Wind Power Investment

Another *Gust Gurus* Analysis

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AvanGrid and Vestas are currently the best wind sector investments.

1. **Wind Power Companies: AvanGrid Renewables LLC**

   3rd Largest Wind Power Producer

   Solid performer across six crucial metrics

2. **Turbine Manufacturers: Vestas**

   2nd Largest Manufacturer

   Solid performer across five crucial metrics

The most favourable investment options are Avangrid Renewables LLC & Mid American Energy Co.

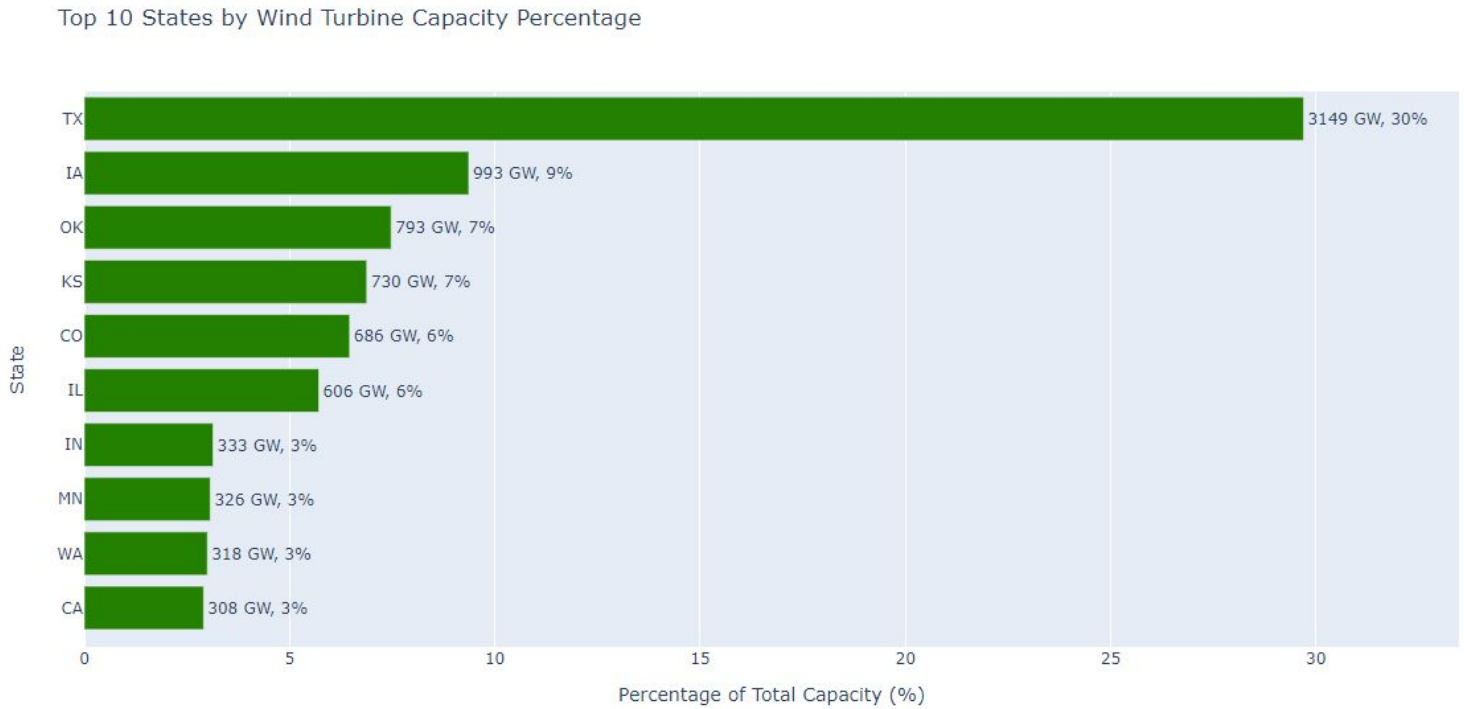
	Wind Power Generation	Turbine Capacity	Retrofit Proportion	Diversification	Efficiency	Geographic Diversification	Total Weighted Score
Capricorn Ridge Wind LLC	20	10	15	5.5	22.5	13.5	86.5
AE Power Services LLC	15	8	6	5.5	20	9	63.5
Public Service Co of Colorado	22.5	9	3	5.5	7.5	13.5	61
FPL Energy	5	5	13.5	5.5	25	6	60
RWE Renewables Americas LLC	10	3	9	5.5	17.5	9	54
Southern Power Co	25	7	3	5.5	2.5	9	52
Invenergy Services LLC	17.5	6	3	5.5	15	3.8	50.8
EDF Renewable	12.5	4	7.5	5.5	12.5	3.8	45.8
Mid American Energy Co	2.5	2	12	5.5	5	13.5	40.5
Avangrid Renewables LLC	7.5	1	10.5	5.5	10	1.5	36

