100% WWS: Energy Technologies to Power the World in 2030 (Jacobson-Delucchi)

(Number needed in U.S.)
- Wind turbine (590,000)
- Concentrated solar (7,600)
- Solar PV plant (6,200)
- Roof PV (265,000,000)
- Geothermal plant (830)
- Hydroelectric plant (140)
- Tidal turbine (7,600)
- Wave device (110,000)
Changing U.S. Electricity Mix

- **Coal**: 2,000 TWh (2007) → 2,300 TWh (2011) (+14%)
- **Gas**: 1,000 TWh (2007) → 1,100 TWh (2011) (+13%)
- **Nuclear**: 700 TWh (2007) → 800 TWh (2011) (+14%)
- **Hydro**: 500 TWh (2007) → 600 TWh (2011) (+20%)
- **Wind**: 100 TWh (2007) → 200 TWh (2011) (+100%)
- **Other**: 200 TWh (2007) → 300 TWh (2011) (+50%)

- **Total**: 5,400 TWh (2007) → 6,600 TWh (2011) (+248%)
Growth Paths of Fledgling Power Technologies (U.S.)

- **Wind, 2000-2011**
- **Nuclear, 1963-1974**

TWh
Policies to Promote Offshore Wind Power

- Pilot Projects
- Pro-active Governance of Fracking
  - Bans
  - Disclosure / Transparency
  - Bonds / Regulation / Fines
- Feed-in Tariffs
- Carbon Tax
Carbon Tax Impact on U.S. Power Costs

- **Coal**
- **Gas (steam)**
- **Gas (Combined Cycle)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Coal</th>
<th>Gas (steam)</th>
<th>Gas (Combined Cycle)</th>
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<tr>
<td>2007</td>
<td>0</td>
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<td>2011</td>
<td>2</td>
<td>4</td>
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<tr>
<td>2011 w/ B.C. tax</td>
<td>4</td>
<td>6</td>
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₵/kWh, fuel only