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, Canadian Co-operative Assoc., CAW, CEERT, 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, and Zond Systems, and written for magazines in the USA, Canada, France, Denmark, and Germany.
Advanced Renewable Tariffs
New Policy Option for North America
by
Paul Gipe
Renewable Energy Has Come of Age

Paul Gipe, wind-works.org
Freiburg -- Germany’s Solar City
World Solar PV Capacity 2008
~13,000 MW

Germany 41%
Japan 17%
Spain 25%
USA 9%
Rest of World 8%

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

- 6,000+ MW/yr
- $20+ Billion/yr
- Major Markets
  - Germany -- 1,500+ MW/yr
  - Spain -- 500+ MW/yr (2,600 MW in 2008)
  - Japan -- 250 MW/yr
  - USA -- 300 MW/yr
  - California -- 175 MW/yr

Paul Gipe, wind-works.org
Rancho Seco, California
Renewable Tariffs
The Philosophical Context

Paul Gipe, wind-works.org
Geothermal: Colline Metallifere, Italy
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
Complacency is Not a Policy

Inaction is Not an Option

Paul Gipe, wind-works.org

Skibsted Fjord, Denmark
Profound Issues Confront North America’s Energy Future

• Climate Change Not Only Issue

• Transportation (Liquid) Fuels
  Very Little Public Transit

• Domestic Supplies Declining

Paul Gipe, wind-works.org
Profound Issues Confront North America’s Energy Future

- Natural Gas Production May Have Peaked Critical for Heating
- Gore Upped the Ante (100%)
North American RE Market Growth

• Exciting, Yes
• Significant, Yes
• Not Nearly Enough by Any Standard
Höhe Westerwald, Germany

Some Fun With Numbers

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

- Nuclear: 801 TWh/yr
- Hydro: 289 TWh/yr
- Other: 81 TWh/yr
- Fossil-Fired: 2850 TWh/yr
### 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
Electric Vehicle Charging

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

• ~2,500,000 MW
• ~120x Today!

Paul Gipe, wind-works.org  Ponnequin, Colorado
USA & Canada
100% Clean Energy?
Yes! It Can Be Done!
But Not With Current Policies
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
North America Better Than Germany?

- More Land
- More Wind
- More Hydro
  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
What are Our Goals?

• Primary
  High Penetration of Renewables Quickly

• Secondary
  Equitably Distributed Ownership
  Rural Development
  Distributed Generation
  New Industry & Jobs
If We Want Renewables Then What Works Best?

• Who Gets to Build
  Elite Few or All Who Want?

• How To Pay For Them
  RECs/ROCs/Green Tags
  Subsidies (PTC, EcoEnergy)
  Advanced Renewable Tariffs
  --Feed-in Tariffs

Paul Gipe, wind-works.org
Dunkerque, France
Market Mechanism Status

• Quotas (RPS & Tendering)
  Typically Anglophone Countries
  Timid Targets Seldom Met

• Renewable Tariffs
  Once Only Non-Anglophone Countries
  Aggressive Targets
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>30%</td>
<td>45%</td>
<td>80%</td>
</tr>
</tbody>
</table>

Paul Gipe, wind-works.org
# Adding Renewables Quickly

Paul Gipe, wind-works.org

<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>5,000 MW</td>
</tr>
<tr>
<td>Spain</td>
<td>15 TWh/yr</td>
<td>28 TWh/yr</td>
<td>3,300 MW</td>
</tr>
</tbody>
</table>

Germany Renewables: 10 Years--5% to 15%

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

#1 Community Involvement
Germany & Denmark

#2 Advanced Renewable Tariffs
18 EU Countries use Electricity Feed Laws

Paul Gipe, wind-works.org
Public Acceptance Critical

• Acceptance Necessary
  For Continued Political Support

• As Renewables Grow
  Entrenched Players Threatened

• Organized Opposition Grows
  Coal & Nuclear Industry

No to Windmills

Paul Gipe, wind-works.org
Building Acceptance

• Must Share Opportunity
• Public Must Participate
• For Renewables To Reach Their Potential

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

“Your Own Pigs Don’t Stink”

Paul Gipe, wind-works.org

Jutland, Denmark
Community Wind--The Third Way
Wind Energy As If People Matter

1. Large Wind Power Plants
2. Small Wind Turbines
3. Locally-Owned Commercial Turbines

WindShare Meeting,
Toronto, Canada

Paul Gipe, wind-works.org
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
Middelgrunden Co-op København

- 20 x 2 MW Off-shore
- 1/2 Owned by Co-op
- 1/2 Owned by Utility
- 8,500 Investors
- €570 per Share
- Visible from Christiansborg Palace

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

<table>
<thead>
<tr>
<th>Country</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
# Minnesota Distributed Wind