Source: U.S. Wind Turbine Database

Note: Weightings = Wind Power Generation 25%, Turbine Capacity 10%, Retrofit Proportion 15%, Diversification 10%, Efficiency 25% & Geographic Diversification 15%

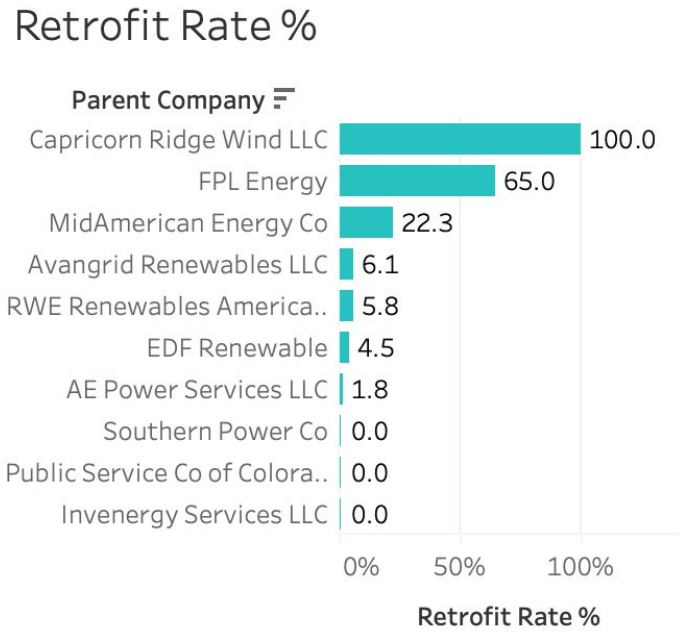
A lower total weighted score is the best outcome

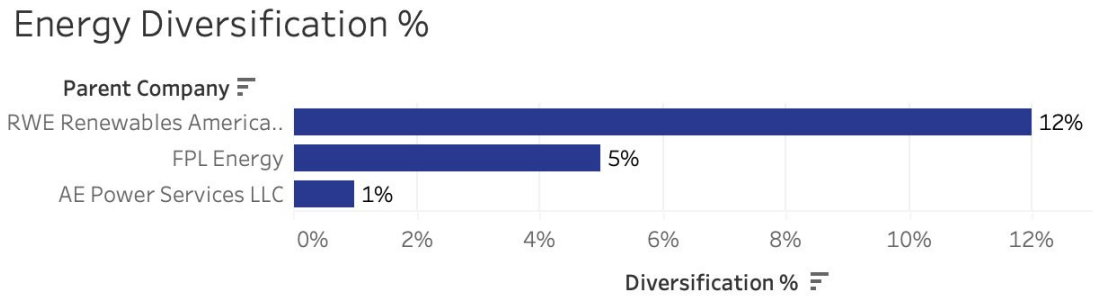
The data shows high capacity sites are agnostic to socio-economics and demographics; but can be based on environmental suitability, state policies, and infrastructure availability.



