EXAMINING STATISTICS: OKLAHOMA'S WIND POWER

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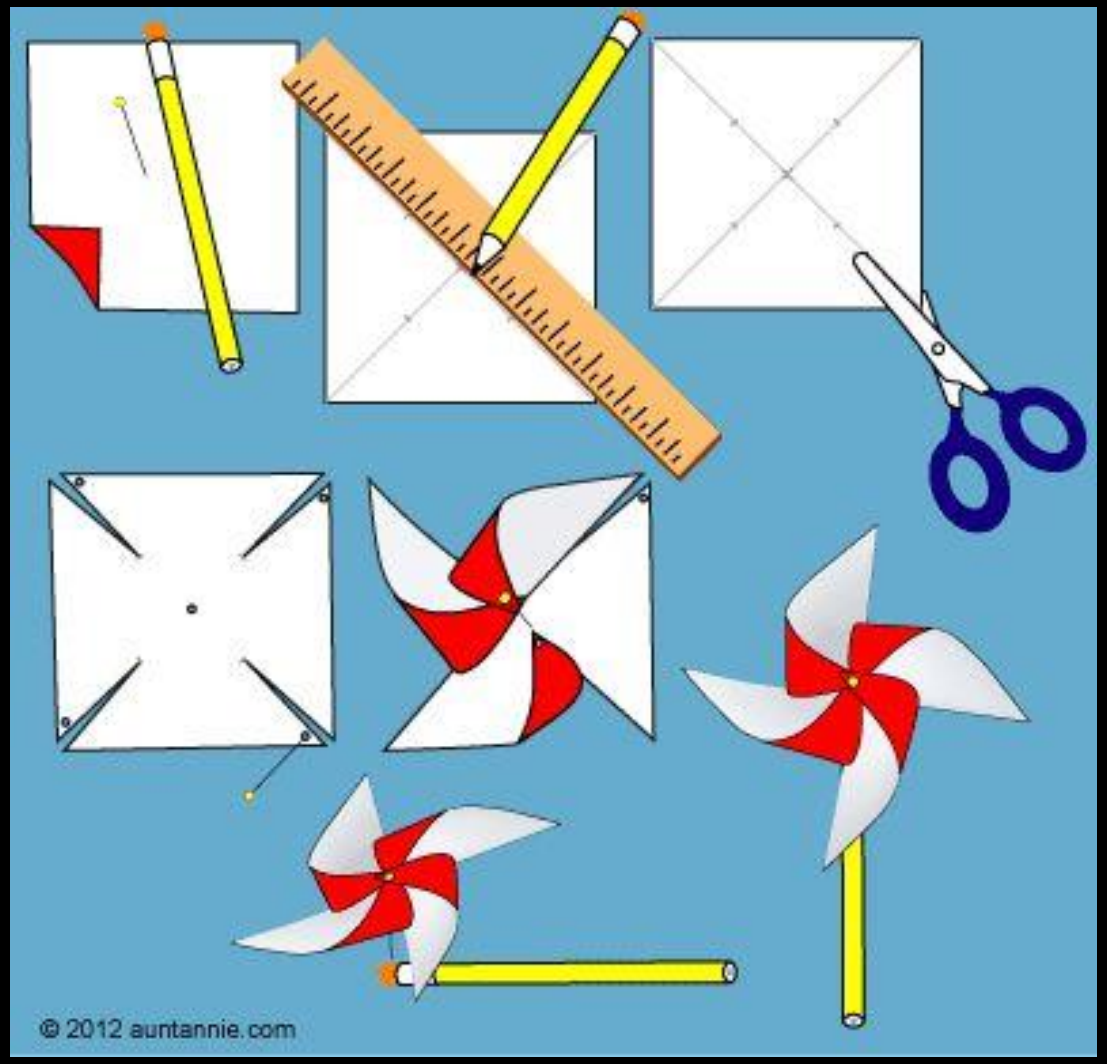
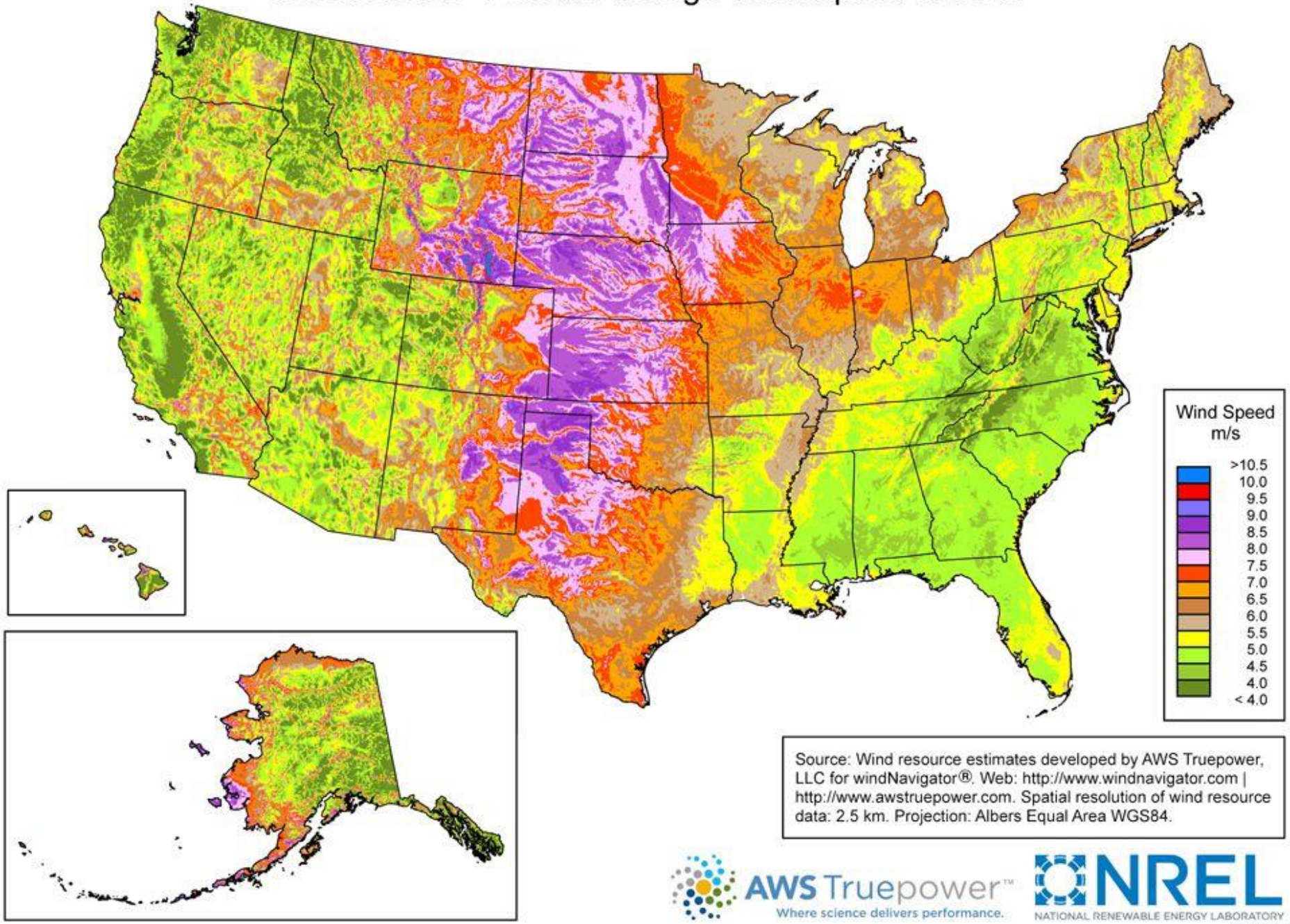
CREATE A PINWHEEL