<table>
<thead>
<tr>
<th>Ownership Type</th>
<th>MW</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Developer</td>
<td>104</td>
<td>12%</td>
</tr>
<tr>
<td>Farmer Owned</td>
<td>74</td>
<td>8%</td>
</tr>
<tr>
<td>Locally Owned</td>
<td>72</td>
<td>8%</td>
</tr>
<tr>
<td>Municipal Utility</td>
<td>19</td>
<td>2%</td>
</tr>
<tr>
<td>Rural Electric Cooperative</td>
<td>6</td>
<td>1%</td>
</tr>
<tr>
<td>College/University</td>
<td>5</td>
<td>1%</td>
</tr>
<tr>
<td>School</td>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>281</td>
<td><strong>31%</strong></td>
</tr>
</tbody>
</table>

Source: Windustry.org, March 2007

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
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
Solar PV in Germany 2008

• 150,000 New Systems
• €6 Billion
• Total of 600,000 Systems
• ~1,500 MW in 2008!
• Total 5,000 MW
• ~2% Supply in Bavaria
• ~1% Supply in Germany

Paul Gipe, wind-works.org
German Homeowners

- ~800 MW on Home Rooftops/yr
- ~3,000 MW+ Total
- ~2.5 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

- ~700 MW on Barn Rooftops in 2008
- ~2,000 MW Total in 2008 (€9 Billion)
- ~2 TWh/yr (€1 Billion)

Paul Gipe, wind-works.org
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 (2008)

- Renewables 15.3% of Supply
- Renewables 9.6% of Primary Energy
- 90,000 Employed in Wind Industry
- 50,000 Employed in PV Industry
- 8,000 Employed in Biogas Industry
- 280,000 Employed in Renewables
- €32 (~$50) Billion Turnover

Paul Gipe, wind-works.org
German Renewables 2008
~93 TWh (15%)

- Wind: 40.4%
- Biomass: 27.1%
- Hydro: 21.8%
- Solar PV: ~1%
- WA: ~100 TWh/yr

Source: BMU
Paul Gipe, wind-works.org
Cost of German EEG (2007) ~$50/yr/household

- Generation 58%
- EEG 5%
- Eco Tax 11%
- VAT 14%
- Concession 10%
- CHP Act 2%

Paul Gipe, wind-works.org
Myths to Dispel

• Renewables are Free or Cheap
  But They Are Affordable & Worth It
• Feed-in Tariffs Too Expensive
• Feed-in Tariffs Not Market Mechanism

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
IEA: Quota & Feed-in Tariff Cost of European Wind (2005)

<table>
<thead>
<tr>
<th></th>
<th>USD/kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quotas &amp; TGC</td>
<td>0.13-0.17</td>
</tr>
<tr>
<td>Feed-in Tariffs</td>
<td>0.09-0.011</td>
</tr>
</tbody>
</table>

Quotas & TGC: $0.04-$0.06/kWh more costly.

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

Paul Gipe, wind-works.org
## Cost of ARTs Relative to ROCs

<table>
<thead>
<tr>
<th></th>
<th>France</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWh 2006</td>
<td>10.5</td>
<td>12.9</td>
</tr>
<tr>
<td>Overcost (Million Euros)</td>
<td>124</td>
<td>611</td>
</tr>
<tr>
<td>CO2 Mitigation (Euros/t)</td>
<td>39.5</td>
<td>86</td>
</tr>
<tr>
<td>Overcost (Euros/kWh)</td>
<td>0.012</td>
<td>0.047</td>
</tr>
<tr>
<td>Relative Cost</td>
<td>0.25</td>
<td></td>
</tr>
</tbody>
</table>

Cécile Bordier, Caisse des Dépôts, Dec. 2008
Over Cost of French ARTs Declining

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

Cécile Bordier, Caisse des Dépôts, Dec. 2008

Overcosts, 2008: ~0 due to increase in electricity costs. Bernard Chabot, Nov. 2008.

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

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

• For Different Technologies
• For Different Applications
• For Different Sizes
• For Different Resource Intensities
  For Wind (Germany & France)
  For Solar (France)

Paul Gipe, wind-works.org
## Renewable Tariffs Contract Length

<table>
<thead>
<tr>
<th>Country</th>
<th>Wind</th>
<th>Solar</th>
<th>Hydro</th>
<th>Biomass</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>15</td>
<td>20</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Germany</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Ontario</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Portugal</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Spain (2007)*</td>
<td>&gt;15</td>
<td>&gt;25</td>
<td>&gt;25</td>
<td>&gt;20</td>
</tr>
</tbody>
</table>

**Longer Contracts Reduce Initial Price.**
## Renewable Tariffs Inflation Adjustment

<table>
<thead>
<tr>
<th>Country</th>
<th>Inflation Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>0%</td>
</tr>
<tr>
<td>Ontario RFP</td>
<td>15%</td>
</tr>
<tr>
<td>Ontario SOC</td>
<td>20%</td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>26%</td>
</tr>
<tr>
<td>France</td>
<td>60%</td>
</tr>
<tr>
<td>Spain</td>
<td>50-75</td>
</tr>
<tr>
<td>Greece</td>
<td>100%</td>
</tr>
<tr>
<td>Ireland</td>
<td>100%</td>
</tr>
</tbody>
</table>

Higher Inflation Adjustment Reduces Initial Price.

