Offshore Wind Potential for Delaware

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Webinar and Discussion
League of Women Voters of New Castle County

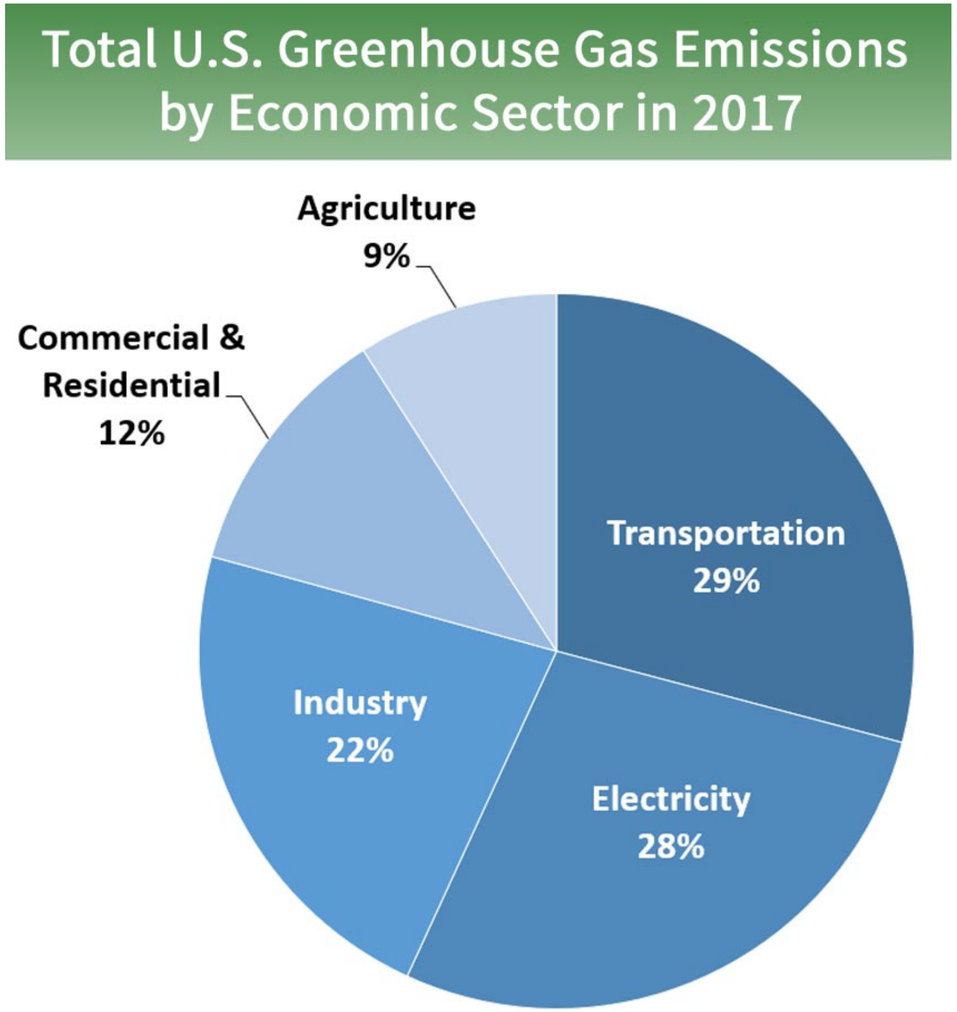
27 July 2020, 11:30 to 1:00

Climate Change - DE Vulnerable

- Delaware is very susceptible to climate change, especially sea level rise
  - We are the 2nd lowest-lying US state (after Lousiana)
- Delaware has substantial health cost from power plant pollution
- DE Now has a state goal of 26% reduction in CO2 emissions
  - But no legislative action on renewables in last session
  - Lets approach climate solutions in a realistic and cost-effective way

Where does GHG come from?

- Electricity and Transportation are the two sectors creating most GHG emissions, together, 57%
- They can also be addressed with technologies that already exist and can be deployed quickly.
  - Renewable energy for electricity.
  - Electric vehicles for transport.
- Other sectors important, also other ways to address transportation (mode shift etc) are important, but the two above can be done quickly with large result in Delaware.