- Overall, how does the direction of the wind hitting the pinwheel affect how the blades spin?

- If the pinwheel were a wind turbine and blowing on the front of it generated electrical energy, which direction(s) should it receive wind from to efficiently make electrical energy?

United States - Annual Average Wind Speed at 80 m



Source: Wind resource estimates developed by AWS Truepower, LLC for windNavigator®. Web: http://www.windnavigator.com | http://www.awstruepower.com. Spatial resolution of wind resource data: 2.5 km. Projection: Albers Equal Area WGS84.

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OKLAHOMA WIND CAPACITY

WIND POWER-VARIOUS LEVELS

Small

(up to 100 kW)

- Homes
- Farms
- Remote Application

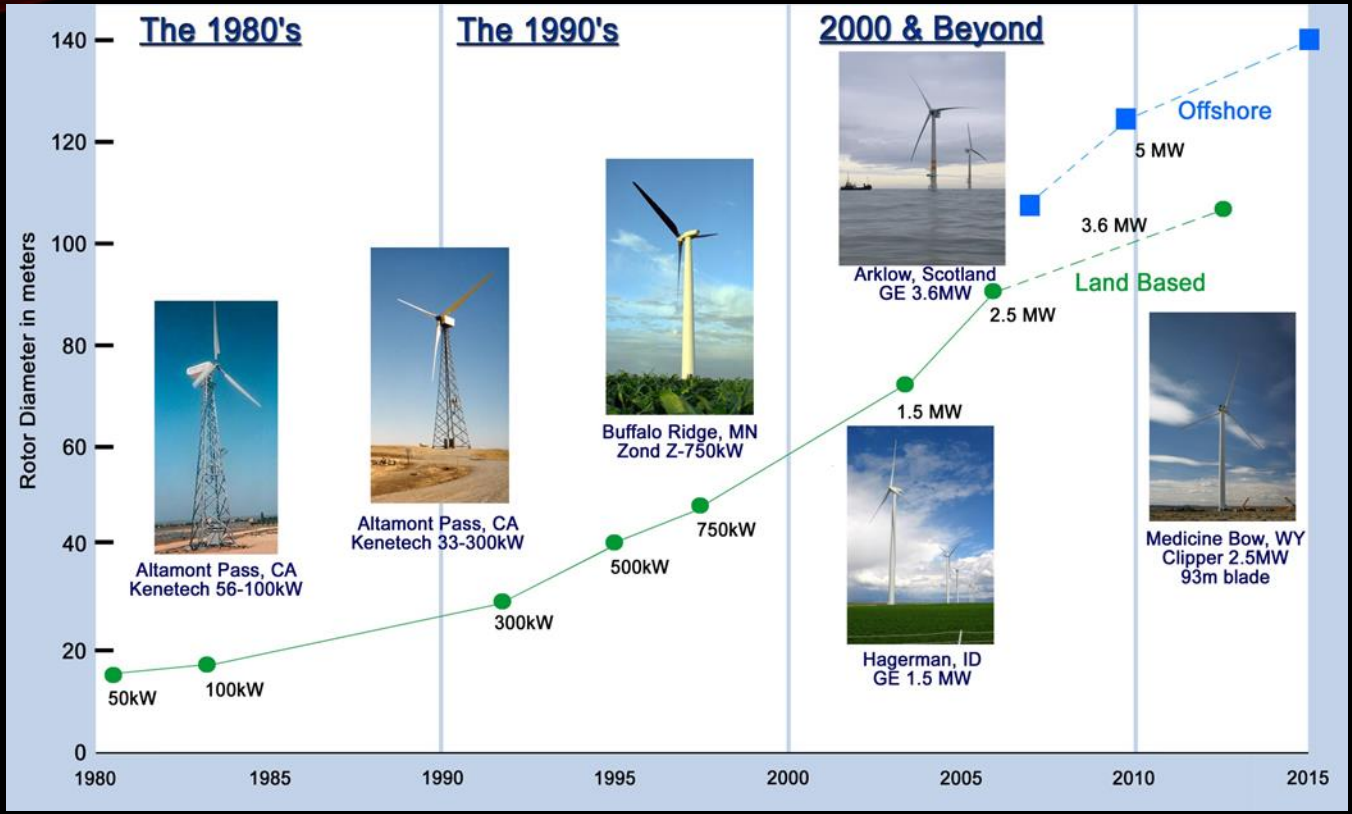
Intermediate
(101kW – 1 MW)

- Village Power
- Hybrid Systems
- Distributed Power

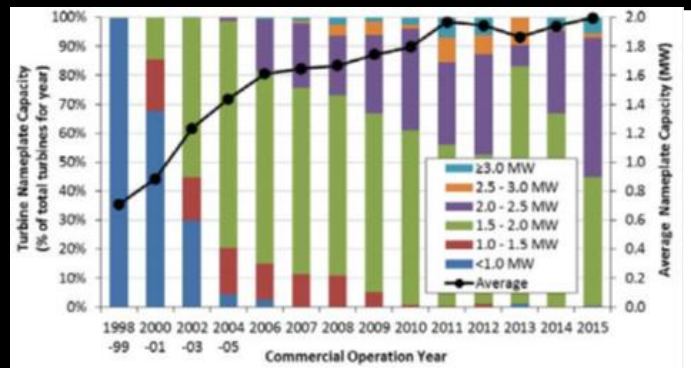
Large (1MW and up)

