



Offshore Wind Capital Costs and REC Price Assumptions for ORTP Calculation

Alex Worsley, Boreas Renewables LLC
Carrie Gilbert, Daymark Energy Advisors
NEPOOL Markets Committee
July 14-15, 2020



www.renew-ne.org
Follow us: [@Renew_NE](https://twitter.com/Renew_NE)



About RENEW





About RENEW

The comments expressed herein represent the views of RENEW and not necessarily those of any particular member of RENEW.

Outline

- Offshore Wind Capital Cost
 - Background
 - Analysis of implied capital costs from local PPA's
 - Global capital cost trends
 - Recommendations
- REC Price



Block Island Wind Farm. <https://www.vox.com/energy-and-environment/2018/5/25/17393156/offshore-wind-us-massachusetts-rhode-island-zinke>

Background

- ISO proposes to assume an overnight capital cost of **\$5,876/kW (2019\$)** for the FCA 16 offshore wind ORTP calculation
 - In discussion, cited Mott MacDonald’s confidential estimating database and the International Renewable Energy Agency’s (IRENA) “Renewable Power Generation Costs in 2018” report¹
- We believe this cost assumption is unreasonable for projects to be built in the MA Offshore Lease Area in 2024-2025
 - Recent PPA pricing suggests capital costs well below ISO’s assumption
 - Latest publicly available data regarding global offshore wind costs supports this claim (we examine IRENA’s Costs report from 2019²)
 - Local OSW developers have significant experience building the largest OSW farms in the world

1) IRENA, “Renewable Power Generation Costs in 2018,” <https://www.irena.org/publications/2019/May/Renewable-power-generation-costs-in-2018>

2) IRENA, “Renewable Power Generation Costs in 2019,” <https://www.irena.org/publications/2020/Jun/Renewable-Power-Costs-in-2019>

PPA Analysis of Implied Capital Costs for Upcoming New England Projects

Wind PPAs Analyzed

Project	Capacity	State RFP	Selection Date	COD Expectation at PPA Execution
Vineyard Wind Tranche 1	400 MW	MA	May 2018	2021
Vineyard Wind Tranche 2	400 MW	MA	May 2018	2022
Revolution Wind Tranche 1	400 MW	RI	May 2018	2023
Mayflower Wind	804 MW	MA	October 2019	2024

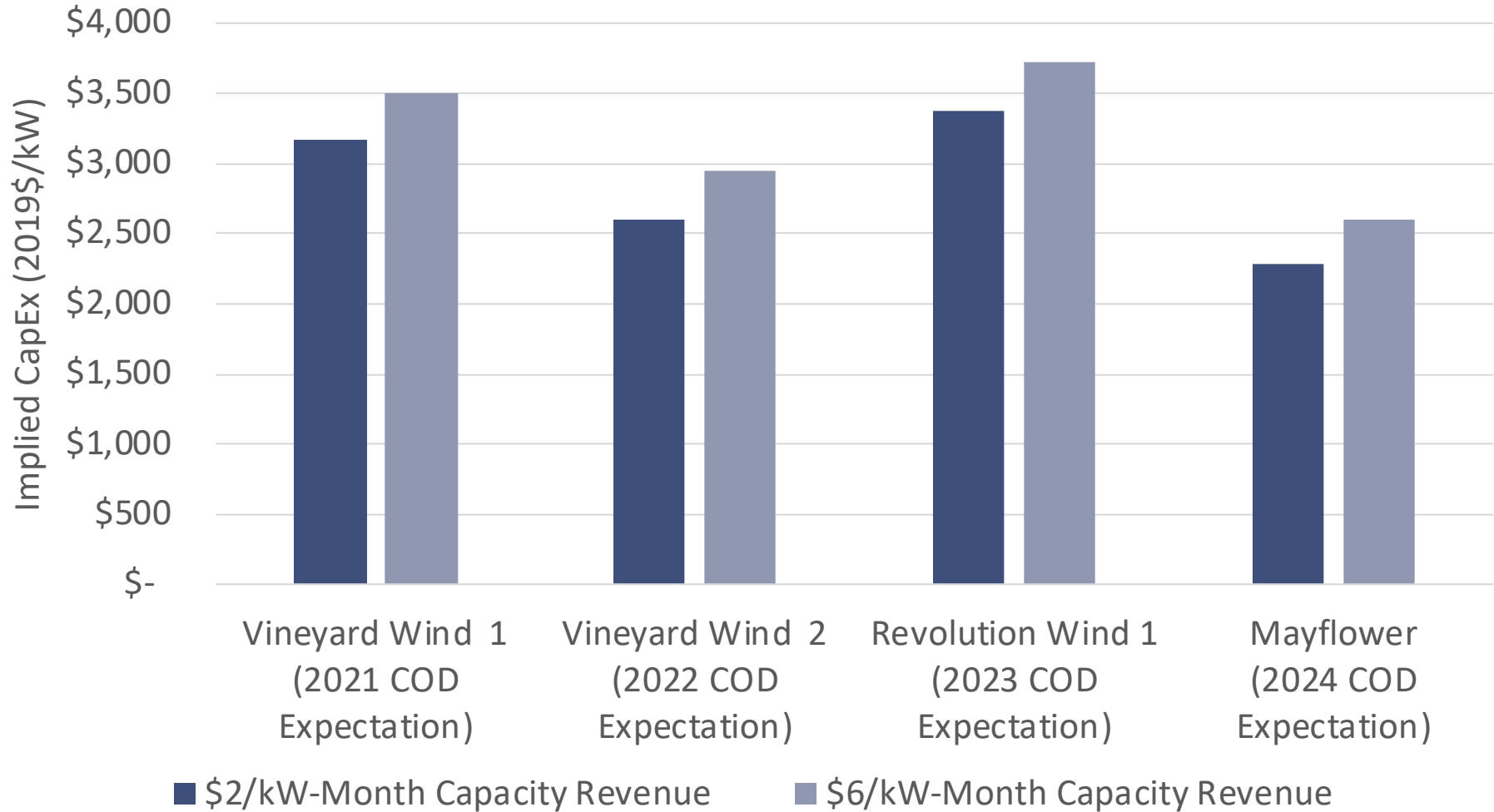
Wind PPAs Not Analyzed (Pricing not publicly available from CT RFPs)

