HEAVY METAL FANS ANALYTICA

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ABOUT US

- Subdivision of WOW Energy Group.
- WOW is a leading investment group in the clean energy industry.
- We have been brought on to guide into investing in wind power.

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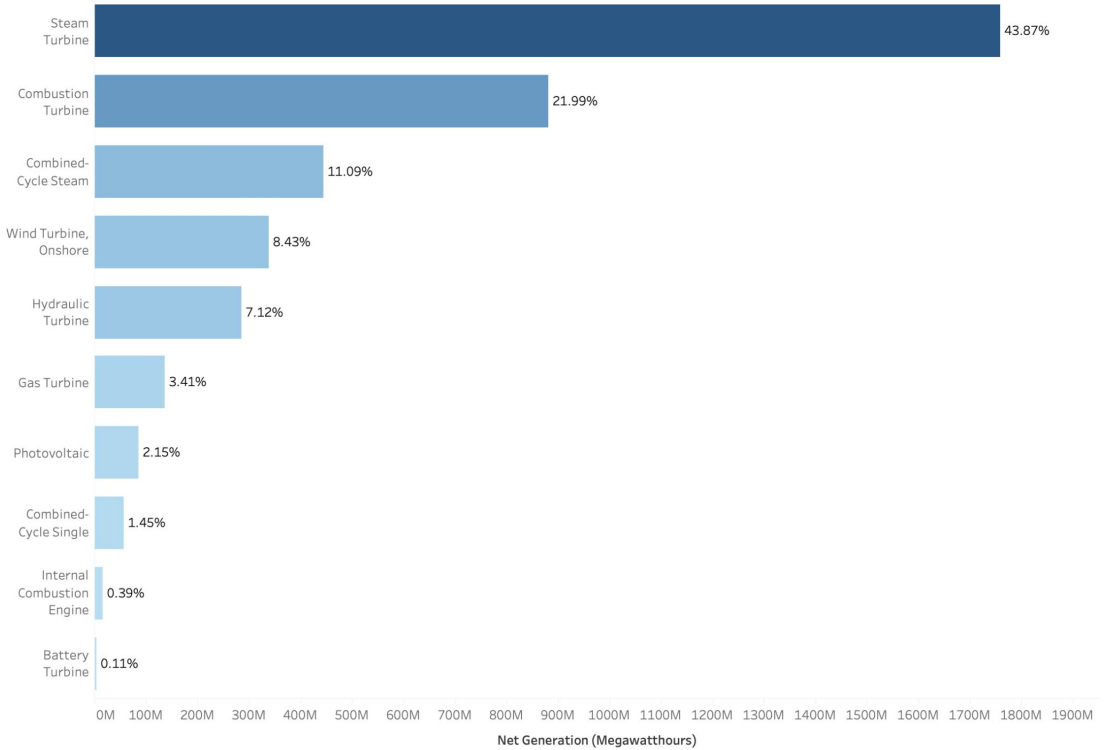
01 OVERVIEW

ENERGY GENERATED IN THE USA

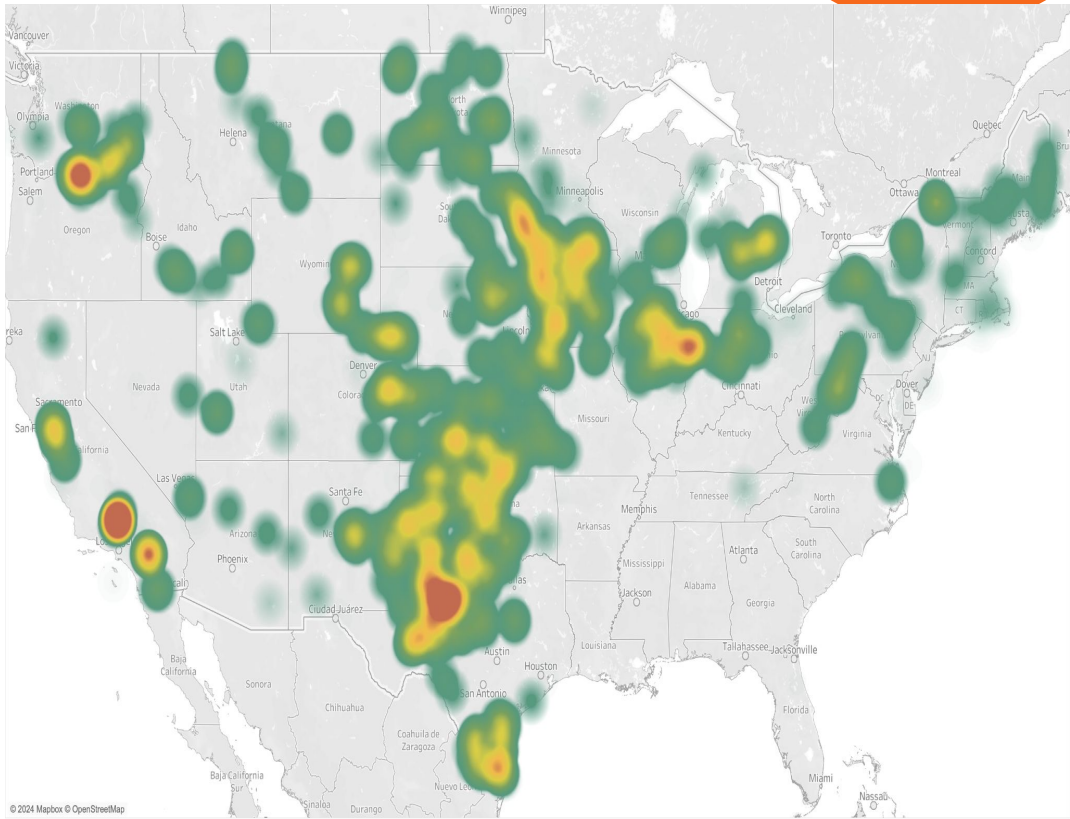
Roughly, 4,000,000 GWh (4,009,276,014 Megawatt Hours) has been generated each year in the US.

- Steam Turbines has generated 43.87% of the total energy whereas,
- Wind Turbines, both onshore and offshore have only generated 8.43% of the total energy.

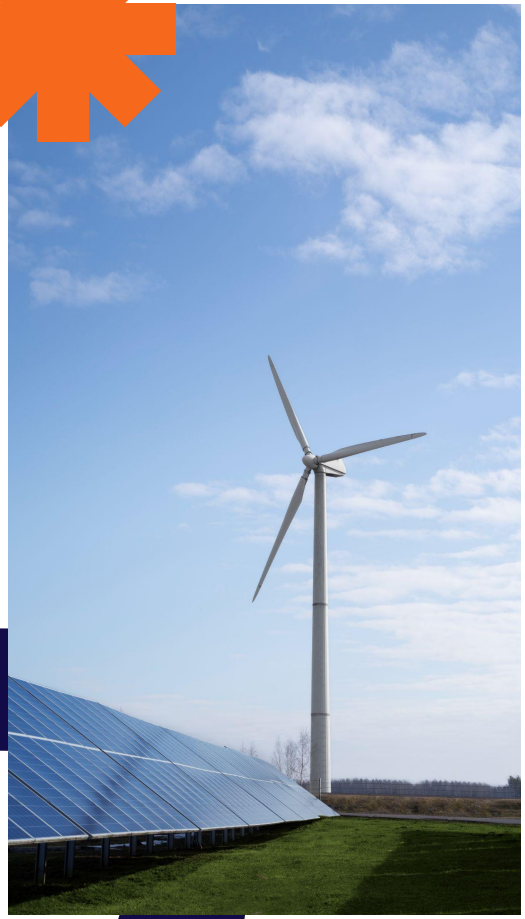


WIND TURBINE LOCATIONS IN THE USA

- The US wind turbine database contains 73,352 active wind turbines.
- Location of the current turbines are heavily concentrated in the Midwest, Texas and Oklahoma area.