- Central Station Wind Farms
- Distributed Power
- Community Wind

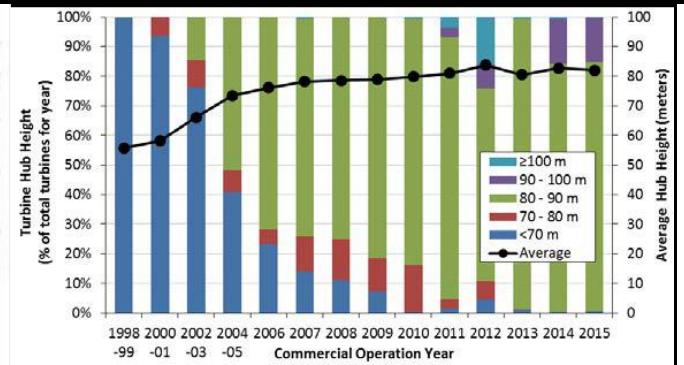
LARGE WIND TECHNOLOGY EVOLUTION



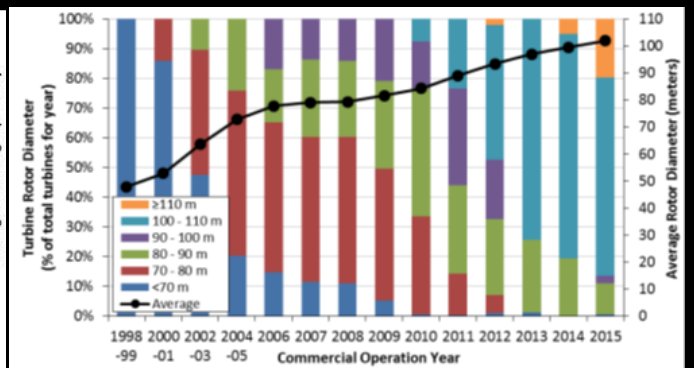
Nameplate Capacity



Hub Height



Rotor Diameter

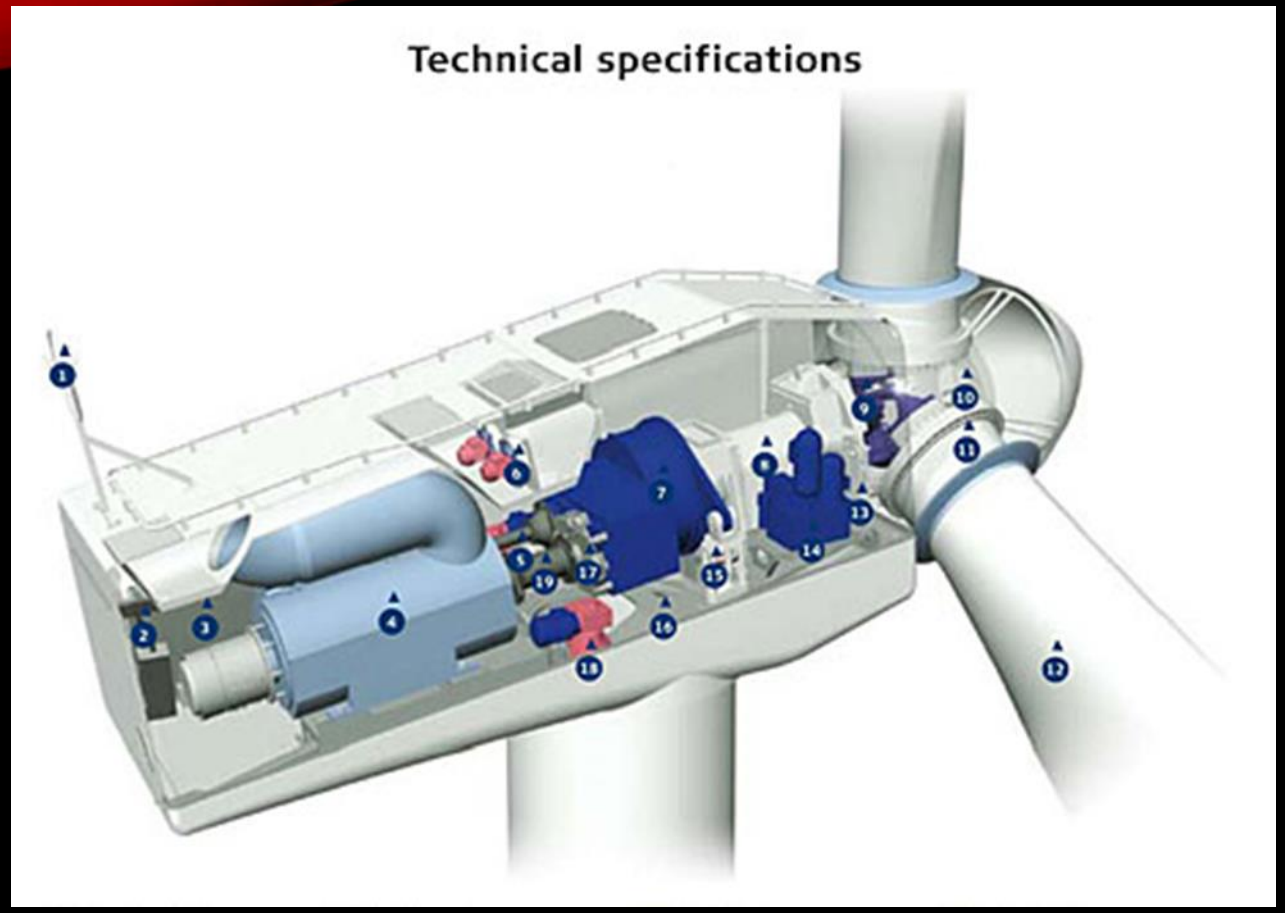


FIRST U.S. OFFSHORE WINDFARM

Block Island Wind Farm

- Five GE 6MW turbines – direct drive
- Power to New Shoreham (17k homes) connecting the island to the grid for the first time (diesel generators)
- $290M construction cost
- Operational November 2016

