PO.ID 225

Providing a plausible roadmap to cost-competitive U.S. offshore wind: Application of European cost reduction in a Mid-Atlantic state

Stephanie A. McClellan, Ph.D Deniz Ozkan, Ph.D. Willett Kempton, Ph.D, Heather Thomson, Andrew Levitt
Special Initiative on Offshore Wind, University of Delaware

Abstract

The United States offshore wind industry is picking up speed and momentum. To continue forward movement, state decision-makers will need to see offshore wind's benefits but also need to see a plausible pathway to cost competitiveness for offshore wind projects.

The study finds that the LCOE for projects off of the coast of a Mid-Atlantic state are likely to be roughly 20% lower for projects having financial close in 2020 than they would be if installed today, if global technological innovation, increased competition in the OSW supply chain, and industry-wide efficiencies driven by European market demand materialize as anticipated. U.S. states can further benefit from their own cost reduction strategies -- those that are inherently local. The analyses demonstrate that state-level actions can lower LCOE. Combined, the actions were found to have a potential combined impact of up to 35% for later-stage offshore wind projects.

To date, decision-makers in U.S. states have been presented with OSW costs for one-off projects and pilot projects, blurring the picture of what is possible. Our findings suggest when viewed in the context of global cost reduction efforts, global supply chain efficiencies and global market development, and of state policy and investment in OSW the picture is quite different.

Objectives

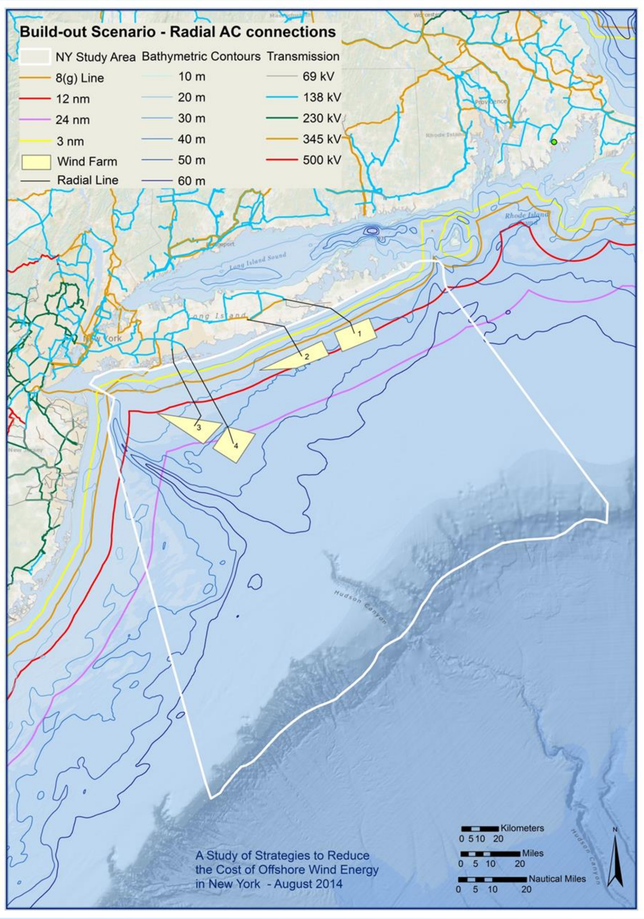
This study develops a framework for understanding the likely cost trajectory for a state in the U.S.'s Mid-Atlantic region by financial close 2020 and for what states can do to maximize cost reduction. Specifically, the objectives of this study were to identify and quantify:

- Global cost-reduction opportunities for OSW that will be transferrable to the U.S. and a Mid-Atlantic state
- Cost reductions associated with U.S. experience (or learning) as additional projects are deployed
- State-specific interventions or actions to reduce the cost of offshore wind and their associated impacts:

Methods

Three levels of cost reduction were analyzed:

