Wind as local renewable resource

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Ministry of the Environment

Wind Energy - The Facts Workshop
22 May 2009, Riga
1. General situation

2. Preconditions for wind energy use and development—wind, suitable site and criteria for development of wind energy
Classification of WPP

Wind Power plant

- On-land
- Off-shore
- On-roof, ships ...

Source: google.com
Sizes and Applications of WPP

Small (≤10 kW)
- Households
- Farms
- Remote Application

Medium (10-250 kW)
- Village Power
- Hybrid Systems
- Distributed Power

Large (660 kW - 2+MW)
- Central Station Wind Farms
- Distributed Power
- Community Wind

Source: NREL
Preconditions for wind energy use and development

1. Wind

2. Suitable site

3. Development criteria’s of wind energy
Wind
- Wind speed
- “Wind rose”
- Type of wind - Local winds (sea breeze, regional winds etc.)
- Other meteorological parameters
Wind maps

Source: www.google.com
... in Latvia


... in Latvia

Electricity produced from WPP

<table>
<thead>
<tr>
<th>Year</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>VIII</th>
<th>IX</th>
<th>X</th>
<th>XI</th>
<th>XII</th>
<th>Total, TWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>45</td>
</tr>
<tr>
<td>2007</td>
<td>9</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>52</td>
</tr>
<tr>
<td>2008</td>
<td>9</td>
<td>8</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>8</td>
<td>7</td>
<td>4</td>
<td>58</td>
</tr>
<tr>
<td>2009</td>
<td>5</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
</tbody>
</table>

Source: www.csb.gov.lv
Suitable site
Roughness

Orography

Source: google.com;
Conflict zones

- Protected areas (including marine territories)
- Sites of intensive fishery
- Fairways
- Telecommunication cables
- Port aquatories.
- Extensive minefields from World War I and World War II
- Military polygons in the Baltic Sea
- Ship sanctuaries
- Sea surveillance system
- Potential oil fields
- …
“Wake” effect

Wake effects in Offshore wind farms

Wind speed, $U$
$U_0$

Distance down stream

$X_{separation}$

$\varphi U$
Development criteria's of wind energy
Criteria

1. Environment and nature
2. Political (administrative procedures etc.)
3. Technical (infrastructure, innovation etc.)
4. Economical (electricity market, competitiveness etc.)
5. Social (public support, employment, job creation etc.)
Environment and nature (1)

- Landscape
- Noise
- Electromagnetic waves
- Construction impact on land
- Protected nature territories
- Birds, bats, fishes etc

- CO2
- Life cycle assessment
...in Latvia

Nature protected territories
... in Latvia
Ornithological restrictions
Political

The main aspect!!!
Wind energy policy formed by two main political documents:


Strategies determine that potential wind energy capacity is about 600 MW, though mostly terrestrial part is considered.

Prediction for 2010 is up to 135 MW, but only in terrestrial wind farms.

Legal basis for permitting and licensing is not yet fully developed for the EEZ and Territorial Sea.

There are no standards or guidelines developed for wind parks.
Technical

- Transmission line capacity
- Connection to the electrical grid
- Parameters of power quality (stable voltage, harmonics etc.)

Balancing of Electricity
Latvia
Grid connection

- Grid infrastructure near sea coastline, specially in the north of Kurzeme, is poorly developed and strongly limits installation of new facilities, including offshore.
- At present, leading energy production company “Latvenergo” analyses potential for new high voltage grid projects.

At present:
- 330 kV – 5 substations – 20 transformers – 1249 km
- 110 kV – 117 substations – 241 transformers – 3427 km
... Latvia
Grid connection

Source: www.energo.lv
**... Latvia
Grid connection**

<table>
<thead>
<tr>
<th>Nominal capacity (kWel or MWel) of power plant</th>
<th>Connection point</th>
</tr>
</thead>
<tbody>
<tr>
<td>till 15 kW</td>
<td>0,4 kV transmission line (EPL)</td>
</tr>
<tr>
<td>till 250 kW</td>
<td>0,4 kV busbars</td>
</tr>
<tr>
<td>till 600 kW</td>
<td>6,10,20 kV EPL</td>
</tr>
<tr>
<td>From 0,6 MW till 20 MW</td>
<td>6, 10, 20 kV busbars 110 kV a/st.</td>
</tr>
<tr>
<td>from 20 MW till 100 MW</td>
<td>110 kV a/st. busbars</td>
</tr>
<tr>
<td>Under 100 MW</td>
<td>330 kV a/st. busbars</td>
</tr>
</tbody>
</table>
Economical (1)
Different Ways to Buy Renewable Energy

- Rate Based as Part of Utility Portfolio
- Green Pricing
  - No competition, monopoly utility offers customers choice of supporting wind power construction.
- Green Marketing
  - In competitive market, customers empowered to choose service providers that contract to purchase renewables
- Green Tags
  - Environmental attributes divorced from energy
Economical

- Financing and Ownership Structure
- Different Ways to Buy Renewable Energy
- Taxes and Policy Incentives
- Plant Size: equipment, installation and O&M economies of scale
- Turbine size, model, and tower height
- What is included: land, transmission, ancillary services
Social

- Land Lease Payments: 2-3% of gross revenue
- Local property tax revenue
- 1-2 jobs/MW during construction
- 2-5 permanent O&M jobs per 50-100 MW
- Local construction and service industry: concrete, towers usually done locally
- Investment as equity owners: production tax credit, accelerated depreciation
Wind Power Isn’t Perfect

Wind Power output varies over time
Wind Power can only meet part of your load
Wind Power is location-dependent
Wind Power is transmission-dependent
Wind Power has environmental impacts

. . . But Wind Power has a Great Future!
Legal acts and support mechanism are developed, however why the use of wind energy in Latvia is not booming?
Thank you for attention!

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Vides ministrija KAED