U.S. Environmental Protection Agency (2019). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2017

https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

How to address

- To address climate, Delaware can:
  - 1. reduce fossil fuel for electric generation, and
  - 2. replace gasoline cars and light trucks with EVs
- (I’m only discussing electric generation here)

Offshore Wind Power

- I gave lectures and advised activists around DE in 2006-2008 when a developer proposed to build an offshore wind project. After a great deal of citizen activism, the state agreed to the proposal, but it was never built, partly due to high costs. Why discuss this 2020?

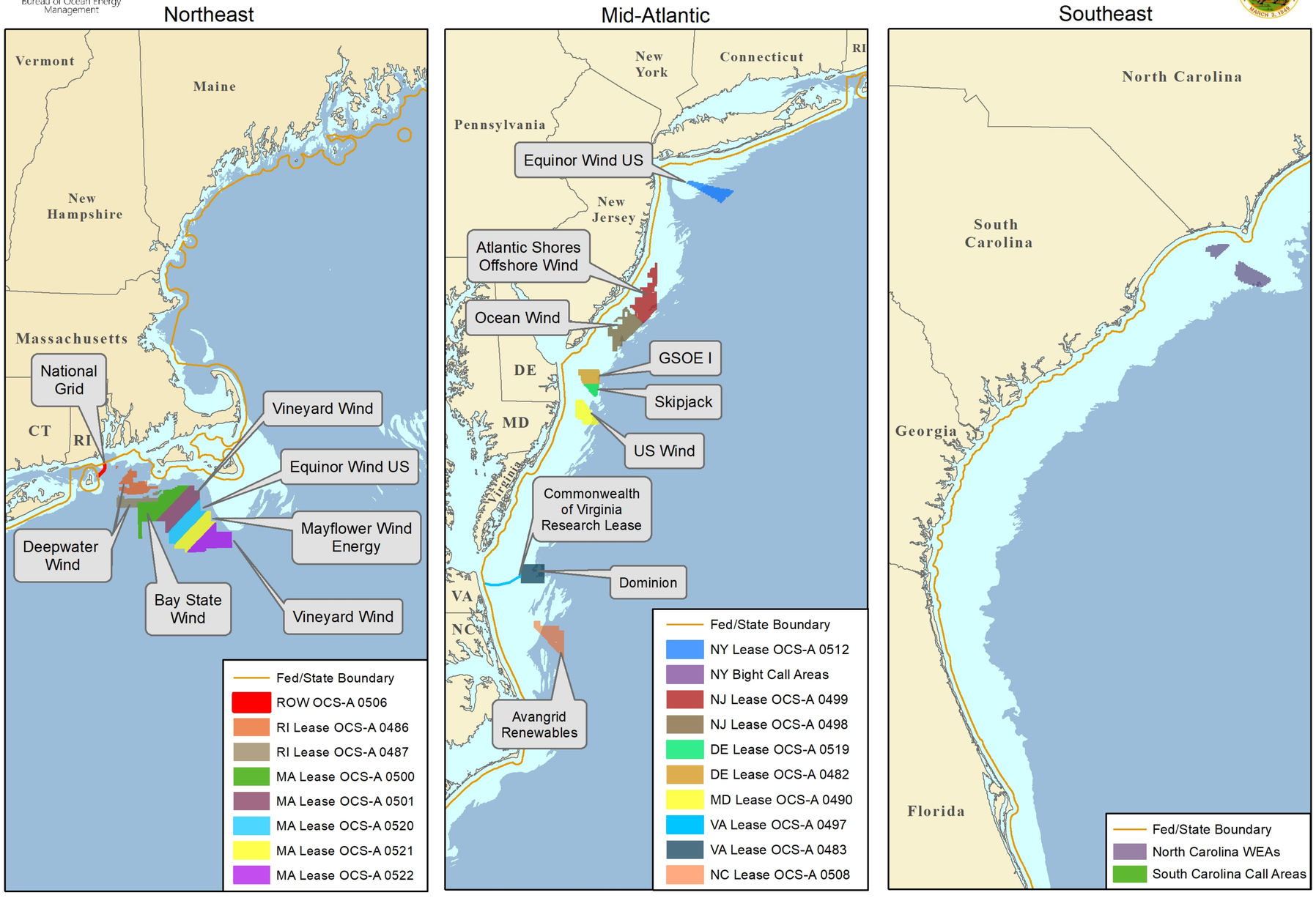
  - The situation now is completely different—the price is much lower, at or near market-competitive, large companies are engaged (Shell, Equinor, Ørsted, EDF, Eversource etc) and almost all NE states are contracting for offshore wind power.