Project	Capacity	State RFP	Selection Date	COD
Revolution Wind Tranche 2	200 MW	CT	Jun 2018	2023
Revolution Wind Tranche 3	100 MW	CT	Dec 2018	2023
Park City	804 MW	CT	Dec 2019	2025

Implied CapEx

- Recent public PPA pricing provides insight into OSW developer CapEx expectations
- Using assumptions consistent with ISO-NE, we calculated CapEx expectations implicit in public PPA pricing
- Analyzed 2 capacity price assumptions (both assume full Qualified Capacity cleared):
 - \$2/kW-month escalating w/inflation
 - \$6/kW-month escalating w/inflation
- Analyzed 25-year life (Contract pricing for 20-years, merchant for 5-years)

Implied CapEx ranges from \$2300-\$3700/kW (in 2019\$)

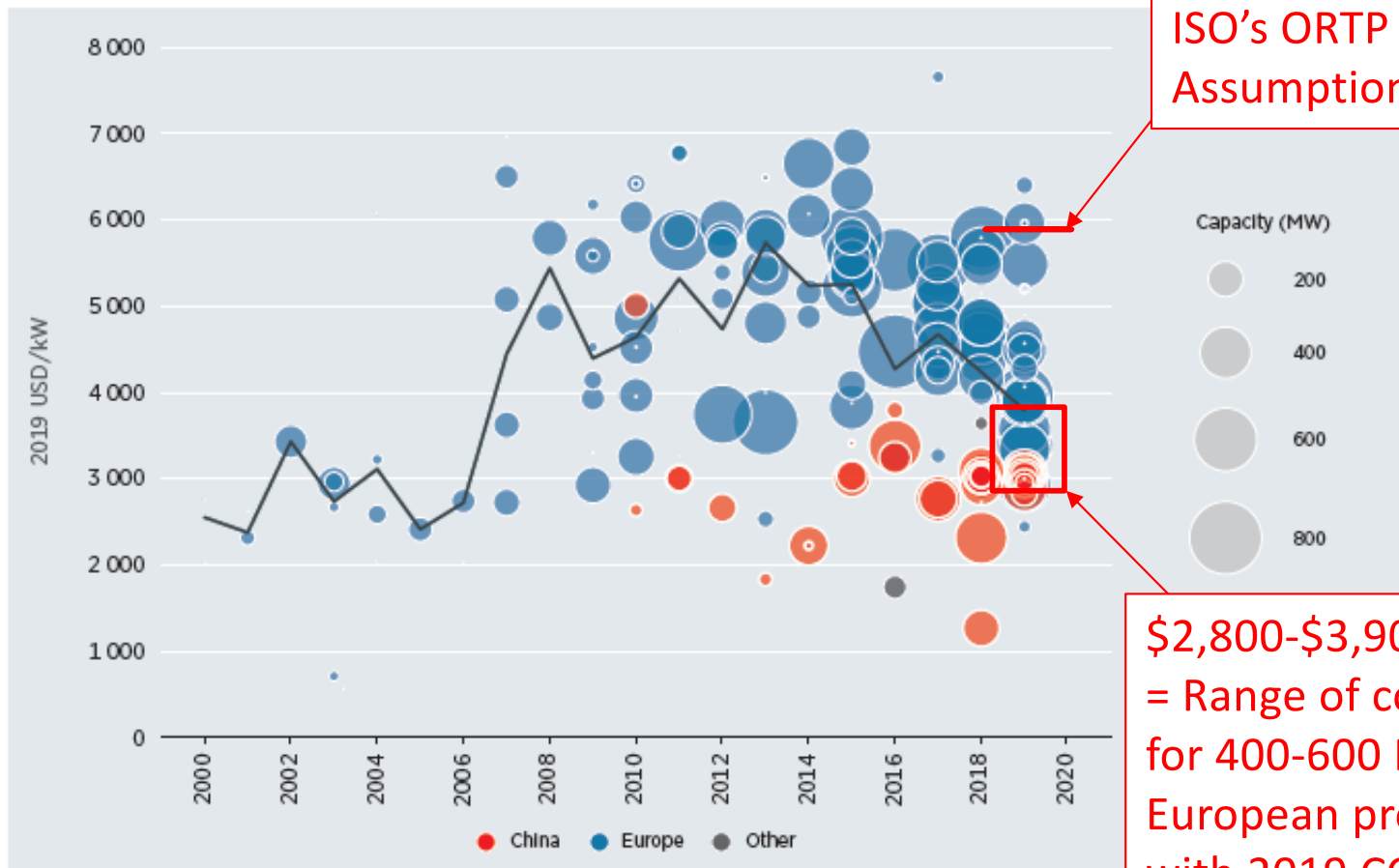


Global Capital Cost Trends

Historical Global CapEx Data

Global cost data shows the implied CapEx range from local PPAs is in line with recently installed European projects

Figure 4.4 Project and weighted average total installed costs for offshore wind, 2000-2019



