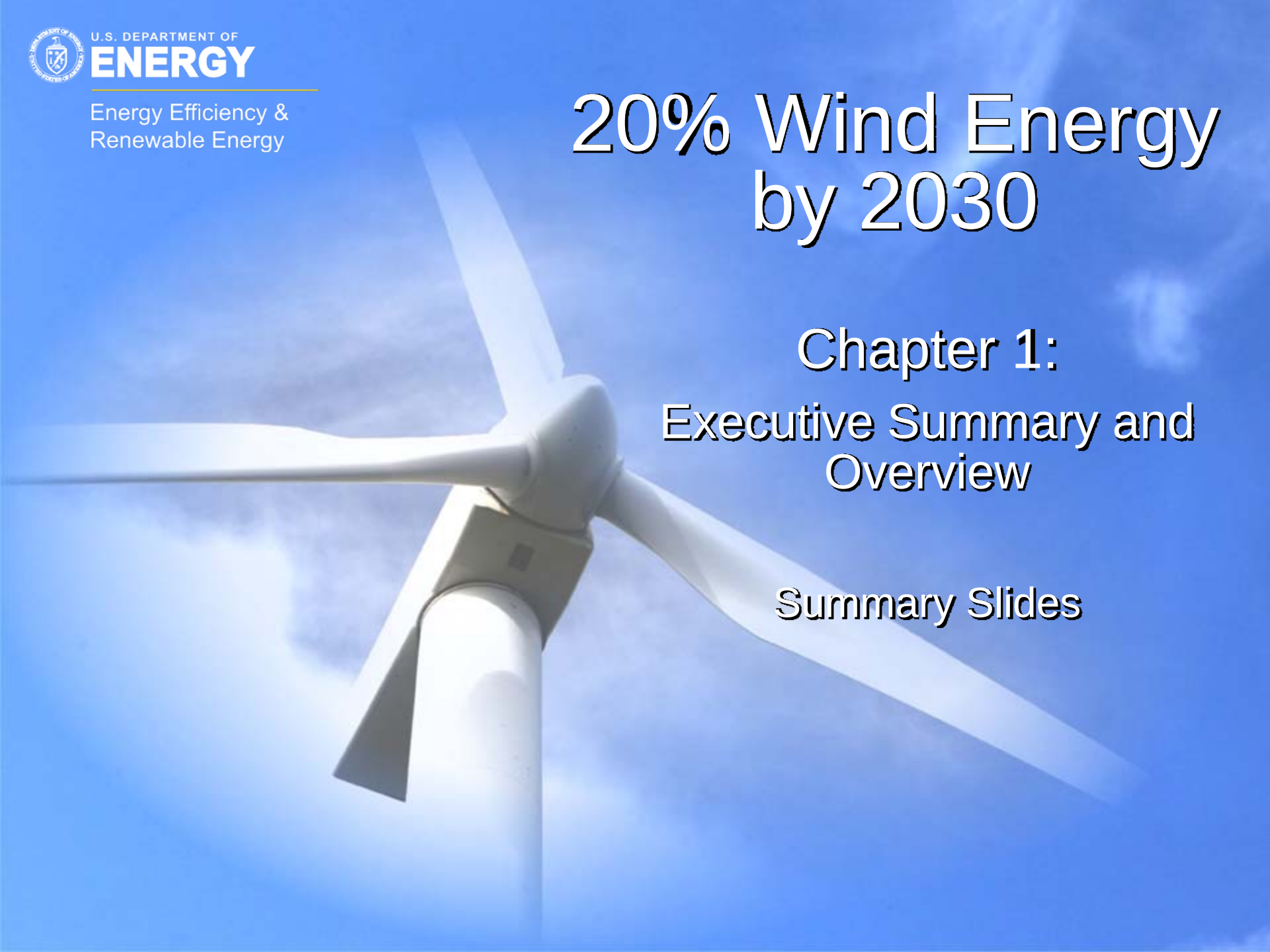

U.S. DEPARTMENT OF
ENERGY
Energy Efficiency &
Renewable Energy
20% Wind Energy by 2030
Chapter 1:
Executive Summary and Overview
Summary Slides

20% Wind Energy by 2030: technical report

- Explores one scenario for reaching 20% wind energy by 2030 (20% Wind Scenario) and contrasts it to a scenario in which no new U.S. wind power capacity (No New Wind) is installed
- Is not a prediction or goal, but an analysis based on one scenario
- Does not assume specific policy support for wind
- Involved more than 100 individuals from 2006 - 2008 (government, industry, utilities, NGOs)
- Analyzes wind's potential contributions to energy security, economic prosperity, and environmental sustainability

