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
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
Galicia, Spain

Paul Gipe, wind-works.org
Freiburg -- Germany’s Solar City
2009 World Wind Capacity

Megawatts (Thousands)

Year

Europe
North America
Asia

More than 1/2 From Feed-in Tariffs

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
Solar Photovoltaics Development

Total Installed MW (Thousands)

Year

USA
Spain
Japan
Germany

Paul Gipe, wind-works.org
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

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
Profound Issues Confront North America’s Energy Future

- Climate Change Only One Issue
- Transportation (Liquid) Fuels
  Very Little Public Transit
- Domestic Supplies Declining
Profound Issues Confront North America’s Energy Future

• Our Total Dependence on Oil as a Transportation Fuel Leads to Tragic Consequences--Only Some of Which Make the News.

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

• Exciting, Yes
• Significant, Yes
• Not Nearly Enough by Any Standard
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
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

Paul Gipe, wind-works.org  Dunkerque, France
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
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

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: ~61 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
<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
Over Cost of French Renewable Tariffs

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

Year
Million Euros
TWh

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

## German Renewable Energy Targets

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electricity</strong></td>
<td>12.5%</td>
<td>39%</td>
<td>50%</td>
<td>80%</td>
</tr>
</tbody>
</table>

Ferndale, Ontario

Paul Gipe, wind-works.org
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
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 Homeowners--New Revenue

- ~100 MW on Home Rooftops 2009
- ~4,000 MW+ Total
- ~4 TWh/yr
- ~€2 Billion/yr Revenue
- Anyone with a Roof Can Do Solar in Germany!

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
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
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
“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

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

Paul Gipe, wind-works.org

Goderich, Ontario
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
Stromrebellen (Electricity Rebels)

- Democratizing Generation
- Creating Local Investment
- Creating Local Jobs
- Creating Opportunity--and Hope
- Denmark, Germany, and France, Minnesota, Ontario and . . . ?
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
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!
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
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
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

Gaspé Peninsula, Quebec

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
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