Delaware Options for Offshore Wind

Willett Kempton
College of Earth, Ocean, and Environment,
Department of Electrical and Computer Engineering, U of Delaware
and
Kris Ohleth
Special Initiative on Offshore Wind (SIOW)

Presentation for
DE Governors Energy Advisory Council (GEAC)
Dover, DE

7 Sep 2023
The US Offshore Wind Industry is Already Well Underway
BOEM has already auctioned many lease areas on East Coast, each can become 1 to 3 projects.
States with required OSW procurements

- NY: Advanced Development
- NJ: Advanced Development
- MA: Advanced Development and Under Construction
- VA: Advanced Development
- MD: Advanced Development
- CT: Advanced Development
- RI: Advanced Development
How could Delaware participate?
The SIOW Report

• Estimate today’s price of OSW power

• Creating a procurement process
  • State actions to reduce electricity cost
  • State actions to increase employment & new businesses

• Four coauthors, 4 advisors, 9 expert peer reviewers.

• https://offshorewindpower.org/offshore-wind-procurement-options-for-delaware
Main points from SLOW Report

• Since 2017 (DE Working Group), cost has dropped by ~1/2, due to:
  • Technology improvements, larger turbines, larger projects
  • New US factories, ports, ships, learning
• Today, OSW is in *same price range* as conventional power
  • *Assuming* procurement is done correctly
  • No need to create RECs, ORECs, or state subsidies
• To lower cost -> competition, clarify process, reduce risk, minimize delays
Comparing today’s cost with OSW

• How to understand existing power cost? Calculated from:
  • Delmarva’s recent power market costs
  • Compare direct cost only
    • Optionally, consider cost of health and climate damages as separate add-on
  • Offshore Wind cost estimated as
    • Recent costs to other states
    • Compare with “bottom up” calculation, based on 2027 costs to estimate a Delaware project when completed
Today’s power $ versus offshore wind

**Market (Delmarva recent wholesale)**

**Market + health cost**

**Market + health + carbon cost**

**Massachusetts**

**Maryland**

**Maryland with Wiser projection for 2025**

**Bottom up, DE Base Project**

**Bottom up, DE Base plus 0 to 6 state options**

$/MWh (2021$)

- $0
- $25
- $50
- $75
- $100
- $125
- $150
- $175
Recent requests for increase in bid prices in NE
How power price reflects cost change

- Fueled generation, e.g. natural gas, typically adds fuel cost to electricity cost
- Thus, electricity price goes up & down over life of power contract
- For renewables, PPAs are set at bid time by the developer. Process is:
  - Developer calculates bid price by estimating future cost of materials, vessel lease, etc
  - To consumer, once bid is accepted, price is constant (perhaps with inflation escalator)
  - But developer incurs costs during construction, ~5 years after bid
Fall 2023 Update

• What changed since NE OSW bids:
  
  • Post-covid inflation, supply chain shortages, invasion of Ukraine
  
  • NYSERDA PPA filings show a time lag+inflation problem for recent solar, land wind & offshore wind
    
    • Offshore wind inflation price increase requests range from 26% to 48%
  
    • State options: accept change in bid, OR reject and fine developer for contract breach (& do another RFP later)
Renewable prices decline, with recent tick up

The Cost of Renewable Energy Has Plummeted

Cost of building and running new power plants, in dollars per megawatt hour

**SOLAR**
Utility-scale

**WIND**
Onshore

**OTHERS**

- Nuclear: $180
- Coal: $117
- Gas: $70

**Source:** Lazard  -  Notes: Charts reflect the mean levelized cost of energy, which captures the price of building and running new power plants but excludes other electrical system costs. Lazard did not release data for 2022. In 2023, costs rose because of supply-chain problems, inflation and other issues.  -  By The New York Times

Data from Lazard LCOE, graphic by NY Times, 17 Aug 2023 “The Clean Energy Future Is Arriving Faster Than You Think”
Component costs to build OSW

Figure 2-7. Relevant Prices Indices for Onshore and Offshore Wind Projects, 2016-2023

Component costs to build OSW

Figure 2-7. Relevant Prices Indices for Onshore and Offshore Wind Projects, 2016-2023

Offshore Wind, long-term cost trends

Figure 3-10. Actual and Forecasted CAPEX for Offshore Wind Projects, Annual Averages (2016-2035)

Error in original: $ axis and CAPEX key should be $/kW capacity, not $/kWh energy
DE action: steps for procurement

- State creates a procurement process, by legislation. Steps:
  - Select options to reduce cost, reduce risk and/or increase jobs
  - State issues RFP for power
  - Competitive bidding process
  - Private developers bid to sell electricity at a defined price.
  - State evaluates bids, selects winner, need not accept any bid unless favorable.
  - Utilities sign contracts to purchase electricity from winning bidders.
  - Developers build project, sell electricity.
### Table 8. Summary of price impacts of stat actions, relative to Base Project (two pages).