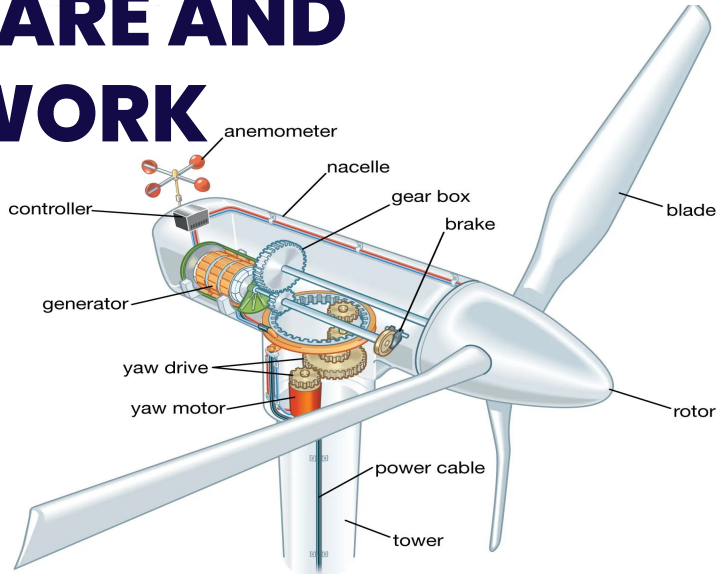


02
MECHANICS



WHAT THEY ARE AND HOW THEY WORK

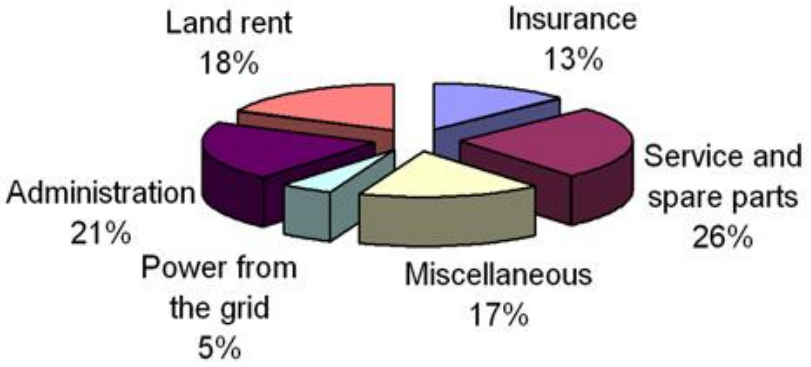
Wind turbine operates on a simple principle. The energy in the wind turns the propellers (blades) around a rotor. The rotor is connected to the main shaft, which spins a generator to create electricity.



WHAT DOES IT COST?

INSTALLATIONS

- An average producing capacity cost per megawatt is around $1.2 million
- The total cost of an average turbine can range from $2.5 million to $4 million



MAINTENANCE

- The operations and maintenance will cost around $42,000 to $48,000 per year for the first ten years
- Insurance alone is around $8,000 to $10,000 per year per turbine
- Administrative and legal costs, add up to around $6,000 to $10,000 per year

ONSHORE WIND ENERGY

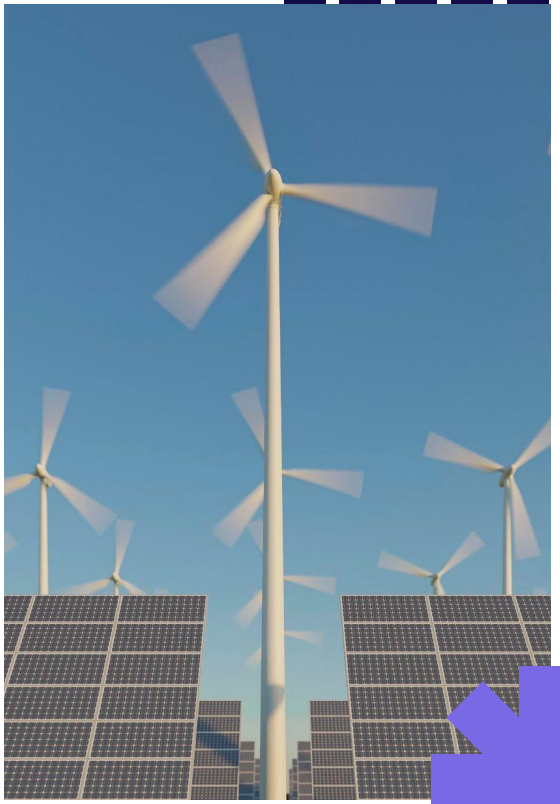
- Generates energy from wind turbines located on the land.
- Commonly located on the rural areas or fields.
- Built in less populated areas with fewer buildings that could interrupt the air flow.

PROS

- Reduced environmental impact
- Quicker installation and easier maintenance
- More job creation

CONS

- Changing wind speeds
- No wind or intermittent generation
- Less power generation
- Effects on nature



OFFSHORE WIND ENERGY

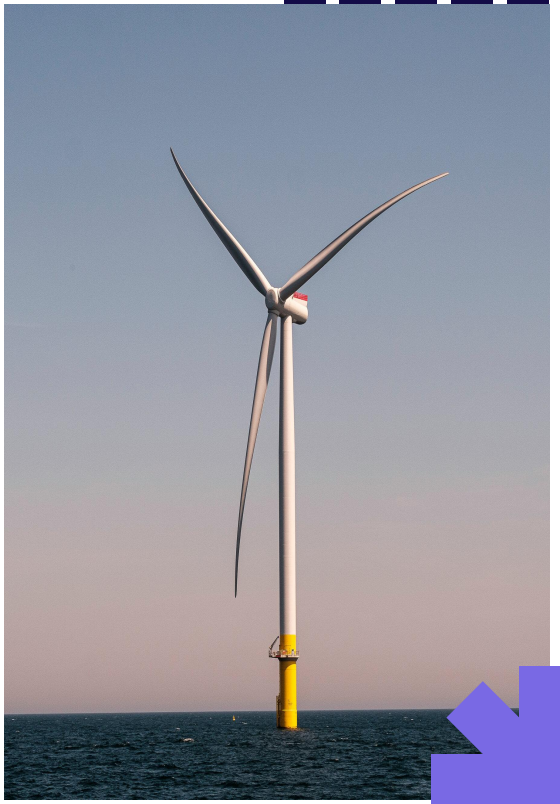
- Generates energy from wind blowing across the sea.
- Considered more efficient due to higher speed of winds with greater consistency as their is lack of any physical interference.

