

Renewable Energy Trends & Opportunities in Sussex County

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**League of Women Voters
Sussex County**
Georgetown, DE

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Presentation Outline

- Goals of our renewable energy initiative in Sussex County
- Electricity supply in Delaware
- Current US energy transition
 - Solar and wind are the fastest growing new energy supplies and jobs
- Sussex County Comprehensive Planning Process
- Possible next steps in the renewable energy transition & energy efficiencies
- Discussion of opportunities and challenges
 - Gauging interest

UD Research Goals

- Sussex County Comprehensive Plan
 - *Include renewable energy (RE) developments in utilities and economic development chapters*
- Identify and engage stakeholders & decision makers
 - *Assess knowledge base and gauge interest*
- Identify and engage educational institutions
- Identify barriers and opportunities for expanding domestic, renewable energies

The Need for a Clean Energy Transition

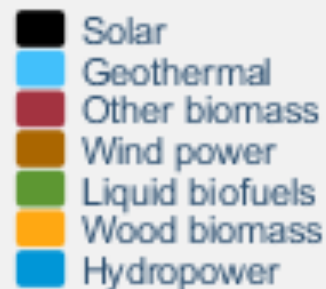
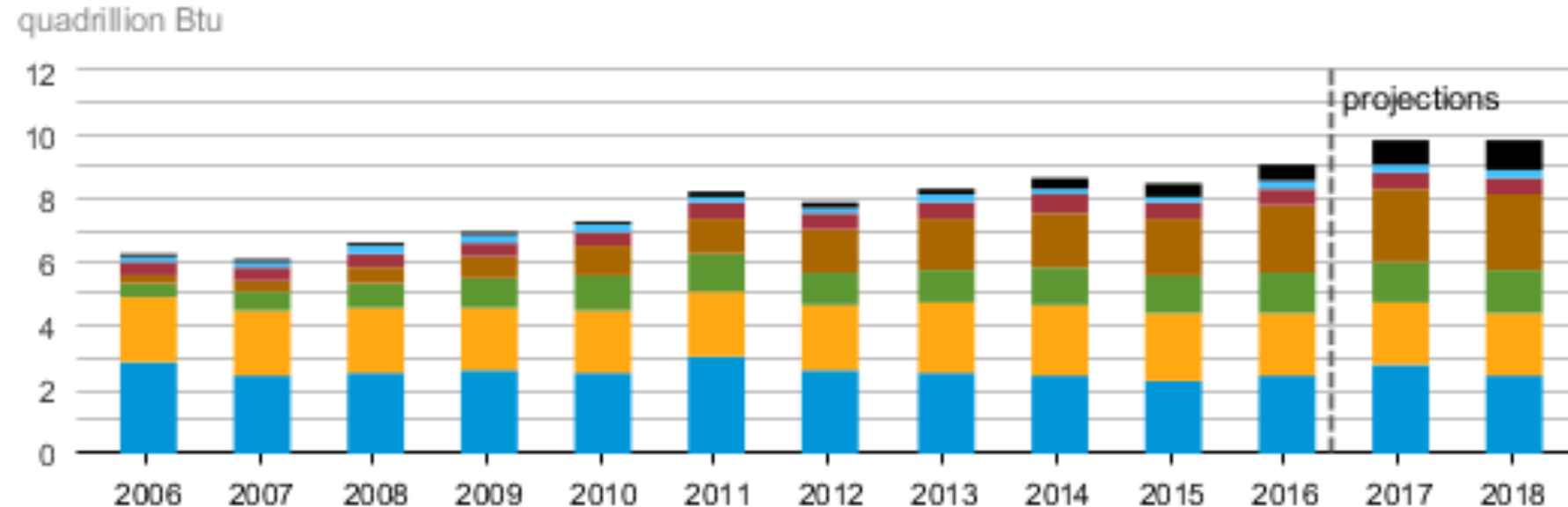
- Address climate change on regional level
 - Addressing coastal resilience & extreme weather
- Reduce air pollution & water use from traditional energy sources
 - Links to improving public health
- Implement low hanging fruit
 - energy efficiency
 - using less heat and power
- Economic development and jobs

DE joins US Climate Alliance

- "Delaware is the country's lowest-lying state and with 381 miles of coastline, climate change is a very real threat to our future," **Delaware Gov. John Carney** said.
- "As sea levels rise, **more than 17,000 Delaware homes, nearly 500 miles of roadway and thousands of acres of wildlife habitat including our critical wetlands are at risk of permanent inundation.** Rising average temperatures and an increase in extreme weather events also pose health risks to Delawareans, and threaten our economy. The U.S. should lead in the global fight against climate change. Delaware is proud to join this **coalition of states** providing that necessary leadership."

U.S. Renewable Energy Supply (2016)

