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.

Paul Gipe, wind-works.org
Advanced Renewable Tariffs
Grading North American Efforts
and Ontario’s Status
Colorado Governor’s Energy Office
by
Paul Gipe

Paul Gipe, wind-works.org
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
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>
</tr>
</thead>
<tbody>
<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>
</tr>
</tbody>
</table>

Paul Gipe, wind-works.org
# Grading North American FITs

## Existing FITs

<table>
<thead>
<tr>
<th>Location</th>
<th>Score</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario (2009)</td>
<td>84</td>
<td>A-</td>
</tr>
<tr>
<td>Vermont</td>
<td>54</td>
<td>D</td>
</tr>
<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>
</tr>
</tbody>
</table>

Paul Gipe, wind-works.org
<table>
<thead>
<tr>
<th></th>
<th>Score</th>
<th>Grade</th>
</tr>
</thead>
<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>
</tr>
</tbody>
</table>
## Making the Grade: What’s Needed

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

*Paul Gipe, wind-works.org*

*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

Paul Gipe, wind-works.org  Solar Park Rodenäs
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

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

Paul Gipe, wind-works.org

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
  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

• **$9 Billion in Likely Private Investment**
Ontario Program Status

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

- **MicroFIT Revision August 2010**
  - Split into Two Tranches
    - Rooftop PV & Ground
- **2011 Program Review

Toronto, Ontario
Paul Gipe, wind-works.org
# North American Solar PV Market

## Ontario Moves into Top Three

<table>
<thead>
<tr>
<th>Rank</th>
<th>State</th>
<th>MW 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>California</td>
<td>212</td>
</tr>
<tr>
<td>2</td>
<td>New Jersey</td>
<td>57</td>
</tr>
<tr>
<td>3</td>
<td>Ontario</td>
<td>46</td>
</tr>
<tr>
<td>4</td>
<td>Florida</td>
<td>36</td>
</tr>
<tr>
<td>5</td>
<td>Colorado</td>
<td>23</td>
</tr>
</tbody>
</table>

Ontario 2010: ~100-200 MW  
Clear Sky Partners: ~800 MW/yr  
Paul Gipe, wind-works.org
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
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
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
    - Colorado -- 25 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

More than 3/4 from Feed-in Tariffs

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

• Most Efficient
• Least Costly
• Simpler
• Is Compatible with Market Economics

From Bernard Chabot, ADEME

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
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

---

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

Paul Gipe, wind-works.org

Chateau de Lastours, France
Renewable Tariffs & Solar Photovoltaics in Germany

Year

MW Total (Thousands)

Advanced Renewable Tariffs Launched
100,000 Rooftops
1,000-Rooftops (2,500 x 3kW)

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

Paul Gipe, wind-works.org

Höhe Westerwald, Germany
German Renewables 2009
~93 TWh (16%)

Wind 38%
Biomass 30.6%
Hydro 19%
Solar PV 6.2%

Source: BMU
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
Over Cost of French Renewable Tariffs

Source: www.cre.fr
Paul Gipe, wind-works.org
Potential per Ontario Farm

- 2MW Turbine, 80 m Ø, 80 m Tower
- ~$5 million CAD Installed
- ~4 million kWh/Year (~6.5 m/s)
- ~$500,000 CAD/yr @ $0.145/kWh
- Simple Payback: ~10 Years
- After Payback: ~$500,000 CAD/yr
Solar PV
Ontario Barn Roof

- 30 kW; ~$275,000
- 30,000 kWh/yr
- $21,000/yr
- Simple Payback ~13 years
Solar PV Yields

Source: RetScreen
Paul Gipe, wind-works.org
The Farmers of Nordfriesland

- **0.7% the Size of Colorado**
  - 2,000 km²
- **560 MW of Wind**
  - Community-Owned, <1% of Land Area
- **1.3 TWh/yr**
  - 2% of Colorado’s Total Generation
  - €100 million ($150 million)/yr
## European Projected Development 2010 with Feed-in Tariffs

<table>
<thead>
<tr>
<th></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>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 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>Energy Source</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
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