INSIDE A WIND TURBINE

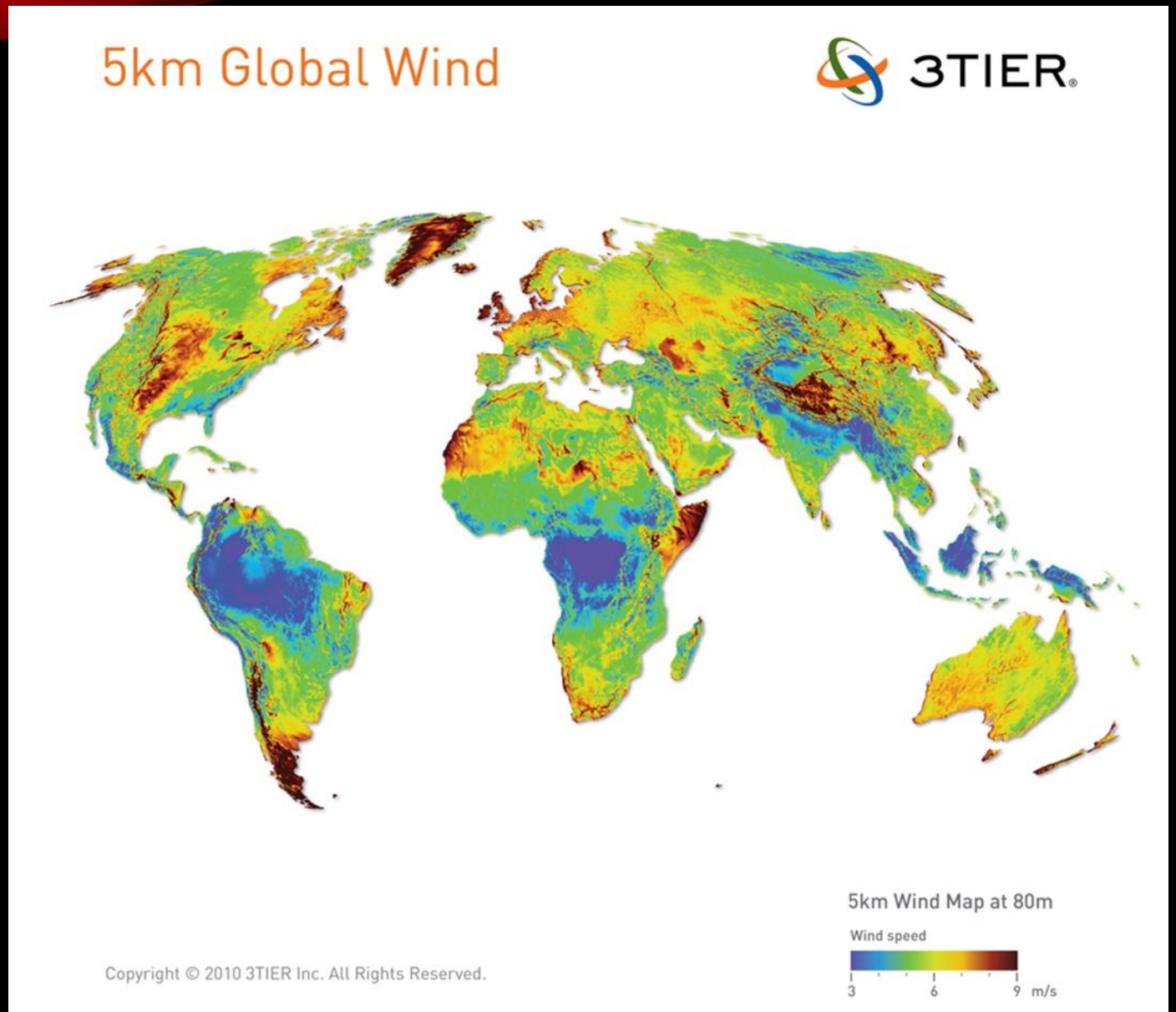


8,000 individual components make up a nacelle

Domestic manufactured content has grown from ~25% in 2006-07 to ~70% in 2012-13

1. Wind Sensor
2. Service Crane
3. VMP Top controller with converter
4. Generator
5. Pitch cylinder
6. Oil/Water coolers
7. Gearbox
8. Main shaft
9. Pitch system
10. Blade hub
11. Blade bearing
12. Blade
13. Rotor lock system
14. Hydraulic unit
15. Torque arm
16. Machine Foundation
17. Mechanical disc brake
18. Yaw gear
19. Composite disc coupling

