Steps toward decarbonization and net zero

United States Mid-Century Strategy for Deep Decarbonization (White House, Nov. 2016)
Pillars for clean energy, plus need to control other GHGs and create carbon sinks

Cohan, *Confronting Climate Gridlock*, March 2022

*(Electrification and clean fuels)*
Pillars of Decarbonization in Texas

- **Efficiency**: Untapped opportunities
- **Clean electricity**: Leader in wind; fast-growing solar
  - Innovation in solar, geothermal, and offshore wind
- **Fuel switching**: Opportunities to electrify vehicles, etc
  - Innovation in biofuels, hydrogen, and EVs
- **Other greenhouse gases**: Control methane leaks
- **Carbon sinks**: Innovation, infrastructure, and geology for sequestration
Electricity in ERCOT

Solar growing 2-3x per year (record pace)

Wind large and growing

2020 Energy Use

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas</td>
<td>45.5%</td>
</tr>
<tr>
<td>Wind</td>
<td>22.8%</td>
</tr>
<tr>
<td>Coal</td>
<td>17.9%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>10.9%</td>
</tr>
<tr>
<td>Other*</td>
<td>2.9%</td>
</tr>
</tbody>
</table>

*Other includes solar, hydro, petroleum coke, biomass, landfill gas, distillate fuel oil, net DC-tie and Block Load Transfer imports/exports and an adjustment for wholesale storage load

ERCOT fact sheet; NREL seams study; ERCOT capacity changes
Proposed wind and solar projects in ERCOT interconnection queue (June 2020)

Wind (108 sites; 26,272 MW)

Solar (262 sites; 73,655 MW)

Morse et al., in review
ERCOT June 2020 Generator Interconnection Status Report
Wind and solar are complementary

**January**
- **Wind**
- **West Texas**
- **Coastal**

**Solar**
- **West Texas**

**July**
- **West Texas**
- **South Texas**

Morse et al., in review