

Title: By the Numbers: Lifetime Performance of World's First Offshore Wind Farm

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Synopsis: Decommissioning of world's first offshore wind farm offers an opportunity to see how industry costs have changed over the past 25 years.

Tags: wind, offshore, renewable

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Decommissioning of world's first offshore wind farm offers an opportunity to see how industry costs have changed over the past 25 years.



Decommissioning has started at the 26-year old Vindeby offshore project, one of the world's first The 4.95MW Vindeby offshore project was installed in 1991 using 11 Bonus 450kW turbines. It operated 1.5-3.0km off the southern Danish coast.

Lifetime Performance of World's First Offshore Wind Farm

As of April 2017, the [first offshore windfarm](#) in the world has just been decommissioned and is now being torn down. Its lifetime performance specs are illuminating in comparison with recent wind industry data, and alternative generation options.

1991 Vindeby Offshore Wind Farm - Denmark

Years of Operation:	1991-2016 (25)
Capital Cost:	75M Kroner = \$13M (1991USD) = \$23M (2017USD)
Number of Turbines:	11 @ 450 kW
Lifetime Generation:	243 GWh
Nameplate Capacity:	4.9 MW
Average Power Output:	1.1 MW
Nameplate Capacity Cost:	\$2.65/Watt (1991USD), \$4.70/Watt (2017USD)
Lifetime Capacity Factor:	22%
Effective Capacity Cost:	\$12/Watt (1991USD) = \$21/Watt (2017USD)
Levelized Capital Cost:	\$53/MWh (1991USD) = \$95/MWh (2017USD)

Levelized VOM Cost: \$65/MWh (2017USD) estimated using \$130/kw-yr industry figures for 2015

Lower Bound of LCOE: \$160/MWh (2017USD)

2015 [Industry Performance Data](#) for Offshore Wind

Cost/Nameplate Capacity: \$5/Watt

Initial Capacity Factor: 40%

Effective Capacity Cost: \$12.5/Watt

O&M Costs: \$130/kW-yr

Lower bound of LCOE: \$150/MWh (2015USD) = \$154/MWh (2017USD)

Conclusions:

1. While turbines are getting larger, able to operate at lower wind speeds, and improving their capacity factors, the ***total lifecycle cost per unit of energy provided from offshore wind has not perceptibly decreased*** from 1991 to 2015. Higher costs of O&M for larger turbines farther offshore seems to consume savings from higher capacity factors.

2. As it is uncontrollably variable and weather dependent, ***offshore wind generation remains uncompetitive with gas and coal*** which are half the cost (~ [\\$70/MWh LCOE](#)) while providing fully dispatchable and weather-independent power that is of much higher value to a power grid.

About the Author

Captain Todd “Ike” Kiefer, USN (ret.) is director of government relations and economic development for East Mississippi Electric Power Assn. and president of North Lauderdale Water Assn. His career in public utilities follows 25 years as a naval officer and aviator. He has degrees in physics, strategy, and military history, and diverse military experience that spans electronic warfare, nuclear submarines, operational flight test, particle accelerators, Pentagon Joint Staff strategic planning, and war college faculty. Deployed eight times to the Middle East and Southwest Asia, spent 22 months on the ground in Iraq. Commanded Al Asad Air Base and Training Squadron NINE. Author of several published papers on energy security and biofuels.

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