

U.S. DEPARTMENT OF
ENERGY

Office of
**ENERGY EFFICIENCY &
RENEWABLE ENERGY**

Wind Energy Technologies Office Overview

2019 Wind Program Peer Review

April 30 – May 2, 2019



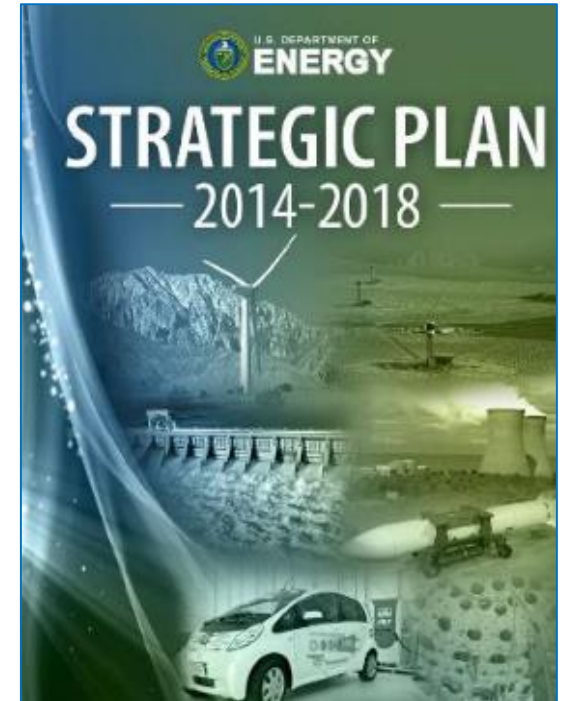
U.S. Department of Energy – *Providing Value to the Nation*

DOE Mission

To ensure America's security and prosperity by addressing its energy, environmental and nuclear challenges through **transformative science and technology solutions**

The Office of Energy Efficiency and Renewable Energy (EERE) promotes affordable and reliable energy to enhance America's economic growth and energy security.

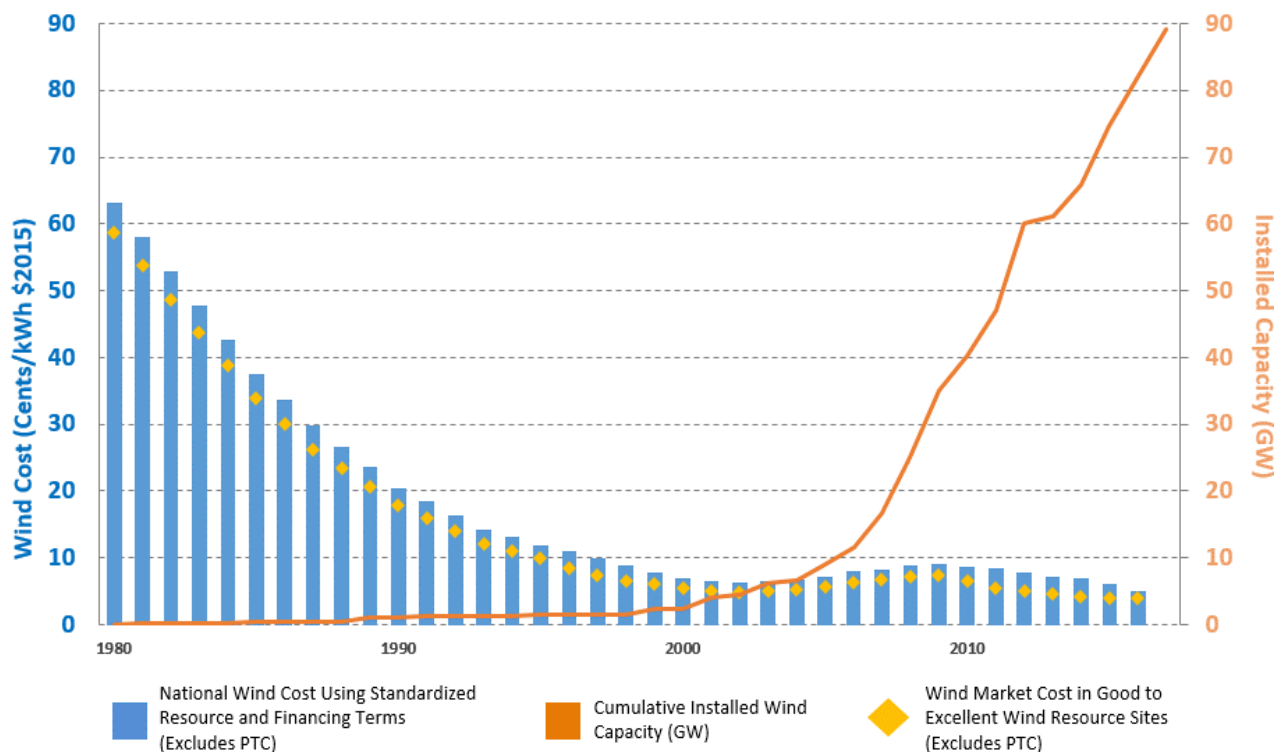
- Priority focus areas include:
 - Energy Affordability
 - Energy Integration
 - Energy Storage