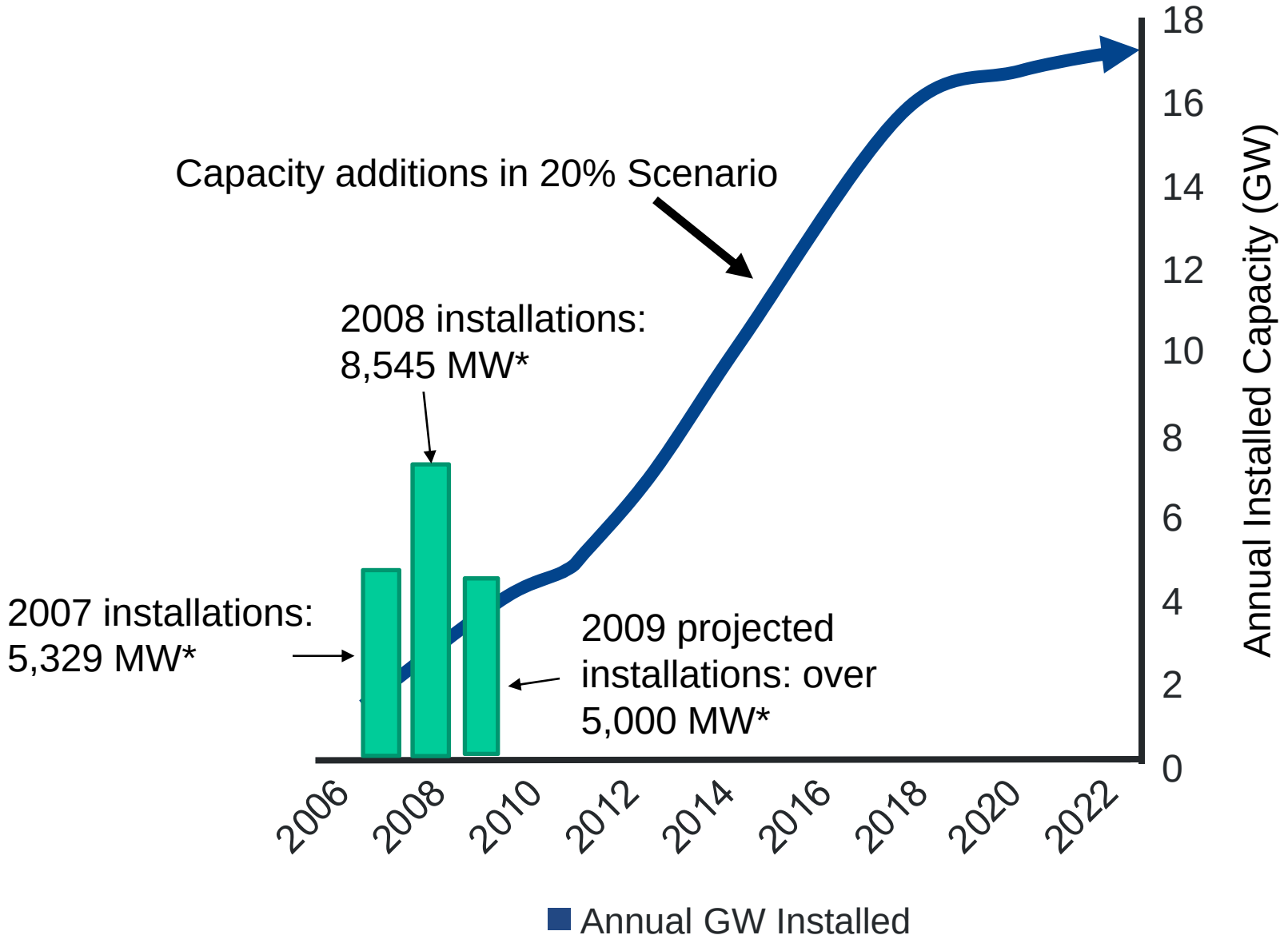
The 20% Wind Scenario: primary assumptions

- U.S. electricity consumption grows 39% from 2005 to 2030 – to 5.8 billion MWh (Source: EIA)
- Wind turbine energy production increases about 15% by 2030
- Wind turbine costs decrease about 10% by 2030
- No major breakthroughs in wind technology needed
- R&D needed to increase reliability

