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

Disclosure: Paul Gipe has worked with Aerovironment, ANZSES, APROMA, ASES, AusWEA, AWEA, BWEA, BWE, CanWEA, CAW, CEERT, DGW, DSF, EECA, ES&T, GEO, GPI Atlantic, IREQ, KWEA, MADE, Microsoft, ManSEA, MSU, NRCan, NRG Systems, NASA, NREL, NZWEA, ORWWG, OSEA, PG&E, SeaWest, SEI, TREC, USDOE, WAWWG, WE Energies, the Folkecenter, the Izaak Walton League, the Minnesota Project, the Sierra Club, and Zond Systems, and written for magazines in the USA, Canada, France, Denmark, and Germany.
Tarifs Efficace et Equitables
New Policy Option for North America

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

Little Recognition of the Crisis Facing the Continent

Paul Gipe, wind-works.org
Complacency is Not a Policy

Inaction is Not an Option

Paul Gipe, wind-works.org

Skibsted Fjord, Denmark
The Troika of Meeting Demand

- Conservation
  #1 Use Less
- Improve Efficiency
  #2 Do More with Less
- Renewable Energy
  #3 Invest in the Future

Fuchskauten, Höhe Westerwald, Germany
## Typical Household Consumption

<table>
<thead>
<tr>
<th>Location</th>
<th>kWh/yr/home</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>14,000</td>
</tr>
<tr>
<td>Ontario</td>
<td>10,000</td>
</tr>
<tr>
<td>California</td>
<td>6,500</td>
</tr>
<tr>
<td>Netherlands</td>
<td>3,000</td>
</tr>
</tbody>
</table>

Paul Gipe, wind-works.org
Texas
Ontario
California
Germany

Swept Area per Household

Wind Turbine Area (m²)/Household (~6.4 m/s)

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

Noordoost polder, the Netherlands

Paul Gipe, wind-works.org
Montefalcone, Italy
Finisterra, Spain

Paul Gipe, wind-works.org
Freiburg, Germany
Why Now?

• Wind Works
  Greater Reliability

• Productivity Improved
  More Efficient
  Taller Towers

• Costs Declined
  Economies-of-Scale

Paul Gipe, wind-works.org
Northern Ireland

40 m, 500 kW

80 m, 1.8 MW

Kincardine, Ontario

Paul Gipe, wind-works.org
We Know What Works . . . and What Doesn’t
World Wind Capacity 2006
~70,000 MW

Europe 66%
Asia 16%
North America 17%
South America 1%
Africa 0%

Paul Gipe, wind-works.org
2006 World Wind Capacity

12,000 MW

48,000 MW

12,000 MW

Paul Gipe, wind-works.org
Wind Energy is a Real Business
$35 Billion in 2006

Project Development 65%
Electricity Sales 32%
O&M 3%

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

<table>
<thead>
<tr>
<th></th>
<th>Percent Wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Netherlands</td>
<td>2%</td>
</tr>
<tr>
<td>Spain</td>
<td>9%</td>
</tr>
<tr>
<td>Germany</td>
<td>6.5%</td>
</tr>
<tr>
<td>Denmark</td>
<td>23%</td>
</tr>
<tr>
<td>Denmark (CHP)</td>
<td>30%</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Location</th>
<th>Percent Wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark, January 2007</td>
<td>36%</td>
</tr>
<tr>
<td>Spain, 16 February, 2006</td>
<td>20%</td>
</tr>
</tbody>
</table>

Paul Gipe, wind-works.org
Wind Growing Rapidly 2002-2006

- Germany: ~2,400 MW/yr
  20,000 MW by 2006
  30,000 MW by 2012
- Spain: ~1,700 MW/yr
- USA: ~1,500 MW/yr
- Growth: 20%-40%/yr

Paul Gipe, wind-works.org
Why Wind?