The priorities outlined in DOE's strategic plan are critical to advancing the nation's energy and security goals and strengthening our economy to provide a cleaner energy environment and a more secure and prosperous country for future generations

DOE R&D has Contributed to Significant U.S. Wind Industry Innovation and Cost Reduction

National laboratories and federal wind test centers have enabled cost-effective development and validation of high-risk innovative wind technologies for over four decades



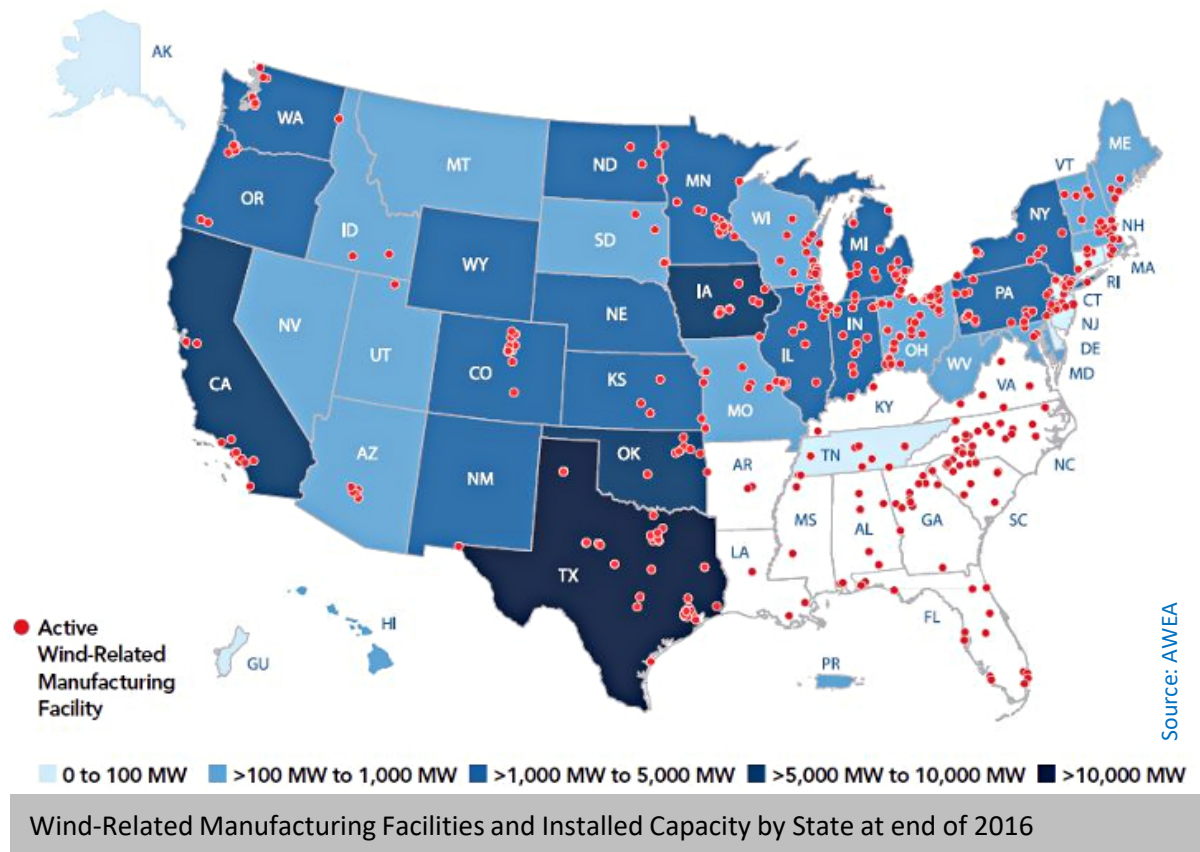
U.S. Wind Cost and Cumulative Deployment. The unsubsidized cost of wind energy in good to excellent wind sites dropped 90% from 1980 to 2018 – driven in part by DOE research and innovation. Industry has deployed over 90 GW cumulative.