The 20% Wind Scenario: primary findings

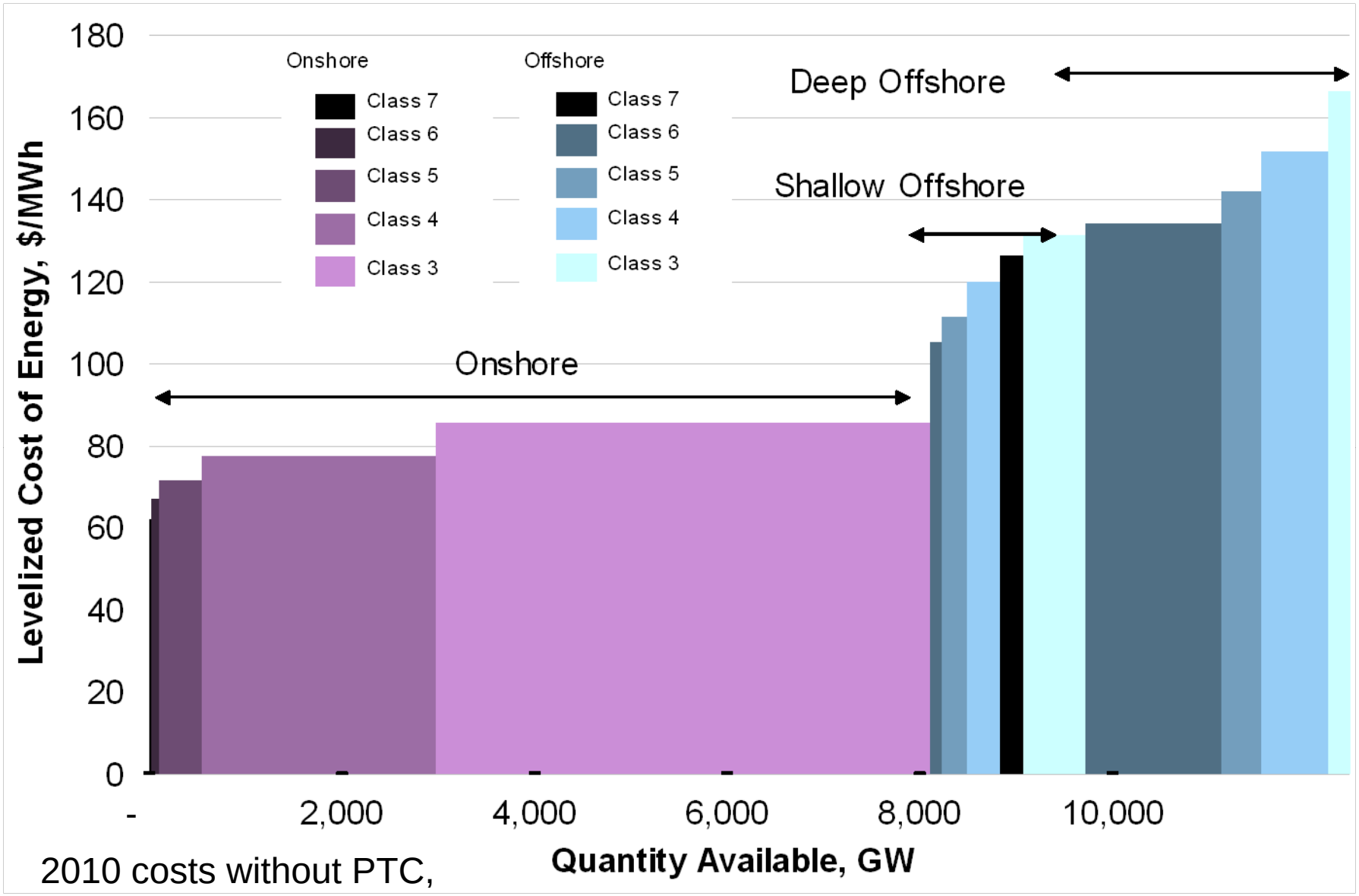
- 20% wind electricity would require about 300 GW (300,000 MW) of wind generation
- Affordable, accessible wind resources available across the nation
  - 8000GW of land-based resources are estimated to be economically available, not including transmission costs
- Cost to integrate wind is modest
  - Including transmission costs, up to 600 GW is estimated to be available for $60-$100 per MWh
- Emissions reductions and water savings:
  - Reduces CO_2 emissions in 2030 by 825 million metric tons over No New Wind
  - Cuts electric sector water consumption by 17% in 2030 over No New Wind
- Transmission of 20% wind could be a challenge, but not an absolute barrier
  - Investment in the nation's transmission system and development of larger electric load balancing areas, in tandem with better regional planning, is needed

Actual annual installations exceed 20% Wind Scenario projections



*Source: AWEA, 2009

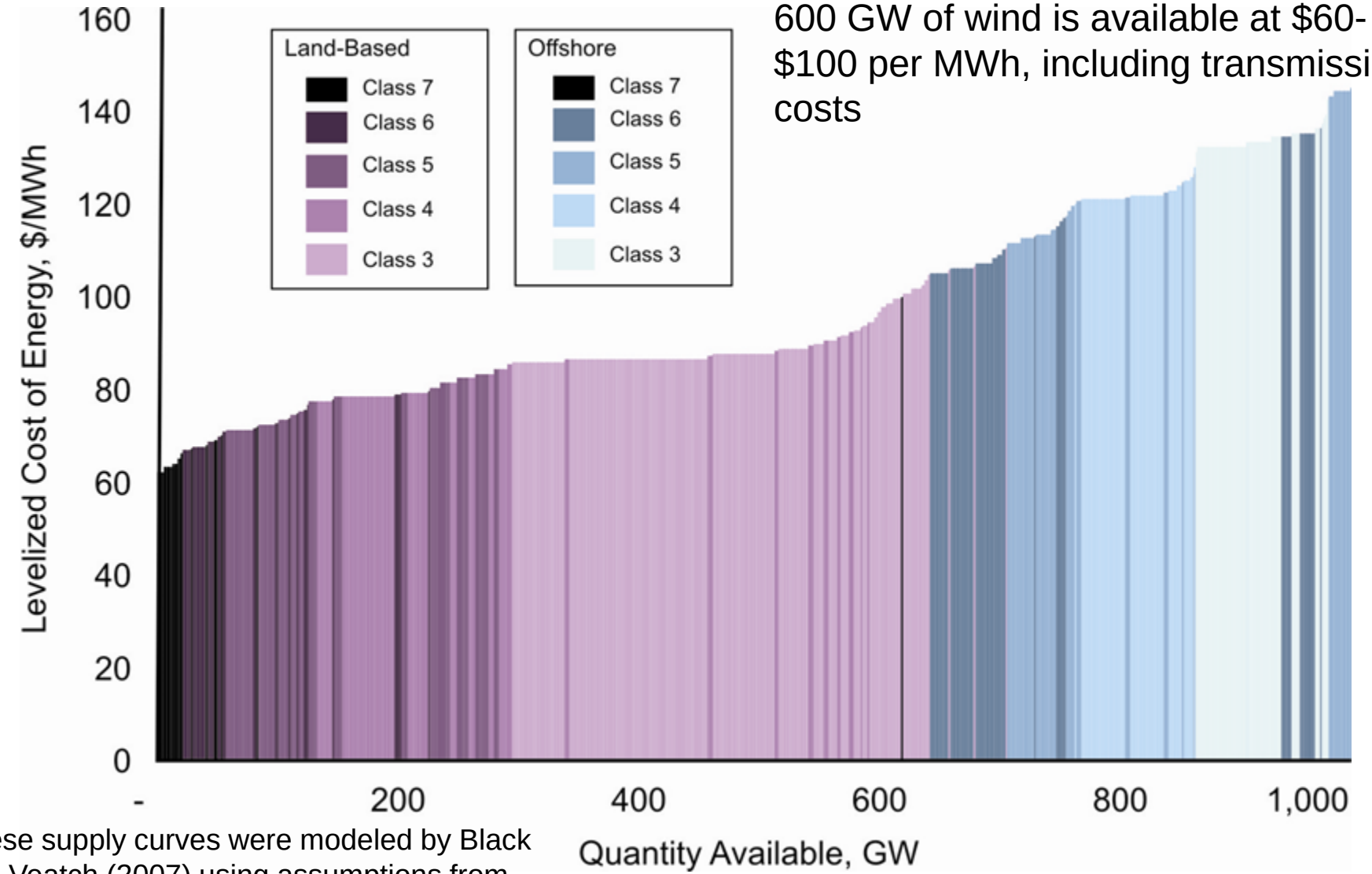
Wind resource potential: 8000 GW economically available (excluding transmission costs)



