OFFwind Highlights No. 14 – OCTOBER 2025

FUTURE COST OF OFFSHORE WIND POWER

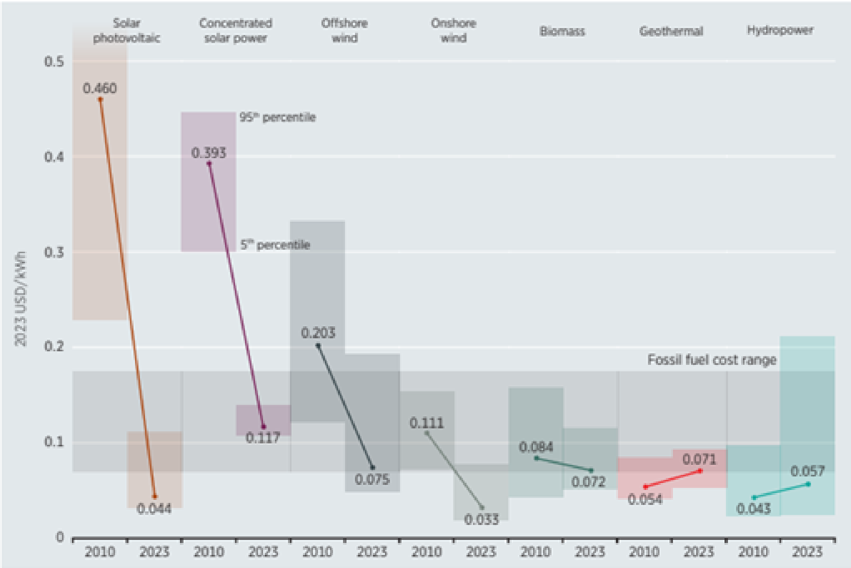
This Highlight tries to summarize the likely future cost of offshore wind power 2025-2050, and the main factors affecting these costs.

Predicting the future costs of offshore wind power is challenging. The cost predictions vary considerably and should be taken as indicative estimates.

According to the mid scenario of a recent (2024) extensive study made by the US National Renewable Energy Laboratory, the Levelized cost of energy (LOCE) is estimated to drop to 72$/MWh for fixed-bottom offshore wind power and to 95$/MWh for floating offshore wind power by year 2050.

Present cost of renewable electricity

The development of the costs for renewable electricity from year 2010 to 2023 is shown in Picture 1 below. The cost of offshore wind power is currently higher than the costs of onshore wind and solar photovoltaic power. As can be seen in the picture, the costs for solar power has dramatically reduced during this time.



Picture 1. Global LCOE from newly commissioned, utility-scale renewable power technologies, 2010 and 2023. Source: IRENA "Renewable power Generation Costs in 2023"

The global weighted average LCOE values derived from the individual power plants commissioned in year 2023, as stated by IRENA, are:

- Offshore wind 7,5 US₵/kWh
- Biomass 7,2 "
- Geothermal 7,1 "
- Hydropower 5,7 "
- Onshore wind 3,3 "

Offshore wind is presently a relatively expensive energy source, and power from floating wind parks are more expensive than power from fixed bottom parks.

Some major factors influencing the costs of offshore wind power

Lack of standardisation and mass production. Solar panels experienced a huge 80 -90% cost reduction in 15 years - due to standardisation and mass production. Offshore wind is still a relatively small evolving market with bigger turbines and no mass production volumes.

Small sub-market of the wind industry, only around 5% of the installed capacity 2015-2022.

Challenging environment. Need for specific products, salt corrosion protection etc.

Location. The distance from shore, water depth and local environmental conditions (waves and ice etc.) have a big impact on the installation and foundation costs.

Wind conditions. The location also determines the Net Capacity Factor, NCF, of the turbines. *The LCOE is most sensitive to the change in the wind conditions.*

Technology. The type of turbine and foundation (e.g., fixed-bottom vs. floating) significantly affects costs. Offshore requires specialised equipment like port facilities, ships, cranes etc., and offshore maintenance is more complex.

Logistics & Infrastructure. Distance to ports and port infrastructure, and the costs for specialized equipment and installation logistics are a major cost factors.