PROS

- Offshore wind turbines are more efficient
- Reduced environmental impact
- More space to construct

CONS

- Higher Cost
- Maintenance and repairs
- Less local involvement



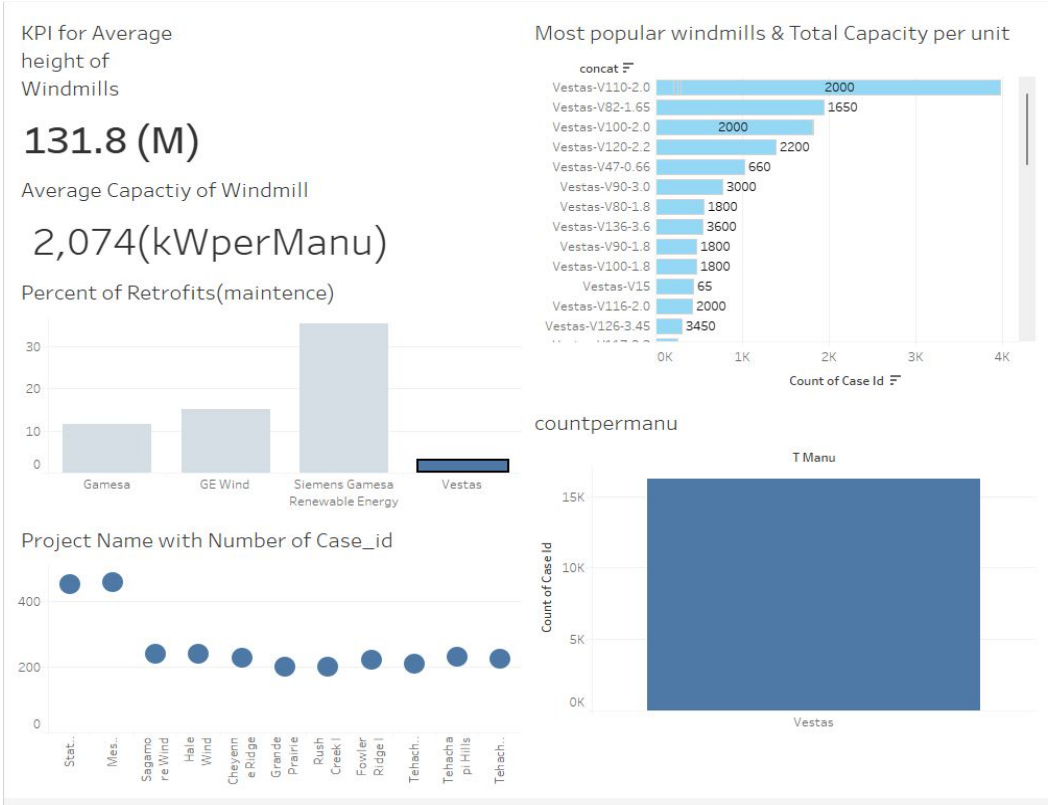
03

RECOMMENDATIONS

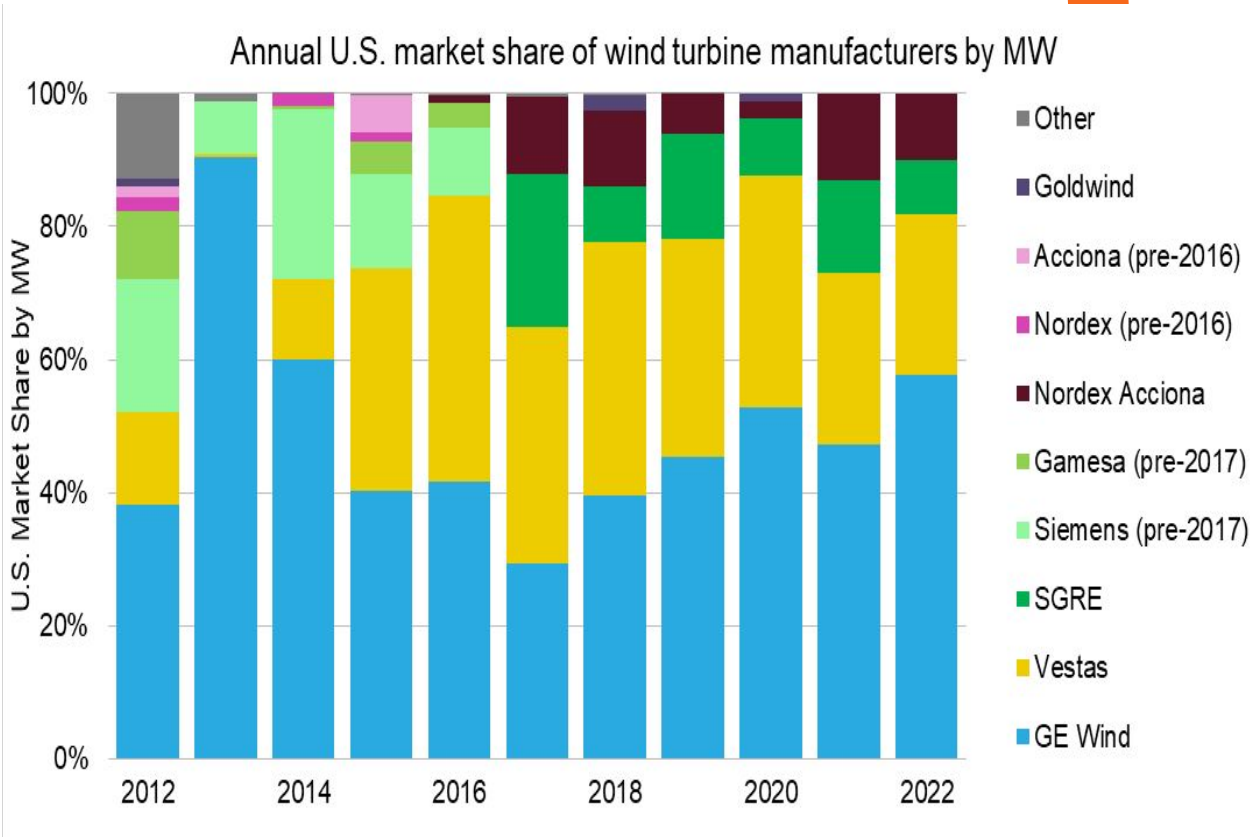
Recommendation (Manufacturer)