2010 costs without PTC, transmission nor integration costs

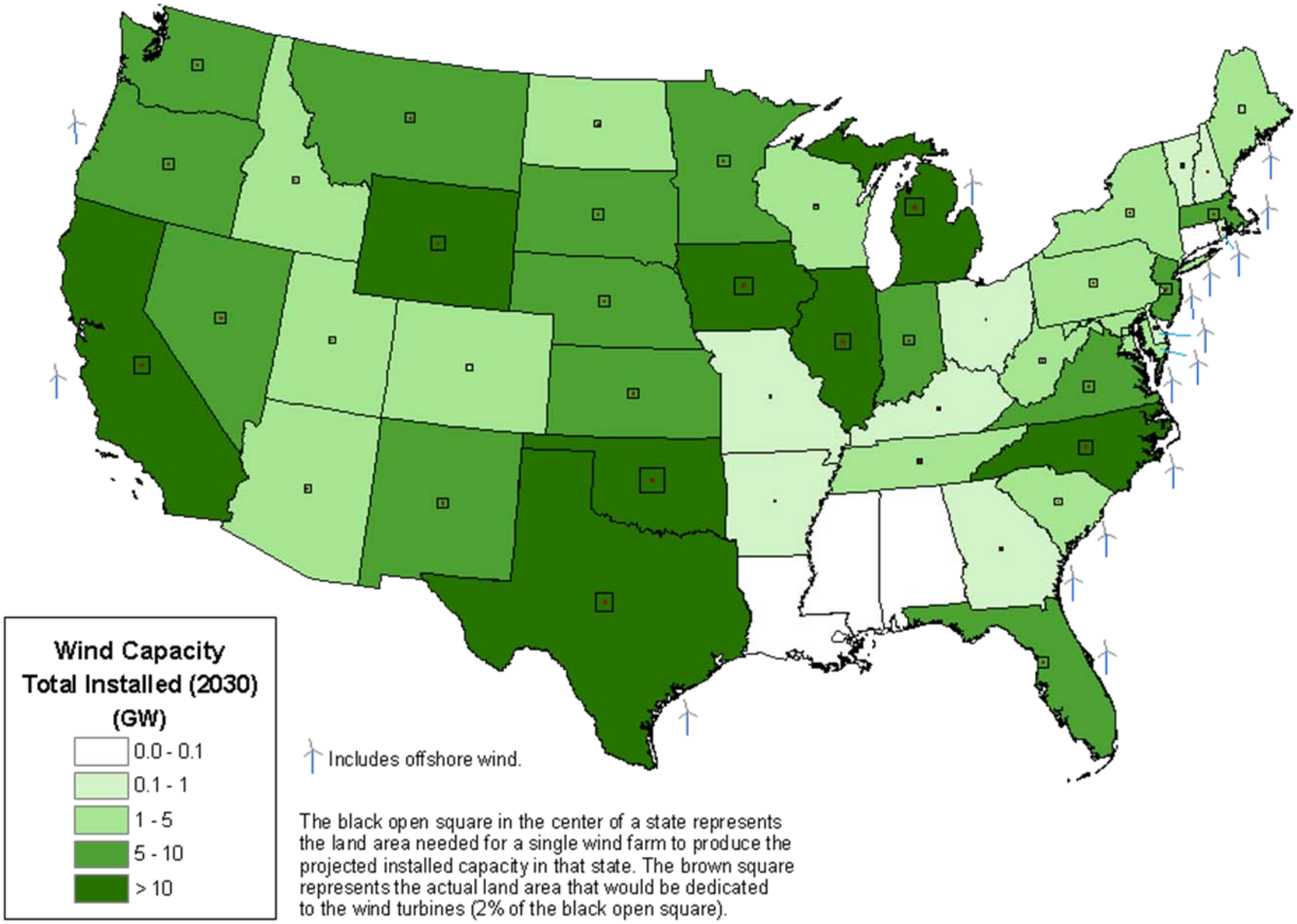
600 GW of wind economically available, including connection costs

This supply curve shows that up to 600 GW of wind is available at $60-$100 per MWh, including transmission costs