\$5,876/kW =
ISO's ORTP
Assumption

\$2,800-\$3,900/kW
= Range of costs
for 400-600 MW
European projects
with 2019 COD

Source: IRENA Renewable Cost Database.

Recommendation

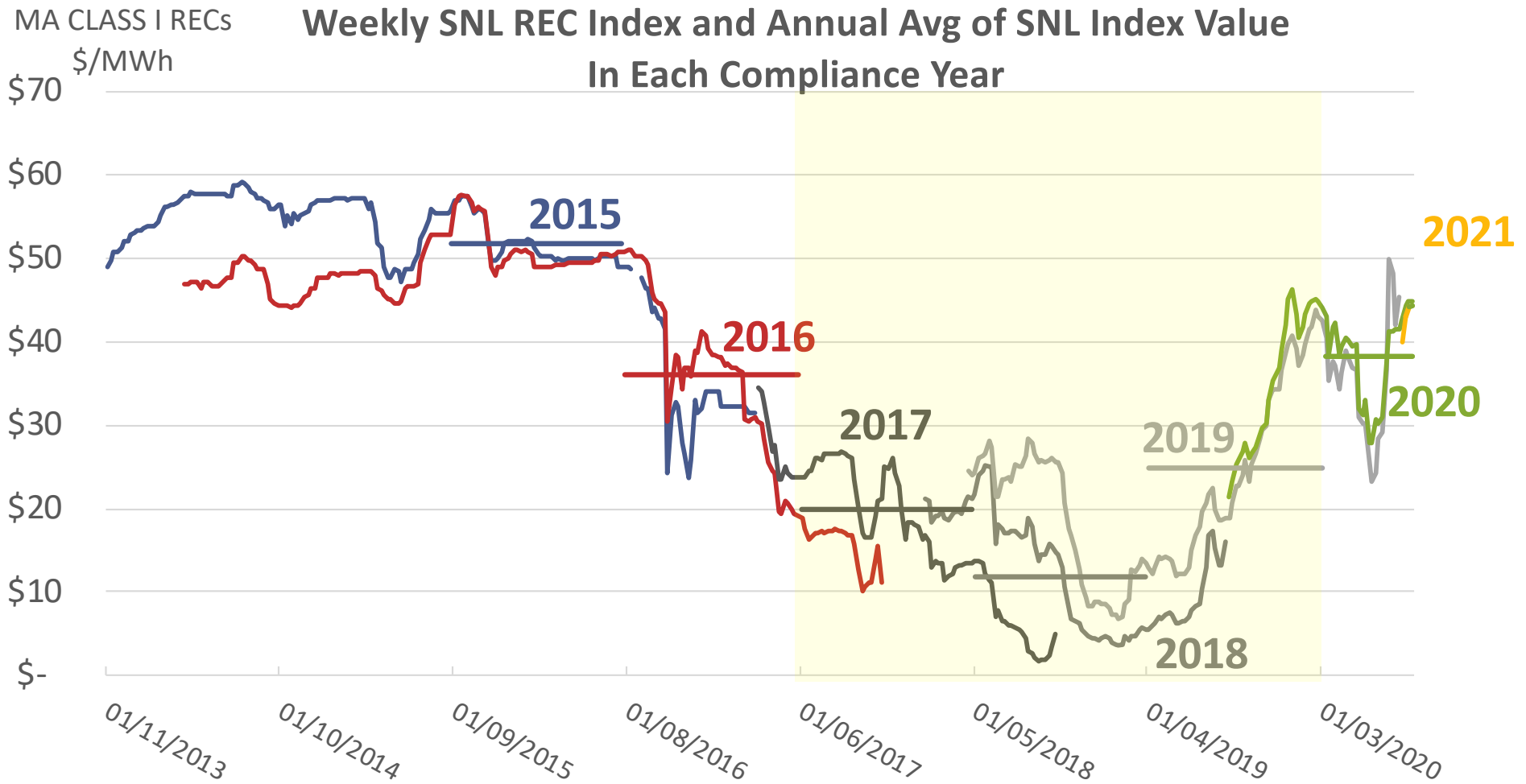
- Our analysis of commercial commitments made via PPAs and the latest publicly available data support lower OSW overnight capital cost assumptions in the ORTP calculations for FCA 16
 - Our PPA analysis shows \$2,300 - \$3,700/kW expected CapEx range
 - IRENA shows \$2,800 - \$3,900/kW range of costs for the larger 2019 COD European projects
 - Lazard 2019 LCOE analysis shows \$2,350 - \$3,550/kW range
- We suggest the overnight capital costs of this hypothetical 800 MW project to be built in 2024-2025 should be approximately **\$2,905/kW (2019\$)**
 - Weighted average of Implied CapEx in our PPA analysis
- A \$2,971/kW difference in the capital cost assumption would significantly impact the ORTP value