Project Size. Larger projects can benefit from economies of scale.

Distance to the electricity grid. Connecting offshore wind parks to the electricity grid is a major cost which depends on the distance to the grid.

Supply chain disturbances. The global supply chain crisis in 2022-2023 increased the investment costs of offshore wind around 15% and the generation costs around 10%.

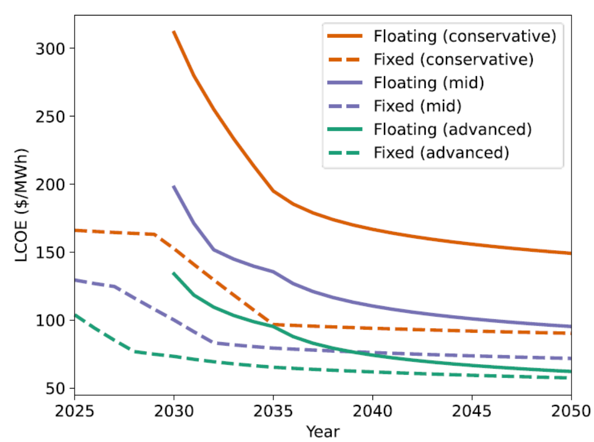
Inrerest rates. Offshore wind is a capital intensive industry, and a 2% increase in debth interest rate can lead to an 8% change in the nominal Fixed Charge Rate, FCR, a factor used to determine how much revenue must be collected from customers annually to pay for the fixed, non-operational costs of energy infrastructure.

Future cost of offshore wind power

Predicting the future costs of offshore wind power is challenging. The cost predictions vary considerably and should be taken as indicative estimates.

Levelized cost of energy (LOCE)

The US National Renewable Energy Laboratory has, in August 2024, published an extensive report *The Cost of Offshore Wind Energy in the United States From 2025 to 2050* estimating the cost development for a floating offshore wind project on the West Coast and a fixed-bottom project in the New York Bight. The results are summarized in Picture 2 and Tables 1-3 below.



Picture 2. LCOE ($/MWh) at the point of interconnection for reference fixed-bottom and floating offshore wind energy projects.

Year	Fixed bottom offshore park	Floating offshore park
2030	100	198
2035	79	136
2050	72	95
2050 advanced scenario	57	62

Table 1. Estimated LCOE ($/MWh) at the point of interconnection for reference fixed-bottom and floating offshore wind energy projects according to the mid scenario.
(Note 1 Euro = 1,16 USD in October 2025)

In the **most advanced (optimistic) scenario,** the LCOE drops to 57 $/MWh for the fixed bottom park and 62 $/MWh for the floating park in 2050.

Capital Expenditures (CapEx)

Year	Fixed bottom offshore park	Floating offshore park
2025	5809	
2030	4399	8845
2035	3500	5956
2035 advanced scenario	2892	4276

Table 2. CapEx ($/MW) mid cost scenario for reference fixed-bottom and floating offshore wind energy sites. Floating offshore wind energy costs are presented from 2030 when the first commercial scale floating offshore wind projects might feasibly be constructed in the United States

In the **most advanced (optimistic) scenario,** by 2035 the CapEx drops to 2892 $/MWh for the fixed bottom park and to 4276 $/MWh for the floating park.

Operational Expenditures (OpEx)

Year	Fixed bottom offshore park	Floating offshore park
2025	84	
2035	74	60
2035 advanced scenario	68	55

Table 3. CapEx ($/kW/a) mid cost scenario for reference fixed-bottom and floating offshore wind energy sites.

In the **most advanced (optimistic) scenario,** by 2035 the OpEx drops to 68 $/kW/a for the fixed bottom reference park and to 55 $/kW/a for the floating park in 2050.

Source if not otherwise stated: Fuchs, Rebecca, Gabriel R. Zuckerman, Patrick Duffy, Matt Shields, Walt Musial, Philipp Beiter, Aubryn Cooperman, and Sophie Bredenkamp. 2024. *The Cost of Offshore Wind Energy in the United States From 2025 to 2050*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-88988. https://www.nrel.gov/docs/fy24osti/88988.pdf.

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