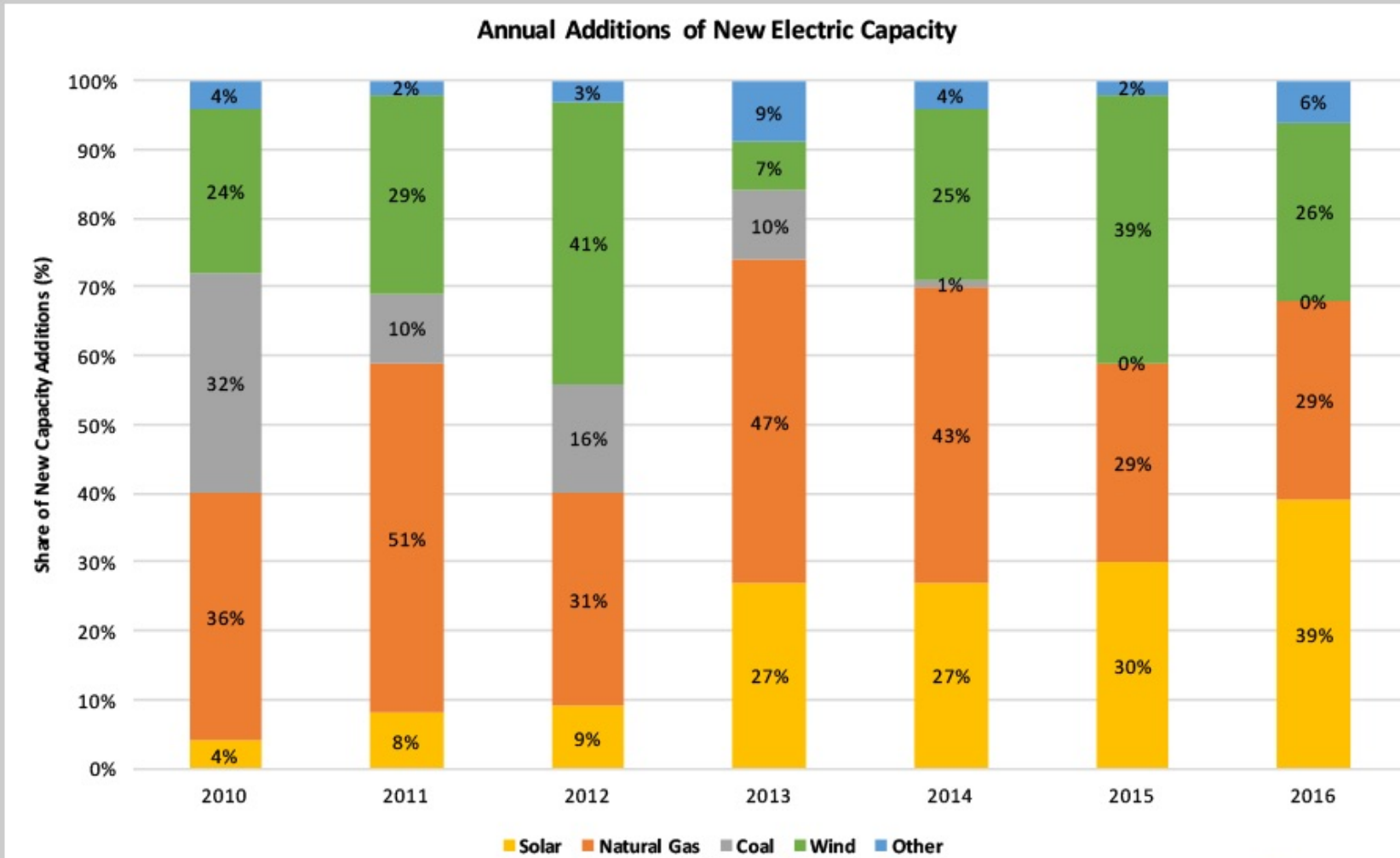
U.S. renewable energy supply



Source: Short-Term Energy Outlook, September 2017

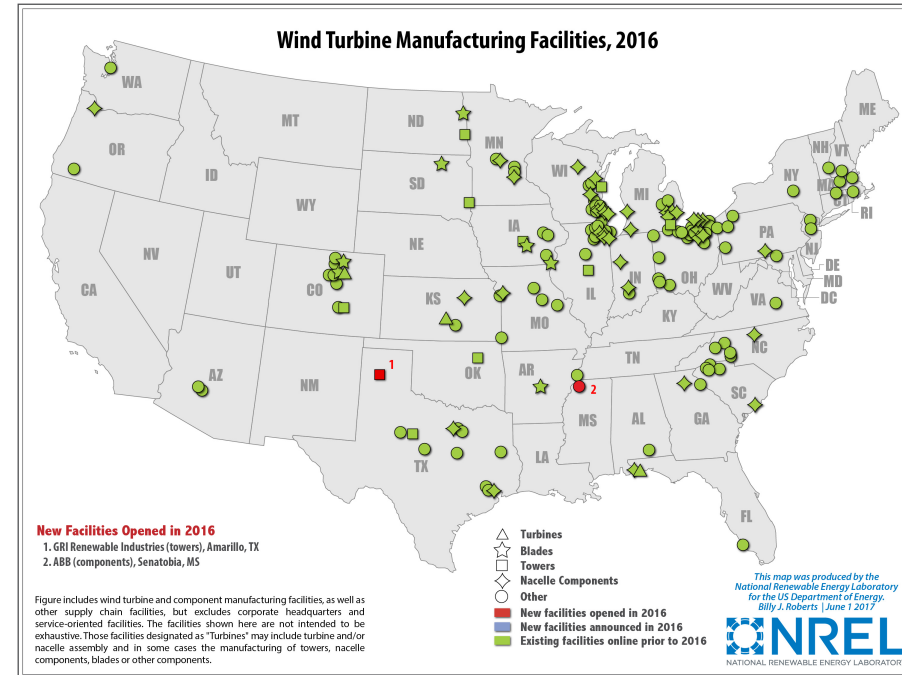
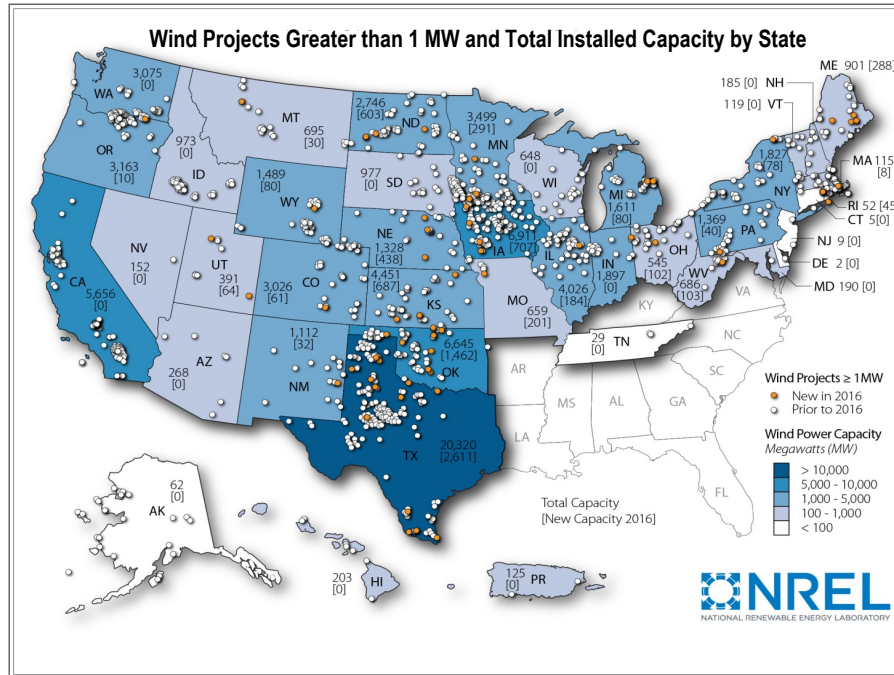
Note: Hydropower excludes pumped storage generation. Liquid biofuels include ethanol and biodiesel. Other

Annual additions of new electric capacity



Wind Technologies Market Report - Key Findings

40 states with utility-scale wind projects at end 2016
(now 41); wind industry jobs up 32% to 102,000



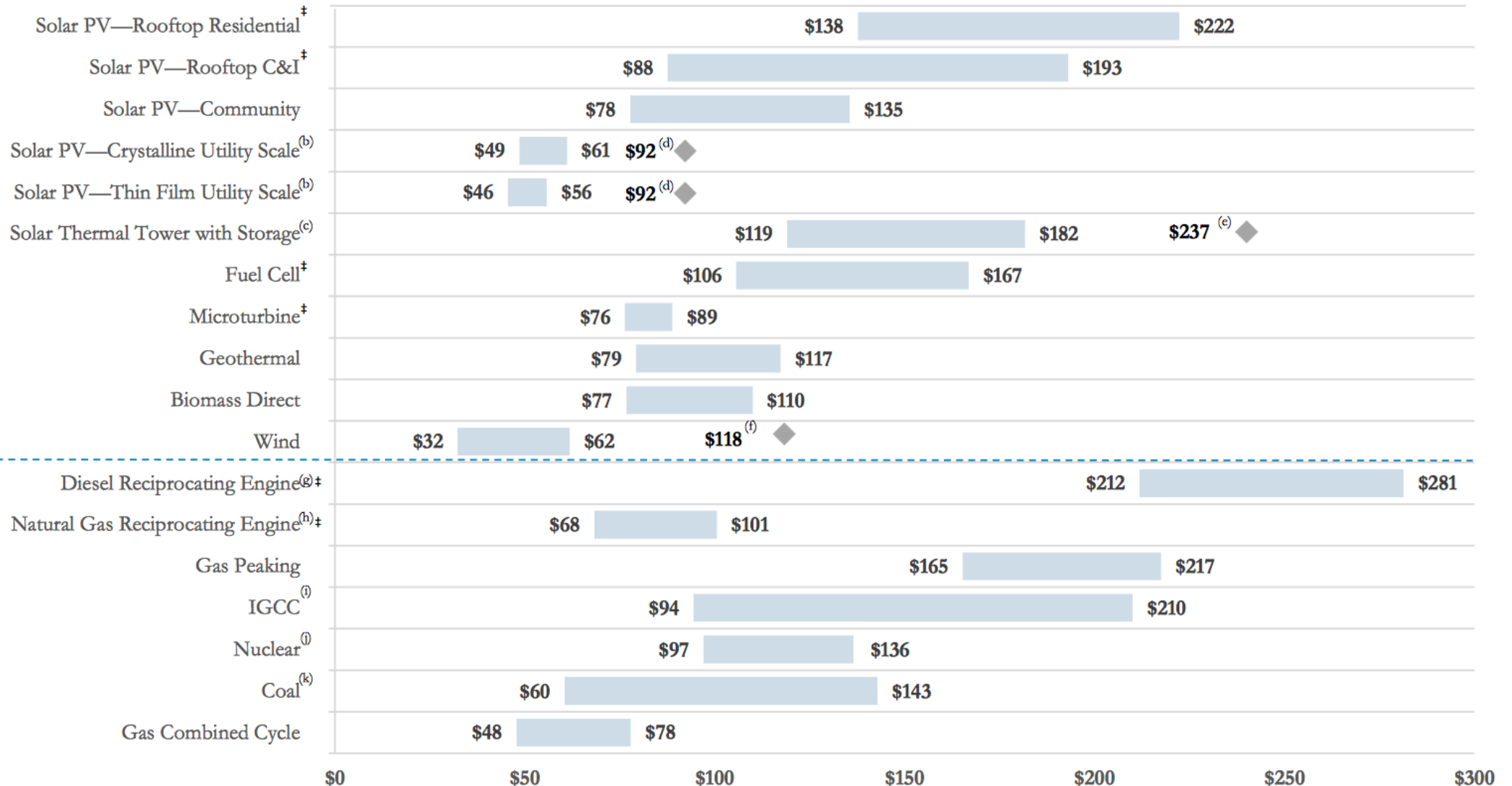
Note: Numbers within states represent cumulative installed wind capacity and, in brackets, annual additions in 2016. Manufacturing map shows major manufacturers and is not intended to be exhaustive – e.g. does not include some second-tier parts suppliers, logistics facilities or R&D centers.

