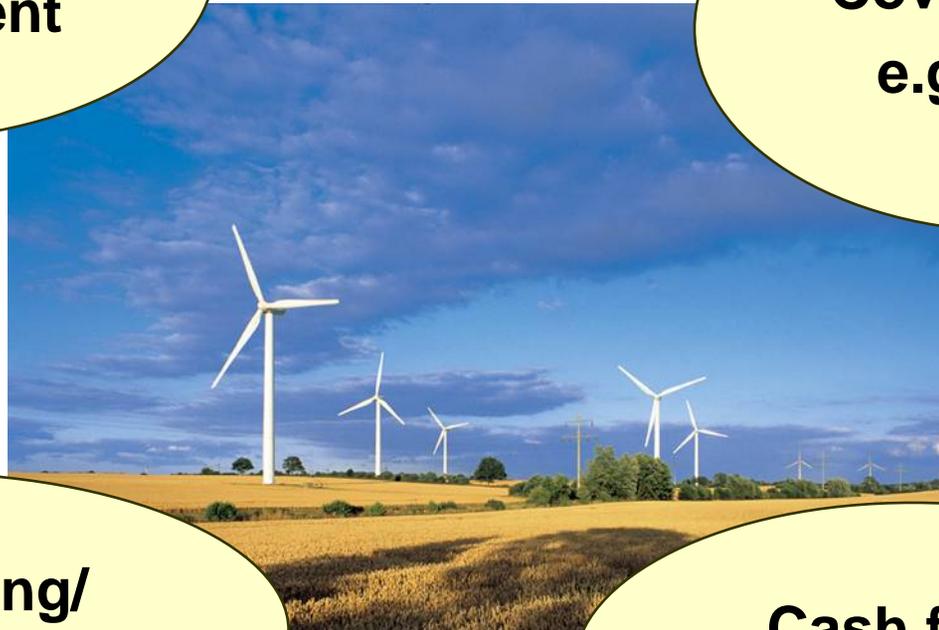


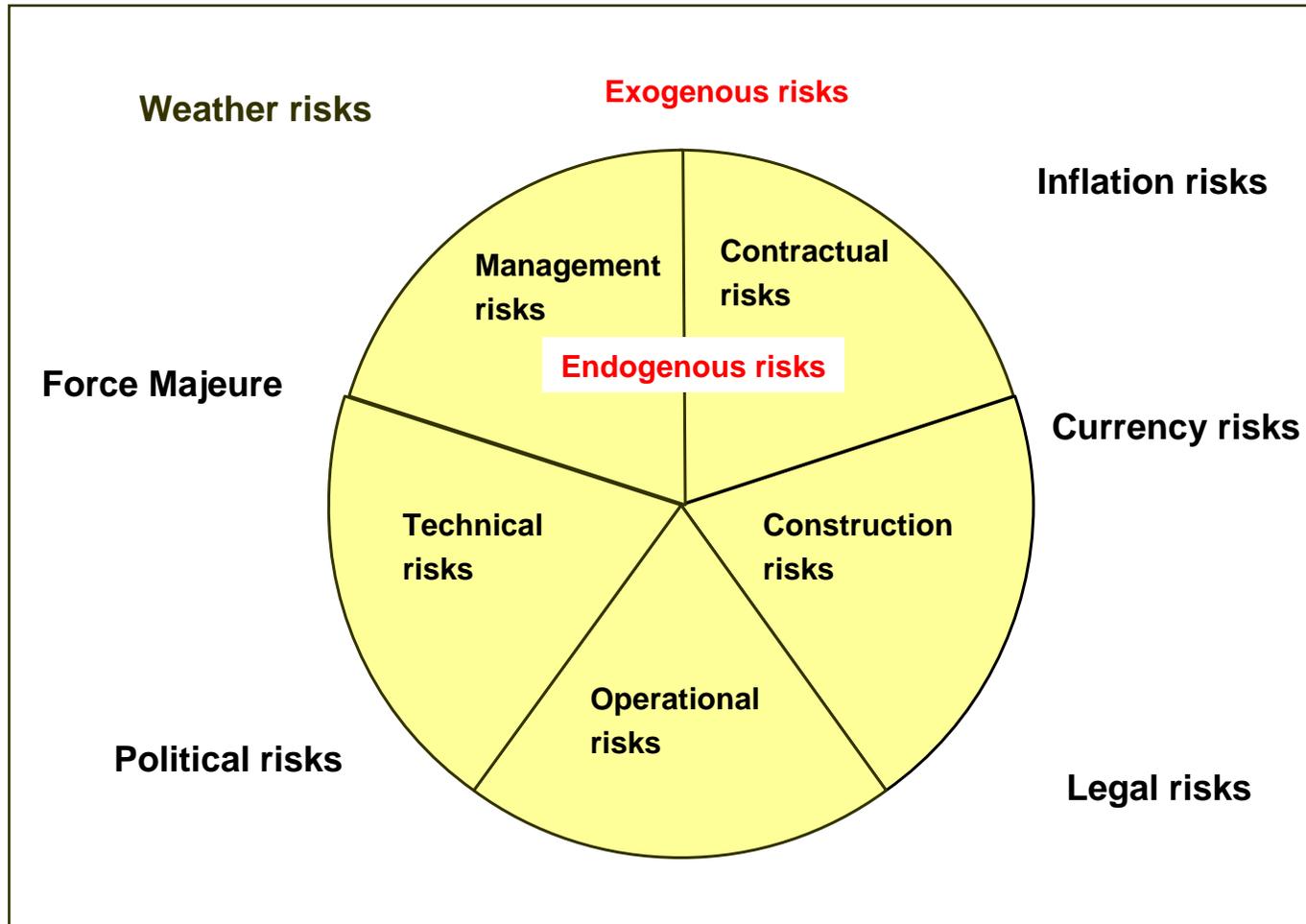
**Risk
management**

**Cover ratios:
e.g. DSCR**

**Risk sharing/
allocation**

**Cash flow
related lending**