Vestas

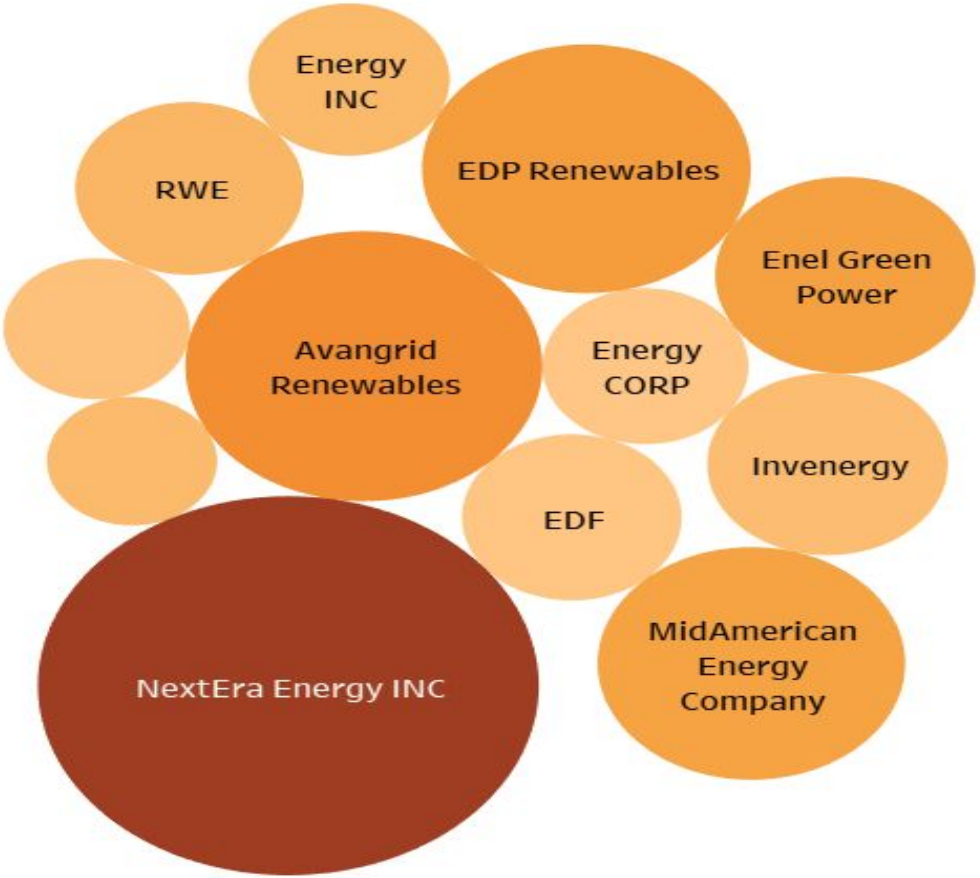
- With over **15k in wind turbines** operations and **less than 4% retrofit (updating)**
- Put up first wind turbine in 1982
- **2nd most operational** windmill in the US
- **2nd and 3rd largest** Wind farms in the US are with Vestas



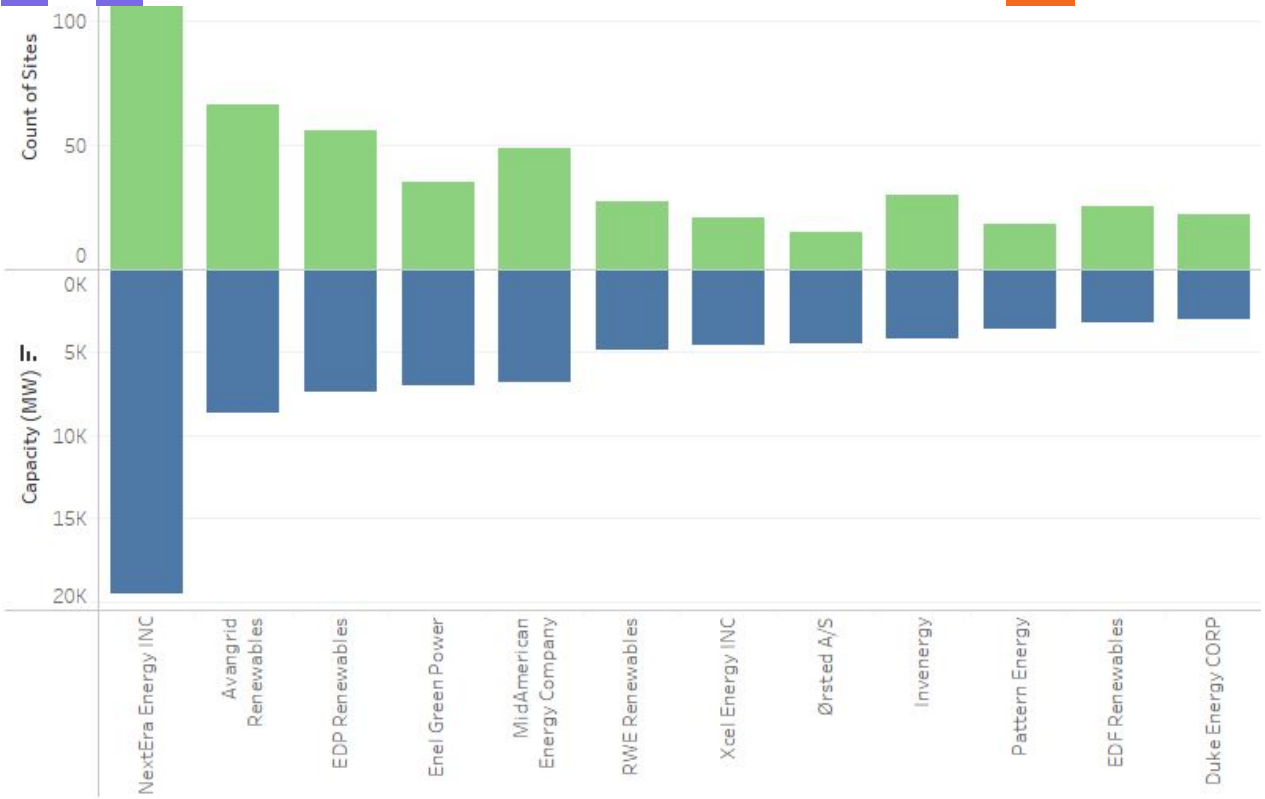
Turbine Manufacturing has **consolidated**



Who are the owners?



NUMBER OF SITES AND TOTAL CAPACITY BY OWNER



Recommended Owner:

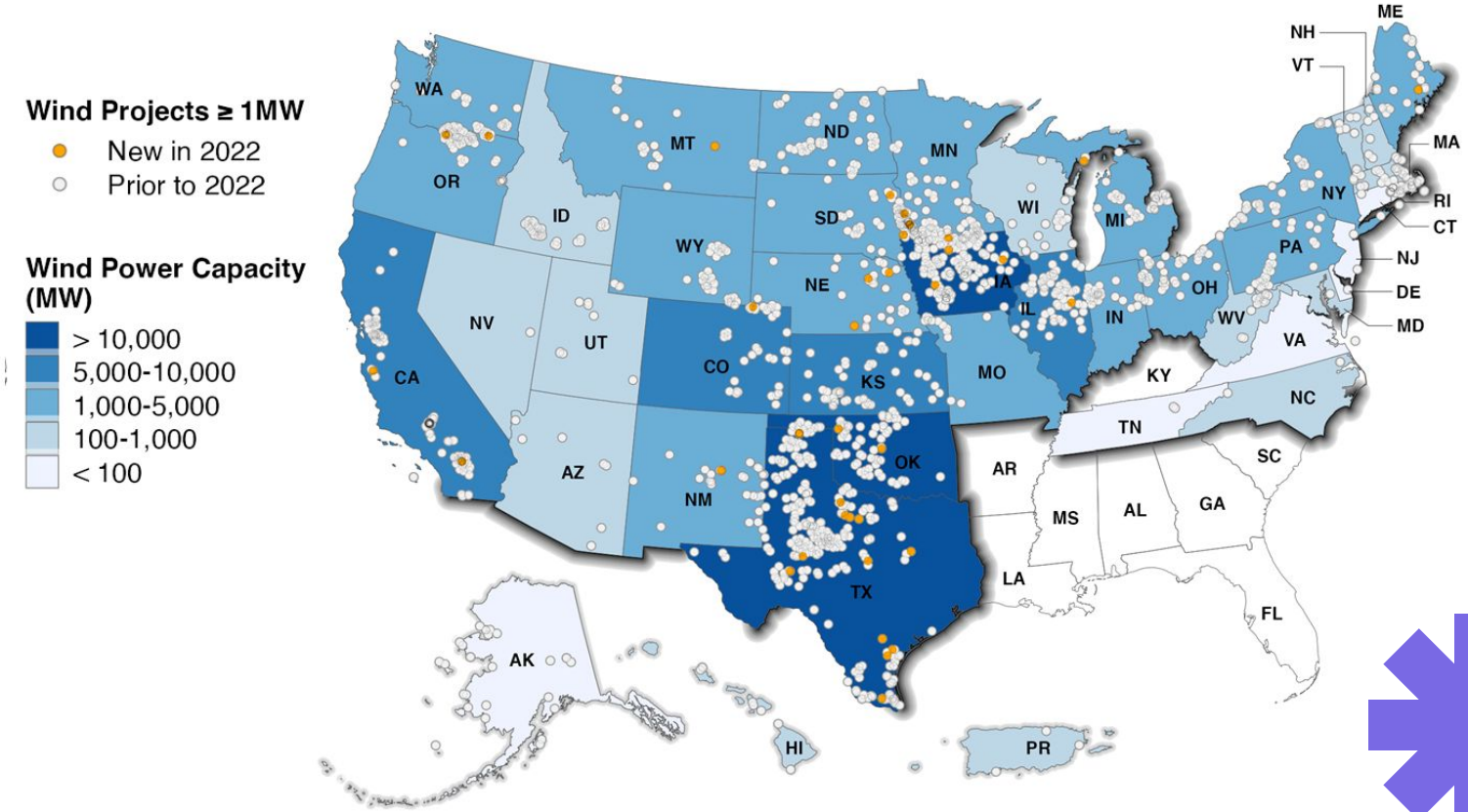
Most Established: NextEra Energy INC

For Growth: Enel Green Power

Offshore Windmill Farms Venture capital:
Siemens Gamesa Renewable Energy SA (SGRE); Acteon Group LTD

