Advanced Renewable Tariffs
Getting it Right in North America
by
Paul Gipe

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

Noordoostpolder, the Netherlands

Paul Gipe, wind-works.org
Montefalcone, Italy

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

Megawatts (Thousands)

- 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

Paul Gipe, wind-works.org

Rancho Seco, California
Solar Photovoltaics Development

Total Installed MW (Thousands)

USA
Spain
Japan
Germany

Year

0 2 4 6 8 10

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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
Hohe Westerwald, Germany

Setting the Stage

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

Most Policies Timid Half Measures

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

Paul Gipe, wind-works.org

Buffalo Ridge, Minnesota
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
Renewable Tariffs
The Philosophical Context

Geothermal: Colline Metallifere, Italy

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
Do We Really Want Renewables?

San Gorgonio Pass, California

Paul Gipe, wind-works.org
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

Ydbj, Denmark
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
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>
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</thead>
<tbody>
<tr>
<td>Germany</td>
<td>15 TWh/yr</td>
<td>35 TWh/yr</td>
<td>5 TWh/yr</td>
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<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%
California Consumption: ~300 TWh/yr

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

<table>
<thead>
<tr>
<th>Country</th>
<th>Percent Wind</th>
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<tbody>
<tr>
<td>France</td>
<td>1.2%</td>
</tr>
<tr>
<td>California</td>
<td>1.5%</td>
</tr>
<tr>
<td>Germany</td>
<td>7%</td>
</tr>
<tr>
<td>Spain</td>
<td>12%</td>
</tr>
<tr>
<td>Denmark</td>
<td>21%</td>
</tr>
</tbody>
</table>

2007, EWEA; Excepting California by Paul Gipe; IEA California: 2.3%.

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

Year

MW Total (Thousands)

0 1 2 3 4 5 6

Advanced Renewable Tariffs Launched

1,000 Rooftops

100,000 Rooftops

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

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Solar PV in Germany

• ~3,800 MW in 2009!
• Total 9,000 MW
  ~9 TWh/yr of Generation
  ~80% on rooftops
• New Target: 3,000 MW/yr!
• ~2% Supply in Bavaria
• ~1+% Supply in Germany

Paul Gipe, wind-works.org
German Renewable Generation

TWh Generated per Year

- **ARTs (EEG)**
- **Feed Law (StrEG)**

Advanced Renewable Tariffs Launched
Feed-in Tariff (StrEG)

Year

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German Renewables 2009
~93 TWh (16%)

- Wind: 38%
- Biomass: 30.6%
- Solar PV: 6.2%
- Hydro: 19%
- ~1%

~33% of California’s Current Demand

Source: BMU
Paul Gipe, wind-works.org
Germany’s Renewable Tariffs
The Results (2009)

- 16% of Electricity
- 10% of Primary Energy
- 300,000 Jobs
  - Wind: 90,000
  - Solar PV: 50,000
  - Biogas: 8,000

Paul Gipe, wind-works.org
Hohe Westerwald, Germany
Cost of German EEG (2008)
~$50/yr/household

BMU: EEG Costs <5%, ~€0.01/kWh, 2008.
Paul Gipe, wind-works.org
## Political Price-Political Quantity Market Mechanisms

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

Figure 9 – Amount of energy from renewable sources and costs linked to the feed-in tariffs

Source: Energy Regulation Commission, 2008, author’s calculations.

Cécile Bordier, Caisse des Dépôts, Dec. 2008

Overcosts, 2008: ~0 due to increase in electricity costs. Bernard Chabot, Nov. 2008.
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>
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<tbody>
<tr>
<td>Electricity</td>
<td>12.5%</td>
<td>30%</td>
<td>45%</td>
<td>80%</td>
</tr>
</tbody>
</table>
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

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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
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)

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Differentiated Tariffs for Wind

• Distributed Benefits
  Only Accrue From Distributed Generation
  Differentiated Tariffs = Distributed Wind

• Reduces Pressure on Windiest Sites
  Profitability Still Higher at Windy Sites

• Reduces NIMBYism
  By Enabling Greater Participation

Paul Gipe, wind-works.org

San Gorgonio Pass, California
French Wind Tariffs
Resource Productivity Method

• Fair Profits at Medium Wind Sites
• Not “Undue” Profits at Windy Sites
• Profitability Index Method (Chabot)

Not Discounted Cash Flow Model

Paul Gipe, wind-works.org
Igny, Lorraine, France
French Wind Tariffs by Specific Yield

Specific Yield (kWh/m²/yr)

$CAD/kWh

Base
Medium
High

Chateau de Lastours, France

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*
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

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Renewable Tariffs . . . Developing Momentum

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Grassroots Movement

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

Paul Gipe, wind-works.org
San Gorgonio Pass, California
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 & Green Economy Act

• Multi-faceted
• Efficiency & Conservation
• Renewable Energy

Procure Through Feed-in Tariffs

Paul Gipe, wind-works.org
Ontario’s Green Energy Act
The Most Progressive Renewable Energy Policy in North America in Two Three Decades

Paul Gipe, wind-works.org
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
- Targets Job Creation
  Goal: 50,000 Jobs in 3 Years

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Ontario’s Feed-in Tariffs

- Differentiated by Size & Technology
- Differentiated by Application
- Tariffs Based on Cost of Generation
  Plus Reasonable Profit
- No Program Cap (Bring It On!)

