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

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Paul Gipe, wind-works.org
Renewable Energy Has Come of Age

Noordoost polder, the Netherlands

Paul Gipe, wind-works.org
North Americans Have Been Dabbling Around the Edges of Renewable Energy Policy

Little Recognition of the Crisis Facing the Continent

Paul Gipe, wind-works.org
North America Needs Massive Reconstruction of its Infrastructure

Renewable Energy Development Can Reindustrialize the North American Economy

Paul Gipe, wind-works.org
Noordoostpolder, the Netherlands
And Create a Rural Revolution Through “Electricity Rebels”*

*Who own their own generation.

Paul Gipe, wind-works.org
Friedrich-Whilhelm-Lübke-Koog, Germany
Myths to Dispel

• Renewables are Free or Cheap
  But They Are Affordable & They Are Worth It
• Renewables Can’t Be Added Quickly
  or Can’t Make a Difference
• Feed-in Tariffs Not Market-Based
• Feed-in Tariffs are Costly

Paul Gipe, wind-works.org

Husum, Germany
Renewables Can Be Added Quickly

<table>
<thead>
<tr>
<th></th>
<th>Wind 5 yrs</th>
<th>Wind 10 yrs</th>
<th>Solar 5 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>15 TWh/yr</td>
<td>35 TWh/yr</td>
<td>5 TWh/yr</td>
</tr>
<tr>
<td>Spain</td>
<td>15 TWh/yr</td>
<td>28 TWh/yr</td>
<td>5 TWh/yr</td>
</tr>
</tbody>
</table>

Germany Renewables: 10 Years--5% to 15%
Spain: 10 Years--0% to 10%
Colorado: ~53 TWh/yr

Paul Gipe, wind-works.org
### High Penetration Quickly is Possible

<table>
<thead>
<tr>
<th>Country</th>
<th>Percent Wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>1.2%</td>
</tr>
<tr>
<td>California</td>
<td>1.5-2.3</td>
</tr>
<tr>
<td>Germany</td>
<td>6.5%</td>
</tr>
<tr>
<td>Spain</td>
<td>14.3%</td>
</tr>
<tr>
<td>Portugal</td>
<td>15.3%</td>
</tr>
<tr>
<td>Denmark</td>
<td>21%</td>
</tr>
</tbody>
</table>

*2009: Multiple Sources*

*Paul Gipe, wind-works.org*

*Cowley Ridge, Alberta*
### Political Price-Political Quantity Market Mechanisms

<table>
<thead>
<tr>
<th></th>
<th>Price</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed Law</td>
<td>Political</td>
<td>Market</td>
</tr>
<tr>
<td>Quota/RPS/Tendering</td>
<td>Market</td>
<td>Political</td>
</tr>
</tbody>
</table>

Both are Market Mechanisms

Paul Gipe, wind-works.org
Ernst & Young
Germany and Britain
Cost of Renewables (2006)

• Germany: 4x more energy generated
• Germany: @ 1/5 less relative cost
  of GB Renewable Obligation Certificates

Paul Gipe, wind-works.org
Over Cost of French Renewable Tariffs

Source: www.cre.fr
Paul Gipe, wind-works.org

Year

TWh

0 5 10 15 20

Million Euros

0 50 100 150 200 250 300 350

Million Euros

Wind
Small Hydro
Other
Waste

Source: www.cre.fr
Paul Gipe, wind-works.org
Cost of German EEG (2008) ~$50/yr/household

BMU: EEG Costs <5%, ~€0.01/kWh, 2008.
Paul Gipe, wind-works.org
Feed-in Tariffs Deliver Results

- >50% of Wind Worldwide
- >75% of Solar PV Worldwide
- >90% of Farm Biogas Worldwide
Advanced Renewable Tariffs

• What Are They?
  Payment for Generation (Feed-in Tariffs)
  Political Price, Not Political Quota

• How Do They Work?
  Price Differentiation
  Paying for Solar, Paying for Wind

• Where?
  Germany, France, Spain . . .
  . . . 18 EU countries

Paul Gipe, wind-works.org
Renewable Tariff Design
Price Differentiation

• For Different Technologies
• For Different Applications
• For Different Sizes
• For Different Resource Intensities

For Wind (Germany, France, & China!)
For Solar (France, Oregon)

Paul Gipe, wind-works.org
# European Projected Development 2010 with Feed-in Tariffs

<table>
<thead>
<tr>
<th>Country</th>
<th>Wind</th>
<th>Solar PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>2,500</td>
<td>6,000</td>
</tr>
<tr>
<td>Spain</td>
<td>2,500</td>
<td>50-100</td>
</tr>
<tr>
<td>France</td>
<td>1,000</td>
<td>400</td>
</tr>
<tr>
<td>Italy</td>
<td>Quota</td>
<td>1,500</td>
</tr>
</tbody>
</table>