- 500+ suppliers in 41 states supplied products to the wind industry (major plants shown above right)
- Domestic content is high for major components (65-80% towers, 50-75% blades, >90% nacelle assembly)
- Continued supply chain growth expected in short-term
- NC became 41st state with utility-scale wind (Avangrid's Amazon East Wind Farm) in early 2017

Lazard Unsubsidized Cost of Energy (Dec 2016)

<https://www.lazard.com/media/438038/levelized-cost-of-energy-v100.pdf>

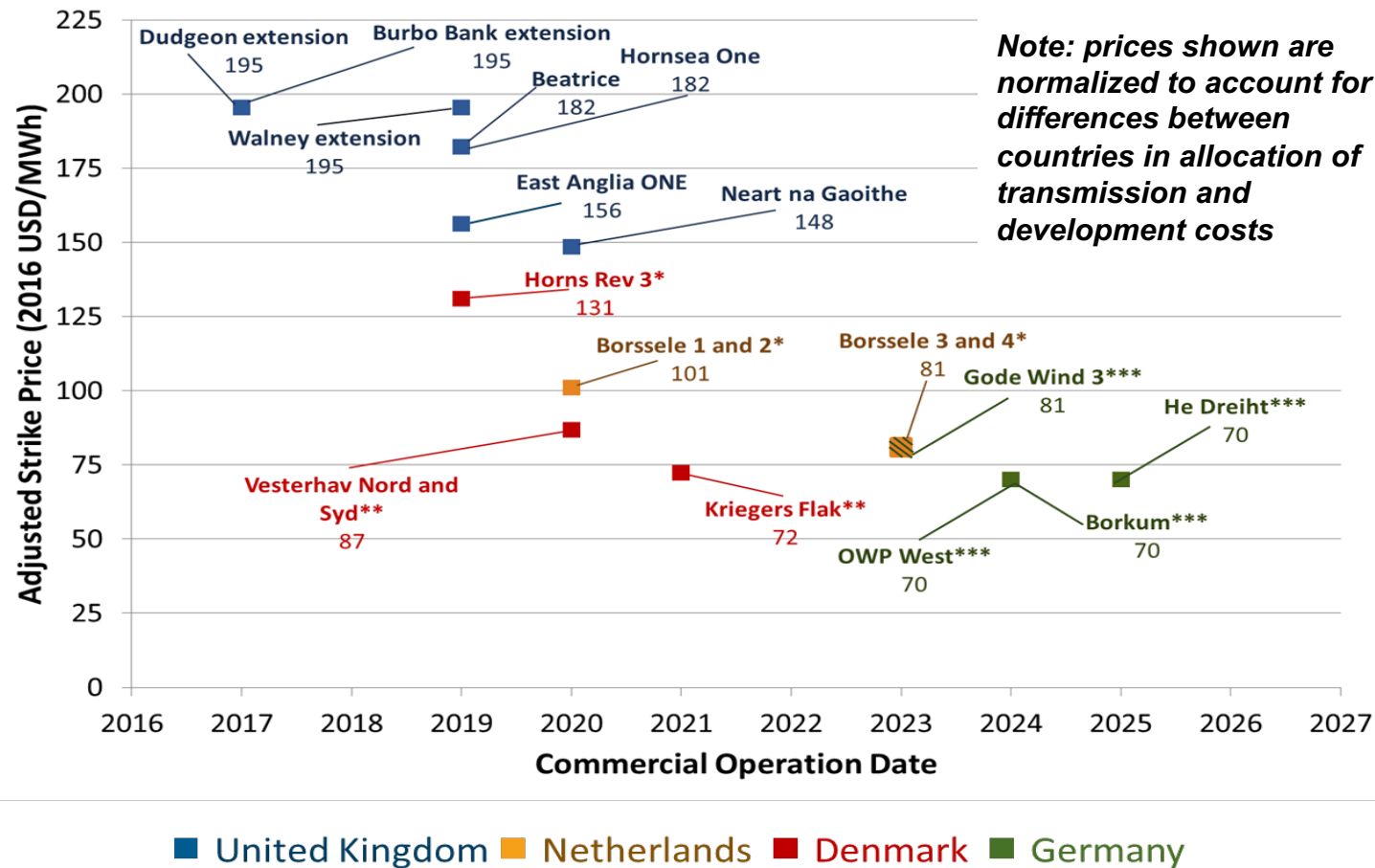
ALTERNATIVE ENERGY^(a)



Levelized Cost (\$/MWh)

Offshore Wind Technologies Market Report - Key Findings

Contract Electricity Prices for European Offshore Wind Farms Have Fallen to Unsubsidized Levels in Recent Auctions



Energy System Transformation 1980 -> 2005 in Delmarva

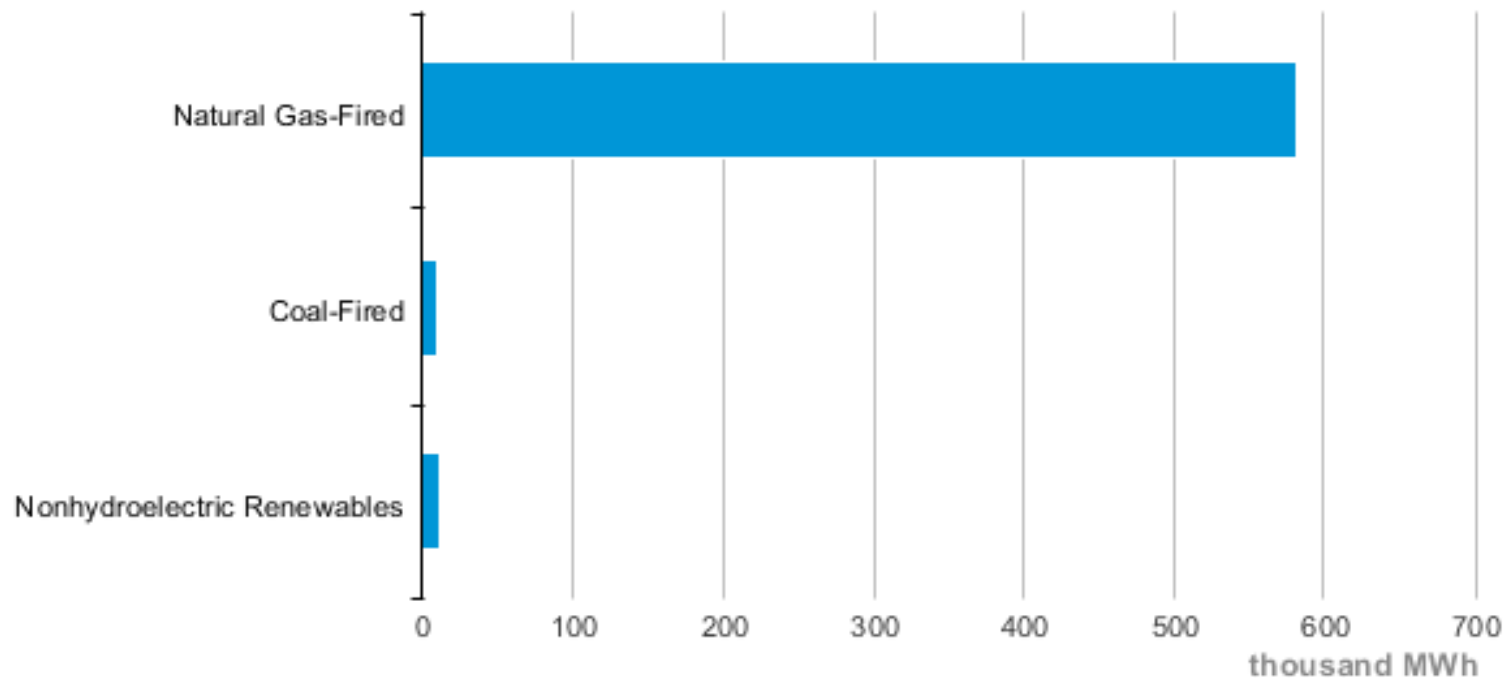


- In 2016, **Delaware** generated 89% of its electricity from natural gas,
- Up 7% from what it had been two years before
- Generation from coal fell to 5.5%, less than half of what it had been two years before.
- Solar generates 1.61 % of the total electricity now
- **5% reduction in CO₂**
- RPS in place
 - Purchase of Renewable Energy Credits
- Average Retail Price of Electricity to Residential Sector (14.77 cents/kWh)

