U.S. wind industry today

2,860 MW commissioned in Q1 2009

1,210 MW commissioned in Q2 2009

>5,500 MW under construction (for completion in second half of 2009 and/or first half of 2010)

U.S. Wind Installation Growth

Over 4,000 MW installed in 1st half of 2009
Installations Growing Throughout U.S.

As of end of June 2009, 29,440 MW of wind installed in 35 states

> 1 GW
100 MW - 1 GW
< 100 MW
Four Trends in the market

• Market Scaling Up
  – Sustained Growth
• Strong Investment, Larger Players
• Global Market/Supply Chain Growth
  – Less Eurocentric
• More Robust Long-term Vision
Hindrances to wind energy growth

• Inconsistent federal and state policies
• Duplicative/overlapping layers of permitting (e.g., county and state)
• Transmission constraints
Wind is cost-effective

Estimated Cost of New Generation

- Nuclear
- Conventional Coal
- IGCC Coal
- Combined Cycle
- Combustion Turbine
- Wind
- Geothermal
- Concentrated Solar

Source: Compiled by FERC Staff from various sources. Cost estimates exclude carbon capture and sequestration costs.

$0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000

2003-04
2008
$/kW
Wind energy saves water

Nearly 50% of all the water the U.S. withdraws from streams, rivers and aquifers is for electricity consumption.
Wind energy creates jobs

- 20% Wind Scenario stimulates significant domestic job creation
- Wind turbine manufacturing, installation and operations
- Over 500,000 jobs would be supported between 2007 and 2030
- 150,000 directly employed by wind industry
- 100,000 jobs supporting the wind industry
- 200,000 jobs indirectly
### Wind energy is wildlife-friendly

**Table ES-2: Highest Levels of Relative Wildlife Risks for each Life Cycle Stage of Each Electricity Generation Source**

<table>
<thead>
<tr>
<th>Source</th>
<th>Resource Extraction</th>
<th>Fuel Transportation</th>
<th>Construction of Facility</th>
<th>Power Generation</th>
<th>Transmission and Delivery</th>
<th>Decommissioning of Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>Highest Potential</td>
<td>Lower Potential</td>
<td>Lower Potential</td>
<td>Highest Potential</td>
<td>Moderate Potential</td>
<td>Lower Potential</td>
</tr>
<tr>
<td>Oil</td>
<td>Higher Potential</td>
<td>Highest Potential</td>
<td>Lower Potential</td>
<td>Higher Potential</td>
<td>Moderate Potential</td>
<td>Lower Potential</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>Higher Potential</td>
<td>Moderate Potential</td>
<td>Lowest Potential</td>
<td>Moderate Potential</td>
<td>Moderate Potential</td>
<td>Lowest Potential</td>
</tr>
<tr>
<td>Nuclear</td>
<td>Highest Potential</td>
<td>Lowest Potential</td>
<td>Lowest Potential</td>
<td>Moderate Potential</td>
<td>Moderate Potential</td>
<td>Lowest Potential</td>
</tr>
<tr>
<td>Hydro</td>
<td>None</td>
<td>None</td>
<td>Highest Potential</td>
<td>Moderate Potential</td>
<td>Moderate Potential</td>
<td>Higher Potential</td>
</tr>
<tr>
<td>Wind</td>
<td>None</td>
<td>None</td>
<td>Lowest Potential</td>
<td>Moderate Potential</td>
<td>Moderate Potential</td>
<td>Lowest Potential</td>
</tr>
</tbody>
</table>

From “Comparison of Reported Effects and Risks to Vertebrate Wildlife from Six Electricity Generation Types in the New York/New England Region,” NYSERDA Report 09-02

The wind industry addresses wildlife issues pro-actively and collaboratively

“The Colorado Renewables and Conservation Collaborative (CRCC) is an informal collaborative effort between the renewable energy industry and the conservation community to constructively address conservation concerns related to renewable energy development in Colorado. Specifically, the group wishes to develop tools to assist the renewable energy industry to reach its project development and transmission goals while simultaneously enabling the conservation community to meet its goals. Ultimately, the participants in the CRCC hope the collaboration will result in a high-performing renewable energy industry and the preservation of the opportunity to conserve vibrant prairie and mountain ecosystems in Colorado.”

