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, An Environmental Trust, APROMA, ASES, AusWEA, AWEA, David Blittersdorf, Jan & David Blittersdorf Foundation, BWEA, BWE, CanWEA, Canadian Co-operative Assoc., CAW, CEERT, Deutsche Bank, DGW, DSF, EECA, ES&T, GEO, GPI Atlantic, IREQ, KWEA, MADE, Microsoft, ManSEA, MSU, NRCan, NRG Systems, NASA, NREL, NZWEA, ORWWG, OSEA, Pembina, PG&E, SeaWest, SEI, TREC, USDOE, WAWWG, WE Energies, the Folkecenter, the Izaak Walton League, the Minnesota Project, the Sierra Club, World Future Council, and Zond Systems, and written for magazines in the USA, Canada, France, Denmark, and Germany.
Advanced Renewable Tariffs for an Energy Revolution
by
Paul Gipe
Renewable Energy Has Come of Age

Noordoost polder, the Netherlands

Paul Gipe, wind-works.org
Jutland, Denmark

Paul Gipe, wind-works.org

Biogas Combined Heat & Power, Jutland, Denmark
Freiburg -- Germany’s Solar City

Paul Gipe, wind-works.org
2009 World Wind Capacity

Megawatts (Thousands)

- Europe
- North America
- Asia

Year

More than 1/2 From Feed-in Tariffs

Paul Gipe, wind-works.org
2009 World Wind Capacity

38,000 MW

77,000 MW

42,000 MW

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%

Rest of World
11%

Czech
2%

More than 3/4 from Feed-in Tariffs

Paul Gipe, wind-works.org
Setting the Stage

... The Scale of the Problem

Höhe Westerwald, Germany

Paul Gipe, wind-works.org
Lackawanna, New York

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
Profound Issues Confront North America’s Energy Future

- Climate Change Only One Issue
- Transportation (Liquid) Fuels
  Very Little Public Transit
- Domestic Supplies Declining

Paul Gipe, wind-works.org
Cowley Ridge, Alberta
US Electricity Generation
~4,000 TWh/yr

- Nuclear: 801 TWh/yr
- Hydro: 289 TWh/yr
- Other: 81 TWh/yr
- Fossil-Fired: 2850 TWh/yr
Canadian Electricity Generation
~530 TWh/yr

- Hydro: 325
- Nuclear: 75
- New RE: 10
- Fossil-Fired: 155

Paul Gipe, wind-works.org
# Scale Needed: North America

<table>
<thead>
<tr>
<th>Thermal Generation</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>75,000</td>
</tr>
<tr>
<td>USA</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Total</td>
<td>1,600,000</td>
</tr>
</tbody>
</table>

Paul Gipe, wind-works.org

Buffalo Ridge, Minnesota
## Scale Needed: North America

<table>
<thead>
<tr>
<th>Passenger Vehicle Miles</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>50,000</td>
</tr>
<tr>
<td>USA</td>
<td>750,000</td>
</tr>
<tr>
<td>Total</td>
<td>800,000</td>
</tr>
</tbody>
</table>

Paul Gipe, wind-works.org
Scale Needed: North America

- ~2,500,000 MW Wind
- ~120x Today!

Paul Gipe, wind-works.org
Ponnequin, Colorado
Can It Be Done in North America?

- 2,500,000 MW / 200,000 MW/yr
- ~12.5 yrs
- <20 years Heavy Truck Production
  Thermal Generation
  Passenger Vehicle Miles
- Yes, It Can Be Done
- But Not At Current Pace

Paul Gipe, wind-works.org
North American RE Market Growth

• Exciting, Yes
• Significant, Yes
• Not Nearly Enough by Any Standard
USA & Canada
100% Clean Energy?
Yes! It Can Be Done!
But Not With Current Policies

Paul Gipe, wind-works.org
Cowley Ridge, Alberta
Canadian Electricity Consumption with 325 TWh Hydro

100% Renewable

50% Cut in Consumption

Export or Transport

275

50

Paul Gipe, wind-works.org
North America is Capable of Huge National Undertakings

- TVA, BPA, WPA
- Ontario Hydro, Hydro Quebec
- Universal Health Care (Canada)
- Civil Rights, Anti-Smoking

Paul Gipe, wind-works.org
Alberta Has the Best Wind & the Best Solar Resource in Canada

Cowley Ridge, Alberta

Paul Gipe, wind-works.org
Solar PV Yields

Source: RetScreen
Paul Gipe, wind-works.org
North America
Better Than Germany?