USA: Wind, 10,000 MW?; PV, 450 MW

Paul Gipe, wind-works.org
## European 2010 Feed-in Tariffs

<table>
<thead>
<tr>
<th>Country</th>
<th>Wind</th>
<th>Solar PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>Stable</td>
<td>2010 Cuts in Two Steps: New 3,000 MW Target</td>
</tr>
<tr>
<td>Spain</td>
<td>Possible Cuts</td>
<td>Further Cuts</td>
</tr>
<tr>
<td>France</td>
<td>Stable</td>
<td>Raised Tariffs: New Resource</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Differentiated Tariffs</td>
</tr>
<tr>
<td>Italy</td>
<td>Quota</td>
<td>2011 Cuts: New Target; 3,000 MW 2011-13</td>
</tr>
</tbody>
</table>

Paul Gipe, wind-works.org
<table>
<thead>
<tr>
<th>Country</th>
<th>Resource</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>Wind &amp; Biomass</td>
</tr>
<tr>
<td>Great Britain</td>
<td>Renewable Heat</td>
</tr>
<tr>
<td>Malaysia</td>
<td>All Resources</td>
</tr>
<tr>
<td>Philippines</td>
<td>All Resources</td>
</tr>
<tr>
<td>Japan</td>
<td>All Resources</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>ComFIT, no Solar PV</td>
</tr>
</tbody>
</table>

Paul Gipe, wind-works.org
2009 Solar PV Capacity

• 20,000 MW Worldwide
• 7,000+ MW/yr
• $20+ Billion
• Major Markets
  Germany--3,800 MW*
  Italy--700 MW/yr*
  Japan--500 MW
  USA--450 MW/yr
  California--200 MW/yr

*Feed-in Tariff Market
Paul Gipe, wind-works.org

Rancho Seco, California
World Solar PV Capacity 2009
~20,000 MW

Germany 44%
Spain 16%
Japan 13%
USA 8%
Italy 5%
Czech 2%
Rest of World 11%

More than 3/4 from Feed-in Tariffs

Paul Gipe, wind-works.org
Stromrebellen (Electricity Rebels)

- Democratizing Generation
- Creating Local Investment
- Creating Local Jobs
- Creating Opportunity--and Hope
- Denmark, Germany, and
  France, Minnesota, Ontario and . . . ?
Local People Helping Local People
Hans-Heinrich Andresen

- Manages 16 Wind Farms
- in 16 Villages
- All Locally Owned
  - 15 Owners in Smallest
  - 400 Owners in Largest
- Now Planning Their Own Transmission Line

Paul Gipe, wind-works.org
Local Entrepreneurs Building Local Projects

- 2.6 MW Locally Owned Solar Plant
- Locally Developed, Locally Built, Locally Owned

Nico Petersen, Solar Park Rodenäs

Paul Gipe, wind-works.org
Ontario Moved First

First Modern System of Advanced Renewable Tariffs in North America

Paul Gipe, wind-works.org

Montfort, Wisconsin
Ontario “Gets It”

• Closing Coal Plants
• Delaying Nuclear Build
• Putting Renewables First

Groundbreaking in North America
Ontario’s Green Energy Act
The Most Progressive Renewable Energy Policy in North America in Two–Three Decades

Paul Gipe, wind-works.org
Goderich, Ontario
North American Solar PV Market
Ontario to Move into Top Three

<table>
<thead>
<tr>
<th>Rank</th>
<th>State</th>
<th>Total Installed MW 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>California</td>
<td>768</td>
</tr>
<tr>
<td>2</td>
<td>New Jersey</td>
<td>128</td>
</tr>
<tr>
<td>3</td>
<td>Colorado</td>
<td>59</td>
</tr>
<tr>
<td>4</td>
<td>Ontario</td>
<td>48</td>
</tr>
<tr>
<td>5</td>
<td>Arizona</td>
<td>46</td>
</tr>
</tbody>
</table>

Clear Sky Partners: ~700 MW in 2011; ~3,000 MW by 2015!

Paul Gipe, wind-works.org
Some Comparisons for Scale

• France Solar PV 2010
  400 MW ~ as much as US in 2009

• Italy Solar PV 2010
  1,500 MW ~ as much as US in 30 years!

• Germany Solar PV 2010
  June 2,100 MW ~more than US in 30 years!
  April & July ~ each more than US in 2009

• Ontario Solar PV 2010
  ~ as much as California in 2009
Advanced Renewable Tariffs

• Deliver More Capacity--
  --More Quickly
  --More Equitably
• Enabling Participation
  --Everyone

Paul Gipe, wind-works.org
No Time for Half-Measures

No Time to Lose

Paul Gipe, wind-works.org
We Need A Lot More Wind . . .

Matane, Quebec

Paul Gipe, wind-works.org
A Lot More Solar

Paul Gipe, wind-works.org

Hinesburg, Vermont
Renewable Energy

The Revolution Has Begun!

www.wind-works.org

Manawatu Gorge, New Zealand