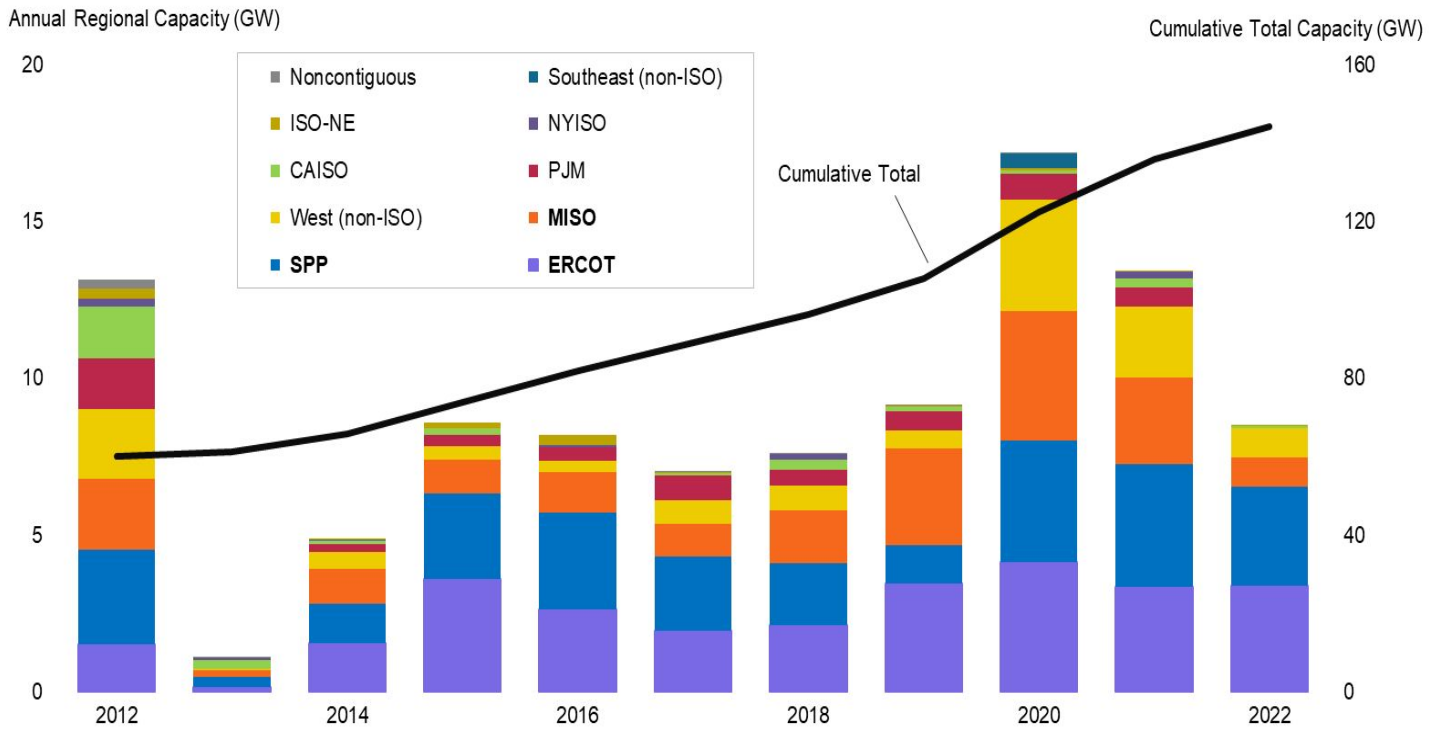
04
ANALYSIS

State Wind Turbine Capacity



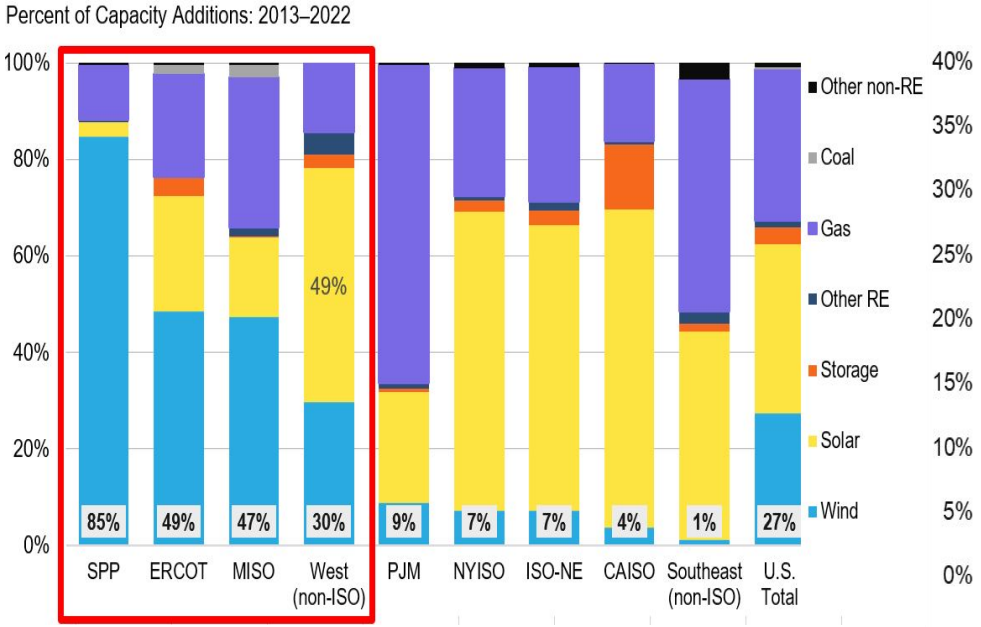
Trend #1

Despite annual volatility, **capacity keeps increasing**

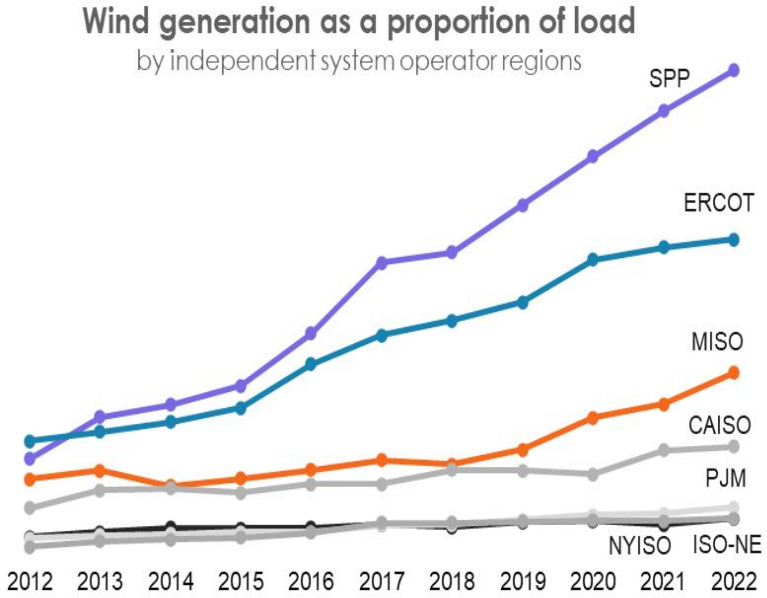


Trend #2

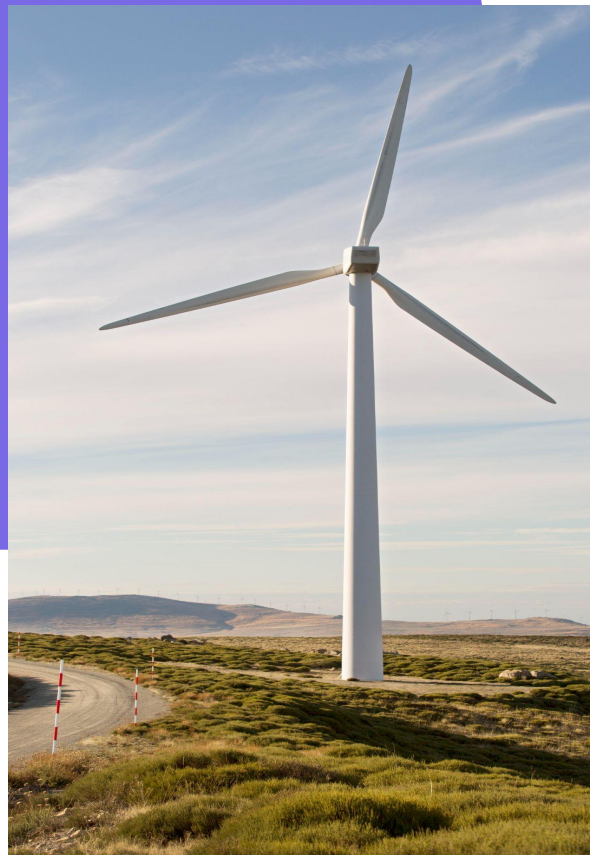
High Wind Speed regions see biggest capacity additions



Market Share is growing



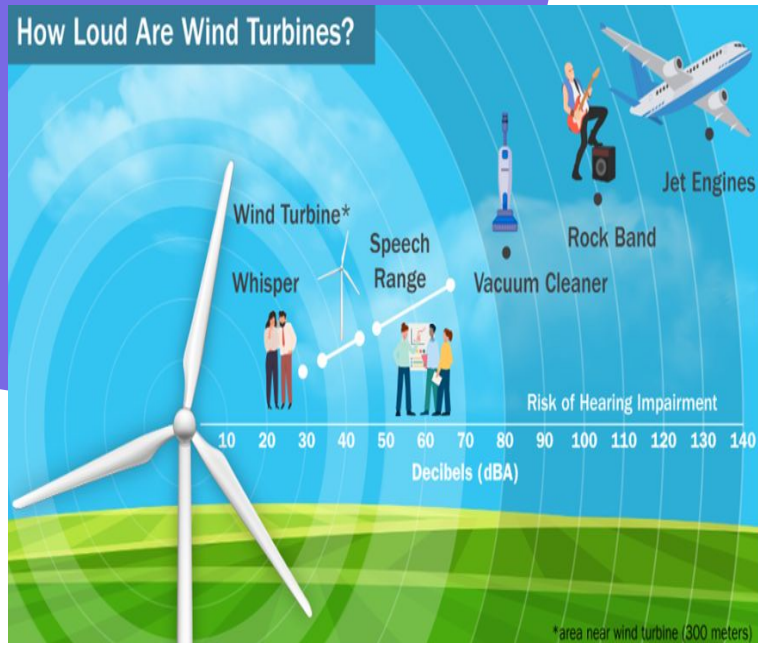
05 FINDINGS



Airplane Obstructions and the FAA

- **Rotating** turbine **blades interfere** with **radar**
- Turbines over 200ft (60m) above ground level are **FAA regulated** to ensure **compatibility** with **aviation safety** and **airspace radar**
- Wind turbines **can pose a hazard** to **low-level aircraft** if **inappropriately lit or marked**