- More Land
- More Wind
- More Hydro (Notably Canada)
  For Backup & For Storage
- Fewer People

Paul Gipe, wind-works.org
North America Better Than Germany?

• Biomass: Forests and Wood Wastes?
• Solar PV: Much Better than in Germany
• Geothermal: More Than We Thought
• North America Has it All
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
A Challenge Worthy of Great Nations

Paul Gipe, wind-works.org

Vestas V110, Denmark
Renewable Tariffs
The Philosophical Context

Paul Gipe, wind-works.org
Geothermal: Colline Metallifere, Italy
What are Our Goals?

• **Primary**
  High Penetration of Renewables Quickly

• **Secondary**
  Equitably Distributed Ownership
  Rural Development
  Distributed Generation
  New Industry & Jobs

Paul Gipe, wind-works.org
Wieringemeerpolder, the Netherlands
If Yes, Then What Works Best?

• Who Gets Contracts
  Elite Few or All Who Want Them?

• How To Pay For Them
  RECs/ROCs/Green Tags
  Subsidies (PTC, ITC)
  Advanced Renewable Tariffs
    --Differentiated Feed-in Tariffs
Market Mechanism Status

- **Quotas (RPS & Tendering)**
  Timid Targets Seldom Met

- **Renewable Tariffs**
  Once Only Non-Anglophone Countries
  Now Ontario, Great Britain, Vermont

Meeting Aggressive Targets

Paul Gipe, wind-works.org

Haverigg, Cumbria, Britain
Feed-in Tariffs Deliver Results

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

Ydby, Denmark
Paul Gipe, wind-works.org
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
### 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%
Alberta: ~67 TWh/yr

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

<table>
<thead>
<tr>
<th></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>Feed Law</th>
<th>Political</th>
<th>Market</th>
</tr>
</thead>
<tbody>
<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
Over Cost of French Renewable Tariffs

Source: www.cre.fr
Paul Gipe, wind-works.org
Aggressive Targets Require Aggressive Measures

German Renewable Energy Targets

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>12.5%</td>
<td>39%</td>
<td>50%</td>
<td>80%</td>
</tr>
</tbody>
</table>
Why the European Success?

- **#1 Community Involvement**
  Germany & Denmark

- **#2 Advanced Renewable Tariffs**
  Many EU Countries use Electricity Feed Laws

Paul Gipe, wind-works.org
Stauning, Denmark
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

- Simple, Comprehensible, & Transparent
- Priority Access & Purchase
- Lengths Sufficient for Profitability
- Prices Sufficient to Pay for Generation

Fair But Not Undue Profit Through Price Differentiation

Paul Gipe, wind-works.org

Altamont Pass, California
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
Renewable Tariffs & Solar Photovoltaics in Germany

Renewable Tariffs Launched

Year

MW Total (Thousands)

Advanced Renewable Tariffs Launched

100,000 Rooftops

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

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

• ~3,800 MW in 2009!
• Total 9,000 MW
  ~9 TWh/yr of Generation
• New Target: 3,000 MW/yr!
• ~2%Supply in Bavaria
• ~1+%Supply in Germany

USA: Total of 1,250 MW in 2009.
Paul Gipe, wind-works.org
German Farms--Solar PV Crop

- ~1,000 MW on Barn Rooftops in 2009
- ~3,000 MW Total in 2009 (€15 Billion)
- ~3 TWh/yr (€1.5/yr Billion)
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
Germany’s Renewable Tariffs
The Results (2009)

• 16% of Electricity
• 10% of Primary Energy
• Jobs
  Wind: 90,000
  Solar PV: 50,000
  Biogas: 8,000
  Total: 300,000
Cost of German EEG (2008)
~$50/yr/household

BMU: EEG Costs <5%, ~€0.01/kWh, 2008.