• Reduces Use of Fossil & Nuclear Fuels
• Most Cost-Effective of New Renewables
• Relatively Benign

Paul Gipe, wind-works.org
Wind is Modular

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

Paul Gipe, wind-works.org

Tehachapi, California
Wind is Flexible

- Scale
  Big or Small Projects
- Location
  Near or Far
- Time
  Short Lead Times
- Ownership
  Local or Absentee

Paul Gipe, wind-works.org
Wind Energy’s Benefits

- Clean & Green (Mostly)
  - No SO\textsubscript{x}, NO\textsubscript{x}, or CO\textsubscript{2}
- Renewable
  - Net Positive Energy Balance (4-6 months)
- Domestic: Not Subject to Embargo
- Does Not Consume Water
- Modular = Flexible
- . . . and Can be Removed

Paul Gipe, wind-works.org
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 & Bat Kills: Collisions, Electrocutions

Paul Gipe, wind-works.org
Solar PV Growing Rapidly

• 2006: 5,600 MW Worldwide
• 2,000+ MW/yr
• $20+ Billion
• Major Markets
  Germany--800+ MW/yr
  Japan--300 MW/yr
  Spain--50 MW/yr?
  California--50 MW/yr

Paul Gipe, wind-works.org
Rancho Seco, California
Solar Photovoltaic Development

Total Installed MW

Year

USA
Japan
Germany

Paul Gipe, wind-works.org
Solar PV in Germany 2006

- 100,000 New Systems
- €4 Billion
- Total of 300,000 Systems
- ~1,000 MW in 2006!
- Total 2,500 MW
- Costs Dropped 25%
- 300 MW by Farmers!
  On Barn Roofs, 35 kW each

Paul Gipe, wind-works.org
Renewable Tariffs & Solar Photovoltaics in Germany

Year

0 500 1000 1500 2000 2500 3000

MW Total

Renewable Tariffs Launched

1,000-Rooftops (2,500 x 3kW)

100,000 Rooftops

Paul Gipe, wind-works.org
German Farms . . .
. . . Solar PV Cash Crop

• 300 MW on Barn Roof Tops in 2006
German Granny Flat

What’s Wrong with This Picture?

Paul Gipe, wind-works.org

Near Freiburg, Germany
Schönau, Germany

German Churches . . . . . . Protecting Creation

Paul Gipe, wind-works.org
German Renewables
More than Electricity

- Hot Water
- Space Heating
- the Hotel Victoria Has it All . . . from Solar Energy

Paul Gipe, wind-works.org
Freiburg, Germany
Germany’s Renewable Tariffs
The Results (2006)

- Renewables 11.5% of Supply
- Renewables 5.3% of Primary Energy
- 70,000 Employed in Wind Industry
- 40,000 Employed in PV Industry
- 8,000 Employed in Biogas Industry
- 214,000 Employed in Renewables
- €22 (~$30) Billion Turnover
Germany’s Renewable Tariffs
The Results (2006)

• 300,000 PV Installations
• 2,000 Biomass Plants
• 550 MW Farm Biogas, 10 TWh/yr
• 6,000 Hydro Plants
• 18,000 Wind Turbines
• Total of ~350,000 Generators!

Paul Gipe, wind-works.org
Cost of German EEG

- Generation: 60%
- EEG: 3%
- Concession: 10%
- CHP Act: 2%
- VAT: 14%
- Eco Tax: 11%

Paul Gipe, wind-works.org
Why the European Success?

• #1 Community Involvement
  Germany & Denmark

• #2 Advanced Renewable Tariffs
  16 EU Countries use Electricity Feed Laws

Paul Gipe, wind-works.org
Renewable Tariffs
Setting the Stage

Paul Gipe; wind-works.org
What are Our Goals?

- **Primary**
  High Penetration of Renewables Quickly

- **Secondary**
  Equitably Distributed Ownership
  Rural Development
  Sustainable Manufacturing
  Distributed Generation
  Improve Resiliency & Reduce Losses
  Firm-Up Wind’s Variability

Paul Gipe, wind-works.org

Wieringemeer polder, the Netherlands
Do We Want Renewables?

