Wind Development in the US: Current Status and Outlook

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The Regulatory Assistance Project
China ♦ India ♦ European Union ♦ Latin America ♦ United States
Wind Power in the US at the end of 2009

- U.S. wind industry is growing and maturing at a rapid pace, effectively preparing itself for further growth
- Wind has been competitive in wholesale power markets for much of the 2000s
- Recent trends in the cost and performance of wind projects have led to an escalation in wind prices
- Corresponding drop in wholesale market prices has put increases in sector growth at some risk
Five Years of Strong Growth:
2009: 9,994 MW Added; $21 billion Investment

2nd largest market (behind China) in 2009 capacity additions; largest market in terms of cumulative capacity

Source: Lawrence Berkeley National Laboratory, Electricity Markets and Policy Group
Wind Is a Major Source of New Capacity Additions: 39% in 2009

Source: EIA, Ventyx, AWEA, IREC, Berkeley Lab
Wind Capacity at End of 2009 Could Deliver 2.4% of US Electricity Supply

Note: Figure only includes the 20 countries with the most installed wind capacity at the end of 2009

Source: Lawrence Berkeley National Laboratory: Electricity Markets and Policy Group
Growing Competition Among Wind Turbine Manufacturers

Source: Lawrence Berkeley National Laboratory: Electricity Markets and Policy Group
Average Turbine Size Increased in 2009; Average Project Size in 2009 = 90 MW

Average Turbine Size

Average Project Size

Source: LBNL, Electricity Markets and Policy Group
Table: US Wind Sector Predictions

<table>
<thead>
<tr>
<th>Source</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
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<tbody>
<tr>
<td>EIA</td>
<td>7,300</td>
<td>10,200</td>
<td>10,300</td>
</tr>
<tr>
<td>BTM</td>
<td>8,000</td>
<td>10,000</td>
<td>15,000</td>
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<tr>
<td>NEF</td>
<td>7,000-8,500</td>
<td>7,500-9,000</td>
<td>8,000-9,000</td>
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Source: LBNL, Electricity Markets and Policy Group
Headwinds May Require Further Policy Intervention

- Investment climate
- Transmission investment
- Comparative economics

EESA 2008; ARRA 2009
New federal/state policy needed?
Federal/state RPS? Climate legislation?

Source: LBNL, Electricity Markets and Policy Group
Wind turbine prices are easing, but are still high by historical standards

Turbine prices up by ~$800/kW from 2002 through 2009, but have softened since 2008 (though recent sample is small)

Source: LBNL, Electricity Markets and Policy Group
Wind Project Installed Costs in 2009 Continued to Rise, on Average

Project costs bottomed out in 2001-2004, and have risen by roughly $800/kW, on average, through 2009.

Source: LBNL, Electricity Markets and Policy Group
Fleet-Wide Average Capacity Factors Have (Generally) Increased Over Time

But… fleet-wide average capacity factor declined substantially in 2009 (30% in 2009 from 34% in 2008)

Source: LBNL, Electricity Markets and Policy Group
As a Result of Foregoing Trends, Wind Power Sales Prices Have Been Rising

- Wind power prices bottomed out with projects built in 2002-03
- Projects built in 2009 are ~$30/MWh higher on average

Source: LBNL, Electricity Markets and Policy Group
...While Wholesale Prices Have Recently Plummeted (with Natural Gas Prices)

Source: LBNL, Electricity Markets and Policy Group
As a Result, the Near-Term Economics of Wind Has Become More Challenging

Note: Wind prices include the value of the PTC

Source: LBNL, Electricity Markets and Policy Group
Forecasts

- The Energy Information Administration forecasts that wind power will provide 2.4% of the US electricity supply in 2030 (124 billion kWh, 40 GW)
  - This forecast makes no assumptions about climate change legislation or other drivers of policy
- The Waxman-Markey climate bill, which passed the House, called for a combined renewables/energy efficiency portfolio standard of 20% by 2020
- To meet 20% of projected demand in 2030, US wind power capacity would have to exceed 300 GW—an increase of more than 290 GW over the next 23 years (USDOE, 20% Wind by 2030, July 2008)
Conclusions

- Wind industry has matured, giving it the standing to be a major contributor to the U.S. supply mix.
- Wind energy’s economic competitiveness in recent years has helped the sector beat its 20%-by-2030 pathway goals.
- Though comparisons of long-term wind pricing to short-term wholesale markets does not tell the full story, recent trends put continued growth in wind additions at risk.

- Current state policies not enough to sustain 8,000+ MW/yr; more federal and state support may be necessary to enable continued growth.