What is Delaware's Opportunity?

- Biggest shift to renewables possible for DE is offshore wind power.
  - Biggest in amount of CO_2 & pollution displaced, and in potential number of jobs.
  - We also want to do solar, energy efficiency, etc
- In 2008, OSW was a new technology, and had a cost premium.
- Today, turbines are 4x bigger, cost is 1/3, and the state can write a power solicitation to insure that there is little or no cost premium.
- Most NE and Mid-Atlantic states have adopted laws requiring purchase of power from OSW.
- Also, this will be a huge industry in the NE and Mid-Atlantic; but few jobs will go to states not in market for wind power.

Atlantic OCS Renewable Energy - Massachusetts to South Carolina

BOEM Bureau of Ocean Energy Management



Bathymetry

- Up to 30 meters
- More than 30 meters

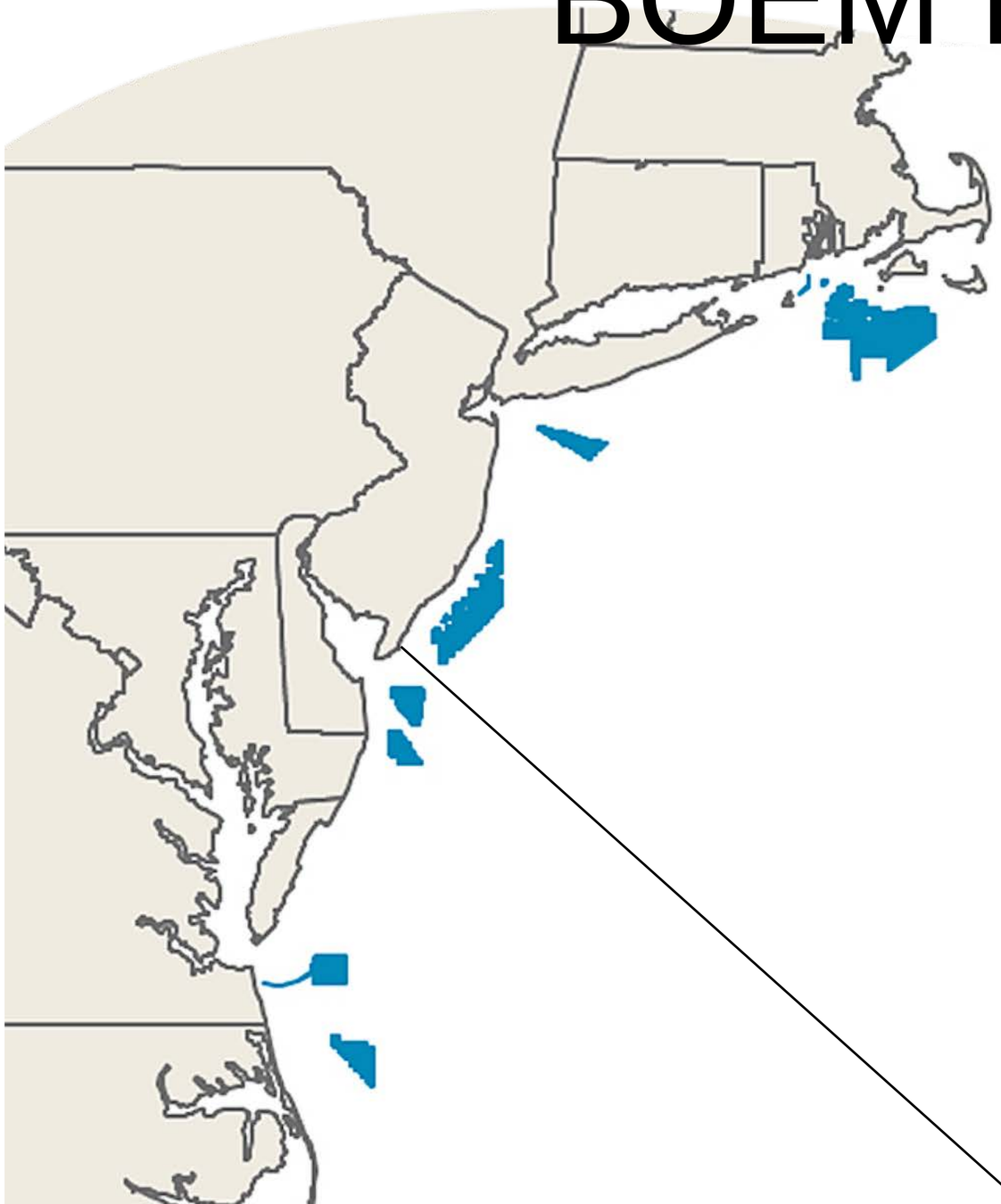
0 50 100 150 200 250

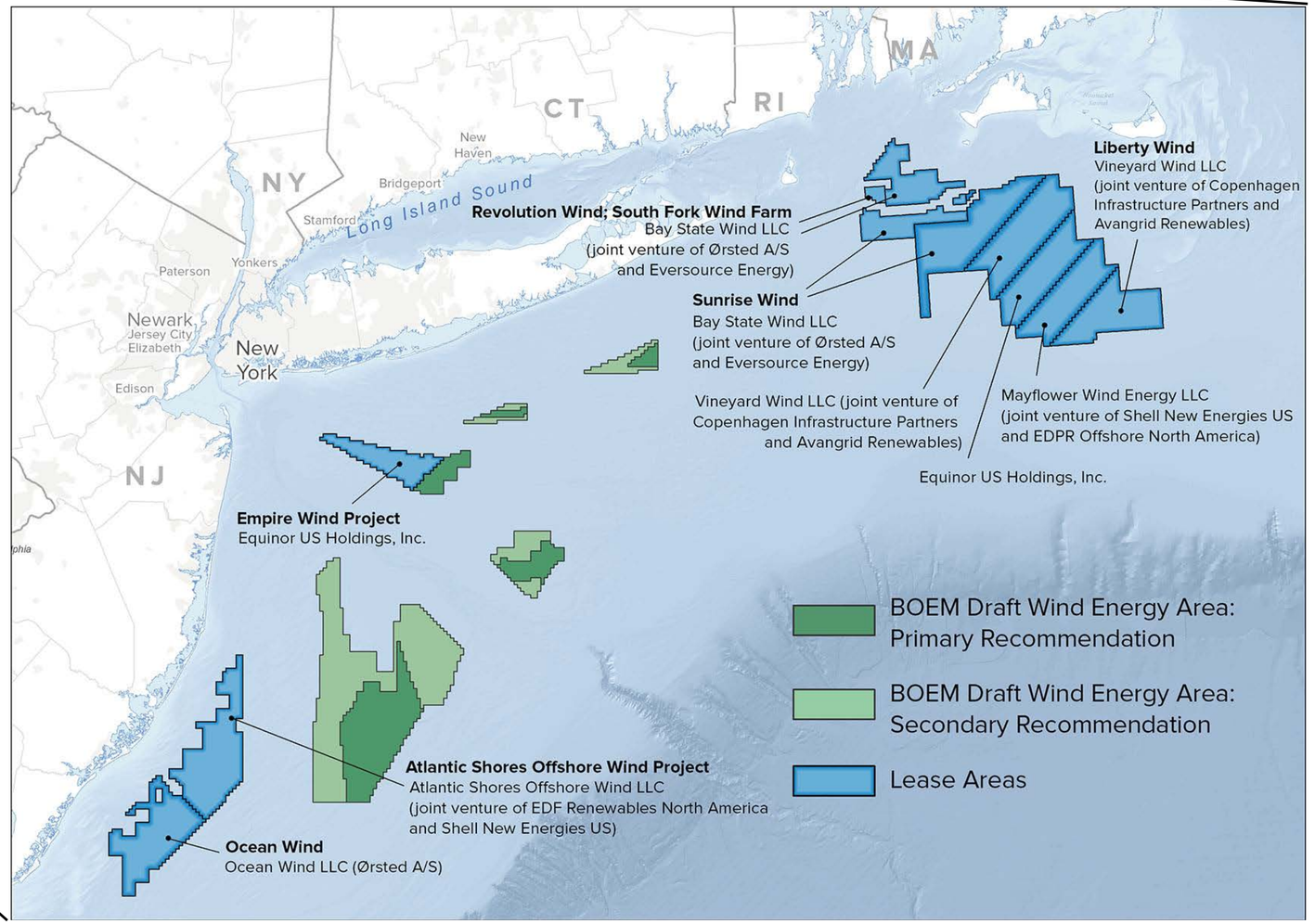