Sample DOE R&D Innovations

- More than 154 DOE-funded wind patents from 1978 through 2017, with an additional 21 wind energy patents pending
- Advanced computer code development and validation have accelerated technology innovation
- Airfoil and blade designs, including **aeroelastic tailoring, flatback airfoils, and carbon fiber design**, have enabled larger rotors with increased energy capture
- Development and demonstration of **MW-class machines** and low wind speed turbines enabled cost-competitive utility-scale wind

The U.S. Wind Industry Today is Creating Significant Economic Value Across the States

Wind provides over 6% of the nation's electricity and supports over 105,000 domestic jobs, including over 500 manufacturing facilities in 41 States



Robust Industry

- Utility-scale wind power in 41 states and distributed wind power in all 50 states
- 14 states $\geq 10\%$ wind generation, with four states $>25\%$ generation
- U.S. utilities operate high wind penetration without one-to-one backup or storage requirements today through balancing and forecasting management
- Wind power represented 25% of capacity additions in 2017
- 30 MW Block Island (RI) first offshore wind project began producing power in 2016

Domestically Sourced Components and Raw Materials

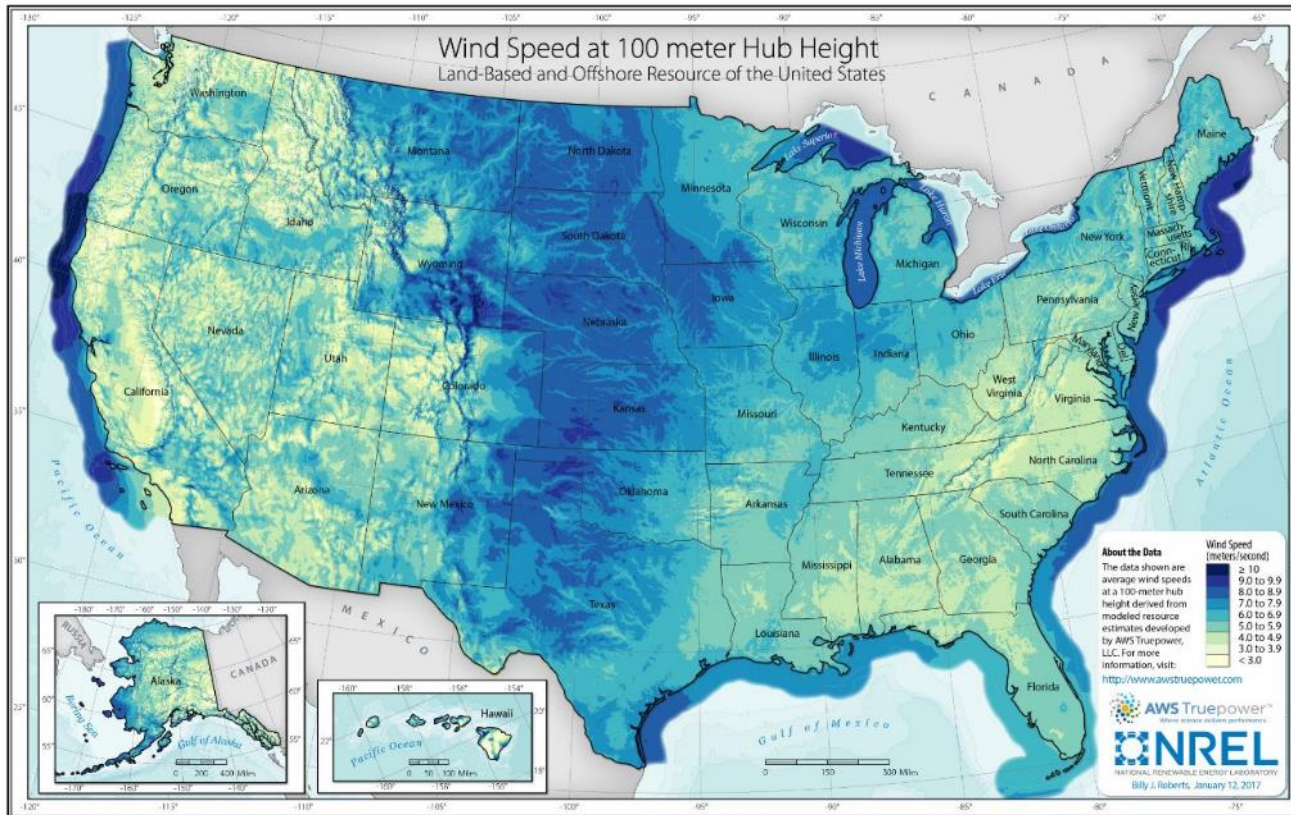
- Through innovations and a robust wind market, 70-90% of towers and 50%-70% of blades and hubs installed in the U.S. in 2017 were made in America.
- Today's U.S. wind manufacturing capacity is 7-12 GW/year