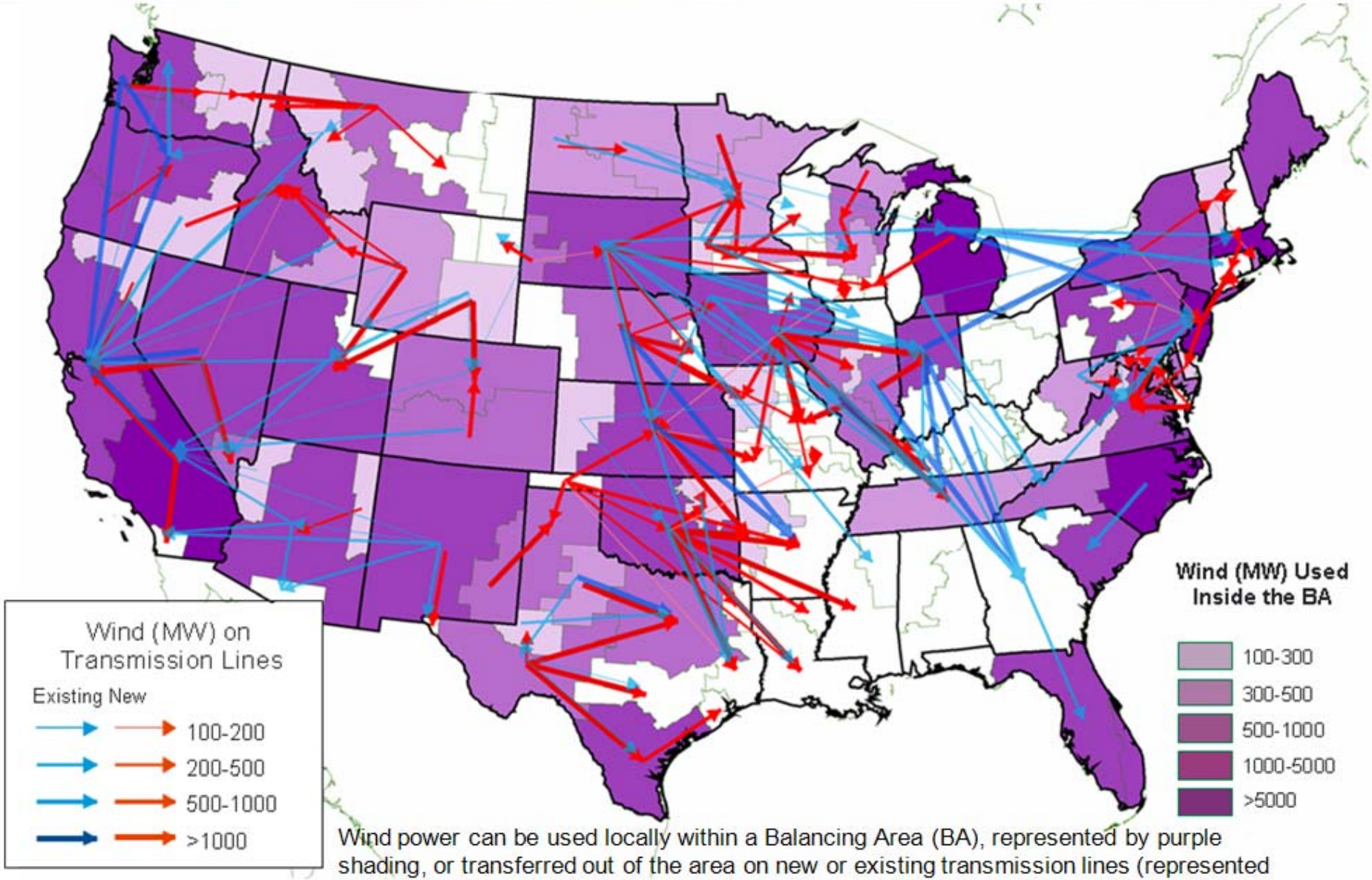
These supply curves were modeled by Black and Veatch (2007) using assumptions from the WinDS model

46 states have wind development by 2030 under 20% Wind Scenario



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).