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>200</td>
</tr>
<tr>
<td>Italy</td>
<td>Quota</td>
<td>1,500</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></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 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
## FIT Programs in Development

<table>
<thead>
<tr>
<th>Country</th>
<th>Resource Type</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
Building Acceptance

- Must Share Opportunity
- Public Must Participate by Creating Equal Opportunity for All
- For Renewables To Reach Their Potential

Paul Gipe, wind-works.org
Husum, Germany
Increasing Acceptance #1

“Your Own Pigs Don’t Stink”

Paul Gipe, wind-works.org

Jutland, Denmark
What is Community Power?

• Local
  Responsible to the Community

• Locally Owned
  Cooperatives, First Nations, Farmers, Homeowners

• Commercial-Scale Generation

Paul Gipe, wind-works.org
Fuchskaute, Germany
Community Power

- Greater Acceptance
- More Power More Quickly
- More People Involved Locally
- More Money Locally
- More Jobs Locally

Paul Gipe, wind-works.org
Danish Co-ops  
*(Vindmøllelaug or Fællesmølle)*

- 1/4 Capacity Nationwide
- ~ $1.7 Billion
- 100,000 Households Own Shares
- 5% of Population
German Co-ops (*Bürgerbeteiligung*)

- 1/3 Capacity Nationwide
- $6 Billion
- 200,000 Own Shares
- 2/3 Schleswig-Holstein
- 4/5 Nordfriesland Amt

Schauinsland, Germany

Paul Gipe, wind-works.org
WindShare
Toronto, Canada

- First Urban Turbine in N.A.
- Co-Owned
  WindShare Co-op
  450 Members
  Toronto Hydro
- Prominent Location
- Highly Visible
- Highly Popular

Paul Gipe, wind-works.org
## Co-Op & Farmer-Owned Wind

<table>
<thead>
<tr>
<th></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>10%</td>
<td>40%</td>
<td>50%</td>
</tr>
<tr>
<td>Denmark</td>
<td>64%</td>
<td>24%</td>
<td>12%</td>
</tr>
<tr>
<td>Great Britain</td>
<td>1%</td>
<td>1%</td>
<td>98%</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, 2008

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 . . . ?

Paul Gipe, wind-works.org

Friedrich-Wilhelm-Lübke-Koog, Germany
Josef Pesch, Fesa

- 45 MW
- 60 million kWh/yr
- Just One of Many

Paul Gipe, wind-works.org
Ursula Sladek, EWS
(Elektrizitätswerke Schönau)

• 31,000 Customers
• Hydro, Solar, & Wind

Paul Gipe, wind-works.org
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
Never Underestimate the Ingenuity of Farmers

• When the Barn Doesn’t Face South
• Build a Rack That Will!

Paul Gipe, wind-works.org
Friedrich-Wilhelm-Lübke-Koog, Germany
The Farmers of Nordfriesland

- 0.3% the Size of Alberta
  2,000 km²
- 560 MW of Wind
  Community-Owned, <1% of Land Area
- 1.3 TWh/yr
  2% of Alberta’s Total Generation
  As Much as All the Wind in Alberta
  €100 million ($130 million)/yr
Community Power is also about Faith in Yourself and in Your Community. Yes, You Can Do This. You Don’t Have to be Danish, German, or French.

Paul Gipe, wind-works.org
Challenges in North America

• Piecemeal Policy Approach
  Too Slow
  RPS for Wind, Subsidies for Solar

• “Cheap Energy Contract”
  Cheap Today--Expensive Tomorrow

Paul Gipe, wind-works.org
Challenges in North America

• Low Program Caps
  California: 20%?
  LABC-Los Angeles: 3%
  Oregon: 25 MW! (Why Bother?)

• Solar Only or Wind Only

• Timidity & Lack of Vision
  Do We Want Renewables or Don’t We?

