

Choosing the Optimal Wind Turbine for Investment

Comparing capacity, efficiency, and long-term reliability of global turbine models.

By Sustainable Analytics Company

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AGENDA

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INTRODUCTION

At **Sustainable Analytics Company**, our data analysis team is at the forefront of driving investment success in the renewable energy sector. Comprising experts in data science, finance, and engineering, we specialize in conducting in-depth analyses.

Our team utilizes advanced analytical tools and methodologies to evaluate market trends, assess project risks, and identify opportunities for growth. We gather and interpret data related to energy production, operational efficiency, and financial performance, providing clients with actionable insights tailored to their investment goals.



CASE STATEMENT

Mr. Ahmed Fakhr approached us, the “Sustainable Analytics Company” to acquire a wind turbine facility and capitalize on the growing demand for renewable energy.

To help him in the decision-making, we have provided a detailed summary of data-driven analysis of leading global turbine manufacturers and the **highest market share** in the industry, as well as an evaluation of the **best-performing turbine models** based on the following:

- Energy Output
- Specifications of the turbine model
- Maintenance Requirements

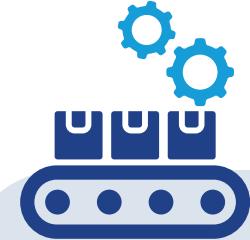
Together, we aim to provide comprehensive insights that align with both investment goals and ecological sustainability.