<table>
<thead>
<tr>
<th>Options for electricity cost reduction</th>
<th>Capital Cost Δ ($x1000 (or $/kW if so marked))</th>
<th>OPEX Δ ($/kW/yr if marked)</th>
<th>Change in PPA price (Δ $/MWh), (negative is savings)</th>
<th>Cause of change in PPA price</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFP for 1200 MW rather than 800 MW, in same location, compare A-800 to A-1200</td>
<td>- 447 $/kW</td>
<td>+ 9.1 $/kW/yr</td>
<td>-3.55</td>
<td>Only project cost tabulated; see text on other cost factors</td>
</tr>
<tr>
<td>Selected proposal is for a more distant location like Site B; compare A-1200 with B-1200, see A vs. B in Figure 4 ✗</td>
<td>+ 789 $/kW</td>
<td>+ 3.90 $/kW/yr</td>
<td>12.60</td>
<td>See Table 2 and discussion of B-1200</td>
</tr>
<tr>
<td>Slowdown or delays prevent developer from meeting federal ITC deadline ✗</td>
<td>+614,000</td>
<td>0</td>
<td>20.42</td>
<td>higher energy price due to lost ITC credit</td>
</tr>
<tr>
<td>Request that BOEM designate more WEAs near Delaware ✔</td>
<td>0</td>
<td>0</td>
<td>-3.00</td>
<td>more competition; assume 1% lower ROE</td>
</tr>
<tr>
<td>Defined process for cable landing that runs from the ocean, under the beach, to a substation ✔</td>
<td>0</td>
<td>0</td>
<td>-5.50</td>
<td>Less construction risk, less delay</td>
</tr>
<tr>
<td>Coordinated single 3GW transmission for 3 projects rather than one cable per project ✔</td>
<td>- 86 $/kW</td>
<td>0</td>
<td>-2.30</td>
<td>shared single cable and converter stations, savings allocated per power capacity</td>
</tr>
<tr>
<td>Clarifications to state permitting and guidance from DNREC to avoid delay ✔</td>
<td>0</td>
<td>0</td>
<td>-3.40</td>
<td>reduce risk of development delay by 6 months</td>
</tr>
</tbody>
</table>

### Example from SLOW Report:

**calculated cost or savings of each procurement rule by the state**
Central Atlantic Wind Energy Areas

Final WEAs, July 2023

Existing leases: Gray

New areas A-2, B-1, C-1

BOEM says total is 4-8 GW

from: https://www.boem.gov/renewable-energy/state-activities/central-atlantic
Takeaways

• DE can’t meet our climate goals without offshore wind power

• OSW requires no added cost if procurement uses best practices
  • Guidelines and options in SIOW report
  • SOIW recommends no new state subsidy
  • Given possible inflation, DE should define potential cost adjustment

• Process:
  • State legislature passes procurement law, giving authority & setting rules; RFP issued
  • Developers submit bids to sell electricity
  • If price not favorable, state need not accept any bids
  • Winning developer signs contracts with utilities, builds project

• Large resource, 100B$ regional industry developing, big CO₂ reductions possible
Research  https://crew.udel.edu/wind-power/
SIOW  https://offshorewindpower.org/
follow mastodon.energy/@willett or X @WillettKempton
Consultation and Review

Advisors and contributors to this study
Todd L. Goodman, Attorney, Phillips, McLaughlin & Hall
Jason J. Folsom, Aker Solutions
Stephanie A. McClellan, PhD, Simply Blue Group; and Founder of SIOW
Deniz Ozkan, PhD, Invenergy

Peer Reviewers
Samual Beirne, Energy Program Manager, Maryland Energy Administration
Philipp Beiter, Senior Offshore Wind Economic Analyst, National Renewable Energy Lab
Amanda Best, Senior Commission Advisor, Maryland Public Service Commission
Josh Kaplowitz, Vice President—Offshore Wind, American Clean Power Association
Walter Musial, Offshore Wind Platform Lead, National Renewable Energy Lab
Sara Parkison, Knauss Fellow, Bureau of Ocean Energy Management, US Dept. of Interior
Erich Stephens, Founding CEO, Vineyard Wind
Marian Swain, Deputy Director of Policy and Planning, Massachusetts Dept. of Energy Resources
Gabe Tabak, Counsel, American Clean Power Association
Earlier SLOW Reports

• New York State
  • SLOW NY report, released 2015
  • Planning process determined “NY cannot meet its climate goals without offshore wind”
  • Gov Executive Order, Jan 2017 for 2.4 GW
  • NY Legislature, 2019 law requiring 9 GW by 2035
  • NYSERDA now saying to add e-fuels NY will require > 9 GW
• Commonwealth of Massachusetts
  • SLOW MA report March 2016
  • MA Legislature, August 2016, law for 1.6 GW PPAs by 2027
  • First 800 MW begins construction early 2023
  • MA H4515 in 2022 increased to require 5.6 GW by 2027
Economic & Employment Benefits

• States buying OSW can also gain local facilities, like…
  • Worker training centers; new opportunities in a growing industry
  • O&M port ~60 jobs over 30 years, plus indirect economic stimulation
  • Marshaling port, start ~500 workers
  • Manufacturing of OSW components