Paul Gipe, wind-works.org
Friedrich-Whilhelm-Lübke-Koog, Germany
Renewable Tariffs . . .
Developing Momentum

Paul Gipe, wind-works.org
Renewable Tariffs in North America . . Unthinkable?

• Yes--Just 4 years ago
  “You’re Absolutely Nuts!”
  Andy Karsner, DOE, 2006

• Today? No

• Now Possible

• Growing Trend
  in North America & Developing World
  China, India, Mongolia

Paul Gipe, wind-works.org
Grassroots Movement

• Explosion of Interest
• Groups Active
  Across US & Canada
• Public Out in Front
  Demands Aggressive Action
• Tipping Point Reached?

San Gorgonio Pass, California
Paul Gipe, wind-works.org
Renewable Tariffs Are In Play

- Nova Scotia to British Columbia
- Washington State to Florida
- Vermont to California
- US House
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
Ontario’s Green Energy Act

• Changes Public Policy on Electricity
  Includes Industrial & Environmental Policy

• Gives Renewables Priority
  In Utility Procurement & System Design

• Targets Industrial Development & Job Creation
  50,000 Jobs in Three Years

Paul Gipe, wind-works.org
Ontario’s Feed-in Tariffs

• First Offshore Wind Tariffs in NA
• First Aboriginal Bonus in NA
  First NA Policy for First Nations
• First Differentiated Solar PV Tariffs
  6 Tranches or Classes
• Most Differentiated Biogas Tariffs
  5 Tranches or Classes
• Best Wind, Solar, & Biogas Tariffs in NA
  Competitive Internationally

Paul Gipe, wind-works.org
Ontario’s Feed-in Tariffs

• No Subsidies or Grants
• Costs Borne by Ratepayers
  Not Taxpayers—More Egalitarian
• Community Wind Bonus
  Individual Farmers Qualify
  $0.01 CAD/kWh Bonus
  $0.145 CAD/kWh (€0.10/kWh)

Paul Gipe, wind-works.org
Ontario Program Status

• 19,000 MicroFIT Applications
  ~190 MW Potential
  6,000 Contracts Offered (~60 MW)
  800 Systems on Line in 1 year

• 8,000 MW of FIT Applications
  Requires Substantial Deposit

• $7 Billion in Likely Private Investment

Paul Gipe, wind-works.org
Ontario Program Status

- 2,500 MW Awarded Contracts
  1,500 MW to Come with Line Completion
- 460 MW Community & Aboriginal
  ~20% of Total

Paul Gipe, wind-works.org
Ontario Program Status

- 650 MW Solar PV
  with 500 MW of SOC PV ~1,000 MW Contracted
- 1,200 MW Onshore Wind
- 300 MW Offshore Wind

Paul Gipe, wind-works.org

Kingston, Ontario
“Nothing is as powerful as an idea whose time has come.”
-- Victor Hugo*

*"Il n'est rien au monde d'aussi puissant qu'une idée dont l'heure est venue." Victor Hugo
Time for North Americans to Take the Road to the Future

Freiburg, Germany

Paul Gipe, wind-works.org
Feed-in Tariffs

“Turn farms, homes, and businesses into entrepreneurs”

--Terry Tamminen, Former Chief Policy Advisor to Governor Arnold Schwarzenegger

Paul Gipe, wind-works.org

Goderich, Ontario
Move From
A Culture of Consumption
to
A Culture of Conservation

--Ontario Premier Dalton McGuinty

Paul Gipe, wind-works.org

Montfort, Wisconsin
Move From
A Nation of Consumers
to
A Nation of Producers

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

No Time to Lose

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

Hinesburg, Vermont

Paul Gipe, wind-works.org
. . . A Lot More Renewable Energy Technology for Life*

*from N.F.S. Grundtvig, Danish Theologian

Paul Gipe, wind-works.org
Renewables . . .

When You Look Closely . . .

. . . Worth Every Cent

Paul Gipe, wind-works.org
Renewable Energy

The Revolution Has Begun!

www.wind-works.org

Manawatu Gorge, New Zealand