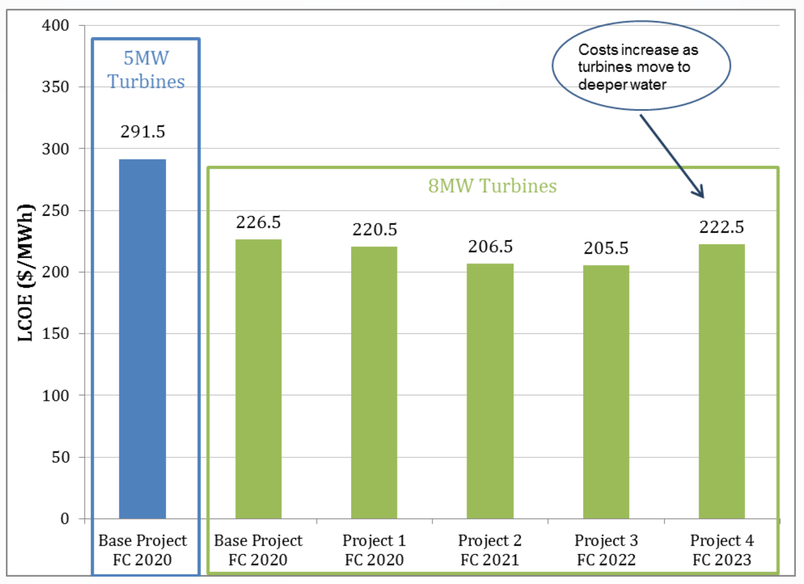
1) Potential impacts of anticipated reductions from global technological innovation in 2020 & 2025
   - To analyze, we modeled the cost of energy off the coast of a Mid-Atlantic state using cost data for technology expected to be commercially available by FID 2020 (BVG Associates 2012) and between FID 2020 and FID 2023 (BVG Associates 2014)
   - A stagnant policy and financing environment was assumed
2) U.S. learning effects during the same period
   - To analyze, we applied a learning rate of 5%, for every doubling of capacity installed over the study period (Weiss et al 2013) to an assumed (conservative) buildout of offshore wind in the U.S. by 2025
   - A stagnant policy and financing environment was again assumed
3) State-specific interventions that can reduce costs
   - After interventions were developed their impact on CAPEX, OPEX, AEP, WACC, and LCOE was calculated



Results

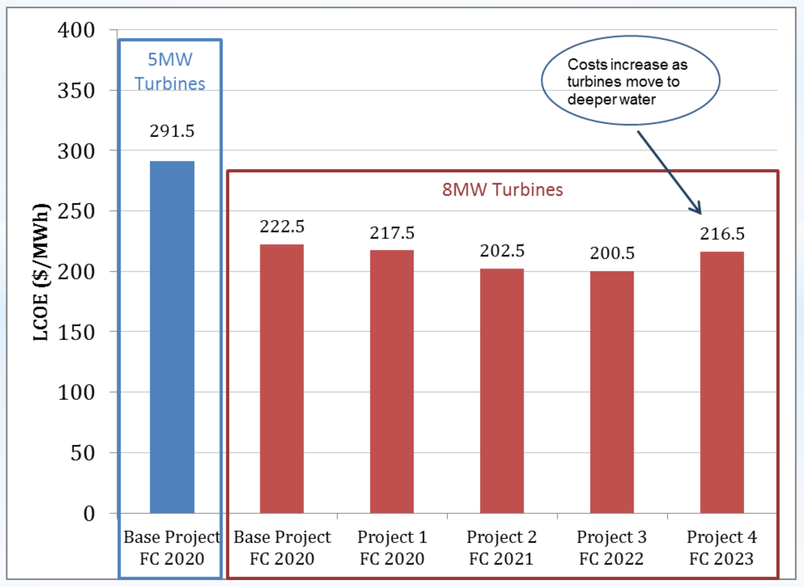
These numbers represent the cost reductions that can be expected from European cost reduction efforts and the effects of learning in the global industry.

Impact of Continuous Global Cost Reduction on NYS LCOE (Assuming Stagnant OSW Policy and Financing)



Some U.S. learning can be assumed as the industry is developed over this time period. This learning rate is in addition to the global cost reduction modeled above, and still assumes a stagnant OSW policy and financing environment.

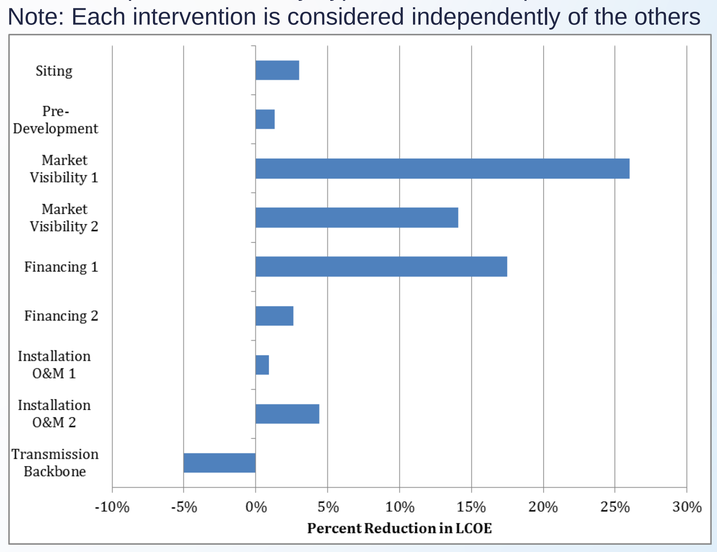
Impact of Continuous Global Cost Reduction and US Learning on NYS LCOE (Assuming Stagnant OSW Policy and Financing)



