Disclaimer: The views expressed are those of Paul Gipe and are not necessarily those of the sponsor.

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L’Énergie Éolienne et les Communautés Éloignées

Chateau de Lastours, France
Wind Energy Has Come of Age

Colorado

California
Montefalcone, Italy
Galicia, Spain
Island & Remote Networks . . . Curaçao
Remote Telecom . . . Pointe au Père, Quebec
Why Wind?

- Reduces Use of Nuclear & Fossil Fuels
- Most Cost-Effective of New Renewables
- Relatively Benign
Wind Energy’s Benefits

• **Clean & Green (Mostly)**
  No SO\(_x\), NO\(_x\), or CO\(_2\)

• **Renewable**
  Net Positive Energy Balance (4-6 months)
  Net Positive Emissions Balance (6-9 months)

• **Domestic: Not Subject to Embargo**

• **Does Not Consume Water**

• **Modular = Flexible**

• **... and Can be Removed**
Wind Energy’s Impacts

- Aesthetics or Intrusiveness
- Erosion & Scarring from Roads
  - Length, Width, Number and Slope
- Shadow Flicker & Disco Effect
- Climate?
- Noise--They are Audible
- Wildlife
  - Habitat Disruption
  - Bird Kills: Collisions, Electrocutions
Birds & Bats

• Before & After Studies of Big Projects
• Studies Necessary for Small Projects?

Paul Gipe & Assoc.

Cros de Gerand, France
Why Now?

- **Wind Works**
  - Greater Reliability
- **Productivity Improved**
  - More Efficient
  - Taller Towers
- **Costs Declined**
  - Economies-of-Scale
We Know What Works...and What Doesn’t
Northern Ireland

40 m, 500 kW

80 m, 1.8 MW

Kincardine, Ontario
Wind is Flexible

- **Scale**
  Big or Small Projects

- **Location**
  Near or Far

- **Time**
  Short Lead Times

- **Ownership**
  Local or Absentee
Wind is Modular

- Quickly Installed
- When Needed
- As Needed
- Where Needed
- By Anyone

Tehachapi, California
World Wind Generating Capacity

Year

Thousand MW

Other  Asia  Europe  North America
World Wind Capacity 2004
~46,000 MW

Europe 75%
Asia 9%
North America 15%
Other Continents 1%
Wind Energy is a Real Business
$23 Billion CAD in 2004

- Electricity Sales: 44%
- Project Development: 51%
- O&M: 5%
2004 World Wind Capacity

7,200 MW  34,700 MW

4,100 MW
Wind Growing Rapidly

- **Germany**
  - 2,000 MW in 2004
  - 20,000 MW by 2006
  - 30,000 MW by 2012

- **Spain**
  - 2,100 MW in 2004

- **USA**: 500-2,000 MW/yr

- **Growth**: 20%-40%/yr
## High Penetration is Possible

<table>
<thead>
<tr>
<th>Country/Kind</th>
<th>Percent Wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Netherlands</td>
<td>2%</td>
</tr>
<tr>
<td>Spain</td>
<td>6.5%</td>
</tr>
<tr>
<td>Germany</td>
<td>5.3%</td>
</tr>
<tr>
<td>Germany 2012</td>
<td>12.5%</td>
</tr>
<tr>
<td>Denmark</td>
<td>20%</td>
</tr>
<tr>
<td>Germany 2025</td>
<td>25%</td>
</tr>
</tbody>
</table>
### High Penetration is Possible

<table>
<thead>
<tr>
<th>Island Networks</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>La Desirade</td>
<td>165%</td>
</tr>
<tr>
<td>Esperance, W. Australia</td>
<td>&gt;24%</td>
</tr>
<tr>
<td>Curaçao</td>
<td>1%</td>
</tr>
</tbody>
</table>
Wind-Diesel Systems for Remote Communities

• Hydro-Quebec’s HPNSWD
  High Penetration, No Storage, Wind-Diesel

• High Penetrations Are Possible
  Denham, Australia--500 kW Wind
  70% Penetration

St. Paul Island, Alaska
  Largest Aleut Community in USA
  Wind Turbine Point of Pride
2004 Installed Wind Capacity
Where Quebec Stands

- Germany
- Spain
- USA
- Denmark
- India
- California
- Texas
- Quebec
- Canada

Megawatts (Thousands)
Era of Distributed Generation

- Here Now
- Resilient, Not Brittle
- Short Lead Times
- Near Load, Less Losses
- Opportunity for Many
- Fosters Energy Awareness

Alberta, Canada

Ontario, Canada
Distributed Wind Energy

Thy, Denmark
Distributed Wind Energy

Ostfriesland, Germany
Why the European Success?

• #1 Community Involvement
Why Community Involvement?