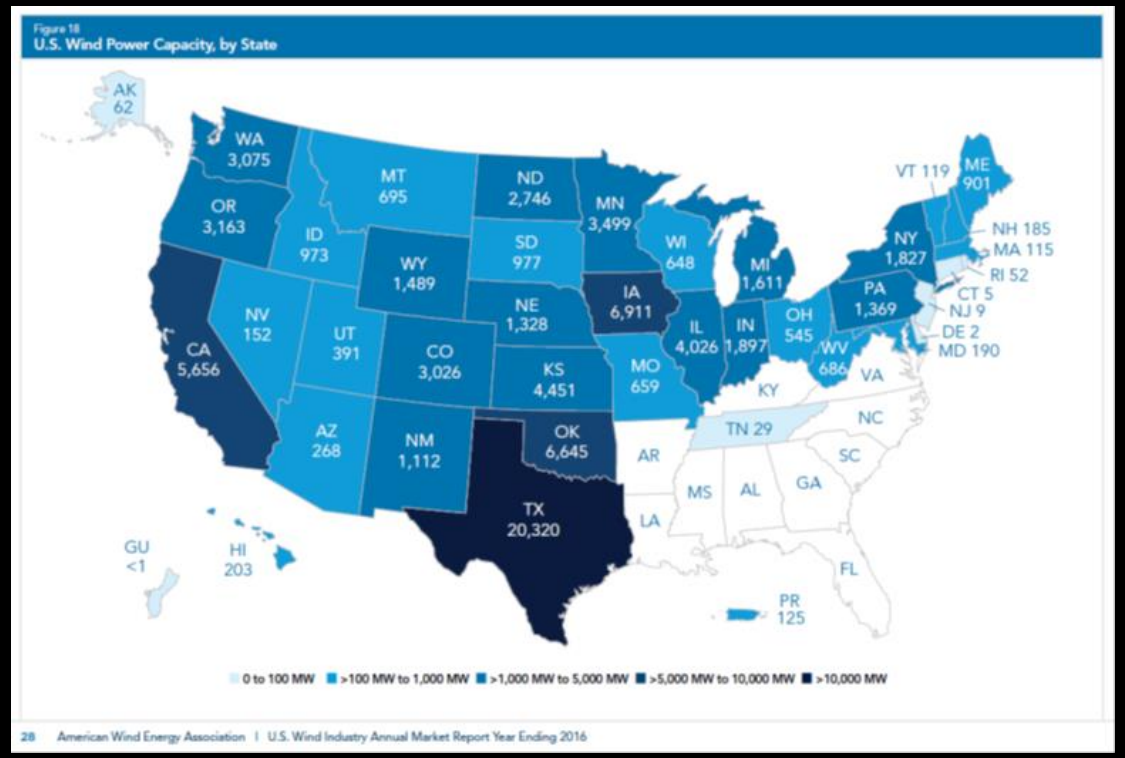
GLOBAL WIND RESOURCE

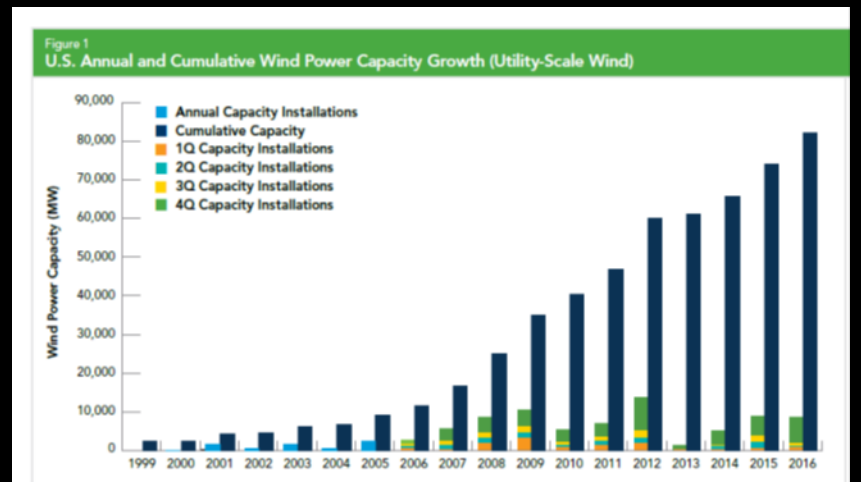


- China – 168,690 MW
- USA – 82,143 MW
- Germany – 50,018 MW
- India – 28,700 MW
- Spain – 23,074 MW
- UK – 14,543 MW
- France – 12,066 MW
- Canada – 11,900 MW
- Brazil – 10,740 MW
- Italy – 9,257 MW

NATIONAL SUMMARY

- Current installed capacity in US is 82,143 MW – 5.5% of US power generation
  - Powers equivalent of 21 million American homes
- 8,203 MW installed in 2016
- 10,432 MW of projects are currently under construction
- Production Tax Credit (PTC) is primary incentive for industry
  - Set to step down and phase out over next 2 years
- Capacity factors average 35%