REC Price Analysis

Previous Treatment of RECs in ORTP Calculation has been forward looking

- **ISO developed a forward-looking REC price forecast for each prior full ORTP calculation (2012, 2013, and 2016)**
 - Supply and demand model
 - RPS requirements in future years
 - Expected entry of renewables
- **Interim year REC assumption uses forward trade values**
 - III.A.21.1.2(e)(5) - “most recent MA Class 1 REC price for the vintage closest to the first year of the Capacity Commitment Period associated with the relevant FCA as published by SNL Financial”
- **Currently proposed REC assumption is purely historical and uses three lowest-price years in recent past**
 - Large departure from prior approaches

Proposed average REC value from 2017-2019 underestimates longer REC pricing trends





Questions?

Alex Worsley

Boreas Renewables, LLC

worsley@boreasrenewables.com

Carrie Gilbert

Daymark Energy Advisors

cgilbert@daymarkea.com

Abby Krich

President, Boreas Renewables, LLC

krich@boreasrenewables.com

Appendix 1: ISO's ORTP Assumptions from June 10 and July 14-15

Offshore Wind

Specification	ISO Estimate June 10	ISO Estimate July 14-15
Turbine Size	12 M	12 MW
Net Plant Capacity	800 MW	800 MW
Location	MA Offshore Lease Area	MA Offshore Lease Area
Overnight Capital Costs	\$5,500-6,000/kW	\$5,876/kW
Fixed O&M Costs	\$100-130/kW/year	\$116.16/kW/year
Capacity Factor	47%	47%

Appendix 2: Assumptions for Implied CapEx Analysis

Assumptions

Assumption	Estimate	Source
After Tax WACC	7.29%	ISO Estimate
Inflation	2%	Daymark Estimate
Federal Tax Rate	21%	
State Tax Rate	8%	
Fixed O&M Costs	\$93.47/kW-year	ISO Estimate
Site Lease	\$665/MW	ISO Estimate
Insurance	0.3% of installed costs	ISO Estimate
Property Tax	1%	ISO Estimate
Capacity Factor	47%	ISO Estimate
Summer Qualified Capacity	35% of nameplate	Based on VW
Winter Qualified Capacity	65% of nameplate	Based on VW
ITC	18% - Vineyard Wind and Revolution Wind 12% - Mayflower Wind	Assumption based on Assumed COD at time of bid