Nautical Miles

Map Date: 8/28/2019

Map ID: ERB-2017-1004

BOEM Lease Areas





Large market demand legally obligated in New England and Mid-Atlantic

1 GW is 1,000 MW
= capacity of a nuclear power plant
about a $3B investment
Delaware runs on ≈ 1.2 GW_a (a=average)

U.S. OFFSHORE WIND

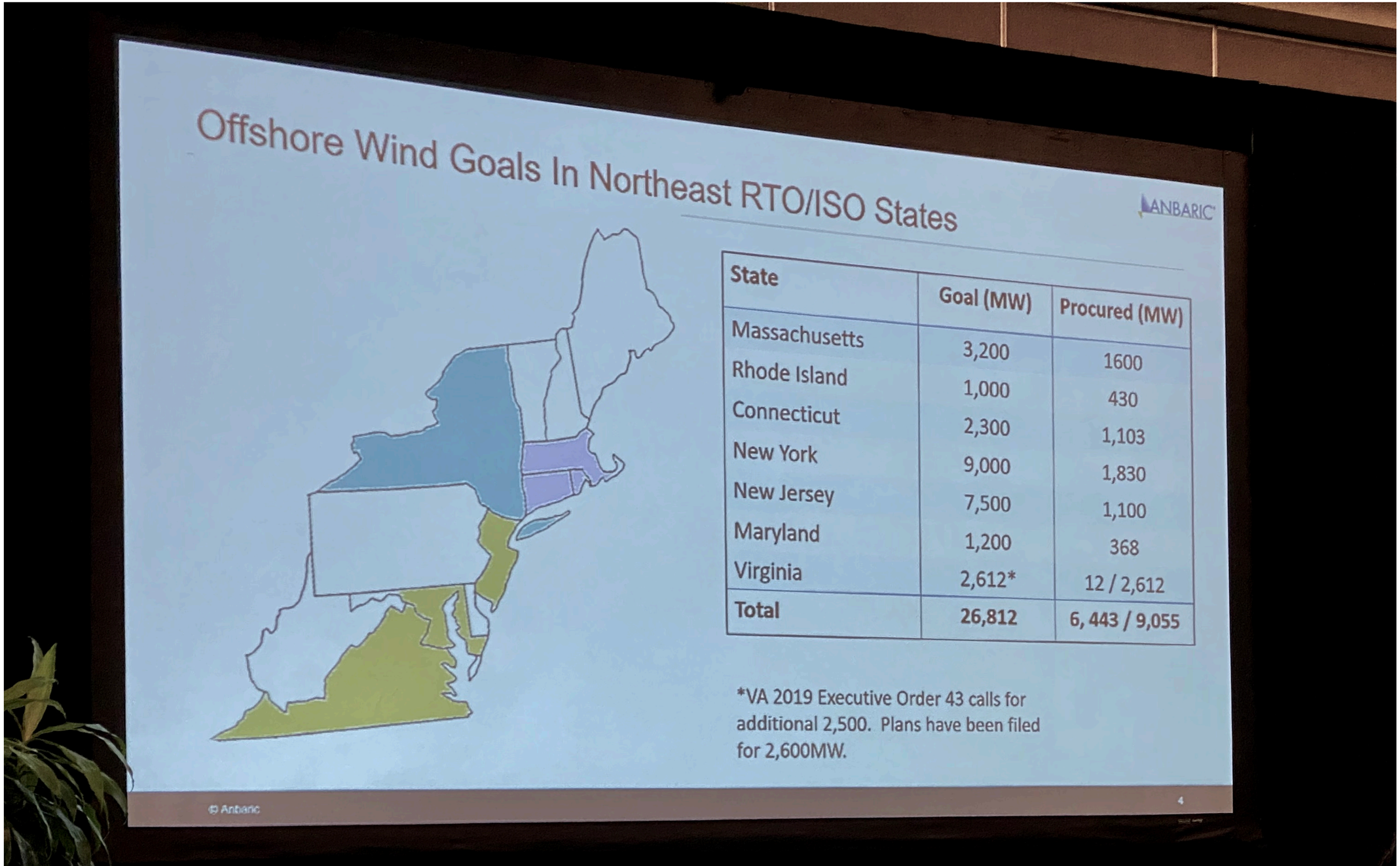
Economies of Scale-o-Meter

– 22 GWs & Counting –

STATE	OSW Approved or Committed
Connecticut	2.300 GW
Maine	0.012 GW
Maryland	1.568 GW