- More Acceptance
- More Power More Quickly
- More People Involved Locally
- More Money Locally
- More Jobs Locally
Increasing Acceptance #1

“Your Own Pigs Don’t Stink”

Jutland, Denmark
Danish Co-ops  
(Vindmøllelaug or Fællesmølle)

- 1/4 Capacity Nationwide
- ~ $1.7CAD Billion
- 100,000 Households Own Shares
- 5% of Population

Thyborøn-Harboøre Vindmøllelaug

Anton Bro
Paderborn Co-op

- 4 Wind Plants
- 17 Companies
- 80 x V66 & E66
- 110 MW
- €140 Million
- 780 ha (2,000 ac)
- All Companies Local
  Paying Local Taxes
Middelgrunden Co-op København

- 20 x 2 MW Off-shore
- 1/2 Owned by Co-op
- 1/2 Owned by Utility
- 8,500 Investors
- ~$1,000CAD per Share
- Visible from Folketing
WindShare
Toronto, Canada

• First Urban Turbine in N.A.
• Co-Owned
  WindShare Co-op
  450 Members
  Toronto Hydro
• Prominent Location
• Highly Visible
• Highly Popular
## Co-Op & Farmer-Owned Wind

<table>
<thead>
<tr>
<th>Country</th>
<th>Farmer</th>
<th>Co-op</th>
<th>Corporate</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Netherlands</td>
<td>60%</td>
<td>5%</td>
<td>35%</td>
</tr>
<tr>
<td>Germany</td>
<td>40%</td>
<td>10%</td>
<td>50%</td>
</tr>
<tr>
<td>Denmark</td>
<td>65%</td>
<td>25%</td>
<td>10%</td>
</tr>
<tr>
<td>Spain</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Source: Dave Toke, University of Birmingham, 2005.*
Market Mechanism Status

- **Premium Prices (Renewable Tariffs)**
  Typically Non-Anglophone Countries

- **Quotas & Tendering**
  Typically Anglophone Countries
  Ireland, France & Britain (Failed)
  RPS in Most USA States
  Most Canadian Provinces

Haverigg, Cumbria, Britain
## Wind Energy Tariffs: A Job Creation Engine

Europe | Direct | Indirect | Total  
-------|--------|----------|--------
Germany | 7,500  | 37,500   | 45,000 |
Denmark | 8,600  | 4,300    | 13,000 |
Spain   | 7,000  | 15,000   | 22,000 |
Total   |        |          | 80,000 |

Enercon, Aurich, Germany
Germany’s Renewable Tariffs
The Results

• Renewables 9% of Supply (~11%, 2005)
• Renewables Generating 40 TWh/yr
• 45,000 Employed in Wind Industry
• 15,000 Employed in PV Industry
• 135,000 Employed in Renewables
• 110,000 Jobs in Wind by 2010
Germany’s Renewable Tariffs
The Results
• 110,000 PV Installations
• 2,000 Biomass Plants
• 6,000 Hydro Plants
• 16,500 Wind Turbines
• Total of 135,000 Generators!

DeWind
External Costs of Generation

- Oil
- Coal
- Natural Gas
- Wind

$CAD/kWh

EU financed international study: ExternE
Climate Change
External Costs Avoided

€/kWh

32$/tC/YOLL
32$/tC/VSL
590$/tC/YOLL
590$/tC/VSL

Olav Hohmeyer, U. Flensburg
Renewable Energy
Is About People--
and Opportunity
Wind Energy is Compatible
With Most Existing Land Uses
... With Rural Residential
Yorkshire, England
Ebeltoft, Denmark

... With Harbours
. . . With Row Crops
With Commercial Uses

Lauwersoog, the Netherlands

Westerwald, Germany
With Grazing

Noordoost Polder, the Netherlands
. . . With Tourism
. . . With Tourism

Chateau de Lastours, France
With Schools

Forest City, Iowa
. . . With Vineyards
With Religious Sites

Montefalcone, Italy

White Deer, Texas
... With Some Parks

Depending Upon the Level of Protection

Wellington (Brooklyn), NZ
. . . With Outdoor Recreation
. . . With Cycling

Royd Moor, England

Westerwald, Germany
. . . With Walking & Jogging
With Hiking... Tehachapi Pass, California
Wind Turbines

Sell Beer, Bier, Birra, Cerveza

Wie das Land, so das Jever.
Jever, D

Thyolmer, DK
Sell Wine

Paul Gipe & Assoc.

Produit de France

domaine des Eoliennes

MERLOT

VIN DE PAYS D'OC

LES VIGNERONS DE NÉVIAN - AUDE
MIS EN BOUTEILLE PAR
LES VIGNERONS DE LA MÉDITERRANÉE
A F 11100 - NARBONNE

12.5% vol

75 cl
. . . Promote Community
. . . Pave the Sidewalk
And the Way to the Future

Wellington (Brooklyn), NZ
Renewables:
When You Look Closely . . .
. . . Worth Every Cent
Renewable Energy
For Today and for Tomorrow
Technology for Life*

*from N.F.S. Grundtvig
Renewables Work!

www.ontario-sea.org

www.wind-works.org