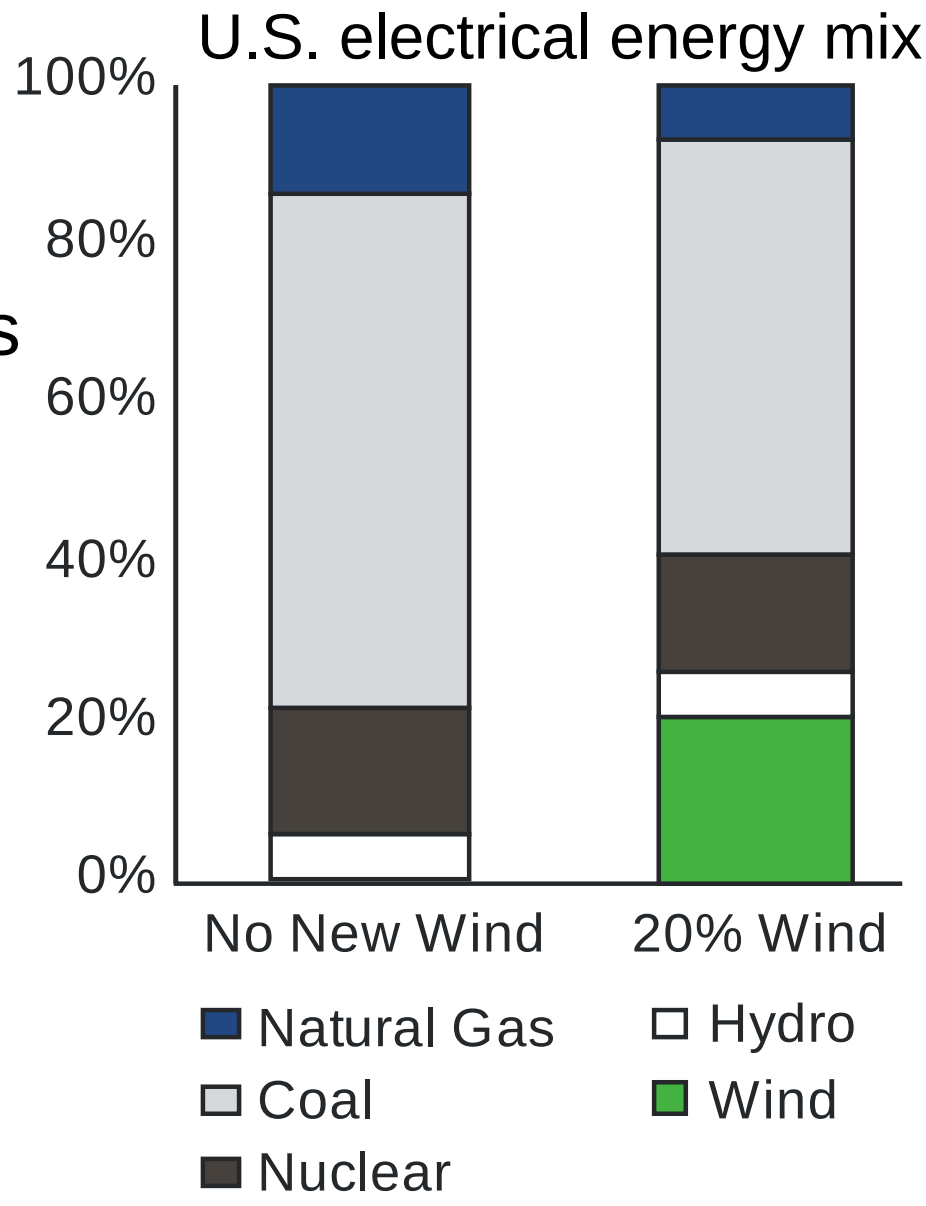
New wind will require new transmission to deliver wind-generated electricity from high-resource areas to high-demand centers



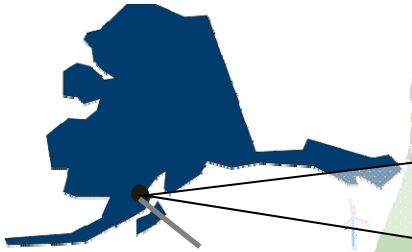
Wind power can be used locally within a Balancing Area (BA), represented by purple shading, or transferred out of the area on new or existing transmission lines (represented by red or blue arrows. Arrows originate and terminate at the centroid of the BA for visualization purposes; they do not represent physical locations of transmission lines.

Coal and natural gas consumption decreases in 20% Wind Scenario

- Reduces electric utility natural gas consumption by 50%
- Reduces total natural gas consumption by 11%
- Reduces electric utility coal consumption by 18%
- Avoids construction of 80 GW of new coal power plants



While land requirements are extensive, actual footprint is small (allowing for multiple land uses)



Anchorage, AK
1,961 mi^2

Actual footprint only

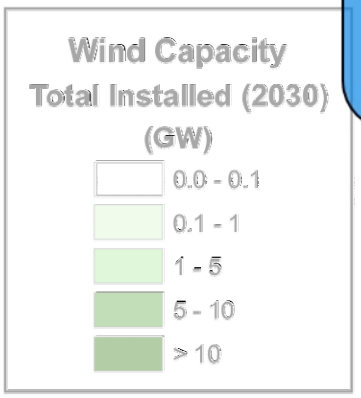
2-5% of area,

~ 618,000 acres: slightly less than area of Rhode Island or

half the size of Anchorage, Alaska

Total area required:

15 million acres

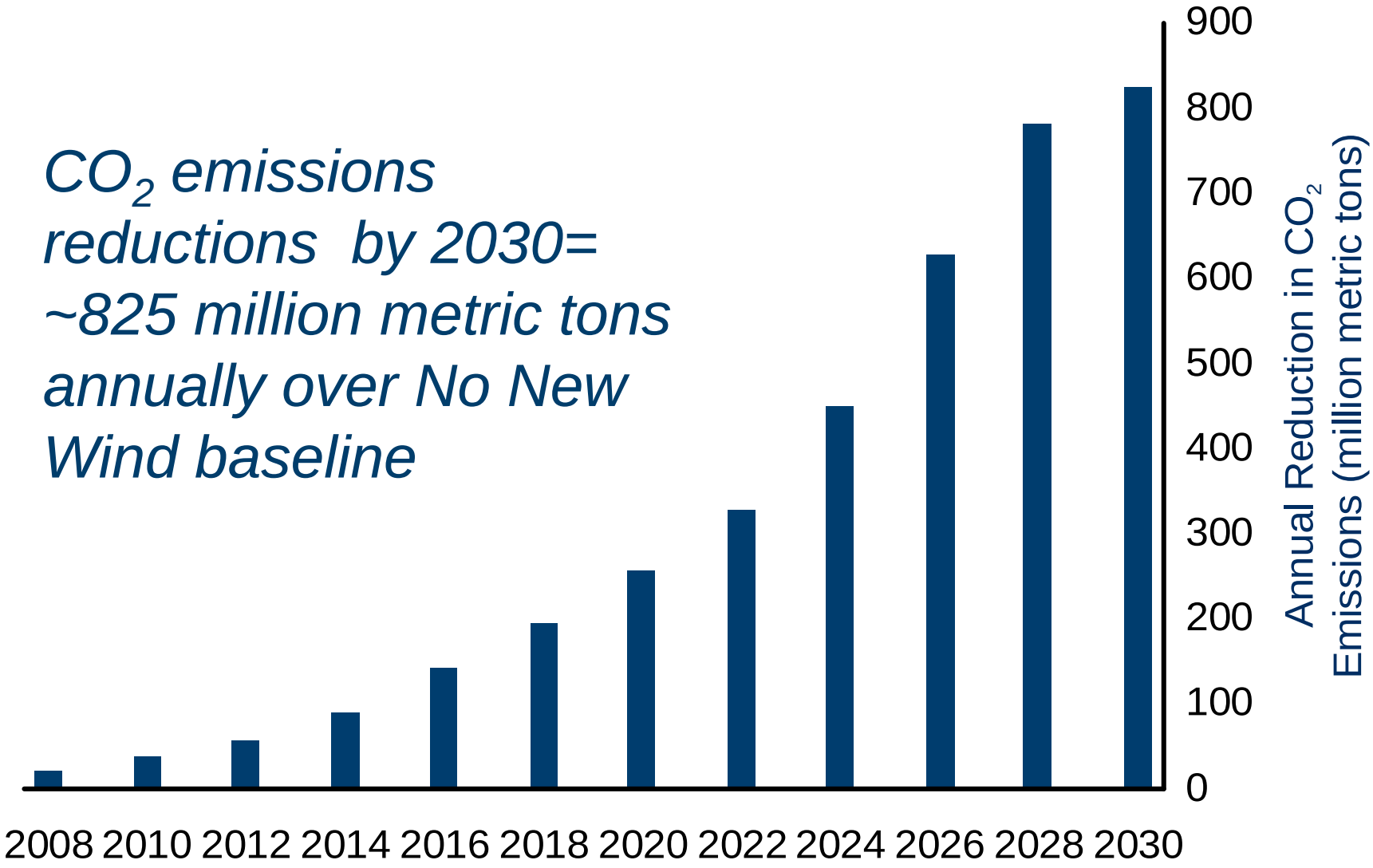


Includes offshore wind.

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).

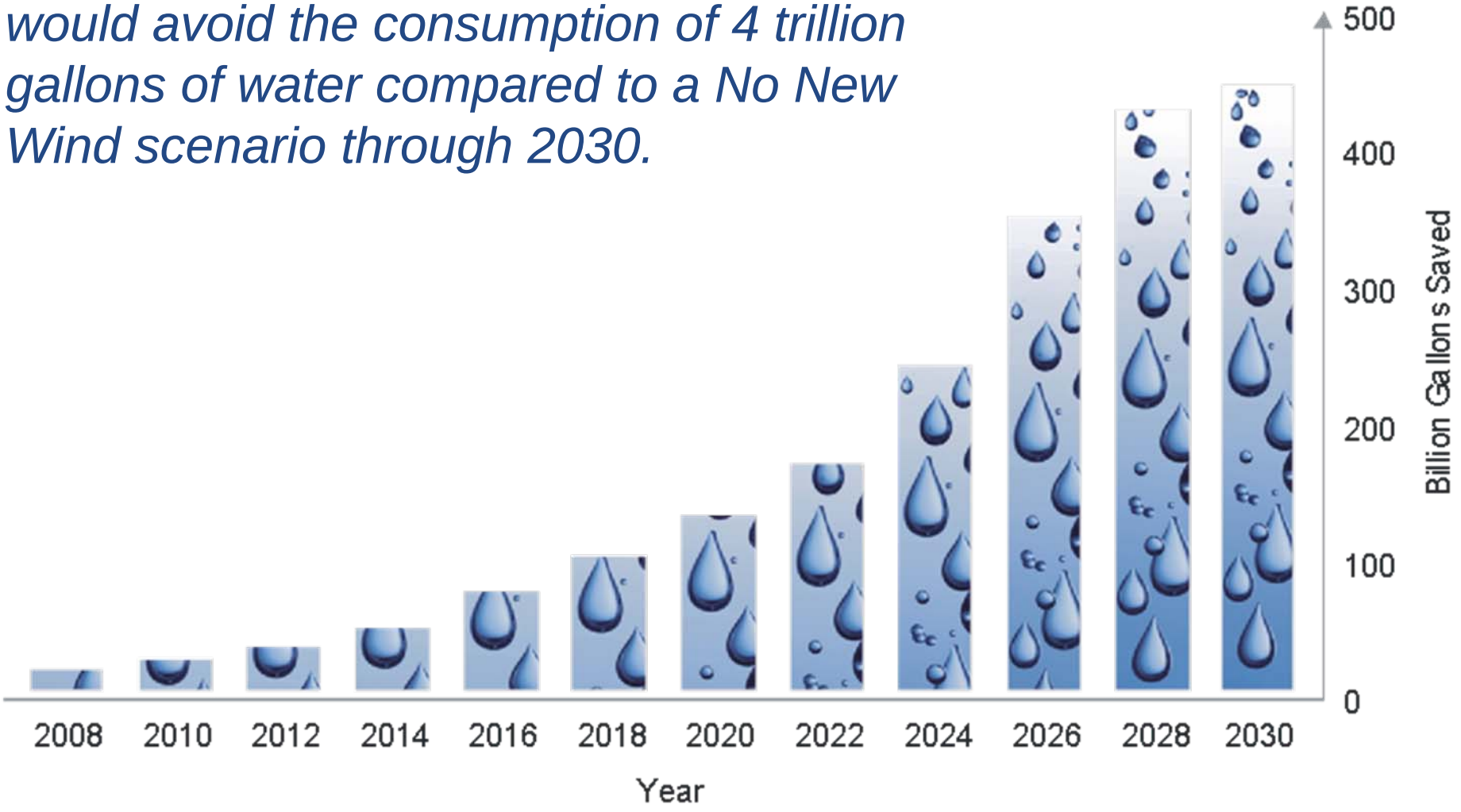
Cumulative total of 7,600 million metric tons of CO_2 emissions avoided by 2030