Massachusetts	3.200 GW
New Jersey	3.500 GW
New York	9.000 GW
Rhode Island	0.430 GW
Virginia	2.512 GW
Total (Sept 2019)	**22.52 GW**

Special Initiative on Offshore Wind (SIOW)
College of Earth, Ocean & Environment at University of Delaware

Example conference slide



Massachusetts to N. Carolina,
The only state not committed to buying offshore wind is…

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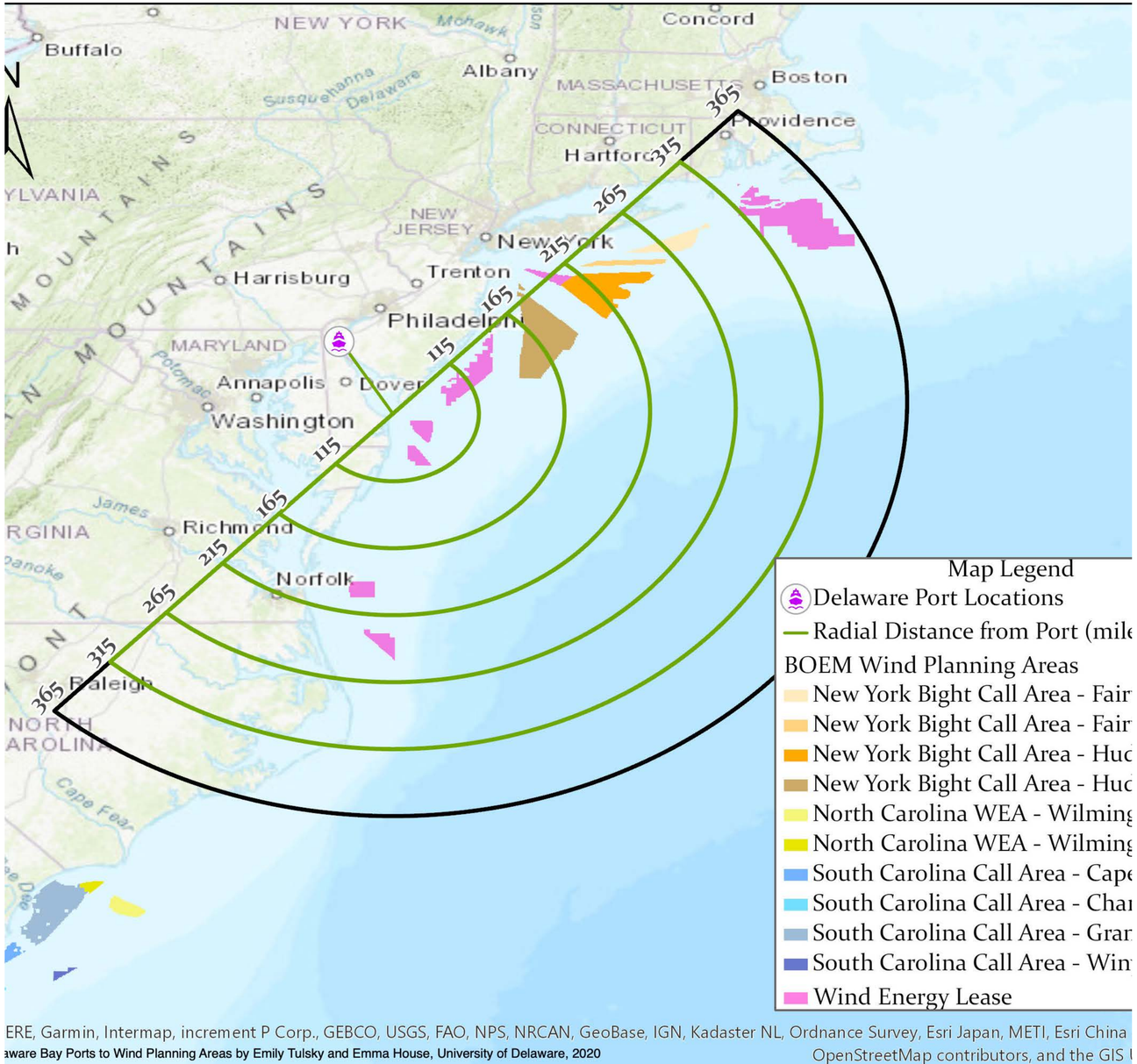
Delaware ☹