Noise



- Wind turbines **sounds** are **35-45 dB** at 300m distance

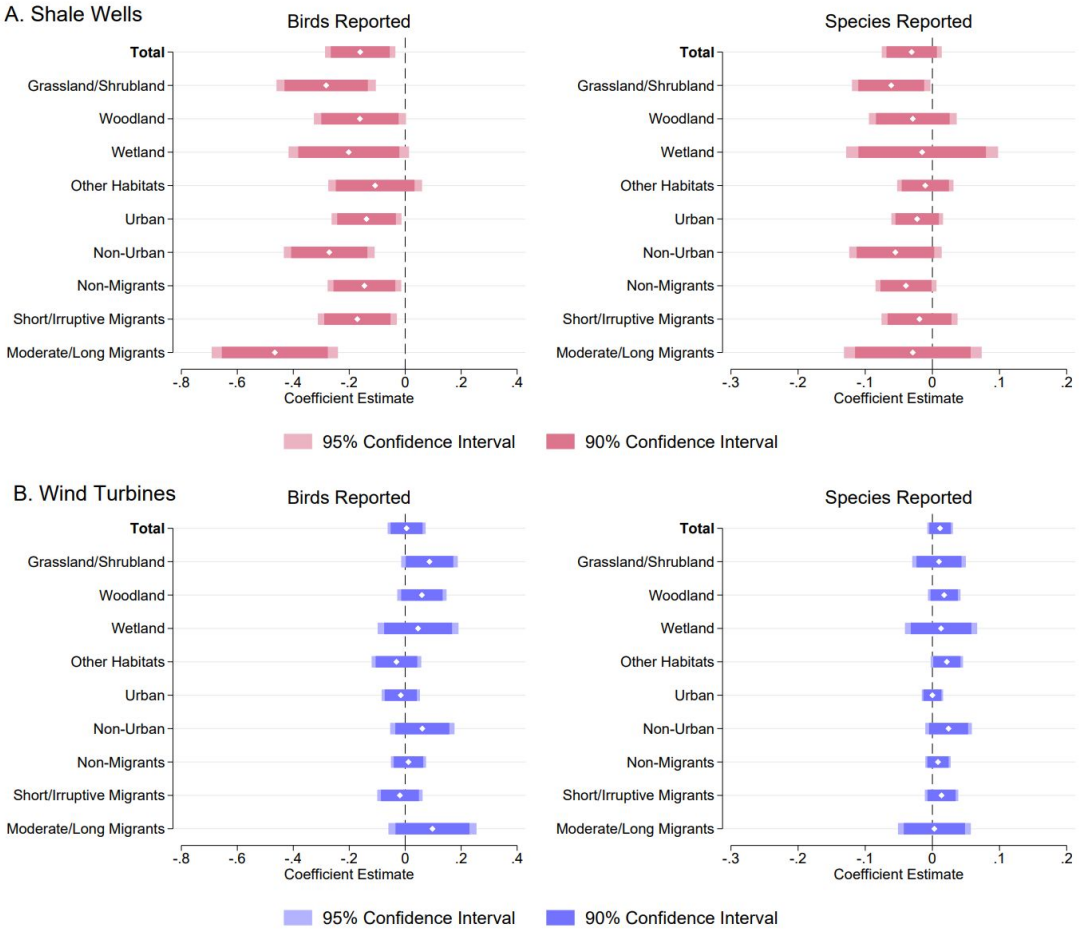
- **Peer-reviewed research** generally does **not support** anecdotal reports of **negative health effects** on people who live close to wind turbines

Impact on Wildlife

15% average **drop** in **bird population** counts when **new shale wells** were drilled

vs

Wind turbines do **not have any measurable impact** on **bird population** counts.



06
CONCLUSION

IN SUMMARY

INVESTMENT OPTIONS

Equipment → **Vestas**

Owners:
→ **NextEra Energy**
→ **Enel Green Energy**

Offshore
→ **Siemens Gamesa Renewable Energy**

COST

- A 4MW wind turbine @ **$5.2Mil** will set to make

$ 1.8 Mil@ 50%
II
$8.8 Mil@ 100%

**** Capacity percentage depends on wind variability of weather*****

ENVIRONMENTAL ISSUES

- Birds will be fine
- FAA regulating any radar or airplane concerns
- Turbines are less noisy than people talking

Be a big fan of wind power!

RESOURCES

- U.S. Wind Turbine Database Viewer
  - URL: U.S. Wind Turbine Database Viewer
- Wind Technologies Market Report by Lawrence Berkeley National Laboratory
  - URL: Wind Technologies Market Report
- Global Energy Monitor (GEM) Wiki
  - URL: GEM Wiki Main Page
- Energy Systems Integration Group (ESIG) Wiki - General Electric 1.5 MW Series
  - URL: ESIG Wiki - General Electric 1.5 MW Series
- Vestas - Leading Wind Turbine Manufacturer
  - URL: Vestas
- Sciencing - Places Where Wind Turbines Produce Electricity
  - URL: Sciencing - Wind Turbines and Electricity
- American Clean Power Association - Wind Power Facts
  - URL: Clean Power - Wind Power Facts
- Today's Homeowner - Guide to Wind Turbine Cost
  - URL: Today's Homeowner - Wind Turbine Cost Guide
- Weather Guard Wind. (Year). How Much Does a Wind Turbine Cost? Is It Worth It? Weather Guard Wind. [URL]
- Quantifying the Effects of Energy Infrastructure on Bird Populations and Biodiversity - Environmental Science & Technology **2024** *58* (1), 323-332

THANKS!

Do you have any questions?

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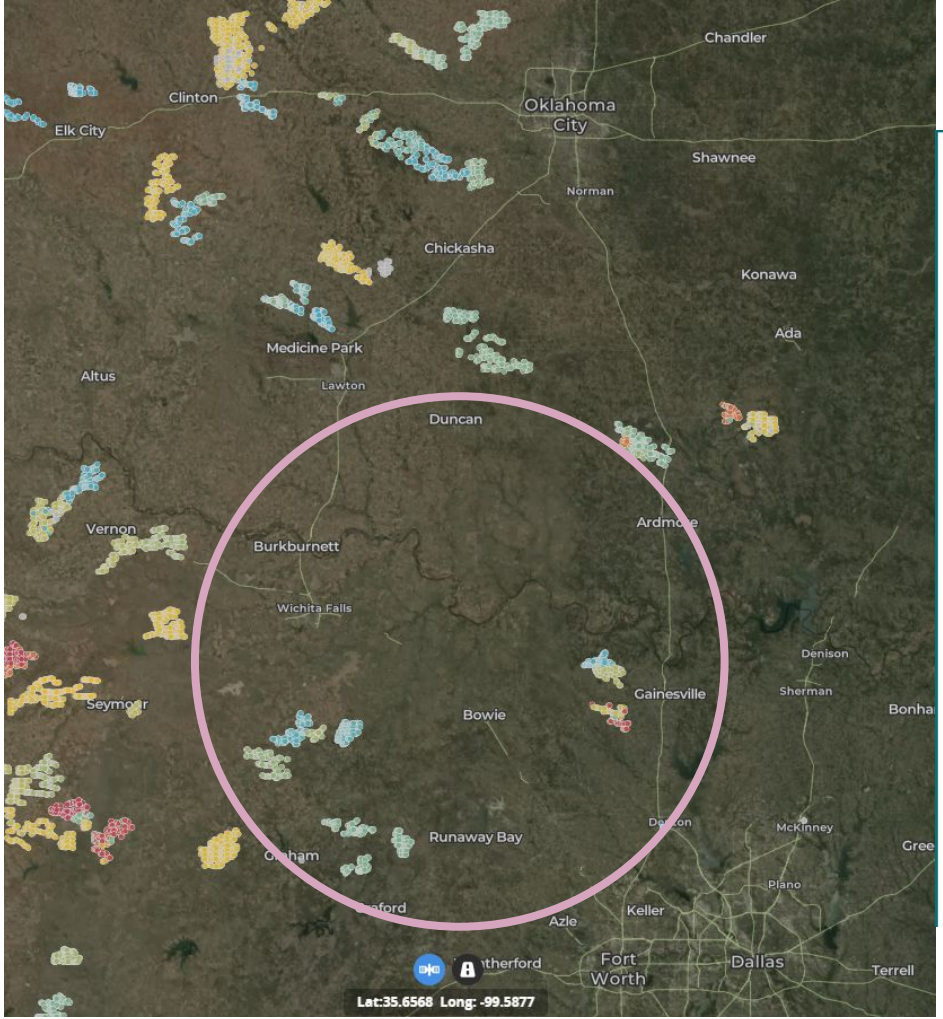
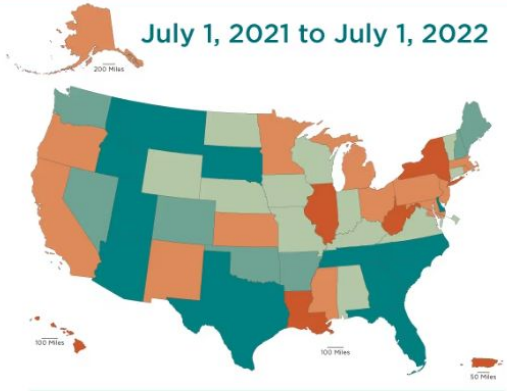
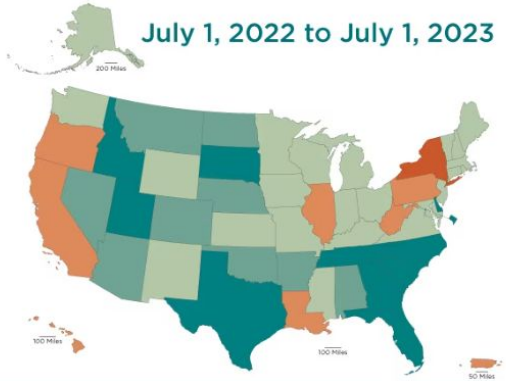


