How much wind turbines are needed to meet the power needs of our planet Earth?

Guess how much wind turbines our world needs to meet the demand for power use?

Wind energy is an extremely underestimated resource because production is not high, but in return it is an abundant source of renewable energy. " *Although the US invested $ 14.5 billion in wind power projects last year, these wind farms only provided 4% of the US electricity* ," according to the US Wind Energy Association (American). Wind Energy Association - AWEA).

Globally, this percentage is not much greater - researchers at Harvard University estimate that urban wind farms outside of the city have the **potential to produce** up to 40 times more **electricity** . with the amount of electricity the world needs to consume. What will a real wind-powered world look like?

Steve Sawyer - General Secretary of the Global Wind Energy Commission, made a preliminary calculation: 21,000 terawatts per hour (average annual energy consumption worldwide - TWh) divided by 0.005256 terawatts on hours of production generated from the annual wind energy of each wind turbine. So the result is about **3,995,434 wind turbines** in the world.

" *The number of more than 3,995,434 wind turbines will account for about half of Alaska's land if they are placed close to each other* ," Sawyer said.

However, wind power projects in the world have different spatial ratios depending on location and terrain but need at least 0.05 - 0.1 km2 to produce 1 MW of electricity.

If **wind turbines** are located further apart, 3.9 million of these turbines will use a much smaller, smaller area than Spain.

To accomplish this calculation, Sawyer said that each wind turbine has **an average of 2MW of energy** and a global efficiency of 30%.

That means these turbines can achieve 30% efficiency at a given time. Because wind turbines are not always active, they also take time for periodic maintenance.

That percentage also explains constraints in the electricity grid - if a network receives more energy from a wind farm than it can handle. For example, managers will turn off some turbines.

However, as John Hensley of AWEA noted before, 30% is really a pretty big number. For comparison, wind power projects appear to be more efficient than average 20% solar power, and fossil fuel power plants can only operate at 40-60% capacity. .

When multiplying the average potential output of a 2MW wind turbine by 30% of the annual energy efficiency can be obtained and 8,760 hours - the number of hours of operation in a year, you will find the estimated output of electricity. Sawyer's annual, calculated in megawatts per hour (Mwh) annually the production energy of each turbine can produce (5265 MWh or 0.005265 TWh).

Depending on **the size of the turbine** (larger sized turbines can produce more electricity), we may need less wind turbines. If we use high-performance turbines (for example, high-performance turbines with an output of 4 MW and energy efficiency of 40% of capacity), we will only need about **1.49 million wind turbines to be able to Power supply for the whole world** .

" *Thanks to advances in wind turbine technology, the cost of deploying wind power has decreased by 90% since 1980. Currently, wind turbines are built higher and larger than ever, giving allow them to get more wind and produce more electricity* , "Hensley said.

In particular, wind farms located in the sea, in which turbines are installed in the oceans and not on land, can provide three times more power than wind turbines installed on. land, because there is more wind blowing on the sea than on land.

However, the above comparisons and calculations are for reference only, because it will be difficult for the whole world to build such a large-scale wind power project. But now, electricity in the world is less dependent on fossil fuels, which has always been considered a worthy target.