Sarnia, Ontario
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
  5 Tranches or Classes
• Best Wind, Solar, & Biogas Tariffs in NA
  Competitive Internationally

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Ontario’s Feed-in Tariffs

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

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Ontario Project Status

• 2,500 MW Awarded Contracts
  1,500 MW to Come
  
• 460 MW Community & Aboriginal
  ~20% of Total
  
• 80 MW Residential Rooftop PV
Ontario Project Status

- 650 MW PV
  w/ 500 MW of SOC PV ~1,000 MW
- 1,200 MW Onshore Wind
- 300 MW Offshore Wind
Challenges in North America

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

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

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Challenges in North America

• Low Program Caps
  Vermont: 2%-3%
  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?
Grading North American FITs
10 Criteria

- Program Caps
- Project Size Caps
- Contract Term
- Technologies Included
- Tariffs Based on Cost of Generation
- Tariffs Differentiated by Technology
- Tariffs Differentiated within Technology
- Wind Tariffs Differentiated by Resource
- Inflation Indexing
- Bonus Payments or Adders

Paul Gipe, wind-works.org
Grading North American FITs
The Gold Standard

<table>
<thead>
<tr>
<th>Country</th>
<th>Score</th>
<th>Grade</th>
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<tr>
<td>Germany</td>
<td>90</td>
<td>A</td>
</tr>
<tr>
<td>France</td>
<td>90</td>
<td>A</td>
</tr>
<tr>
<td>Spain (Fixed Tariff)</td>
<td>80</td>
<td>A-</td>
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Paul Gipe, wind-works.org

Fuchskaute, Germany
## Grading North American FITs

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Germany</th>
<th>France</th>
<th>Ontario</th>
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<tr>
<td>Program Caps</td>
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<td>10</td>
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<td>Project Size Caps</td>
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<td>8</td>
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<tr>
<td>Contract Term</td>
<td>10</td>
<td>10</td>
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<tr>
<td>Multiple Technologies</td>
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<td>Cost-Based Tariffs</td>
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<td>Technology Differentiation</td>
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<td>Technology Banding</td>
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<td>Resource Differentiation</td>
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<td>6</td>
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<td>Bonus or Adders</td>
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## Grading North American FITs

### Existing FITs

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<tr>
<th>State/Region</th>
<th>Score</th>
<th>Grade</th>
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<tbody>
<tr>
<td>Ontario (2009)</td>
<td>84</td>
<td>A-</td>
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<tr>
<td>Vermont</td>
<td>54</td>
<td>D</td>
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<tr>
<td>Maine</td>
<td>43</td>
<td>F</td>
</tr>
<tr>
<td>Wisconsin IOUs</td>
<td>36</td>
<td>F</td>
</tr>
<tr>
<td>California</td>
<td>28</td>
<td>F</td>
</tr>
<tr>
<td>Oregon</td>
<td>16</td>
<td>F</td>
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Grading North American FITs
Ontario & Vermont

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Ontario</th>
<th>Vermont</th>
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<tr>
<td>Program Caps</td>
<td>10</td>
<td>2</td>
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<td>Project Size Caps</td>
<td>8</td>
<td>2</td>
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<td>Contract Term</td>
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<tr>
<td>Multiple Technologies</td>
<td>8</td>
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<td>Cost-Based Tariffs</td>
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<td>Technology Differentiation</td>
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<td>Technology Banding</td>
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<td>12</td>
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<td>Resource Differentiation</td>
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<td>Inflation Indexing</td>
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<td>Bonus or Adders</td>
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Grading North American FITs
Proposed FITs

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<th>Grade</th>
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<tbody>
<tr>
<td>Michigan</td>
<td>82</td>
<td>A-</td>
</tr>
<tr>
<td>Indiana HB1190</td>
<td>82</td>
<td>A-</td>
</tr>
<tr>
<td>California AB 1106</td>
<td>54</td>
<td>D</td>
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Paul Gipe, wind-works.org
# Making the Grade: What’s Needed

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Best Practice</th>
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<tbody>
<tr>
<td>Program Caps</td>
<td>None or &gt;20%</td>
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<tr>
<td>Project Size Caps</td>
<td>None or 20 MW</td>
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<tr>
<td>Contract Term</td>
<td>&gt;20 years</td>
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<tr>
<td>Multiple Technologies</td>
<td>Wind, Solar PV, Solar DHW, Geothermal, CSP</td>
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<td>Cost-Based Tariffs</td>
<td>For All Classes</td>
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<td>Technology Differentiation</td>
<td>Tariffs for Each Class</td>
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<tr>
<td>Technology Banding</td>
<td>By Application &amp; Size</td>
</tr>
<tr>
<td>Resource Differentiation</td>
<td>Wind &amp; Solar PV</td>
</tr>
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</table>

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Middelgrunden, Denmark
Making the Grade: What ‘s Needed

• Open to All for All
  Homeowners, Farmers, Business & Industry,
  Communities, Native Americans
  Regardless of Tax Status
  Tariffs with & without Tax Credits

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Solar Park Rodenäs
Time for Americans to Take the Road to the Future

Freiburg, Germany

Paul Gipe, wind-works.org
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 . . .

Matane, Quebec
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
Renewable Energy

The Revolution Has Begun!

www.wind-works.org

Manawatu Gorge, New Zealand