<https://www.eia.gov/state/?sid=DE>

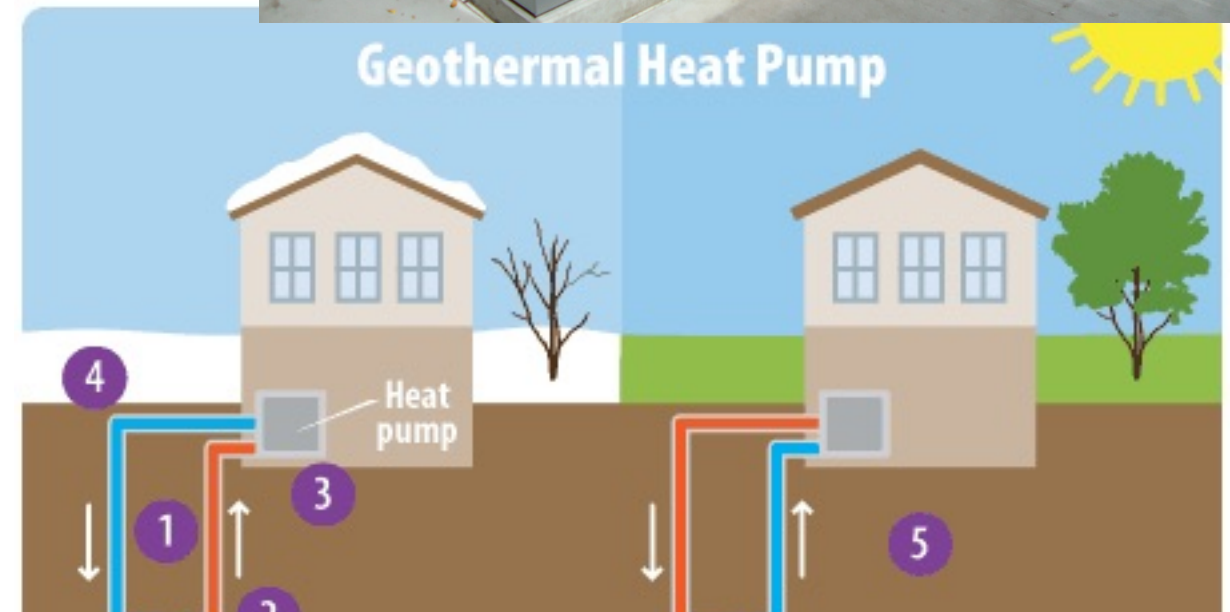
EIA State Electricity Data (2017)

Delaware Net Electricity Generation by Source, May. 2017



DE Renewable Portfolio Standards

- The state wants retail electricity suppliers to purchase (generate) 25 percent of power from renewable sources by 2025
- with 3.5 percent carve out for solar
- Passed in 2005 and then increased again 2010



- RECs and SRECs from out of-state wind & solar account for a large portion of Delaware's RPS requirement.
- Most solar is in state except for 10,000 SRECs from North Carolina being sold to DPL in a 20 year contract

DE Renewable Portfolio Standards

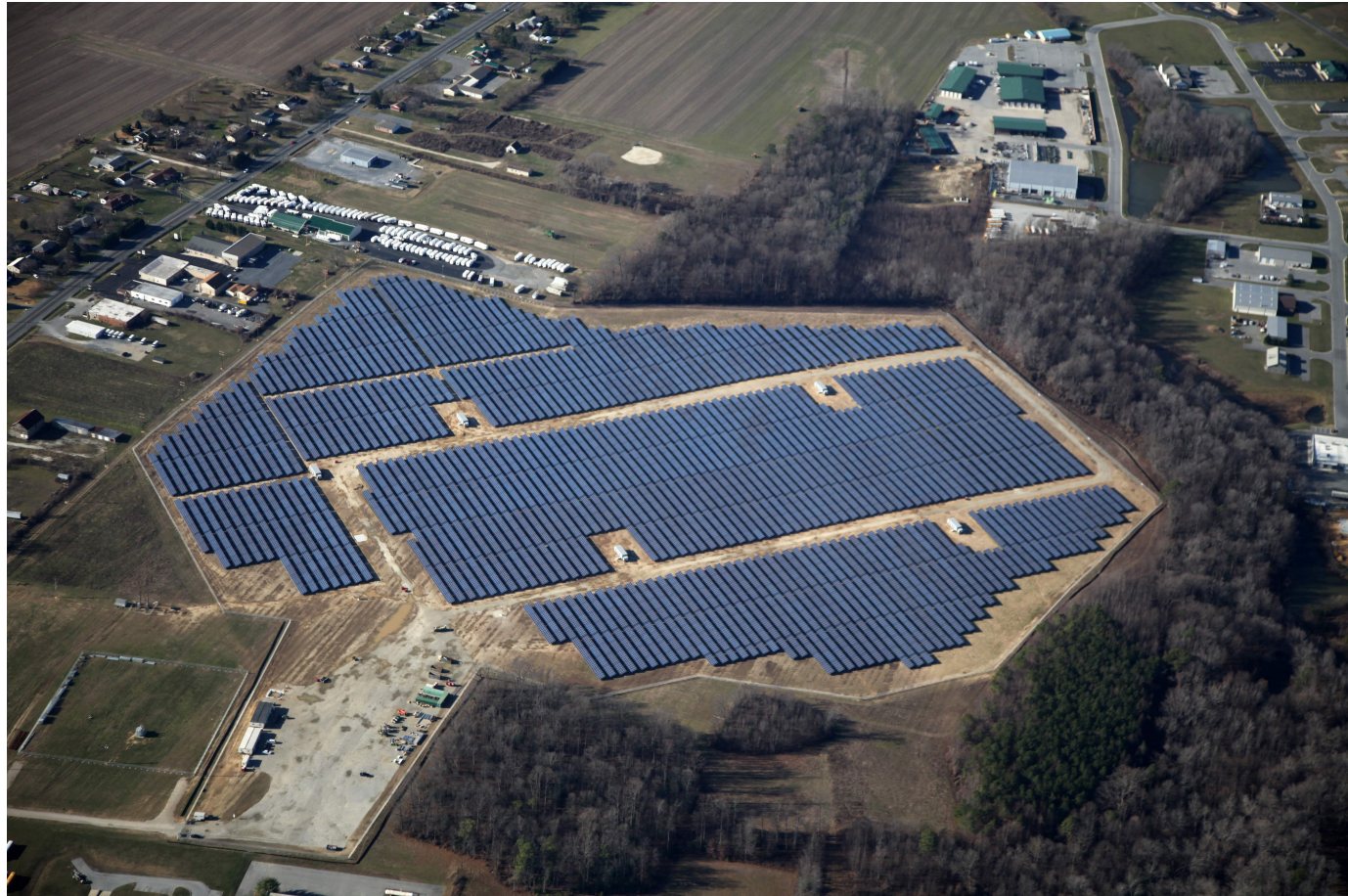


Photo Credit: <https://www.pseg.com/info/media/newsreleases/2013/2013>

DE RPS -eligible energy resources that can be used to meet the 25% by 2025 goal.

- Biomass
- Hydroelectric
- Fuel Cells
- Landfill Gas
- Tidal/Wave & Ocean Thermal
- Anaerobic Digestion
- Geothermal Electric
- Land-based wind –
 - Distributed/ small (<100 kW)
 - Large (tall)
- Offshore wind
- Solar Photovoltaics
- Solar Thermal Electric

LEWES BATTERY STORAGE

- The coastal city will get an eight-megawatt energy storage system produced by Alevo Group, a Swiss energy storage provider that opened a manufacturing plant in North Carolina in 2014. Alevo Group announced the installation, with Lewes as the young company's first announced customer for its GridBanks batteries.
- "The Lewes Board of Public Works has high expectations for the Alevo batteries," Lewes's mayor, Ted Becker, said in a statement. "The installation of the 8 megawatt battery will provide a significant tool to manage our capacity charges, our peak demands and transmission charges, and we anticipate it to be a boon for the citizens of Lewes."
- <http://www.delawareonline.com/story/news/local/2016/03/22/lewes-adds-energy-storage-grid/82113674/>

Possible Next Steps in the Sustainable Energy Transition

- Low hanging fruits = energy efficiencies
 - DOE's study predicts that energy-efficiency employment will have a 9% growth rate over the next 12 months — higher than any other energy sector.

GREEN BUILDINGS

- Save building owners 20-30% in utility costs
- Attract customers
- Show community leadership and draw attention to resource conservation

Hospitality accounts for 6% of U.S. commercial building energy use (\$12 billion)

Source: Energy Information Administration, 2012 CBECS



Possible Next Steps in the Sustainable Energy Transition (cont.)