Eight potential interventions were developed and the impact of each on CAPEX, OPEX, AEP, WACC, and LCOE was determined. Details of each intervention and its impact are shown below. Note that interventions are considered independent in their impact on LCOE and no correlations are assumed.

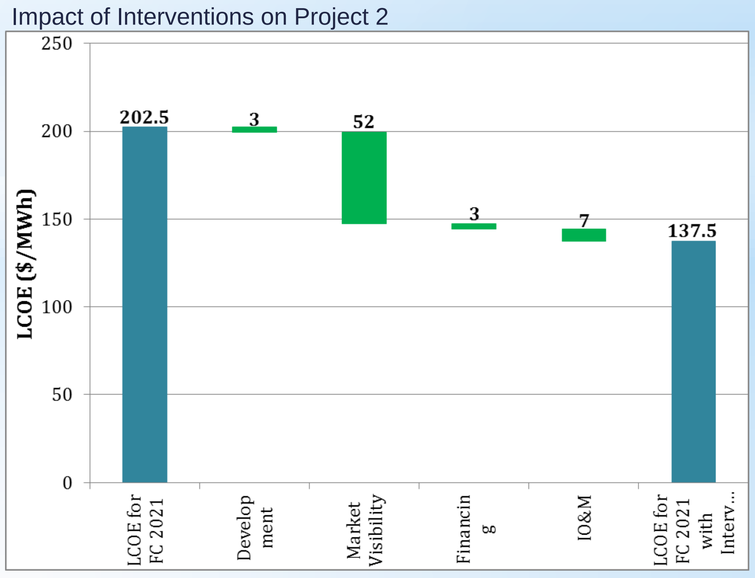
Intervention			
Siting	Site at 8-9 nm from shore	**Financing 1**	Adoption of offshore wind revenue policy designed to reduce investor risk.
Predevelopment	State obtains federal lease, conducts "enabling" offshore and onshore site assessments, including geophysical and geotechnical (G&G).	**Financing 2**	Form an investment partnership between banks to fund offshore wind.
Market Visibility 1	NYS commits to phased-in series of offshore wind projects in the New York ocean, dependent on negotiated long-term price reduction targets.	**Installation, Operations, and Maintenance 1**	Transfer knowledge from experienced European OSW project managers, supervisors and workers to the local workforce.
Market Visibility 2	First project implemented to ensure competition and lower cost of capital in future projects, and application of previous project data for financing.	**Installation, Operations, and Maintenance 2**	Upgrade a New York port for the staging of New York offshore wind farms.
		Transmission	Connect wind farms via HVDC transmission "backbone."

Relative Impact on LCOE by Type of New York-specific Intervention
Note: Each intervention is considered independently of the others



The impact of applying all interventions to each project was also analyzed. Results for Project 2 are shown here.

Impact of Interventions on Project 2



Conclusions and Next Steps

Decision-makers in U.S. states have been presented with OSW costs for one-off and pilot projects, blurring the picture of what is possible. Our findings suggest when viewed in the context of global cost reduction efforts, supply chain efficiencies, and global market development, the picture is quite different. U.S. states can viably take approaches to pre-development, infrastructure, and policy that are shown to be effective at reducing costs in Europe and reduce the cost of US offshore wind..

References

BVG Associates. 2012. Technology Workstream Report, Offshore Wind Cost Reduction Pathway Study, June.

BVG Associates. 2014. Future Renewable Energy Costs: Offshore Wind. prepared for KIC InnoEnergy Renewable Energies, May.

Weiss, Jurgen, M. Sarro and M. Berkman (2013). "A Learning Investment-based Analysis of the Economic Potential for Offshore Wind: The case of the United States," prepared for the Center for American Progress, the U.S. Offshore Wind Collaborative, the Clean Energy States Alliance and the Sierra Club.

OFFSHORE 2015 COPENHAGEN ORGANISED BY EWEA

EWEA Offshore 2015 – Copenhagen – 10-12 March 2015