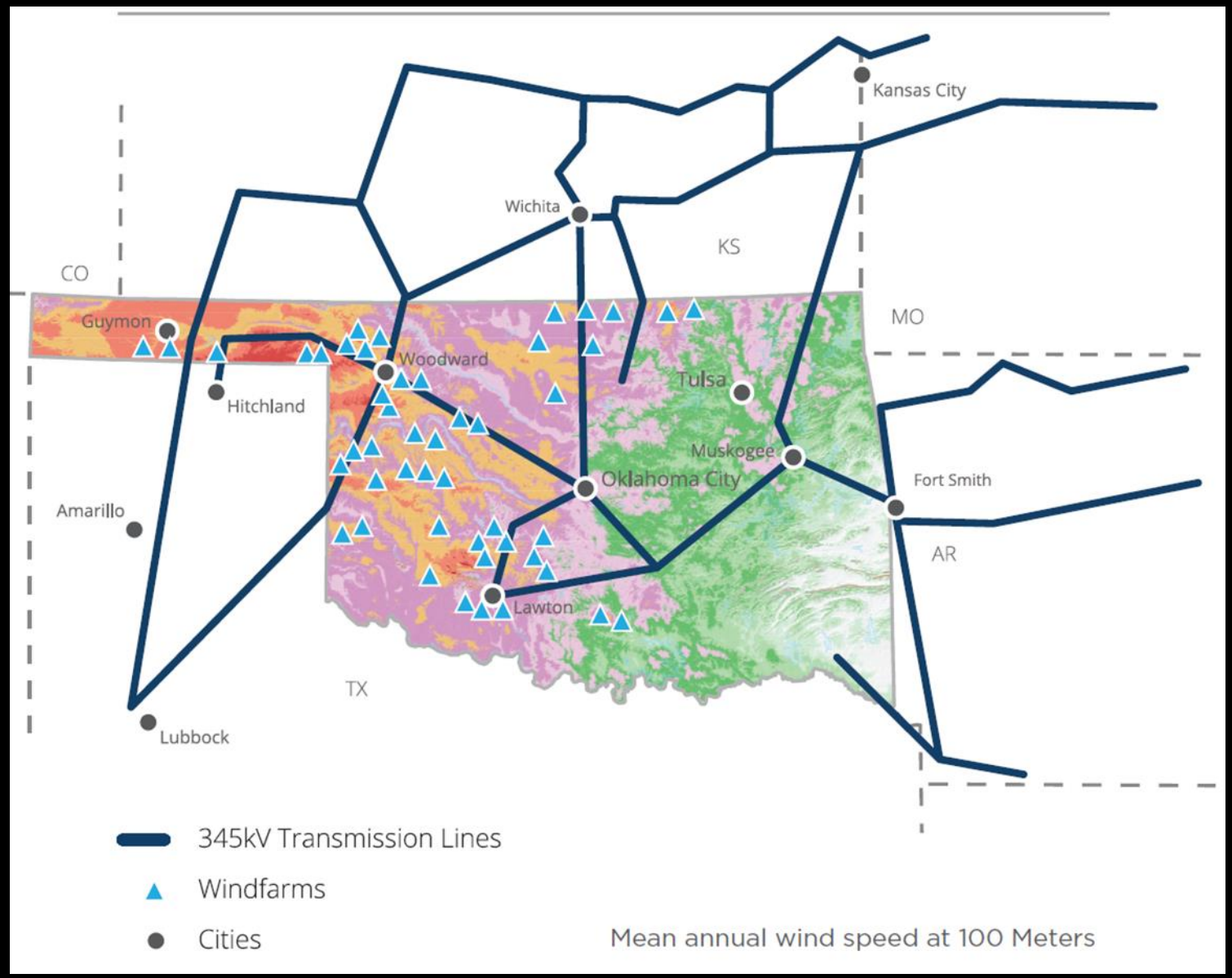


- This amount of wind avoids 159 million tons of CO2 – like taking 33.7 million cars off the road
- Avoids consumption of 87 billion gallons of water annually
  - 500MW coal plant – 2.2 billion gal/yr

