



UPTAKE

**UNTAPPED ENERGY:
HOW THE U.S. WIND INDUSTRY CAN
PRODUCE MORE MEGAWATTS
WITHOUT NEW TURBINES**

For more information:

energy@uptake.com

uptake.com/wind

312.242.2200



Wind energy development has grown dramatically in the United States. In 2016, more than 52,000 wind turbines produced a record 226 TWh of wind energy — up nearly 20 percent from the previous year. **But the industry can and will have to produce more energy from the turbines already installed.**

Some existing wind parks have underperformed preconstruction energy assessments. For projects under development, producing more energy will be necessary as renewable procurement auctions press for ever-lower costs to find an energy buyer.

If the industry improves turbine availability, it can produce more energy from existing turbines to meet this challenge — with no new hardware.

Here's how.





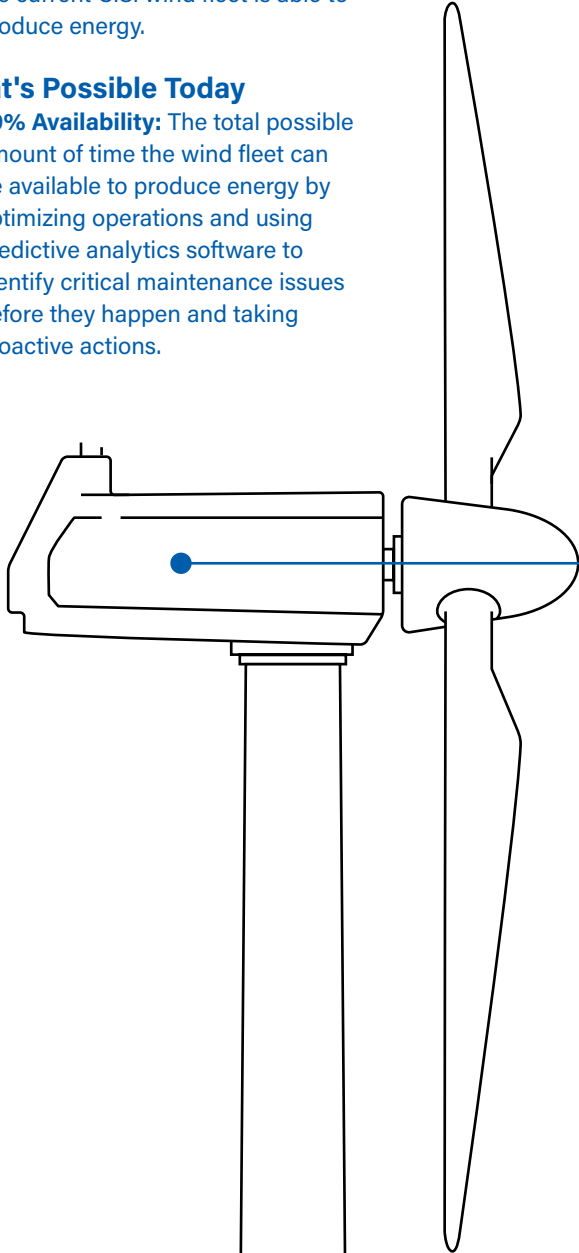
THE MISSED OPPORTUNITY IN THE U.S. WIND FLEET

Current State

— **94% Availability:** The average time the current U.S. wind fleet is able to produce energy.

What's Possible Today

— **99% Availability:** The total possible amount of time the wind fleet can be available to produce energy by optimizing operations and using predictive analytics software to identify critical maintenance issues before they happen and taking proactive actions.



There is an estimated

12 TWh

of total untapped energy due to downtime in the current U.S. wind fleet.



Enough to power all the homes in Chicago for a year

WHAT DOES THAT MEAN?

Each

1%

increase of availability from the current U.S. wind fleet would result in approximately

2.4 TWh

of additional annual energy

Each 1% is roughly equivalent to

450

new wind turbines



OR

1

coal-fired power plant



WHICH IS

enough clean energy to power

222,000

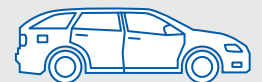


homes annually

AND WOULD

offset the CO₂ produced by

382,000



cars driven each year

REDUCING

1,780,000



tons of CO₂ per year

TWh = terawatt-hours. 1 TWh equals 1 billion kilowatt-hours (KWh), the unit typically used in consumer electricity bills.

**WHAT PREVENTS 99 PERCENT AVAILABILITY?**

While advances in wind energy technology have been made, significant operational hurdles prevent the industry from reaching 99 percent availability and increasing its energy production.

What contributes to downtime and inefficiencies today?

- [Reactive maintenance to unforeseen problems](#)
- [Operations information not centralized in a single, real-time view](#)
- [Inspections based on time instead of component condition](#)
- [Challenges in managing accurate or adequate parts inventory](#)
- [Unknown underperformance of wind turbine components, such as poor vertical \(pitch\) and horizontal \(yaw\) alignments, and defects in anemometers](#)

HOW CAN THE INDUSTRY INCREASE AVAILABILITY?

Greater availability of the U.S. wind fleet can be achieved in several viable ways.

- Greater operational experience that yield best practice in operation and maintenance procedures.
- Predictive analytics and visibility software that optimizes operations:
 - [Provides enhanced real-time turbine status](#)
 - [Generates insights that forecast problems before they occur](#)
 - [Enables technicians to perform proactive maintenance to prevent problems from happening](#)
 - [Allows for more effective maintenance scheduling based on forecasted failures, weather conditions, power prices and other considerations](#)
 - [Optimizes production with better vertical \(pitch\) and horizontal \(yaw\) alignment to capture more wind](#)
 - [Automatically manages parts inventory](#)

→ Uptake's estimates only calculate energy lost due to downtime. It is likely that wind turbine productivity will also increase as operators use predictive analytics software that detects underperforming turbines and looming problems.

Advanced analytics providers like Uptake have software solutions designed specifically for the wind industry. The 12 TWh of untapped energy is achievable using current technology.

METHODOLOGY & SOURCING

Uptake's findings are based on 2016 government and industry data. Energy and CO₂ equivalents were calculated from the Environmental Protection Agency's Greenhouse Gas Equivalencies Calculator. To utilize the additional energy, Uptake's methodology assumes continued low curtailment rates.

2016 annual U.S. wind generation: 226 TWh

Energy Information Agency
www.eia.gov →

Average U.S. wind fleet availability: 94 percent

White Paper on Empirical Observations of Wind Project Availability. DNV GL.
December 2016.
www.issuu.com →

Mean U.S. wind fleet capacity: 34 percent

Energy Information Agency
www.eia.gov →

CO₂ and energy use equivalencies

Greenhouse Gas Equivalencies Calculator
Environmental Protection Agency
www.epa.gov →

Annual U.S. household energy consumption

Energy Information Agency
www.eia.gov →

U.S. coal average capacity and capacity factor

Energy Information Agency
www.eia.gov →

Pew Charitable Trust

www.pewtrusts.org →

Number of households in cities

U.S. Census Data
www.census.gov →