CO_2 emissions reductions by 2030= ~825 million metric tons annually over No New Wind baseline

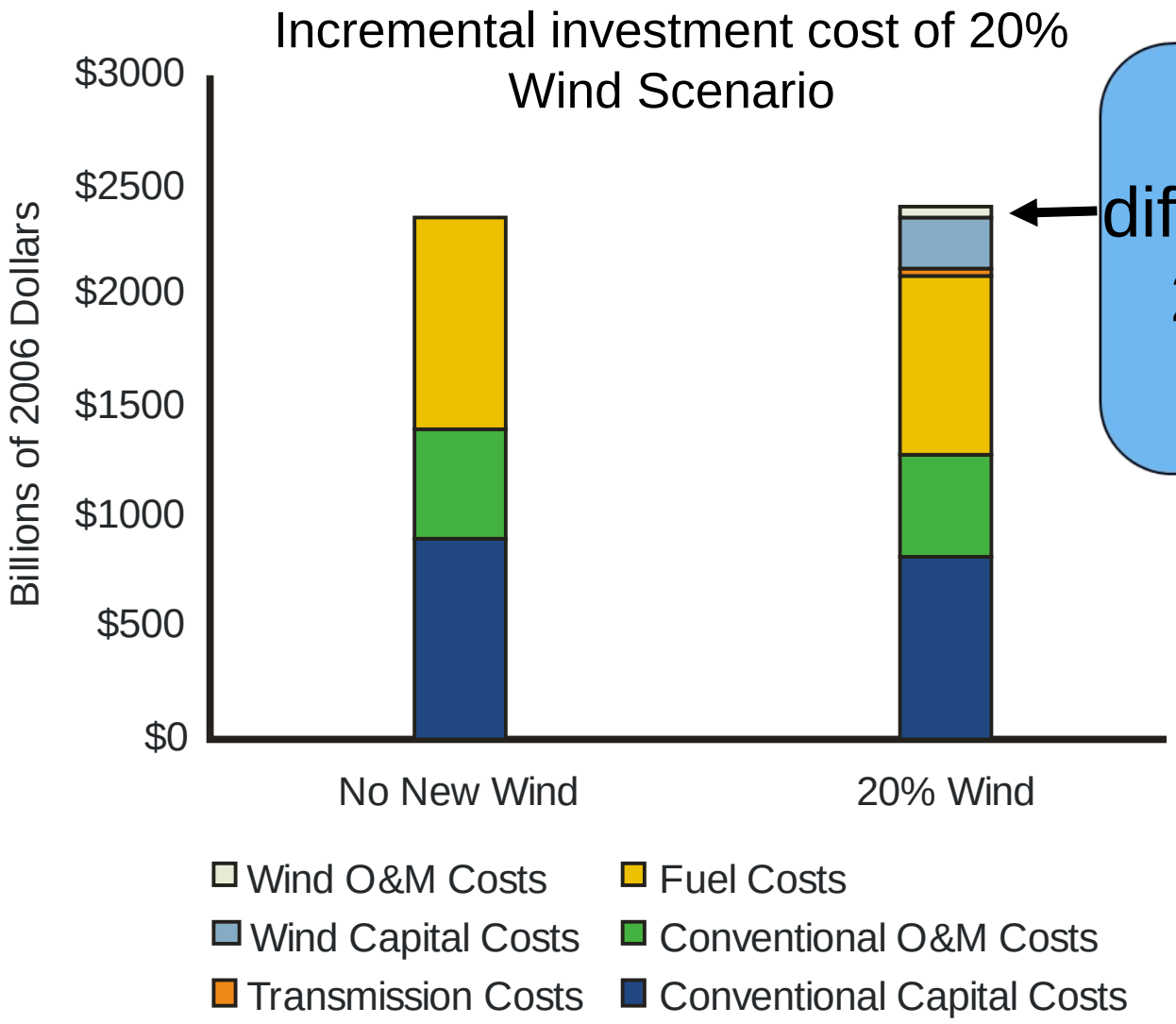


20% Wind Scenario cuts electric sector water consumption by 17% in 2030

Cumulatively, the 20% Wind Scenario would avoid the consumption of 4 trillion gallons of water compared to a No New Wind scenario through 2030.



Additional economic costs of 20% Wind Scenario are small



2% investment difference between 20% Wind and No New Wind

The 20% Wind Scenario would require an incremental investment cost of roughly $0.50 per month per household.