Total Wind Turbine Capacity in the USA: 10,601 GW

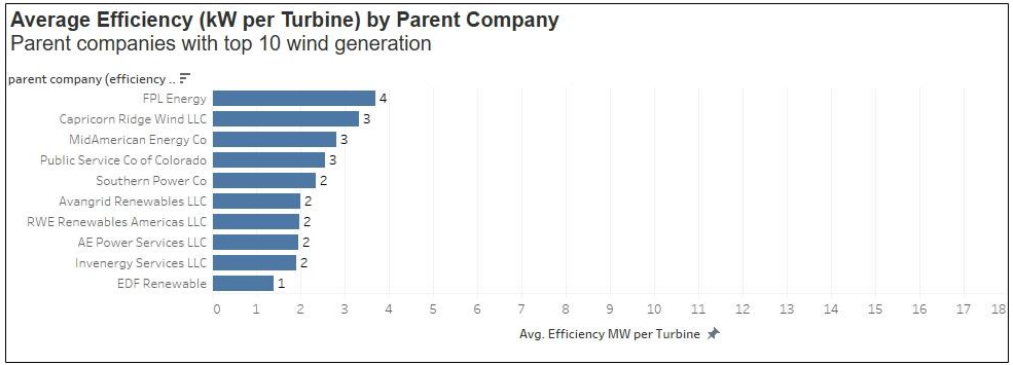
Capricorn's 100% turbine retrofit rate could indicate high future maintenance costs; RWE leads only a small number of companies in Energy Diversification

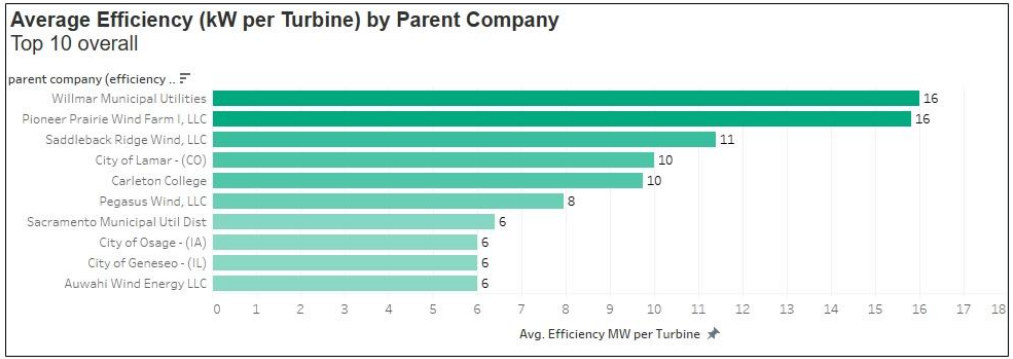




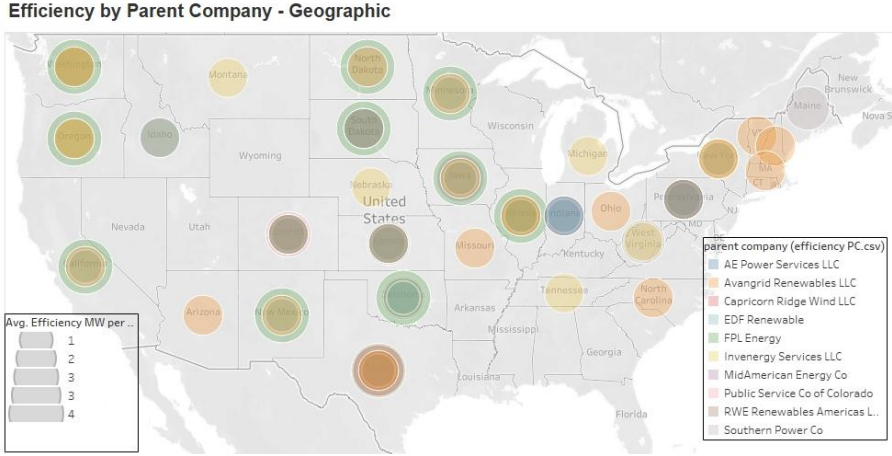
*RWE Energy portfolio includes: wind, hydro & solar energies, *FPL: Natural Gas, nuclear, solar, *AE Power Services: unknown

Top 10 companies shortlisted for investment were not necessarily the most efficient. FPL was the most efficient company in our shortlist for investment (MW per turbine).





Of the 10 shortlisted companies (based on total wind power generated), **FPL Energy was more efficient than the rest**. FPL also had a widespread national presence.



Companies with the **highest efficiency per turbine** were not necessarily the ones that were shortlisted for the comparison matrix – for this, other factors such as total wind power generation, turbine capacity, retrofit proportion, and national presence factored heavily into the equation.

We recommend Vestas as the best OEM for investment based on five key metrics of analysis.