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Introduction

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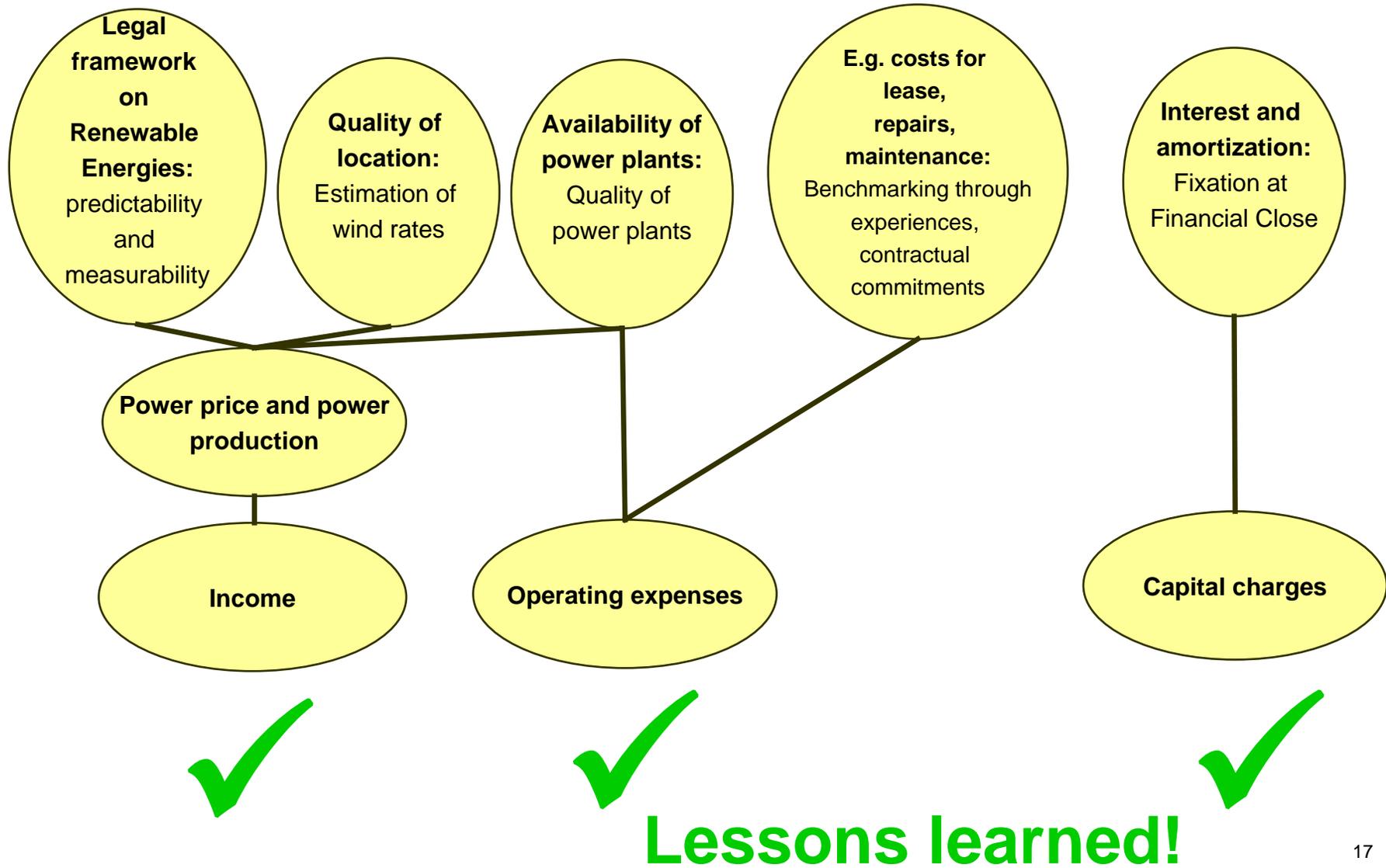
The viewpoint of a bank