Problems with no Plan and no Power Purchase

- Missing opportunity for huge reduction in CO2 emissions
- Missing opportunity to reduce air pollution directly affecting us
- If RFP done correctly, missing an opportunity to reduce electric costs
- Large economic opportunities that Delaware is pushing away
  - Marshaling ports
  - Manufacturing and assembly
  - Training
  - Operations and maintenance

Marshaling Port Opportunities

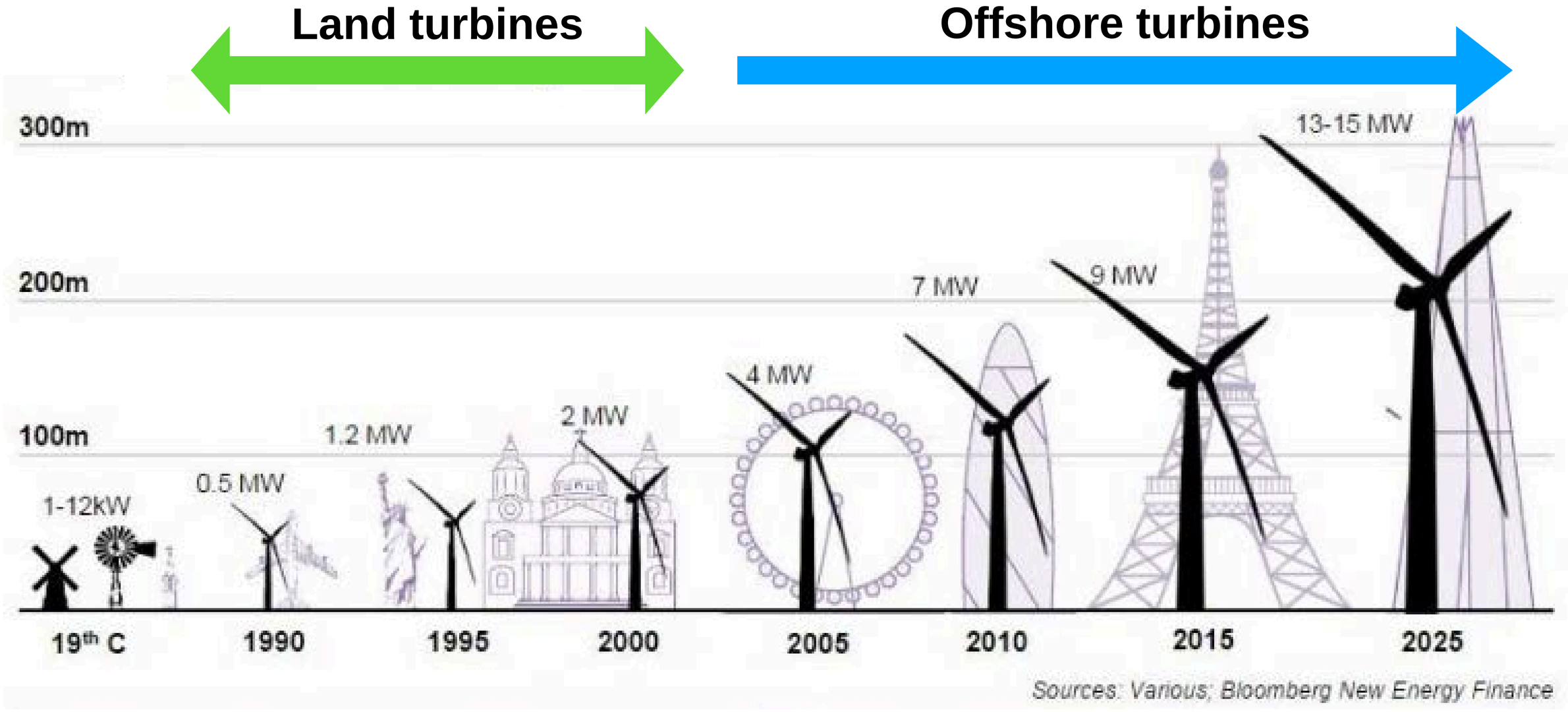
- Delaware Bay ideally sited for Marshaling ports to serve much of the current market
  - UD Study being released this week
- NJ has announced two ports, one for foundations one for marshaling
- Hard to get large industrial facilities when now power purchase