- New energy supplies – renewable and low carbon
 - Meet state RPS requirements
 - Diversify the electricity portfolio
 - Domestic – home grown, not imported
 - Price stability - no fuel costs
- *“Complementing America’s 500 wind manufacturing facilities, the industry currently supports more than 50,000 jobs in services”*

(<https://energy.gov/eere/articles/wind-energy-supporting-600000-jobs-2050>)

LAND-BASED WIND ENERGY IN DELAWARE

- One utility-scale turbine (2MW) at UD campus
 - \$6 million investment installed in 2010
 - Funds from federal gov't, UD, and Gamesa corporation
 - Tower height = 256 feet
 - Blade length = 144 feet
- Until recently, not economically feasible
 - Except along the coast and in the ocean
 - Mainly due to the estimated low wind speeds
- Now manufacturers designed turbines to be deployed at higher hub heights (100m and higher) where wind speeds are greater.
 - Larger rotor diameters allows the turbines to produce significantly more energy at lower wind speeds.



Farming the wind

- Large wind turbines typically use less than half an acre of land, including access roads
- Farmers can continue to plant crops and graze livestock right up to the base of the turbines.
- How can farmers benefit?
 - farmers can lease land to wind developers
 - use the wind to generate power for their farms, or
 - become wind power producers themselves.
- Revenue Options:
 - a fixed annual lease payment,
 - a single up-front payment,
 - a share of revenues from a wind project, or
 - some combination of these.

Farmers and land rental rates

- Farmers can negotiate land rental rates with the developers or turbine companies (compensation varies)
- Typically, farmers are paid between \$8,000 and \$10,000 per turbine (assuming a 2MW size turbine)
- Another payment option is for leasees to be paid a royalty (\$/MWh)
- Payments provide a stable supplement to a farmer's income, helping to counteract swings in commodity prices.

Source: Personal communication with developer. August 2017

What is needed to move forward with land-based wind

- Develop a wind map
 - Install equipment on existing tall tower or structure
 - Get 1-2 years of site specific wind resource assessment
- Discuss ideas with farmers and land owners
- Examine zoning and ordinances
- Consider adopting a property tax measure to capture changes in property value
- Undertake an economic analysis
- Assess environmental constraints/ conservation zones
- Involve the community – early and often



Potential Utility-scale Electricity Opportunities

- Solar rooftop
- Community solar
- Landfill (methane) gas
- Geothermal Units (heat)
- Land-based wind (small & tall)
- Offshore wind



Our First Offshore Wind Project: Block Island

- 30 MW turbine project
 - Five 150-6MW Halidade Turbines
Manufactured by GE (formerly Alstom)
 - Transmission connection to Block Island and a cable connection to the mainland.
- Location
 - Approximately 3 miles off of the Southeast coast of Block Island, Rhode Island
 - Approximately 16 miles off of the coast of Point Judith, Rhode Island



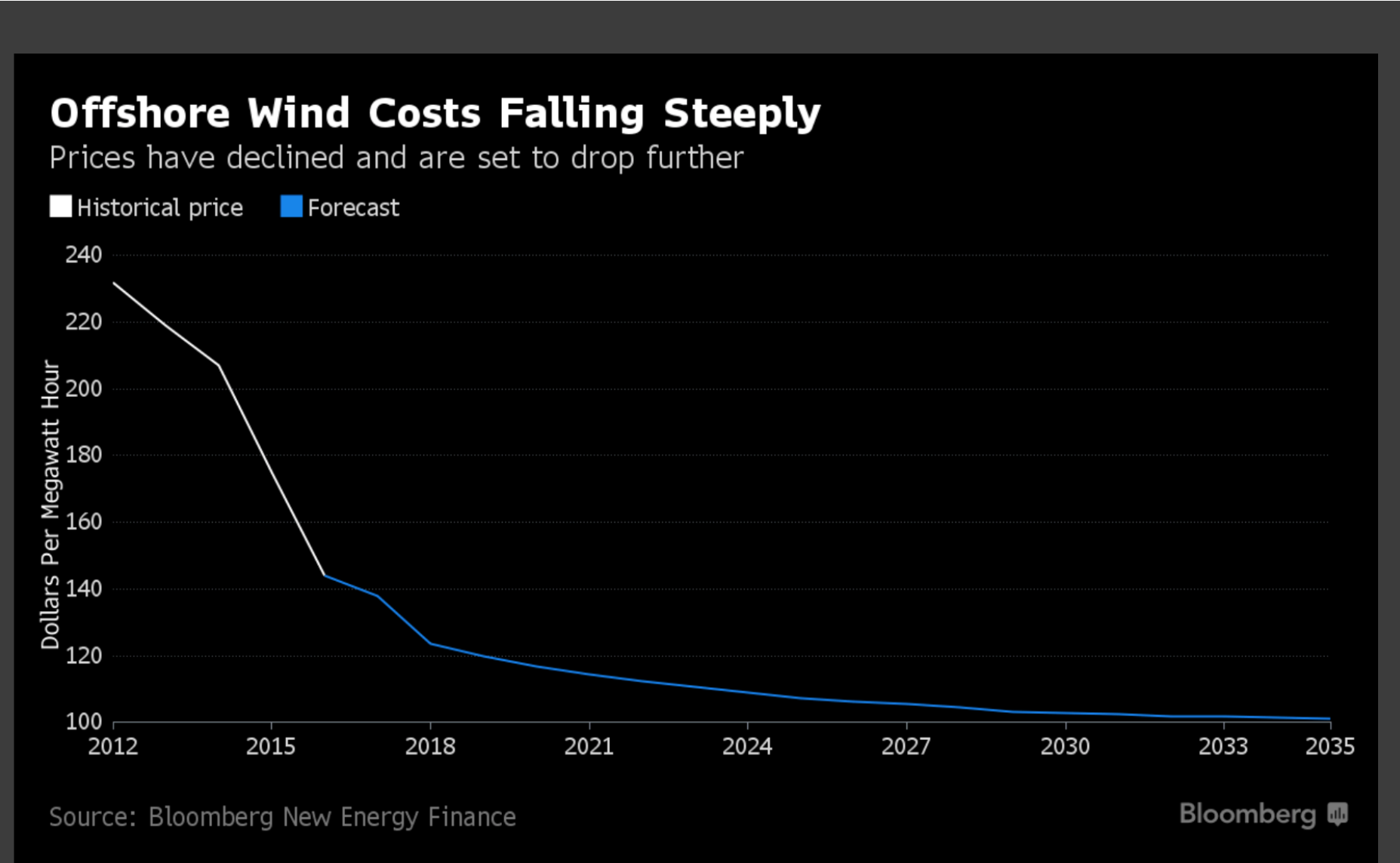
From Block Island (3 miles)



Monitoring potential impacts and benefits:

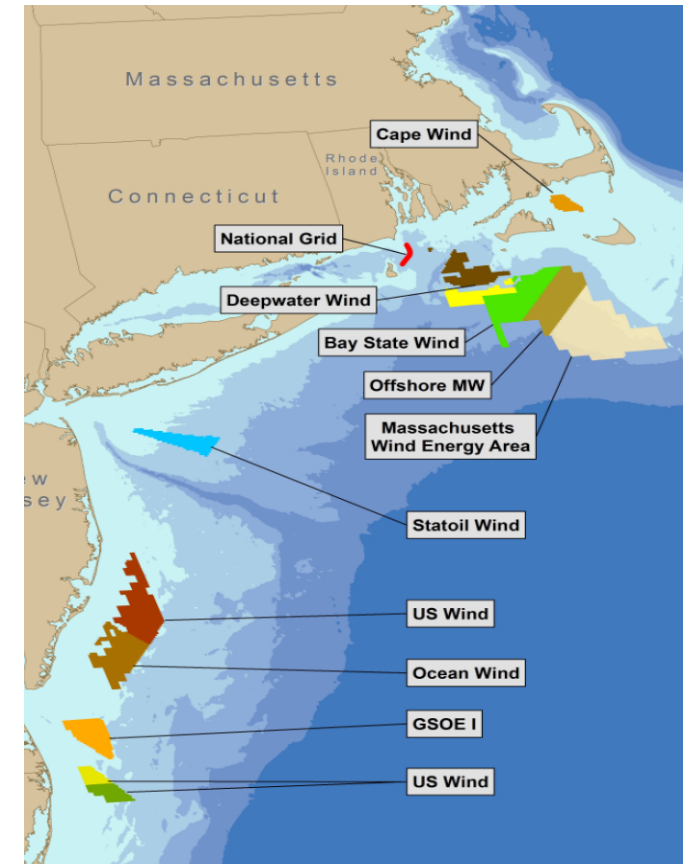
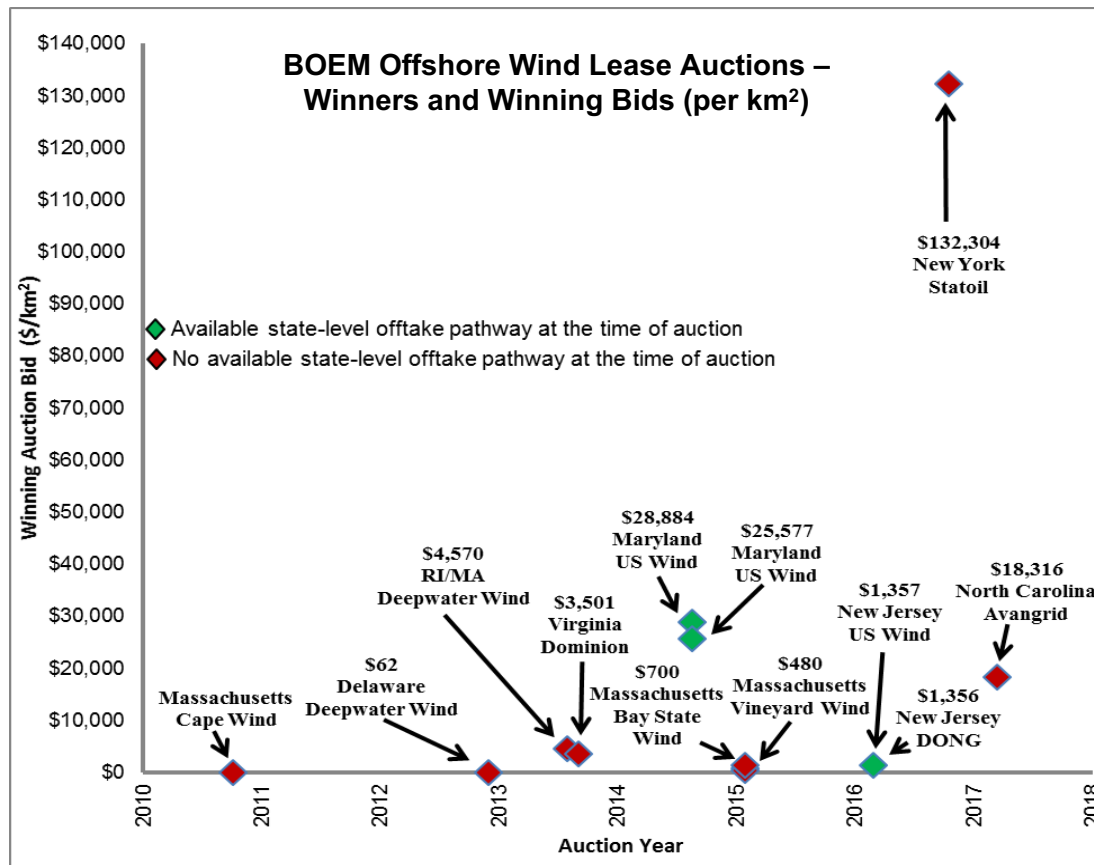
- ❖ Boat tours may increase tourism
- ❖ Growth of biomass around turbine base – benefits to recreational fishing
- ❖ Surveys of beach goers
- ❖ Monitoring wildlife around site
- ❖ Interviews related to visual impacts

Across Europe, the price of building an offshore wind farm has fallen 46% in the last five years – 22% last year alone.



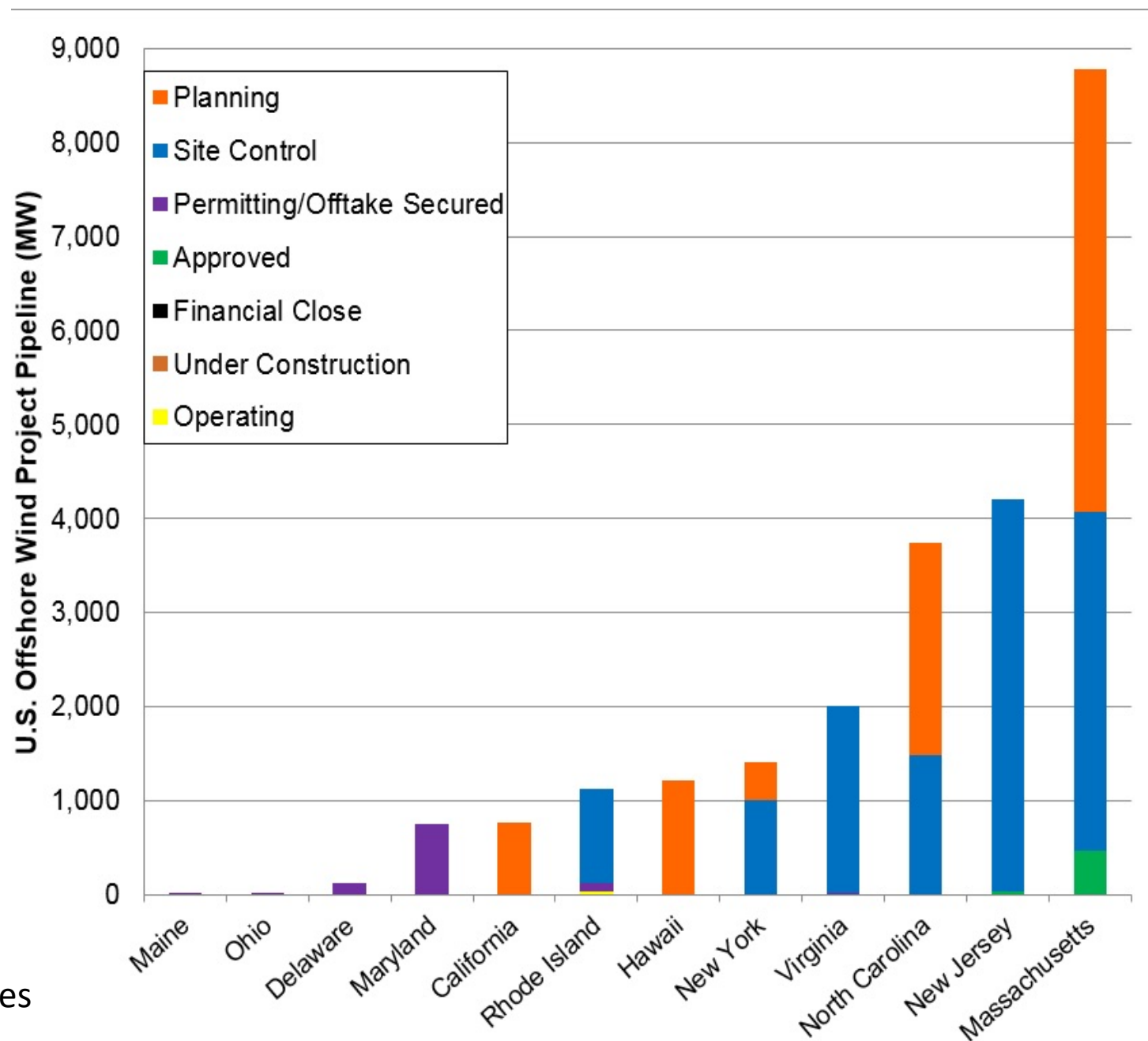
Offshore Wind Technologies Market Report - Key Findings

U.S. Offshore Wind Lease Prices Have Increased as Major European Developers Enter Market and State Policies Become More Favorable to Development



A ROBUST US PIPELINE OF OFFSHORE WIND PROJECTS

SOURCE: <https://energy.gov/eere/articles/4-emerging-trends-us-offshore-wind-technologies>



Maryland PSC Decision – May 2017 - Approves Offshore Renewable Energy Credits (ORECs) for two projects

- Deepwater (Skipjack) –120 MW in the DE Wind Energy Area (WEA)
 - Closest point est. 17 miles
 - Coming ashore in Ocean City (2022)
 - Fifteen-8 MW turbines
 - 114 meter hub height and ~670 feet to tip of blade at apex
 - UD Lewes turbine is 404 feet to tip of blade
- Deepwater Price: 20 year contract @ 2023 Price is \$171.30/MWh rising 1%/year to \$206.95 in 2042.
 - Levelized cost of \$131.93 in 2012\$