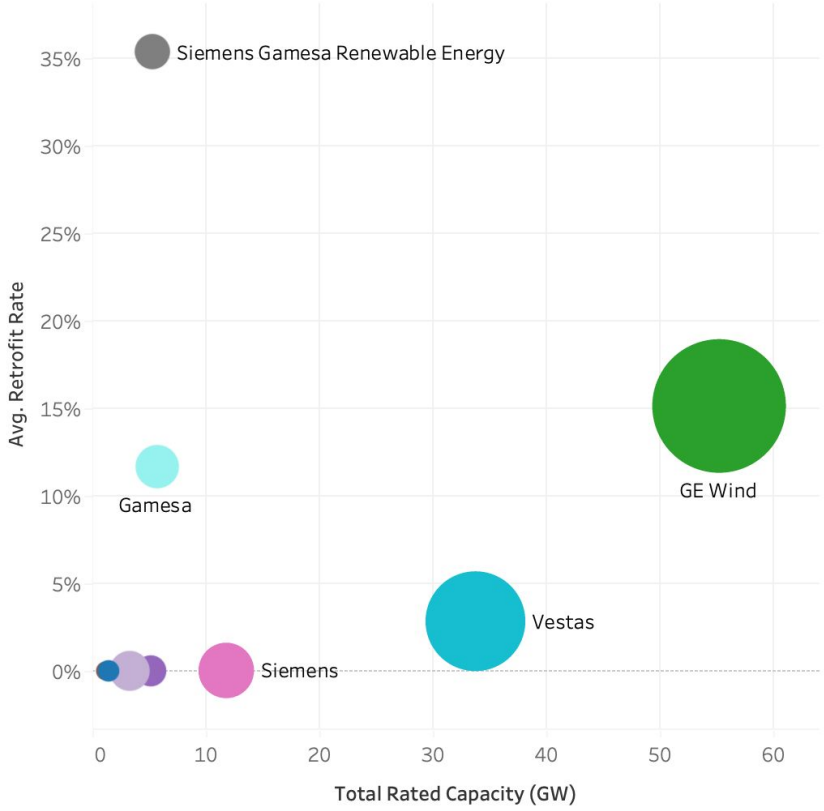
OEM	Wind Power	Turbine Capacity	Retrofit Rate	Efficiency	Diversification	Total Score
Acciona	20.0	9.0	5.2	22.5	15.0	71.7
REpower	25.0	10.0	5.2	12.5	13.5	66.2
Mitsubishi	15.0	7.0	5.2	25.0	12.0	64.2
Suzion	22.5	8.0	5.2	15.0	6.8	57.5
Siemens Gamesa	12.5	5.0	15.0	5.0	9.0	46.5
Nordex	17.5	6.0	5.2	2.5	10.5	41.7
GE Wind	2.5	1.0	13.5	17.5	1.5	36.0
Vestas	5.0	2.0	10.5	10.0	3.0	30.5

Note: Each criterion represents a inverse weightage based on underlying data analyzed below. Lower scores are preferable. Possible total range is 9 to 90.

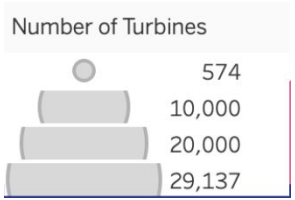
Source: USGS Wind Turbine Database and Form EIA-923, US Energy Information Administration

Despite GE Wind topping in total capacity, Vestas leads with second largest market presence with only a 3% retrofit rate

