Wind Energy Technology: An Opportunity for our Environment, Economic Development and Energy Security

Randall Swisher
Senior Executive Advisor
American Wind Energy Association
Presentation Overview

- Wind Industry Current Status
- What is Wind’s Potential?
- What are the Challenges?
The U.S. Wind Industry Today
Many Types of Wind Power

- Water Pumper
- Customer-Owned Small Generator
- Community Wind
- Offshore Utility Wind Plants
U.S. Leads World in Cumulative Wind Capacity

Rest of the World – 41.8 GW
India – 10.9 GW
Spain – 19.2 GW
Germany – 25.8 GW
China – 25.8 GW
United States – 35.1 GW

U.S. Wind Capacity Growth

10,010 MW installed in 2009
35,086 MW installed in total in U.S.
2010 will be first non-record year since 2004

• California had virtually the only wind power installed in the late 1990s
• 36 states now have utility-scale wind power
• 14 states now have over 1,000 MW of installed wind capacity
Wind Provided 39% of New Capacity

39 U.S. facilities were opened, announced or expanded in 2009.

Over 200 facilities across the U.S. supply to the wind industry, and this figure does not capture the many additional facilities at the sub-supplier level.

Market Drivers Contributing to Wind’s Growth

- Economics - Wind competes well in many regions
- Federal and State Policies
- Wind’s Environmental Benefits
- The New Energy Economy - Jobs
- Public Support
- Other major generation sources constrained
  - Coal’s carbon risk
  - Gas price volatility
  - Nuclear capital costs/perceived risk
## Comparative Energy Cost

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Levelized Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar PV – Crystalline&lt;sup&gt;a&lt;/sup&gt;</td>
<td>$116&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Solar PV – Thin-Film</td>
<td>$87&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Solar Thermal&lt;sup&gt;d&lt;/sup&gt;</td>
<td>$129&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Fuel Cell</td>
<td>$127&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>Biomass Direct</td>
<td>$65&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td>Geothermal</td>
<td>$58&lt;sup&gt;g&lt;/sup&gt;</td>
</tr>
<tr>
<td>Wind</td>
<td>$57</td>
</tr>
<tr>
<td>Energy Efficiency&lt;sup&gt;e&lt;/sup&gt;</td>
<td>$0</td>
</tr>
<tr>
<td>Gas Peaking</td>
<td>$225</td>
</tr>
<tr>
<td>IGCC&lt;sup&gt;f&lt;/sup&gt;</td>
<td>$97&lt;sup&gt;g&lt;/sup&gt;</td>
</tr>
<tr>
<td>Nuclear&lt;sup&gt;b&lt;/sup&gt;</td>
<td>$107</td>
</tr>
<tr>
<td>Coal&lt;sup&gt;f&lt;/sup&gt;</td>
<td>$78</td>
</tr>
<tr>
<td>Gas Combined Cycle</td>
<td>$74</td>
</tr>
</tbody>
</table>

**Levelized Cost ($/MWh)**

- **$0**
- **$50**
- **$100**
- **$150**
- **$200**
- **$250**
- **$300**
- **$350**

Source: Lazard estimates.

Source: Lazard, February 2009
Growing the Wind Industry: What’s the Potential?
20% Wind Energy by 2030

The U.S. possesses sufficient and affordable wind resources to obtain at least 20% of its electricity from wind by the year 2030.

20% Wind Energy by 2030

Installed Capacity at year end 2009 is greater than 35 GW; 3 years ahead of schedule.

Cumulative Installed Capacity (GW)

Offshore  Land-based

305 GW
Job Projections Under 20% Report

• Over 500,000 total jobs would be supported by the wind industry

Source: U.S. DOE, 20% Wind Energy by 2030
CO$_2$ Reductions From Electricity Sector

Source: U.S. DOE, 20% Wind Energy by 2030

- No New Wind Scenario CO$_2$ emissions
- 20% Wind Scenario CO$_2$ emissions
- USCAP path to 80% below today’s levels by 2050

Source: U.S. DOE, 20% Wind Energy by 2030
20% Wind: Electricity Sector Costs

- Both scenarios cost over $2 trillion in new investment in net present value terms by 2030

- 20% Wind Scenario requires only 2% more investment ($43 billion in net present value)
Challenges to Achieving Wind’s Potential
Key Barriers to Achieving 20% Wind

1. Need for long-term stable federal policy
2. Need for transmission infrastructure
3. Perceptual Barrier: Wind’s variability
4. Siting Challenges
Lack of Stable Policy Inhibits Investment

- Need a stable long-term federal policy
  - Long-term federal production tax credit (PTC)
  - Federal renewable energy standard (RES)
  - Climate policy
All Domestic Energy Has Had Long-Term Support, Except Renewables

- Price-Anderson Act
- Credit for Non-Conventional Fossil Fuel
- Intangible Drilling Costs
- Percent Depletion Allowance
- Proposed RES
- PTC for Wind
- Grant in lieu of ITC
- Bonus Depreciation for Wind

Data Sources: Congressional Research Service, Federal Legislation
Transmission Infrastructure

- The lack of transmission infrastructure is the single greatest long-term strategic constraint facing the wind industry.
- There is a growing recognition of this barrier by policymakers.
Green Power Superhighways

- Link areas with vast supplies of renewables to areas of high electricity demand green power superhighways
- Improve grid operations

Source: AWEA and SEIA
What do you do when the wind doesn’t blow?

- Wind is an energy resource, not a capacity resource
- Take the wind when it blows, rely on the utility’s hundreds of other power plants when it doesn’t
- As wind takes a larger role, the electric system will add more flexible resources . . .
  - Demand-response
  - Efficient gas-fired turbines
  - Incremental hydro
  - Energy storage
- And it will consolidate control areas and use generating resources more efficiently
- Storage is not necessary to reach 20% wind – what is important is flexibility in the electric system
State Action is Important

- Finally, central to the progress that has gotten us to this point is effective state action – the state RPS
- State leadership is essential to making the renewable energy vision a reality
Strong Winds are on the Horizon

The Future Looks Bright for Wind Power
• For additional information:
  
  www.awea.org

  rswisher@awea.org