The Southeastern U.S. has more than 100 manufacturing facilities supplying components and materials to the wind industry

We Can Do More Across All Regions

U.S. Wind Resources are Among the Best in the World

The combined land-based and offshore domestic, inexhaustible wind resource potential is more than 10 times greater than the total U.S. electricity demand



Untapped Wind Market Potential in All 50 States

- Land-based utility-scale wind
- Offshore wind (OSW)
- Land-based distributed-scale wind

Barriers

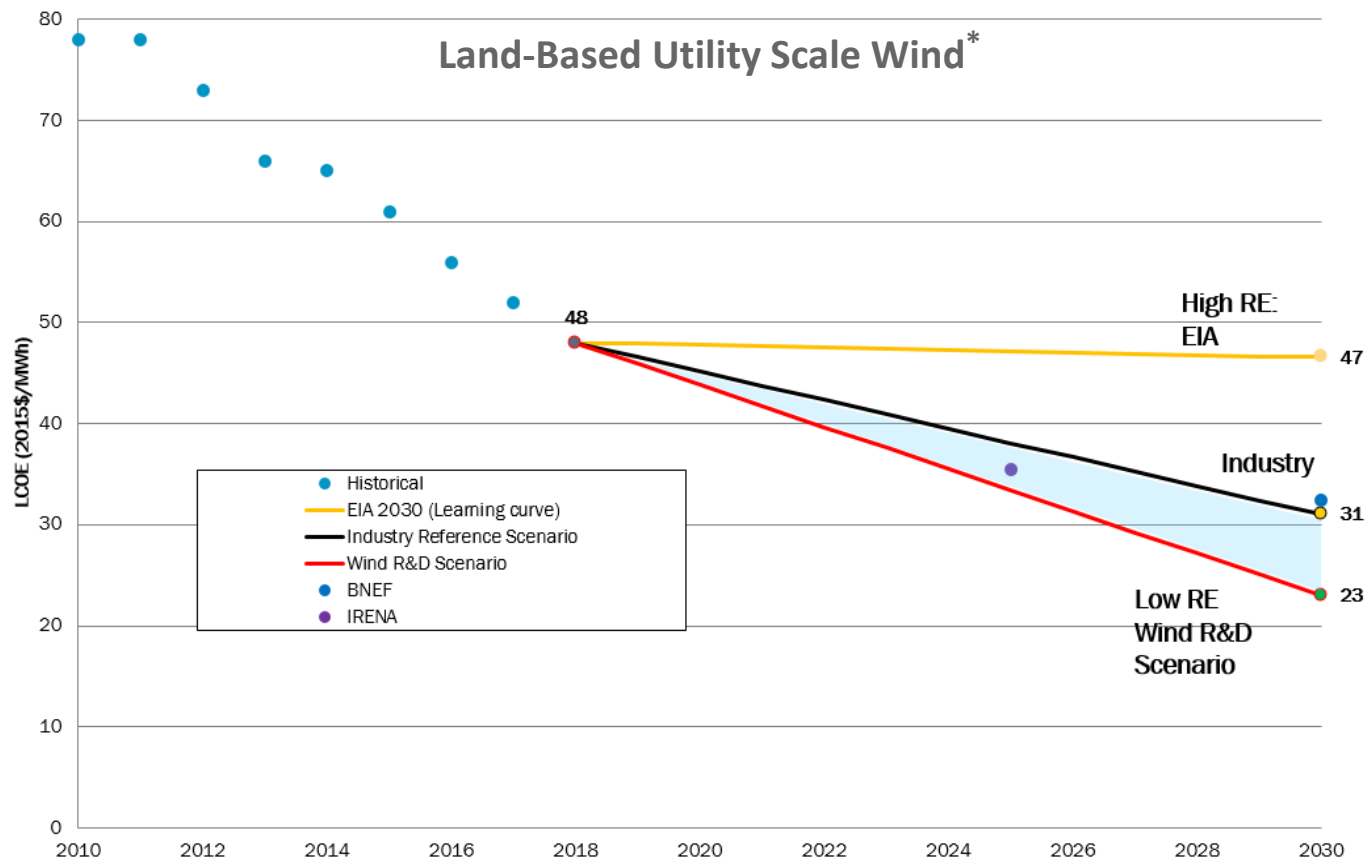
- Wind turbine design
- Reliability
- Wind plant optimization
- Cost reduction
- Grid integration
- Mitigation of environmental impacts and human use impacts such as radar interference