–From http://www.interwest.org/crcc_overview.htm

“The Mission of AWWI is to facilitate timely and responsible development of wind energy while protecting wildlife and wildlife habitat. We do this through research, mapping, mitigation, and public education on best practices in wind farm siting and habitat protection.”

–From http://www.awwi.org/home.php
Federal energy subsidies: R&D

Federal Funding for Energy Research and Development
Fiscal Years 2002 through 2007

Federal tax subsidies

Total Federal Tax Expenditures for Energy Sector
Fiscal Years 2002 through 2007

Federal energy subsidization in 2006

Exhibit 2: Distribution of Federal Fiscal Subsidies to Energy, 2006
Preliminary Estimates

| Source: www.earthtrack.net |

<table>
<thead>
<tr>
<th></th>
<th>$Billions Per Year</th>
<th>% Share</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Avg. of High/Low Ests)</td>
<td></td>
</tr>
<tr>
<td>Oil and Gas</td>
<td>39</td>
<td>52.4%</td>
</tr>
<tr>
<td>Coal</td>
<td>8</td>
<td>10.5%</td>
</tr>
<tr>
<td>Fossil, mixed</td>
<td>2</td>
<td>3.3%</td>
</tr>
<tr>
<td><strong>Total Fossil</strong></td>
<td><strong>49</strong></td>
<td><strong>66.2%</strong></td>
</tr>
<tr>
<td>Nuclear</td>
<td>9</td>
<td>12.4%</td>
</tr>
<tr>
<td>Ethanol</td>
<td>6</td>
<td>7.6%</td>
</tr>
<tr>
<td>Other Renewables</td>
<td>6</td>
<td>7.5%</td>
</tr>
<tr>
<td>Conservation</td>
<td>2</td>
<td>2.1%</td>
</tr>
<tr>
<td>Mixed Resources/Other</td>
<td>3</td>
<td>4.2%</td>
</tr>
<tr>
<td><strong>Total, all resources</strong></td>
<td><strong>74</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
Life-cycle carbon footprints of eight energy technologies

Figure 3. Current and future carbon footprints

Repowering/Decommissioning

• As new turbine models are introduced, older projects can be repowered, providing indefinite project lifespans and continued economic benefits.

• Decommissioned components are handled in environmentally sensitive manner.
Wyoming attitudes toward wind

Building the Wyoming We Want

Priorities and Values

Preliminary Report
June 1, 2009

Presented By:
Dee Allsop, Ph.D., President

Heart + Mind
STRATEGIES
Wyomingites support wind

Strong Support for Wind Energy

Public
- Good Idea: 93%
- Bad Idea: 7%

Leaders
- Good Idea: 75%
- Bad Idea: 25%

Q1150: There has been lots of discussion recently about renewable energy and in particular wind energy. Overall, do you think the growth and development of wind energy in the state is a good idea or a bad idea?
Wyomingites understand and support transmission

Q1155. Moving energy that is produced in Wyoming to the places where it is needed will require the creation of "transmission corridors". In the big scheme of things here in Wyoming, do you believe "transmission corridors" are serious problem or not that big of a deal?
Wyoming business and community leaders pursuing wind
Supply-chain opportunities:
Turbine components

There are over 8000 components in a turbine, including:

**Towers:**
- Towers
- Ladders
- Lifts

**Rotor:**
- Hub
- Nose Cone
- Blades
  - Composites
  - Blade Core
- Pitch Mechanisms
- Drives
- Brakes
- Rotary Union

**Nacelle:**
- Nacelle Cover
- Nacelle Base
- Heat exchanger
- Controllers
- Generator
- Power Electronics
- Lubricants
- Filtration
- Insulation
- Gearbox
- Pump
- Drivetrain
- Ceramics
- Shaft