Percent Change in State Population





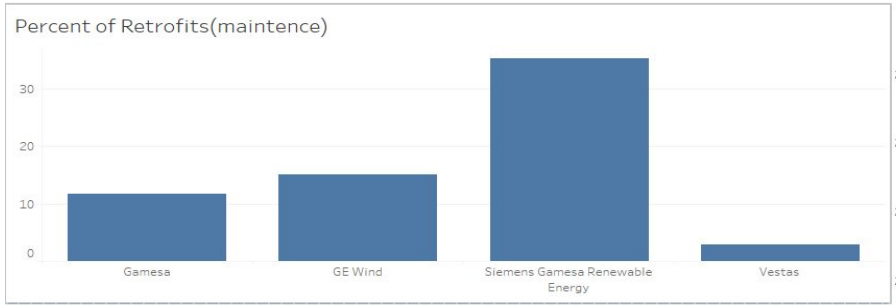
Percent change

- 1.00 or more
- 0.50 to 0.99
- 0.00 to 0.49
- -0.49 to -0.01
- -0.50 or more

COST BREAKDOWN OF A WIND TURBINE

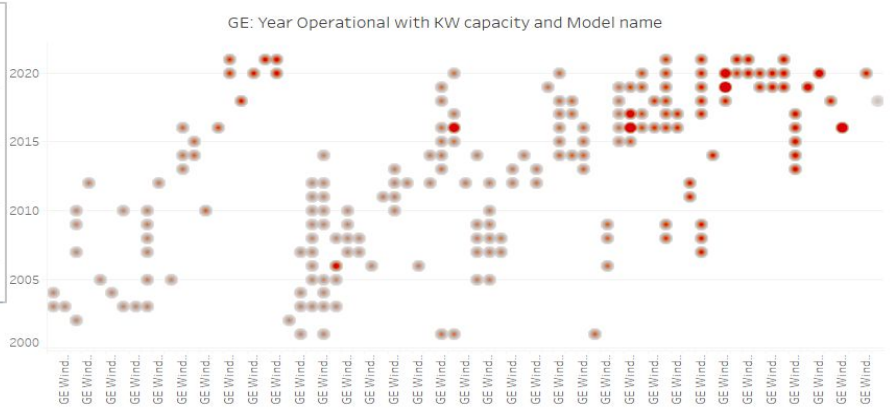
TURBINE SIZE	YEAR REVENUE	35% CAPACITY	50% CAPACITY	65% CAPACITY	100% CAPACITY
1 MEGAWATT	$0.02 per KWh = $20/hour x 24 days x 365 days	$61,320	$87,600	$113,880	$175,200
2.5 MEGAWATT	$0.02 per KWh = $50/hour x 24 days x 365 days	$153,300	$219,000	$284,700	$438,00
4 MEGAWATT	$0.02 per KWh = $80/hour x 24 days x 365 days	$245,280	$350,400	$455,520	$700,800

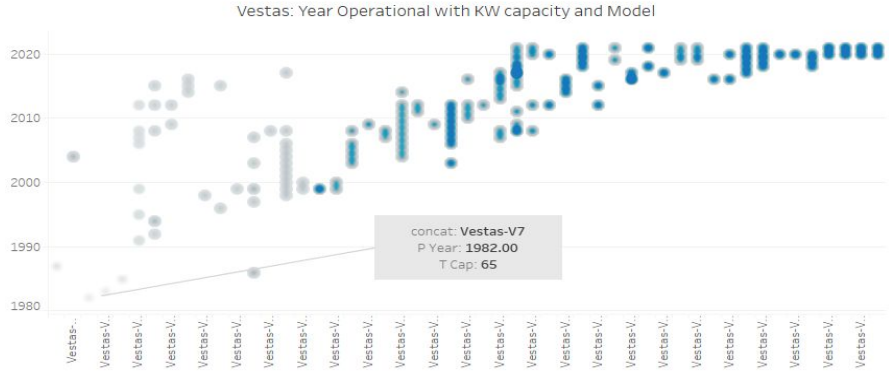
Main Manufacturers & Products

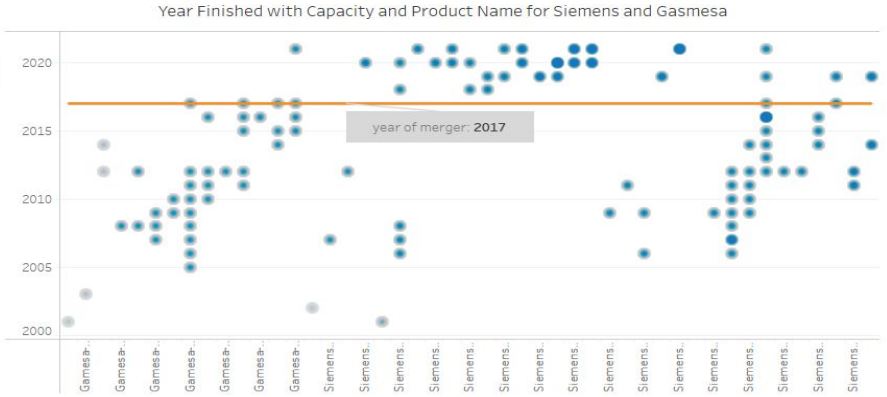


Parameters for Worthy Investing

-Low retrofit percentage
- Established Products
-Potential Growth







Timeline for a Wind Turbine

Phase	DEVELOPMENT		PRE-CONSTRUCTION	CONSTRUCTION
Activity	Environmental planning & permitting, feasibility studies, wind assessment.	Grid & building permits, site layout, technology review.	Site conditioning, detailed design, procurement, financial close.	Construction and commissioning, grid connection
Time