Wind Energy Technologies Office

Overview

Wind Energy Cost Targets

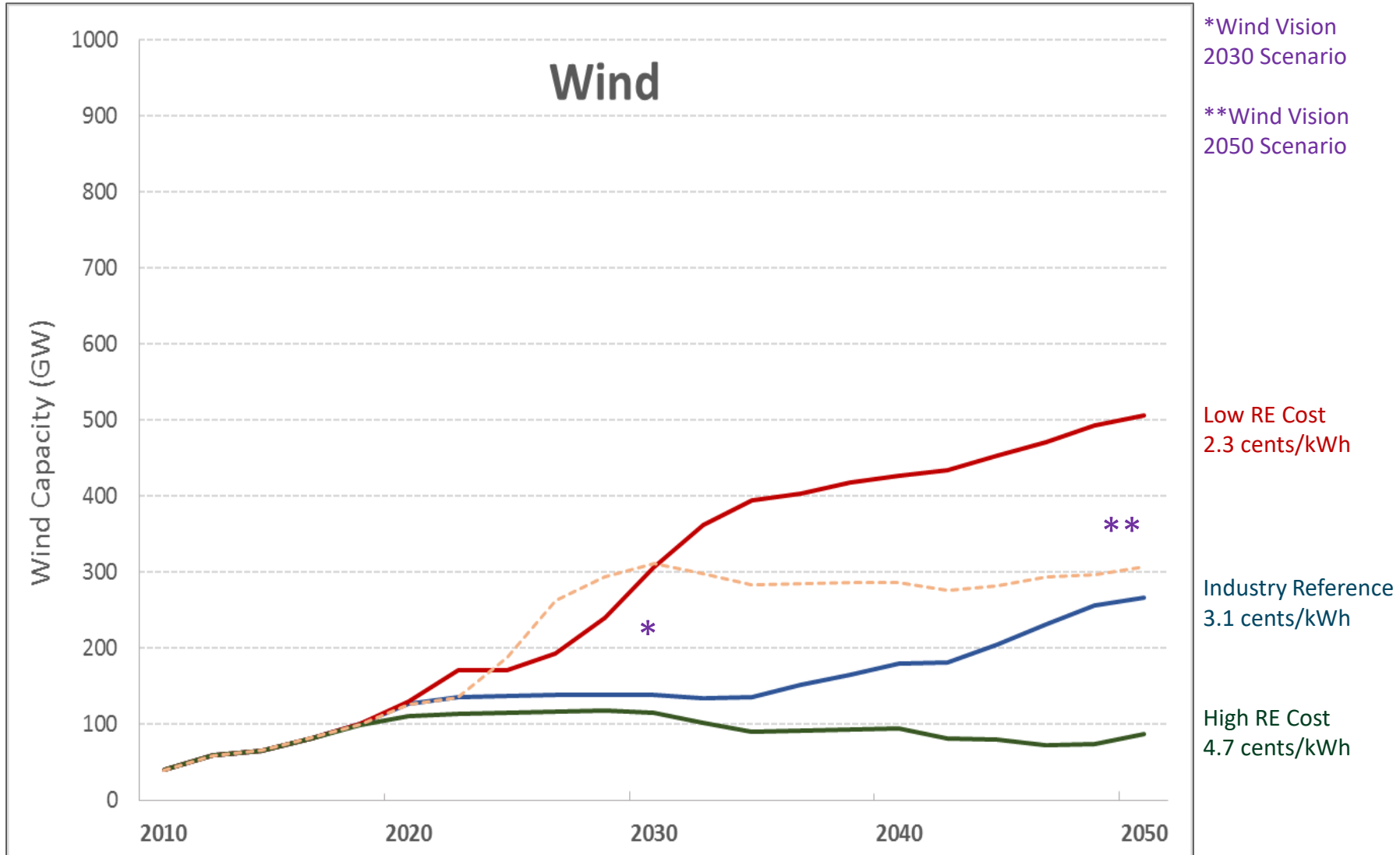
The Wind Energy Technologies Office works to achieve breakthroughs in **reducing the levelized cost of energy (LCOE) for land-based wind by 50% from today's LCOE, to \$.023/kWh without subsidies by 2030** and achieving a **50% reduction in offshore wind and distributed wind by 2030 from a 2015 benchmark**. Achieving these 2030 goals would make wind electricity one of the most affordable forms of electricity in the U.S.