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

Paul Gipe, wind-works.org
Differentiated Tariffs for Wind

- Increases Program Flexibility
  Lessens Pressure to Get Prices Right the First Time
- Reduces Development Risk
  Determining Final Price After 5 Years of Operation
- Spreads Opportunity to All
  Not Just to Elite Few
- Provides Fair Profits at Modest Wind Sites
- Limits "Excessive Profits" at Windy Sites

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

Paul Gipe, wind-works.org

Feed Law-Germany

Feed Law-France

Feed Law-Spain

$USD/kWh

2009
<table>
<thead>
<tr>
<th>Feature</th>
<th>Germany</th>
<th>France</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTs</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cost-Based Tariffs</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Program Limits</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Term</td>
<td>20</td>
<td>15-20</td>
<td>25+</td>
</tr>
<tr>
<td>Inflation</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Solar Tiers</td>
<td>5</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Wind Offshore</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Wind Tiered Tariffs</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Wind Tiers</td>
<td>Continuous</td>
<td>Continuous</td>
<td>n/a</td>
</tr>
<tr>
<td>Community Power</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Paul Gipe, wind-works.org
Often Overlooked
The Value of Predictability

- Renewable Tariffs are Bankable
  More Important Today Than Ever!
- Renewable Tariffs Provide Stable & Predictable Income Streams
Barriers to Renewable Tariffs

• Philosophical: Cost vs Value
  Cost of Generation Plus Fair Profit
• Sticker Shock
  Imbedded Costs of Heritage (Old) Resources
• Unfamiliarity
• Tax Subsidies Distort Market
  Complicate Program Design

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

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

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

Paul Gipe, wind-works.org
Dark Clouds on Horizon

- Rise of Faux Feed-in Tariffs
  Feed-in Tariffs in Name Only (FITINOs)
- Utility “Voluntary” Tariffs
  Co-opting Full-Fledged Programs
  Greenwashing
- Coal & Nuclear Industry
  Awakening to the Threat
  Neoliberal Think Tank Attacks

Paul Gipe, wind-works.org
Strategy--Operating in Parallel

• Run Alongside Existing Programs
  With RPS & Solar Subsidies (ITC)

• Don’t Disrupt Existing Markets
  We Need All RE As Quickly As Possible

• Build Track Record

• Use Renewable Tariffs
  for Meeting RPS Targets

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

• Yes--Just 5 years ago
  “You’re Absolutely Nuts!”
• Today? No
• Now Possible
• Growing Trend
  in USA, Canada
  & Developing World
  China, India, Mongolia
  South Africa

Paul Gipe, wind-works.org

Gaspé, Quebec
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
Renewable Tariffs . . .
Developing Momentum

Paul Gipe, wind-works.org
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
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

Goderich, Ontario
Why?

• All Renewables
  First in North America

• Open To All Players
  First in North America

• Differentiated Tariffs
  First in North America

• Simplified Contracts
  Relatively

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
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
Ontario’s Feed-in Tariffs

- No Subsidies or Grants
- Costs Borne by Consumers
  Not Taxpayers--More Egalitarian
- Community Wind Bonus
  Third Jurisdiction in North America

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

Paul Gipe, wind-works.org
Advanced Renewable Tariffs

• Deliver More Capacity--
  --More Quickly
  --More Equitably
  --For More People
  by Enabling Participation

Paul Gipe, wind-works.org
“Nothing is as powerful as an idea whose time has come.”
-- Victor Hugo
Move From
A Culture of Consumption
to
A Culture of Conservation

--Ontario Premier Dalton McGuinty

Paul Gipe, wind-works.org

Montfort, Wisconsin
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 Nation of Consumers
to
A Nation of Producers

Paul Gipe, wind-works.org
Lackawanna, New York
California Lt. Governor Garamendi

“We know what works. Seems to me we use what works.”*

Geothermal Plant, Mammoth Hot Springs, California
Paul Gipe, wind-works.org
No Time for Half-Measures

No Time to Lose

Paul Gipe, wind-works.org

Gaspé Peninsula, Quebec
We Need A Lot More Wind . . .

Matane, Quebec
... And A Lot More Solar

Paul Gipe, wind-works.org
A Challenge
Worthy of Great Nations

Paul Gipe, wind-works.org

Vestas V110, Denmark
Renewable Energy . . .
For Today and for Tomorrow
Technology for Life*

*from N.F.S. Grundtvig

Paul Gipe, wind-works.org
Renewable Tariffs--
New Policy Option
for North America

www.wind-works.org

Manawatu Gorge, New Zealand