- Peak Oil, Peak Gas
- Climate Catastrophe
  - Europe, 2003: 52,000 Dead
- Public Support High
  - at Level Not Seen in 20 Years
- Desire for New Jobs

Paul Gipe, wind-works.org
Pincher Creek, Alberta: Shell Gas Plant
If Yes, Then What Works Best?

• Who Gets Contracts (PPAs)
  Elite Few or All Who Want Them?

• How To Pay For Them
  RECs/ROCs/Green Tags
  Subsidies (PTC, WPPI)
  Advanced Renewable Tariffs
Renewable Tariffs

The Philosophical Context

Paul Gipe, wind-works.org

Geothermal: Colline Metallifere, Italy
Market Mechanism Status

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

- **Quotas (RPS & Tendering)**
  Typically Anglophone Countries
  Timid Targets Seldom Met
Aggressive Targets Require Aggressive Measures

<table>
<thead>
<tr>
<th>German Renewable Energy Targets</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>12.5%</td>
<td>27%</td>
<td>45%</td>
</tr>
</tbody>
</table>
Advanced Renewable Tariffs

- Deliver More Capacity---
  --More Quickly
  --More Equitably
Advanced Renewable Tariffs

• What Are They?
  Feed Laws or Minimum Price Systems
  Political Price, Not Political Quota
  Simple Contracts

• How Do They Work?
  Simple, Comprehensible, Transparent, Little Administration

• Where?

Paul Gipe, wind-works.org
<table>
<thead>
<tr>
<th>Standard</th>
<th>Non-Standard</th>
<th>Pending</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Czech Republic</td>
<td>Hungary</td>
<td>Japan?</td>
</tr>
<tr>
<td>Brazil</td>
<td>Ireland</td>
<td></td>
<td>Quebec?</td>
</tr>
<tr>
<td>France</td>
<td>Minnesota C-BED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>PEI, Canada</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>Washington State</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy (PV)</td>
<td>Turkey (Wind)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ontario</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Paul Gipe, wind-works.org
Renewable Tariffs: Trend Growing in North America?

Paul Gipe, wind-works.org

Husum, Germany
Renewable Tariffs in North America... Unthinkable?

- Yes--Just 3 years ago
- Today? No
- Now Possible
- Growing Trend in both USA & Canada

Paul Gipe, wind-works.org
Gaspé, Quebec
Willingness to Pay Premium . . . Unthinkable?

- PEI Gasoline Price Regulation
- NS Proposed Gasoline Price Regulation
- Local Content (Quebec)
- Why?
  - Social Economy-Jobs
  - Rural Development

Halifax Herald, May 20, 2005
Evolution of Market Mechanisms

- ARTs Developing Momentum
- RPS/Quota May Have Peaked

Paul Gipe, wind-works.org

Montjoyer, France
## Political Price-Political Quantity

<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
Advanced Renewable Tariffs
Momentum in North America

- Prince Edward Island
- Washington State
- Minnesota C-BED
- California (PV)
- Ontario

Paul Gipe, wind-works.org

Freyssenet, France
Renewable Tariff Design

• Simple, Comprehensible, & Transparent
• Priority Access & Purchase
• Prices Sufficient for Development
• Lengths Sufficient for Profitability
• Fair But Not Undue Profit
• Price Differentiation

Altamont Pass, California
Paul Gipe, wind-works.org
Ontario’s Standard Offer Program

The Most Progressive Renewable Energy Policy in North America in Two Decades

Paul Gipe, wind-works.org

Goderich, Ontario
Advanced Renewable Tariffs for Ontario

• 20 Year Contracts
• <44kV, <10 MW
• Wind, Solar, Hydro, Biomass
• Inclusive--Open to All
• No Program Cap
Ontario’s SOC/ARTs

- Wind, Hydro, & Biomass: $0.11/kWh
- Hydro & Biomass
  $0.0352/kWh on peak
- Solar PV: $0.42/kWh
- Inflation Adjustment: 20%, except Solar PV
- Term: 20 years