*LCOE shown here without the Production Tax Credit

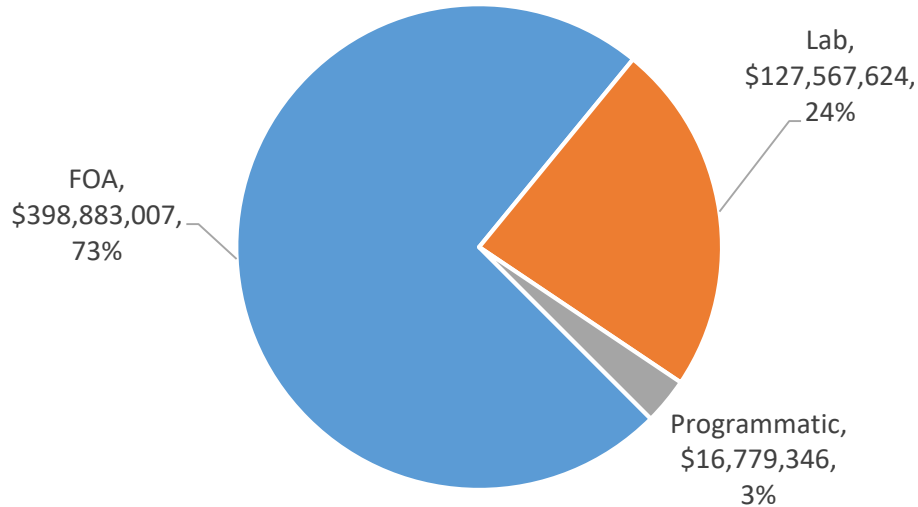
Wind Office Research Strategy

Implications of Hitting Cost Targets

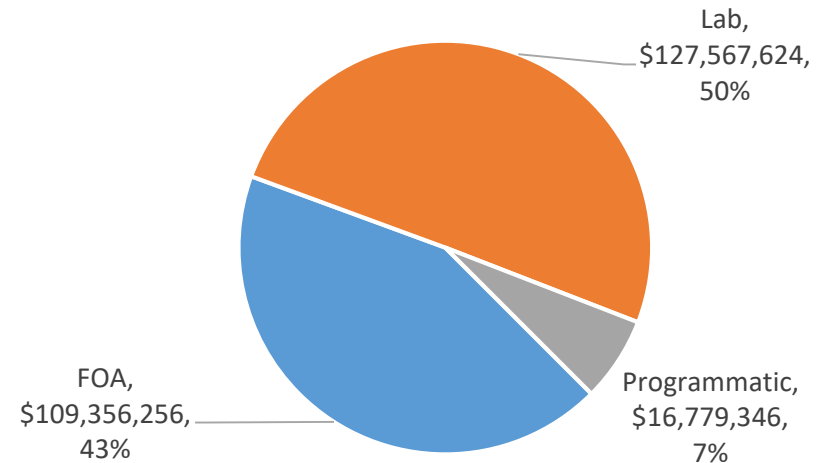


FY17-FY18 WETO Budget (By Funding Mechanism)

FY17-FY18 Office Budget, By Funding Mechanism
(with FOA cost share)



FY17-FY18 Office Budget, by Funding Mechanism
(no FOA cost share)



We are reviewing 100% of R&D projects active FY17 & FY18

We Listen to you!

- Peer Reviewers in 2016 pointed out the need to balance funding between markets to address the broad wind industry
 - The Office significantly increased R&D in the Offshore Wind and Distributed Wind Sectors

	15-16 subtotal	17-18 subtotal
Distributed Wind	\$ 5,214,776	\$ 13,142,700
Offshore R&D	\$ 2,647,000	\$ 4,697,920
Demos	\$ 93,650,000	\$ 40,000,000

- It was suggested that WETO enhance the use of high performance computing and emphasize verification and validation of models
 - Investments made in HFM and associated V&V needed to ensure robust code development **nearly tripled.**
 - \$7M of the \$12.6M spent came from the Office of Science through a competitive award to NREL and SNL to develop the next generation of Exascale Simulation codes that can run on DOE world class computers