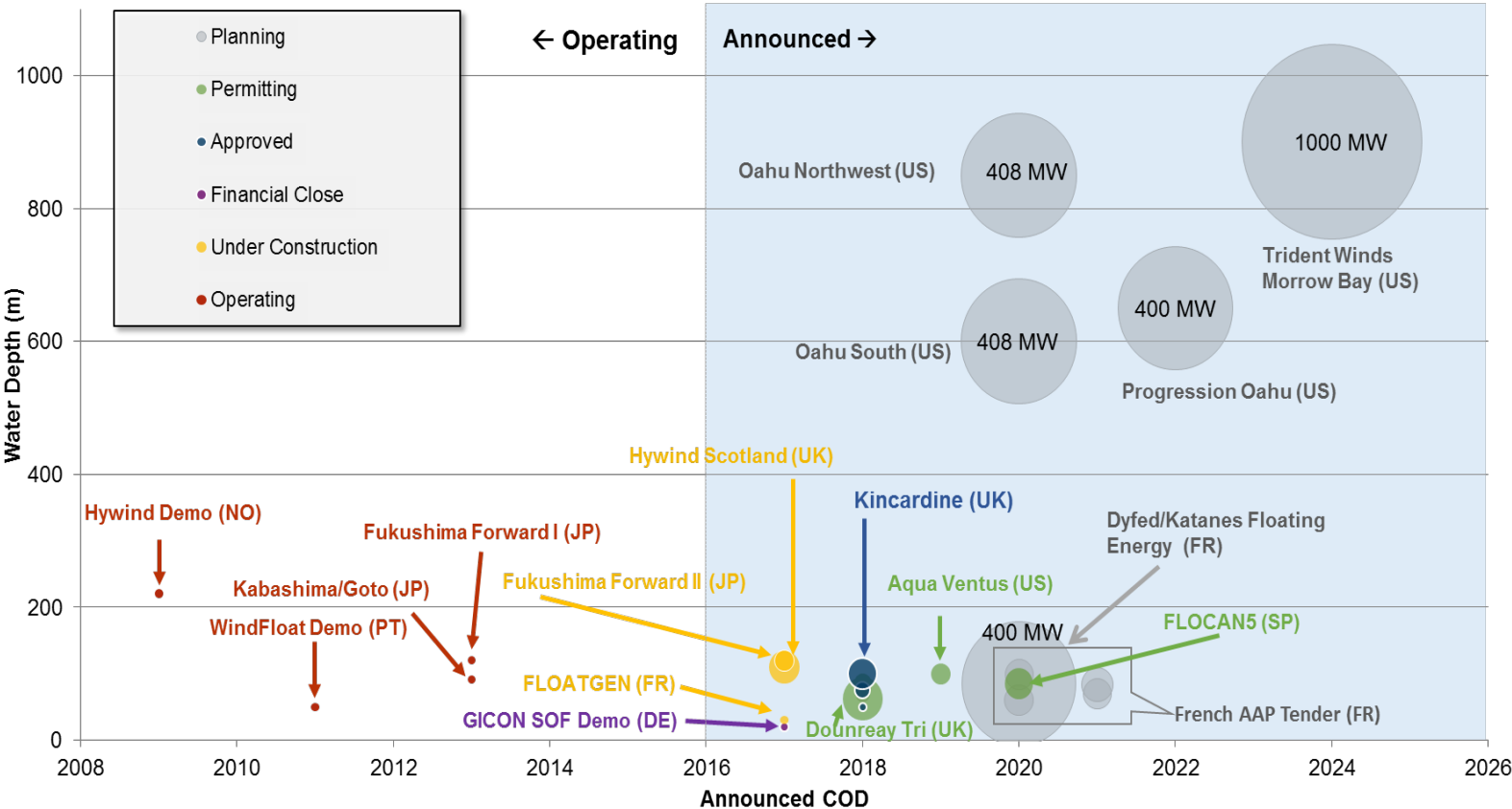
Maryland PSC Decision (cont.)

- ❖ US Wind -248 MW in Maryland WEA
 - ❖ As far north as Fenwick Island)
 - ❖ **coming ashore in Indian River** (Jan 2020).
 - ❖ 4 or 6 MW turbines
- ❖ Utilities to buy OREC's per the state law
 - ❖ Not from state budget
- ❖ Ratepayer Bill increase by 1.4% or \$1.40/month

Offshore Wind Technologies Market Report - Key Findings

Globally, the trend toward floating wind turbines is accelerating. Proof-of-concept projects and research programs have begun to stimulate commercial interest.

Global timeline for floating offshore wind projects



Note: floating projects with turbine capacity <1MW are not included

How can DE reap some of the potential benefits of offshore wind?

- Utility-scale clean energy
 - US Wind will cable connect into Indian River grid
 - DE wind energy area development can help meet state RPS
- Economic development potential
 - Potential port re-development in Wilmington to serve as regional hub
 - Recreational fishing
 - Boat tours
- New Jobs in the region
 - Scientific studies
 - O&M support potential from coast
 - Wind Technicians and training programs

Summary:

Proposed Action Items to Consider

- Land-Based Wind
 - Explore state funds for R&D to support wind measurement campaign
 - Work with UD extension service to identify interested farmers
 - Undertake economic analysis
- Offshore Wind
 - State legislator action on RPS adder
 - Explore local benefits from constructions and operation
 - Consider tourism benefits and tradeoffs
- Solar
 - Evaluate municipal/community solar initiatives in the county
- Understand better the availability of funds
 - State green energy funds available to the county, Low interest loans, RGGI funds

Comprehensive Planning in Sussex County

- Utilities (testimony)
 - Subsequently one paragraph inserted
- Conservation
- Economic Development (upcoming testimony)
 - Evaluate municipal/community solar initiatives in the county
- Understand better the availability of funds
 - State green energy funds available to the county, Low interest loans, RGGI funds

How can DE reap some of the potential benefits of this new energy?

- Gov. Carney formed offshore wind working group
 - Seeking public input
 - Posting information now
- **Future meetings dates are:**
 - November 1, 9am
 - November 15, 1 pm
 - November 29, 9 am
 - December 11, 1pm (if needed)
- All meetings are at the Public Service Commission. Cannon Building. 861 Silver Lake Blvd. Dover DE 19904. Public Service Commission Hearing Room
- <http://dnrec.alpha.delaware.gov/energy-climate/renewable/offshore-wind-working-group/>

Potential Opportunities --- Summary

- Engage residences in deploying potential of clean energy options
 - Solar Rooftops
 - Geothermal units
 - Land-based wind in the farming sector
 - Offshore Wind
- Sustainability leadership of business communities helps address sea level rise and other flooding and climate-related hazards
- Assess benefits & target demographics of branding sustainability and eco-tourism
- Implement energy efficiency incentives – low hanging fruits



Thank you for your attention!

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McCray



EXTRA SLIDES

Education and Training

- Delaware Technical Community College Programs
 - Energy Management
 - Renewable Energy Solar
 - Building Automation Systems
- The University of Delaware
 - Wind Power Program (since 2003) conducts scientific studies & research and engages communities on coastal and offshore wind.
 - Master's and PhD educational programs & Graduate Certificate in Wind Power Science Engineering and Policy



Potential Benefits of Branding Eco-Tourism in Sussex County

- Delmarva Sustainability Tours
 - Eco-tourism – waterways and farms
 - Heritage tours
- Eco-lodging diversifies base
- Demonstrates protection of natural assets
- Efficiency measures reduce energy & water use and waste products – saves money!!
- Brings new tourists

Land-based wind and the farming sector

- Develop a site-specific wind maps
 - Install equipment on existing tall tower or structure
 - Get 1-2 years of site specific wind resource assessment
- Discuss ideas with farmers and land owners
- Examine zoning and ordinances
- Consider adopting a new property tax measure
- Undertake an economic analysis
- Assess environmental constraints/ conservation zones
- Involve the community – early and often