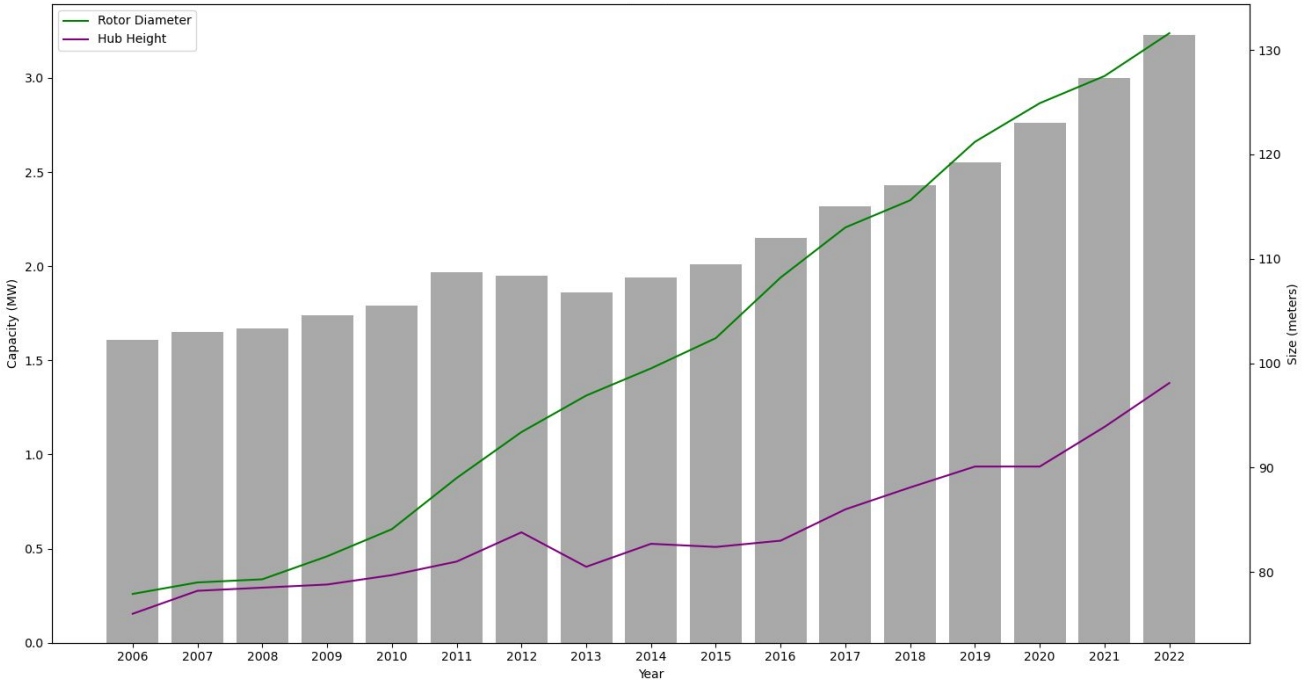
Top 10 Manufacturers and Retrofit Rate



- GE Wind has a **15% retrofit rate**
- **Vestas has only a 3% rate**
- Siemens Gamesa has the highest rate of retrofit



Rotor diameters of Turbines increases with time.



Source: ACP, Berkeley Lab

Assumptions, limitations and caveats:

- **We have limited data on financial viability, climate and weather data, environmental impact and government policy**
- **Most recent data was from 2021.**

Financial viability – Cost of maintenance/ Return on investment

- We don't know the exact cost of retrofit for a turbine. So, we can't put a dollar amount on the ongoing cost of maintaining a power plant. While there is data on whether a turbine has been retrofitted, the extent and effectiveness of these retrofits are not detailed.
- We know the year each turbine was put into service, but there were too many nulls in the retrofit year – hence, we weren't able to calculate the time to retrofit, which would have been a useful metric.
- Operating costs aside, we also don't have financial metrics to calculate profitability, return on investment, debt levels.

Recent climate and weather data by location

The most recent year in the data is 2021. As the data does not cover the current year, it limits the accuracy with which we can make projections for market demand and future efficiency of wind farms. Weather data by state would have been highly pertinent to the analysis, particularly due to recent extreme weather events in the US. We could view performance of the wind farms on a time scale in tandem with changing weather patterns. We are currently assuming that these weather patterns have been consistent since 2021.

Environmental Impact

While there is some information in the data set on impact of turbines on birds and airplanes, we didn't cover it in the analysis. Also, more information on environmental impact of turbines would be good to assess long-term sustainability of projects.

Government Policy

There was no information on policy covering regulation of wind farms in the various states.

AvanGrid Renewables LLC and Vestas stand out as leaders in their respective areas, offering promising investment opportunities.

AvanGrid Renewables LLC:

- Positioning: 3rd Largest Wind Power Producer.
- Performance: Excelling in six crucial metrics like:
  - Wind Power Generation,
  - Turbine Capacity,
  - Retrofit Proportion,
  - Diversification,
  - Efficiency &
  - Geographic Diversification

demonstrating robust operational efficiency and market presence.

Vestas:

- Ranking: 2nd Largest Turbine Manufacturer.
- Performance: Strong across five crucial metrics like:
  - Wind Power,
  - Turbine Capacity,
  - Retrofit Rate,
  - Efficiency &
  - Diversification

showcasing industry-leading manufacturing capabilities and innovation.