Wind Farms

Presented by:
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Customer Relations Coordinator
## Advantages vs Disadvantages

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean, sustainable, and inexhaustible form of energy</td>
<td>Noise pollution and visual impacts to the landscape</td>
</tr>
<tr>
<td>No greenhouse gas (GHG) emissions</td>
<td>May affect local wildlife for birds and bats</td>
</tr>
<tr>
<td>Water is not required to cool the system</td>
<td>Mechanical issues</td>
</tr>
<tr>
<td>Domestic source of energy</td>
<td>Not the most profitable use of private land</td>
</tr>
<tr>
<td>Country</td>
<td>Share of total world wind electricity generation (2020)</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>China</td>
<td>30%</td>
</tr>
<tr>
<td>United States</td>
<td>21%</td>
</tr>
<tr>
<td>Germany</td>
<td>8%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>5%</td>
</tr>
<tr>
<td>India</td>
<td>4%</td>
</tr>
</tbody>
</table>
Wind Farming - Germany

Share of energy sources in gross German power production in 2021.
Data: BDEW 2021, preliminary.

- Natural gas: 89 TWh (15.3%)
- Nuclear: 69 TWh (11.9%)
- Hard coal: 54.3 TWh (9.3%)
- Lignite: 108.3 TWh (18.6%)
- Renewables: 238 TWh (40.9%)
- Mineral oil: 4.8 TWh (0.8%)
- Others*: 18.8 TWh (3.2%)

Power production in terawatt-hours (TWh)

- Wind onshore: 92 TWh (15.8%)
- Wind offshore: 25.3 TWh (4.3%)
- Hydro power: 19.7 TWh (3.4%)
- Biomass: 43.9 TWh (7.5%)
- Solar: 51.2 TWh (8.8%)
- Others: 5.8 TWh (1.0%)

*Without power generation from pumped storage

Note: Government renewables targets are in relation to total power consumption (561.8 TWh in 2021), not production. Renewables share in gross German power consumption 2021 (without pumped storage): 42.4%.
Wind Farming - Germany

- By 2030, Germany aims to have 80% of electricity come from renewable sources
- Germany aims to be net-zero by 2045
- 28,230 on-shore wind turbines (2021)
- 1,500 off-shore wind turbines (2022)
- On-shore Power Act
- Renewable Energy Act
## Wind Farming – U.S.

<table>
<thead>
<tr>
<th>State</th>
<th>Output (MW) Updated June ‘21</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Texas</td>
<td>33,133</td>
</tr>
<tr>
<td>2. Iowa</td>
<td>11,660</td>
</tr>
<tr>
<td>3. Oklahoma</td>
<td>9,048</td>
</tr>
<tr>
<td>4. Kansas</td>
<td>7,016</td>
</tr>
<tr>
<td>5. Illinois</td>
<td>6,409</td>
</tr>
<tr>
<td>6. California</td>
<td>5,922</td>
</tr>
</tbody>
</table>

* Top 5 states produced 56% of the nation’s wind generated electricity in 2021
Wind Farming – U.S.

VINEYARD WIND

South Fork Wind
Wind Farming – CA

California Offshore Wind Goals

- 5 GW by 2030
- 25 GW by 2045

Navy study of offshore windfarm sites

The U.S. Navy sent the Bureau of Ocean Energy Management this map. According to the Navy's assessment, large swaths of California's coast are deemed off limits to offshore wind farms.

Potential Offshore Wind in California

- Humboldt
- Morro Bay
- Diablo Canyon

Sources: U.S. Navy, OpenStreetMap, Mapzen
Beverly Hills & Wind Farming

• Clean Power Alliance Membership
• CPA Renewable Energy Portfolio
  – 37% is wind energy
  – 300 MW in White Hills, AZ
  – 830,000 MWh/year
Wind farming is growing globally.

Growth and rapid expansion will depend on:
- Public interest
- Flexible regulations
- Incentives
Discussion