Experiences onshore

Offshore requirements

Conclusions and outlook

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The Investitionsbank Schleswig-Holstein

Introduction

**Development of onshore wind energy
technology**

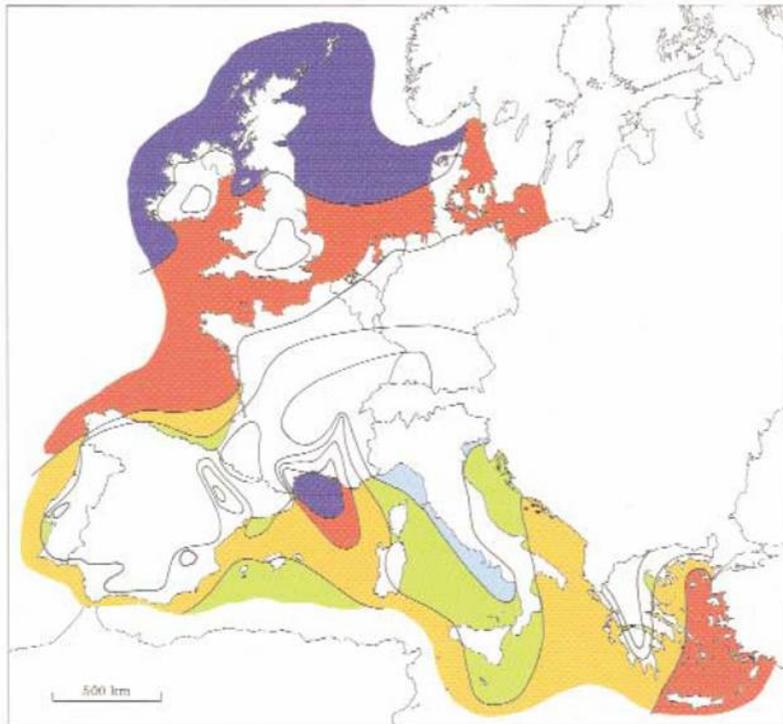
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Experiences onshore