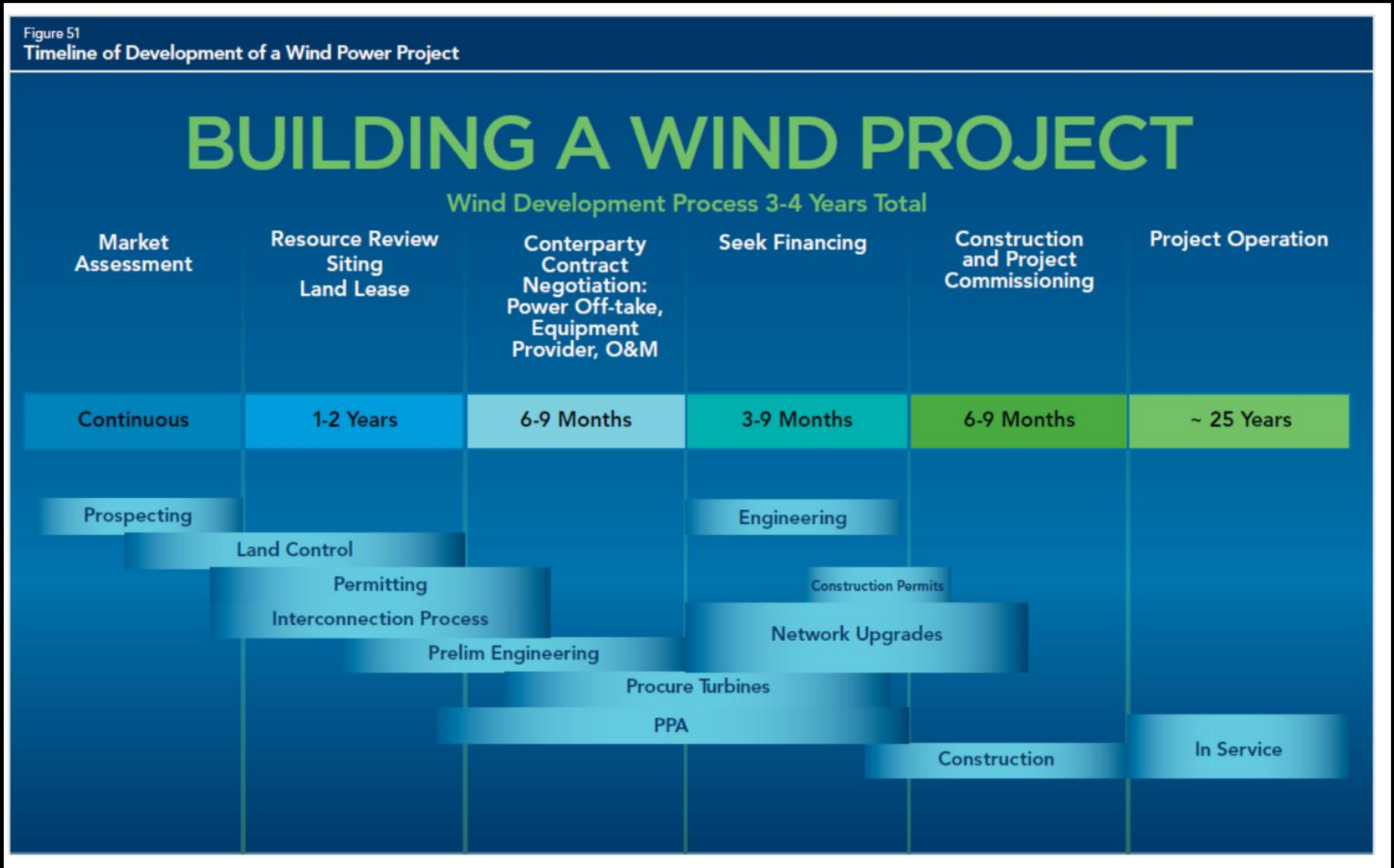
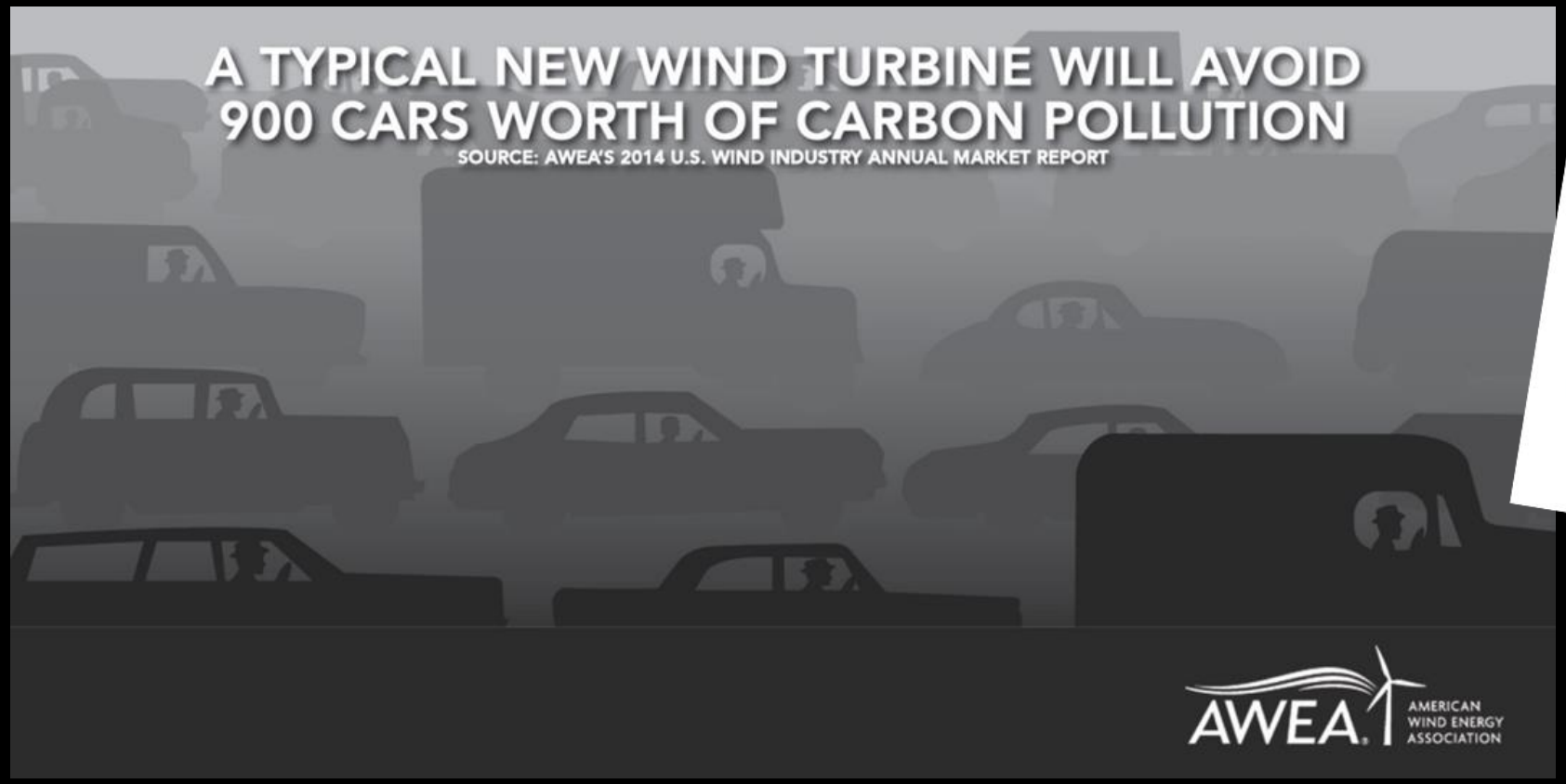
OKLAHOMA WIND STATISTICS

- Currently home to 6,645MW of installed wind power capacity
- 49 operational wind projects
- 3,317 total wind turbines across 10 different manufacturers
- Top 10 wind resource in nation
- Multiple wind projects now exporting wind power
- Google data center in Pryor, OK being powered by wind

OKLAHOMA WIND PROJECTS



BUILDING A WIND PROJECT



WHY WIND ENERGY?