U.S. Wind Leadership

Tom Kiernan, CEO
American Wind Energy Association
U.S. Annual and Cumulative Wind Capacity Growth

- 90,004 MW of wind power at the end of 1Q 2018
- Over 54,000 wind turbines across the U.S.
- U.S. wind power capacity has more than tripled since 2008
- Wind is #1 renewable energy capacity source
- Driving $14 billion in annual investment

U.S. is a global wind leader

- U.S. hosts 16% of the global wind power fleet and is second only to China in cumulative installations
- U.S. wind resources are some of the most productive in the world
Wind Energy Provided 26% of Capacity Additions in 2017

- U.S. electric sector added 26,716 MW of new electricity generating capacity in 2017
  - Natural gas: 10,502 MW
  - Solar: 8,576 MW
  - Wind: 7,017 MW

- All renewable energy sources captured 60% of new capacity additions over the last five years.

- Wind accounted for 25% of capacity additions over last 5 years, and 31% over last 10 years

Wind Energy Provided 6.3% of U.S. Electricity in 2017

Wind Energy Share of Electricity

Top Wind Generation States in 2017

<table>
<thead>
<tr>
<th>Ranking</th>
<th>State</th>
<th>Wind Generation (Thousand MWh)</th>
<th>Equivalent Average U.S. Homes Powered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Texas</td>
<td>67,092</td>
<td>6.24 million</td>
</tr>
<tr>
<td>2</td>
<td>Oklahoma</td>
<td>24,404</td>
<td>2.27 million</td>
</tr>
<tr>
<td>3</td>
<td>Iowa</td>
<td>20,816</td>
<td>1.94 million</td>
</tr>
<tr>
<td>4</td>
<td>Kansas</td>
<td>18,501</td>
<td>1.72 million</td>
</tr>
<tr>
<td>5</td>
<td>California</td>
<td>13,971</td>
<td>1.30 million</td>
</tr>
<tr>
<td>6</td>
<td>Illinois</td>
<td>11,297</td>
<td>1.05 million</td>
</tr>
<tr>
<td>7</td>
<td>North Dakota</td>
<td>10,987</td>
<td>1.02 million</td>
</tr>
<tr>
<td>8</td>
<td>Minnesota</td>
<td>10,885</td>
<td>1.01 million</td>
</tr>
<tr>
<td>9</td>
<td>Colorado</td>
<td>9,567</td>
<td>889,000</td>
</tr>
<tr>
<td>10</td>
<td>Washington</td>
<td>7,481</td>
<td>695,000</td>
</tr>
<tr>
<td>TOTAL</td>
<td>U.S.</td>
<td>254,254</td>
<td>23.6 million</td>
</tr>
</tbody>
</table>

34,449 MW Under Construction or in Advanced Development

Source: AWEA U.S. Wind Industry First Quarter 2018 Market Report
Market Drivers: Cost Reductions

Unsubsidized Levelized Cost of Energy ($/MWh)

- Solar PV—Rooftop Residential: $319
- Solar PV—Rooftop C&I: $194
- Solar PV—Community: $150
- Solar PV—Crystalline Utility Scale: $82
- Solar PV—Thin Film Utility Scale: $82
- Solar Thermal Tower with Storage: $237
- Fuel Cell: $167
- Microturbine: $89
- Geothermal: $117
- Biomass Direct: $114
- Wind: $113
- Diesel Reciprocating Engine: $281
- Natural Gas Reciprocating Engine: $210
- Gas Peaking: $231
- IGCC: $183
- Nuclear: $143
- Coal: $78

Source: Lazard’s Levelized Cost of Energy Analysis 11.0
Market Drivers: Turbine Technology Advancements


Average capacity: 2.32 MW

Average rotor diameter: 113 m
Average hub height: 86 m

Utilities and corporate customers are buying wind

- 1,524 MW of PPAs signed during the second quarter
- 5,083 MW contracted YTD
- Corporate customers signed 56% of PPA capacity

U.S. Wind Power Purchasers: Corporate and Non-Utility Customers

- More than 9,000 MW of wind procured to date

U.S. Offshore Wind Energy

- States selected 1,400 MW of offshore wind energy through large-scale solicitations in the second quarter
  - Massachusetts utilities selected 800 MW from the Vineyard Wind project
  - Rhode Island selected 400 MW from the Revolution Wind project
  - Connecticut DEEP selected 200 MW from the Revolution Wind project
- New Jersey passed a law calling for 3,500 MW of offshore wind by 2030
- BOEM announced a Proposed Sale Notice for two additional wind energy areas off of Massachusetts
Drivers: Investment in Transmission Remains Critical

- Transmission needed to transport wind energy from remote areas to load centers
- Critical to approve and build transmission projects currently in development
- Near-term transmission projects in development could support tens of thousands of additional wind MWs

Thank You