Offshore requirements

Conclusions and outlook

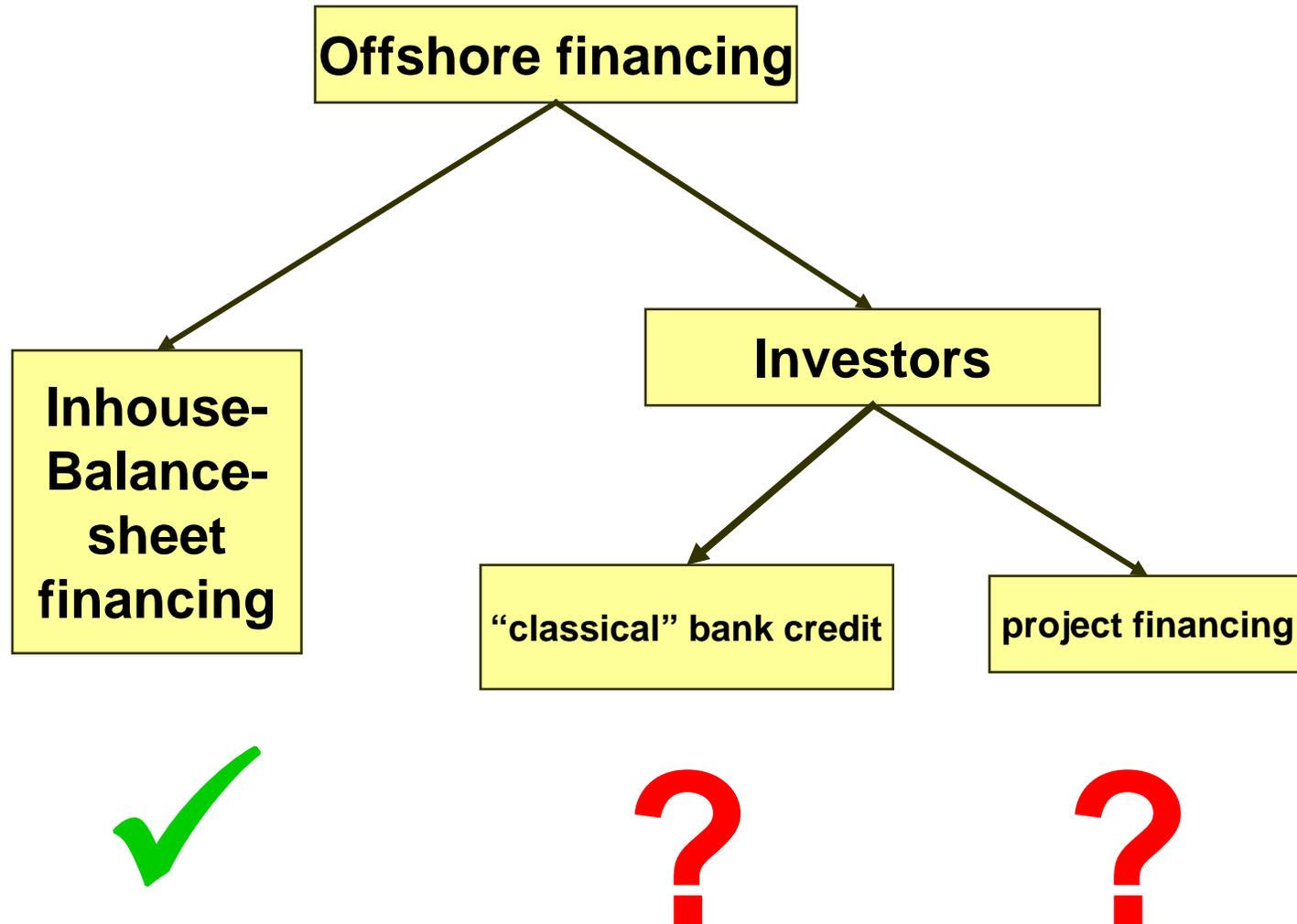
Why offshore? (I)



Offshore wind is a Northern European Resource

Wind resources over open sea (more than 10 km offshore) for five standard heights

10 m		25 m		50 m		100 m		200 m	
$m s^{-1}$	W_{in}^{-2}								
> 8.0	> 800	> 8.5	> 700	> 9.0	> 600	> 10.0	> 1100	> 11.0	> 1500
7.0-8.0	350-600	7.5-8.5	450-700	8.0-9.0	600-800	8.5-10.0	650-1100	9.5-11.0	900-1500
6.0-7.0	250-500	6.5-7.5	300-450	7.0-8.0	400-600	7.5- 8.5	450- 650	8.0- 9.5	600- 900
4.5-6.0	100-250	5.0-6.5	150-300	5.5-7.0	200-400	6.0- 7.5	250- 450	6.5- 8.0	300- 600
< 4.5	< 100	< 5.0	< 150	< 5.5	< 200	< 6.0	< 250	< 6.5	< 300



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- **Giving wind power a new European dimension**
- **Dealing with intermittency: large quantities of wind power in a large grid stabilize supply**
- **Lower operating risk of energy system based on defined upfront costs with no risk in respect of fuel price increases**
- **Renewing the European grid and the European energy system alongside with an optimized balance between centralized and decentralized power production**