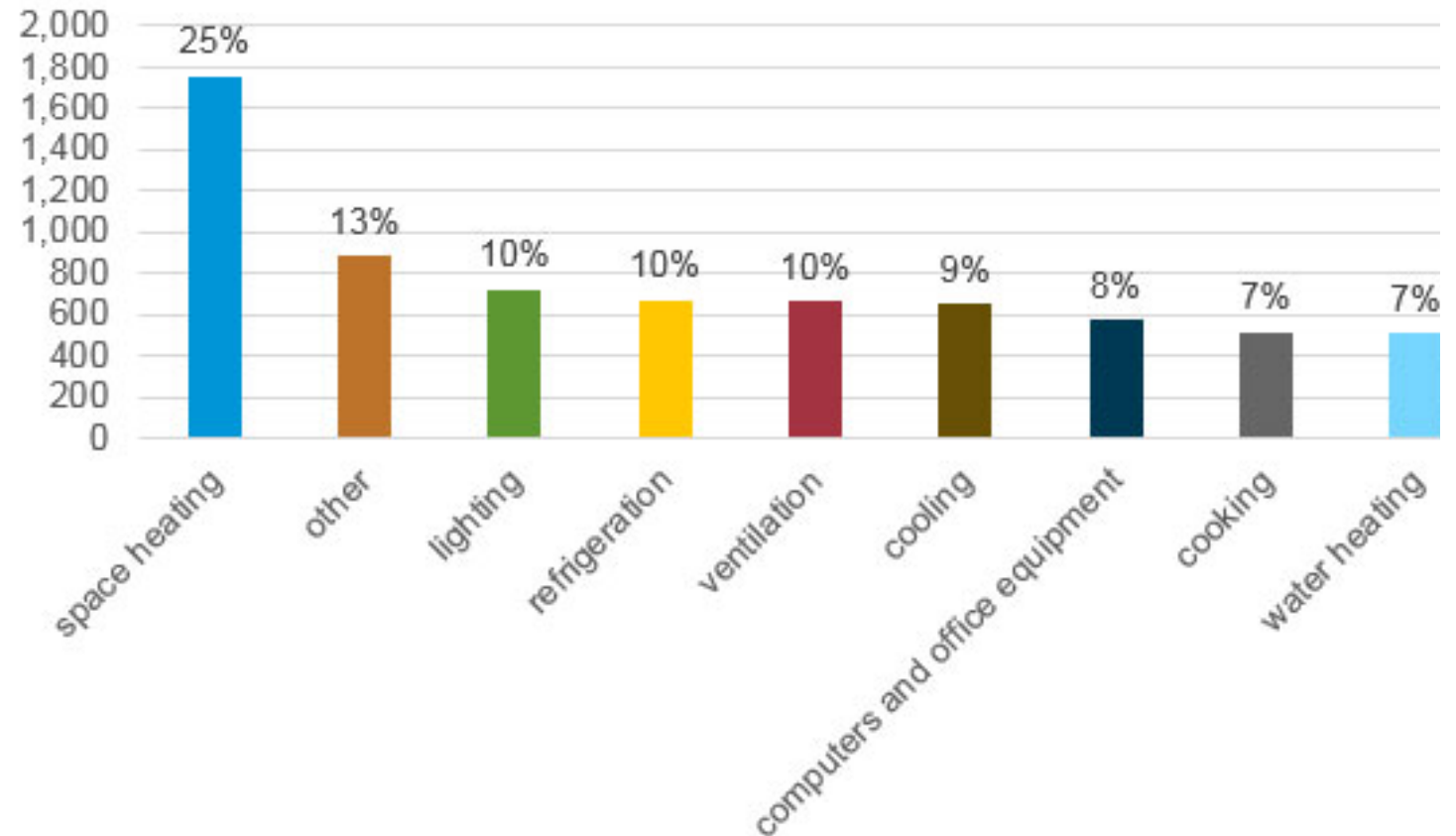


AFFORDABLE UPGRADES SAVE MONEY

- Replace light bulbs (LED) and take advantage of day lighting
- Turn down water heater temperature
- Check insulation, seal windows and doors
- Efficient technologies for heating and cooling, refrigeration, and water heating
- Engage guests, promote using less water and electricity

Energy use in U.S. commercial buildings by major end uses, 2012

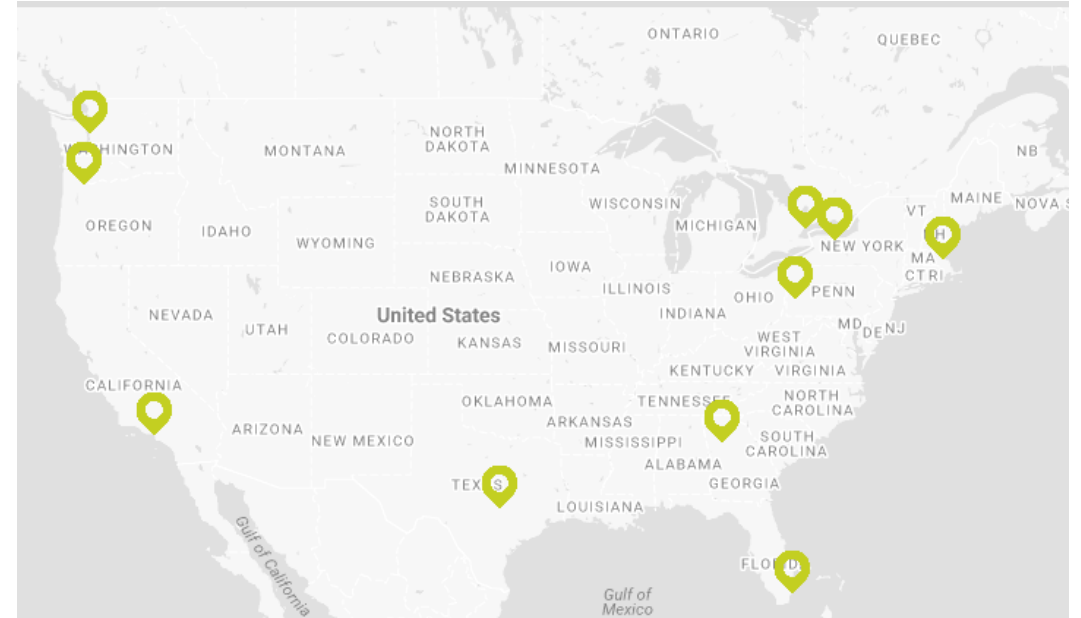
trillion British thermal units



Source: U.S. Energy Information Administration, 2012 Commercial Buildings Energy Consumption Survey: Energy Usage Summary, Table 5 (March 2016)

COMMUNITY BENEFITS

- Eco-districts build more resilient and stronger shores
- Create good jobs
- Reinforce environmental stewardship, clean air and water
- Save businesses and taxpayers \$\$\$



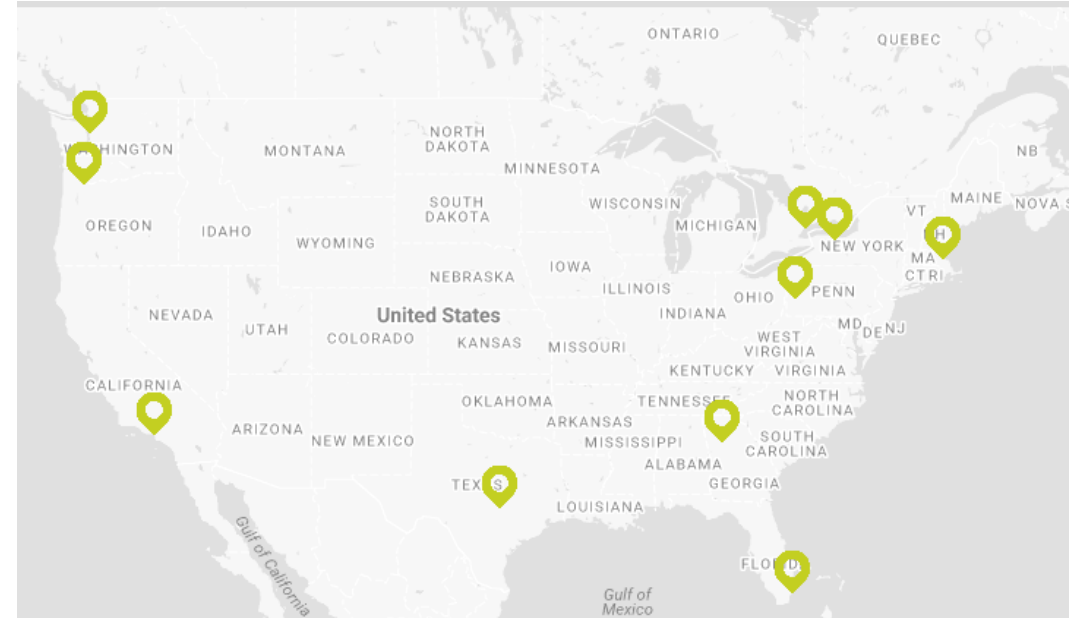
Map of Eco Districts in the United States

COMMUNITY BENEFITS

- Eco districts build more resilient and stronger shores
- Create jobs, longer lasting and often healthier buildings
- Reinforce environmental stewardship, clean air and water
- Save businesses and taxpayers \$\$\$

Did you know? Since 2009, the State of Delaware has cut carbon emissions by 5 percent

Source: Energy Information Administration, 2012 CBECS
<https://www.eia.gov/state/analysis.php?sid=DE>



Map of Eco Districts in the United States
Source: <https://ecodistricts.org/>