Paul Gipe, wind-works.org

Voreifel, Germany
Prices Paid for Wind Energy in Europe

Feed Law-Germany
Feed Law-France
Feed Law-Spain
Quota-Italy
Quota-Britain
Feed Law-Ontario

Euro Cents/kWh

0 2 4 6 8 10 12 14

Paul Gipe, wind-works.org
Prices Paid for Biomass in Europe

Euro Cents/kWh

Feed Law-Germany
Feed Law-France
Feed Law-France
Feed Law-Spain
Quota-Italy
Quota-Britain
Feed Law-Austria
Feed Law-Ontario

Paul Gipe, wind-works.org
Ontario Solar Tariff
North American Comparison

$ CAD/kWh Over 20 Years

California Buy-Down
California Solar PBI
Washington State
New Jersey RPS
Wisconsin
Ontario Solar Tariff

Paul Gipe, wind-works.org
Solar PV Tariffs Worldwide

- Italy
- South Korea
- France
- Germany
- Czech Republic
- Spain
- Austria
- Ontario
- Washington State*
- California*
- South Australia*

*Limited duration with net-metering.

Paul Gipe, wind-works.org
French Solar PV Tariffs

*Plus 50% tax credit on hardware.

Paul Gipe, wind-works.org
Ontario’s Standard Offer Program
What’s Next?

• 2 Year Review March, 2008
• Revisit
  Prices (Tariffs)
  Increase Differentiation
  Differentiated Tariffs for Wind
  Inflation Indexing (60%)
• Add Offshore Wind
• Add Solar Thermal
Advanced Renewable Tariffs
A Question of Equity

- Feed Laws are Fair
- Nearly All Can Play
  Farmers, Ranchers, First Nations, & Co-ops
Wind Energy is Compatible
With Most Existing Land Uses

... With Rural Residential

Yorkshire, England
Paul Gipe, wind-works.org
With Commercial Uses

Lauwersoog, the Netherlands

Westerwald, Germany

Paul Gipe, wind-works.org
With Row Crops

Paul Gipe, wind-works.org

Minnesota, USA
. . . With Grazing

Paul Gipe, wind-works.org

Noordoost Polder, the Netherlands
With Vineyards

Paul Gipe, wind-works.org

Donzere, France
. . . With Tourism

Paul Gipe, wind-works.org
With Tourism

Paul Gipe, wind-works.org

Chateau de Lastours, France
. . . With Schools

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Forest City, Iowa
. . . With Some Parks

Depending Upon the Level of Protection

Wellington (Brooklyn), NZ

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... With Outdoor Recreation

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With Cycling

Royd Moor, England

Westerwald, Germany

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Within Urban Areas
With Religious Sites

Montefalcone, Italy

White Deer, Texas

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. . . With Historical Sites?

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Tre Kroner Historic Park, Denmark
With Walking & Jogging

Paul Gipe, wind-works.org

Dunkerque, France
With Hiking
Wind Turbines

. . . Sell Beer, Bier, Biere, Birra, Cerveza

Paul Gipe, wind-works.org
Sell Wine

Paul Gipe, wind-works.org
Sell Clothes

Paul Gipe, wind-works.org

Cathy Sims, Palmerston North, New Zealand
sell Texas Towns--Yee Ha!

Paul Gipe, wind-works.org
Renewables:

When You Look Closely . . .

. . . Worth Every Cent

Paul Gipe, wind-works.org
. . . Pave the Sidewalk
And the Way to the Future

Paul Gipe, wind-works.org
Wellington (Brooklyn), NZ
Renewable Energy . . .  
For Today and for Tomorrow 
Technology for Life*

*from N.F.S. Grundtvig
Greening New Brunswick . . . With Renewable Tariffs

- More Wind
- More Small Hydro
- More Biogas
  Cow Power!

Paul Gipe, wind-works.org

Searsburg, Vermont
We Need More Wind . . .
... And More Solar

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

No Time to Lose

Paul Gipe, wind-works.org
Tarifs Efficace et Equitables--
New Policy Option for North America

www.wind-works.org

Manawatu Gorge, New Zealand