

Ocean Area Required to Power the World

with **Zero Carbon Emissions** using only **Offshore Wind**



Offshore Wind

The blue areas represent potential offshore wind farms.

Some are already operational or under development, like in Europe's North Sea.

The total installed offshore wind capacity in 2020 was 30 GW.

About this Graphic

Powering the world for all forms of energy would require 2.8 million offshore turbines rated at 11 MW peak capacity with an operational capacity factor of 45%.

Each turbine has a 200-meter diameter rotor. Turbines are spaced 6.5 rotor diameters apart, providing an open 1.7 km² per turbine.

Energy capacity density is 6.7 MW/km². Total final energy consumption is 125,000 EJ or 53 GJ per capita and 8.5 billion people.

Total ocean surface within the blue areas is 4.7 million square kilometers, distributed based on the best available wind resources.

The blue areas represent 31,700 GW of installed offshore wind capacity.

Energy Mix

A 100% renewable energy world will ultimately be powered by a diverse and decentralized mix of energy sources—solar, wind (onshore and offshore), biofuel, hydrogen, wave, tidal, and river hydropower.

References

Energy capacity densities for offshore wind

https://vasab.org/wp-content/uploads/2018/06/BalticLINes_CapacityDensityStudy_June2018-1.pdf

<https://on.ny.gov/2RWX48T>

Global wind energy map from DTU, the Technical University of Denmark

<https://globalwindatlas.info/downloads/high-resolution-maps/World>

Estimate of future total annual global energy consumption in 2050

https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Apr/IRENA_Global_Energy_Transformation_2019.pdf