**Foundation:**
- Rebar
- Concrete
- Casings

**Other:**
- Transformers
- Bolts/Fasteners
- Wire
- Paints and Coatings
- Lighting
- Lightning Protection
- Steel Working/Machining
- Communication Devices
- Control and Condition Monitoring Equipment
- Electrical Interface and Electrical Connection
- Batteries
- Bearings
- Brakes
Communities embrace wind:
Lamar, Colorado
Lamar’s community-owned wind project
Local economic benefits: Lamar, Colorado
Wind energy can enhance national security

From New York Times, 9 August 2009

Climate Change Seen as Threat To Security and Drain on Military

By JOHN M. BRODER

WASHINGTON — The changing global climate will pose profound strategic challenges to the United States in coming decades, raising the prospect of military intervention to deal with the effects of violent storms, drought, mass migration and pandemics, military and intelligence analysts say.

Such climate-induced crises could topple governments, feed terrorist movements or destabilize entire regions, say the analysts, experts at the Pentagon and intelligence agencies who for the first time are taking a serious look at the national security implications of climate change.

Recent war games and intelligence studies conclude that over the next 20 to 50 years, vulnerable regions, particularly sub-Saharan Africa, the Middle East and South and Southeast Asia, will face the prospect of food shortages, water crises and catastrophic flooding driven by climate change that could demand an American humanitarian relief or military response.

An exercise last December at the National Defense University, an educational institute that is overseen by the military, explored the potential impact of a destructive flood in Bangladesh that sent hundreds of thousands of refugees streaming into neighboring India, touching off religious conflict, and spread of contagious diseases and vast damage to infrastructure. "It gets real."

Continued on Page 4
Proposed Transmission Projects in the Western Interconnection

Note: This plot includes selected projects from Table 3.2 of 2008 TEPPC Study Plan(v7).
Projects have been grouped to simplify coding.

- Sea Breeze Projects
- TransCanada Projects
- Gateway & Other NTTG Projects
- Columbia Grid Projects
- TransWest Express
- LS Power & Great Basin Projects
- WY-CO Intertie Project
- High Plains Express
- Sun-ZIA
- Canada/PacNW-NoCalif
- Central CA Clean Energy (C3ET)
- Green Path North
- Devers-Palo Verde 2
- Navajo Transmission Project
Green power superhighways

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

Critical to Development Renewable Potential
Federal legislative priorities

☑ Near-term action – Recovery Act
  ▪ 3-year PTC extension
  ▪ Option to choose grant in lieu of PTC

☐ Mid-Term Action
  ▪ National Renewable Electricity Standard
  ▪ National Transmission Legislation

☐ Long-Term Action:
  ▪ Effective Carbon Regulation
The black open square in the center of a state represents the land area needed for a single wind farm to produce the projected installed capacity in that state. The brown square represents the actual land area that would be dedicated to the wind turbines (2% of the black open square).

Wind Capacity
Total Installed (2030) (GW)
- 0.0 - 0.1
- 0.1 - 1
- 1 - 5
- 5 - 10
- > 10

Includes offshore wind.

46 states would have substantial wind development by 2030.
So, What’s in it for Wyoming?

- **Hundreds of new permanent jobs**
  Average of one job per installed 10 MW, plus significant potential number of supply-chain jobs

- **Thousands of construction jobs**
  Number varies depending on project and location

- **Millions of dollars in local economic benefits**
  Increased local tax base, new infrastructure, landowner payments, economic multipliers

- **End of boom-bust cycle**
  Wind is inexhaustible and less vulnerable to booms and bust

- **Opportunity to lead in a 21st-century energy industry**
  Worldwide demand is booming for clean energy technologies

- **Strengthening U.S. energy security – and national security**
  Clean energy will be a cornerstone of America’s national security in the 21st century
Thank you

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