Why lower cost ¢/kWh now?

- Bluewater Wind price was 14¢/kWh, recent US bids at 6.5¢ and 5.8¢ (vs. today's Delmarva Power wholesale purchase at 8¢). Why?
- Technology development, including larger turbines
- Experience developing in Europe, specialized vessels and handling
- In US, a project pipeline assuring payoff of supply chain investments
- US solicitations use competitive bidding, compete on price
  - (UD recommended the latter items to NY, MA, and they worked!)

Turbine Size Evolution



New size: 12 MW capacity, 220 m rotor

Compare: 220 m rotor diameter, versus Airbus A380 Wing Span = 80 m

Environmental impacts

- Way biggest environmental impact is positive, large reduction in CO2 and criteria pollutants by displacing thermal power generation.

- Marine mammals (esp. right whales) sensitive to pile driving noise and are in area. Mitigated by care during construction, later by replacing construction methods.

- A few species (sharks, rays) may have directional signaling temporarily disrupted when they pass very near cables. (very minor effect)

- Large wind turbines will kill some avian species. Land-based turbines average 2.6 avian deaths per year.

    - My (unpublished) calculation from Sovacool et al is that pollution reduction saves more birds than impact deaths

How Does an OSW Purchase Process Work?

- Does not work from an RPS or subsidy. Efficiency requires ~800 - 1200 MW project, revenue based on steady electricity price, etc.
- State sets parameters for bidding, writes RFP, may collect some data in advance.
  - Can be either law or executive order.
  - One case, Virginia, primary initiation was from utility, coordinated with state
- State, or utilities, issue request for proposals for a power purchase agreement. Criteria may prioritize price of electricity, economic development, or other factors.
- State Public Service Commission, consulting with utilities, evaluate the bids and pick one (or more)
- Developer secures financing and proceeds to build project.
- Power on! Electricity flows to buyers. Somewhere, existing power plants must be turned off.

URL https://crew.udel.edu/wind-power/

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How to Get a Wind Purchase for Delaware

- The ask:
  - State law to establish a bid process for offshore wind power - New process, not RPS
  - Contract should limit price to be cost-competitive, process withinsure multiple bidders etc.
  - Size: big enough to be commercial, low cost, and to make a significant difference, like 800 or 1,000 MW (average Delaware load is 1,200 $MW_{a,}$ so 800 MW project would be about 40% of Delaware's electricity)
- The process prior to state action:
  - A study group by League?
  - Explore options with stakeholders
  - Campaign agree to "explore"
  - Probably a legislative process, so need sponsors etc, governor buy-in, etc.