DATA SUMMARY



65K

TOTAL CASES



62

TOTAL MANUFACTORS



313

TOTAL MODELS



1998 - 2019

TIME LINE



1919 kW

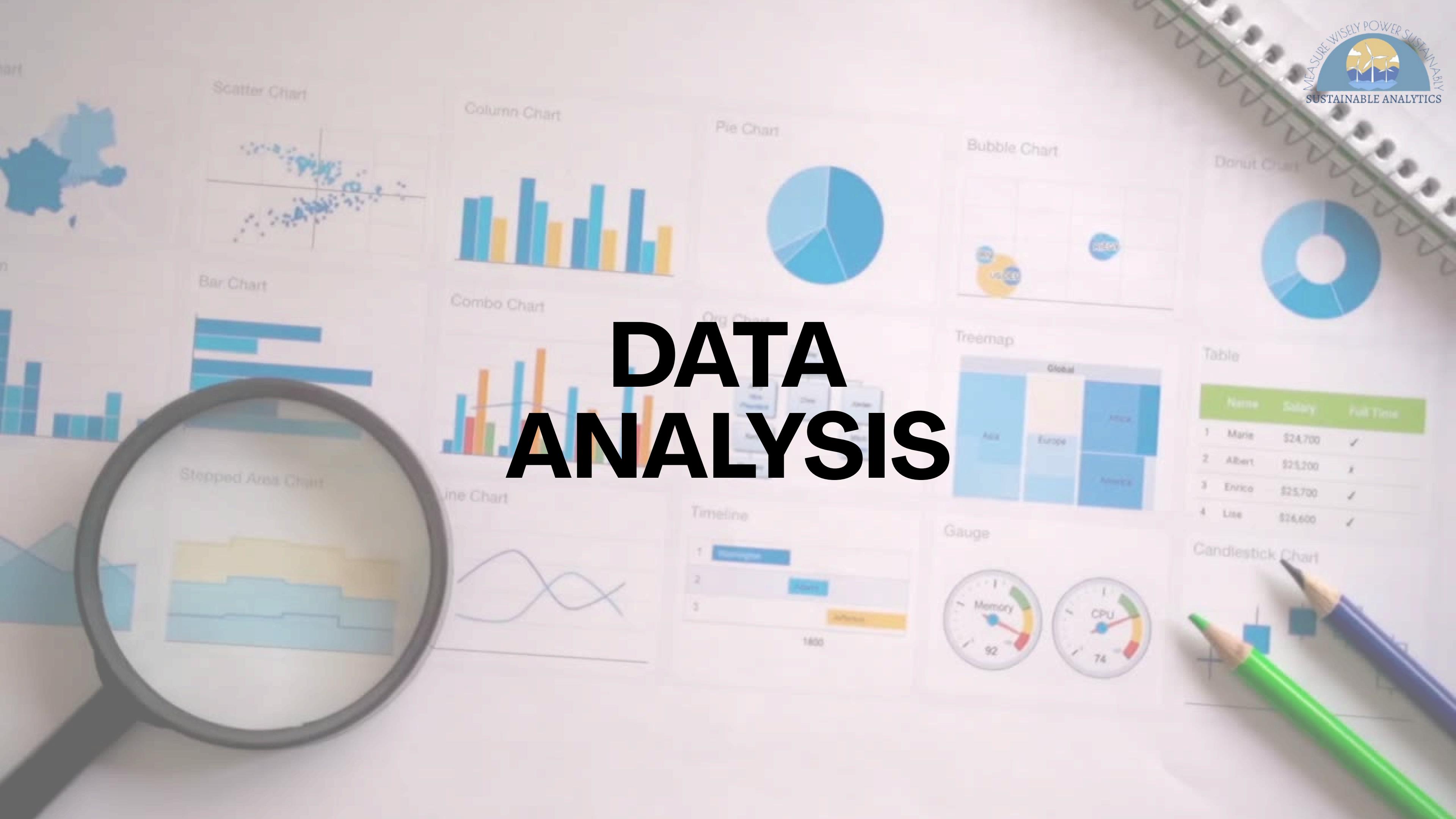
AVERAGE CAPACITY



12 YEARS

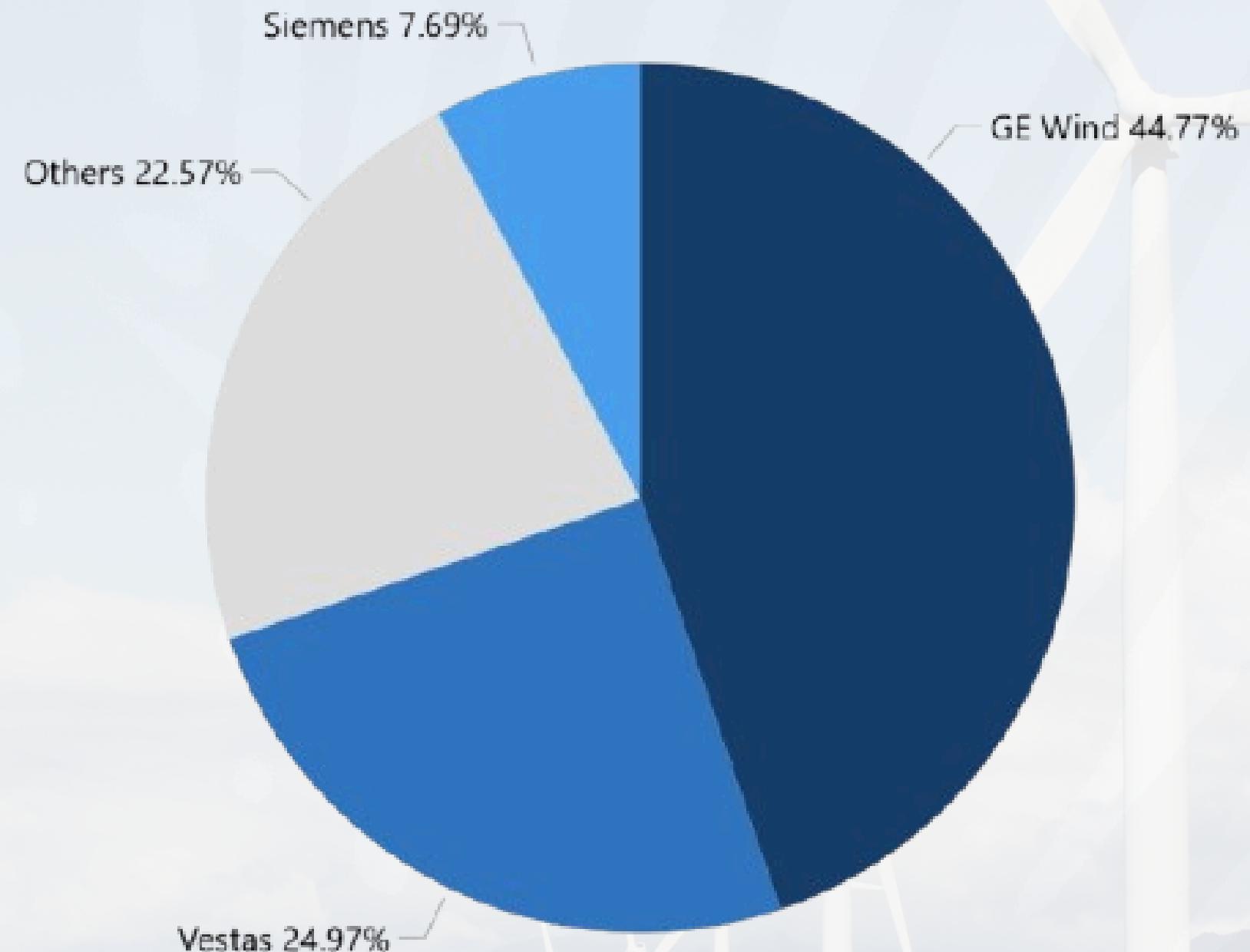
AVERAGE MAINTENANCE LIFESPAN

DATA ANALYSIS



Manufacturers Market Share

Market Distribution of Manufacturers

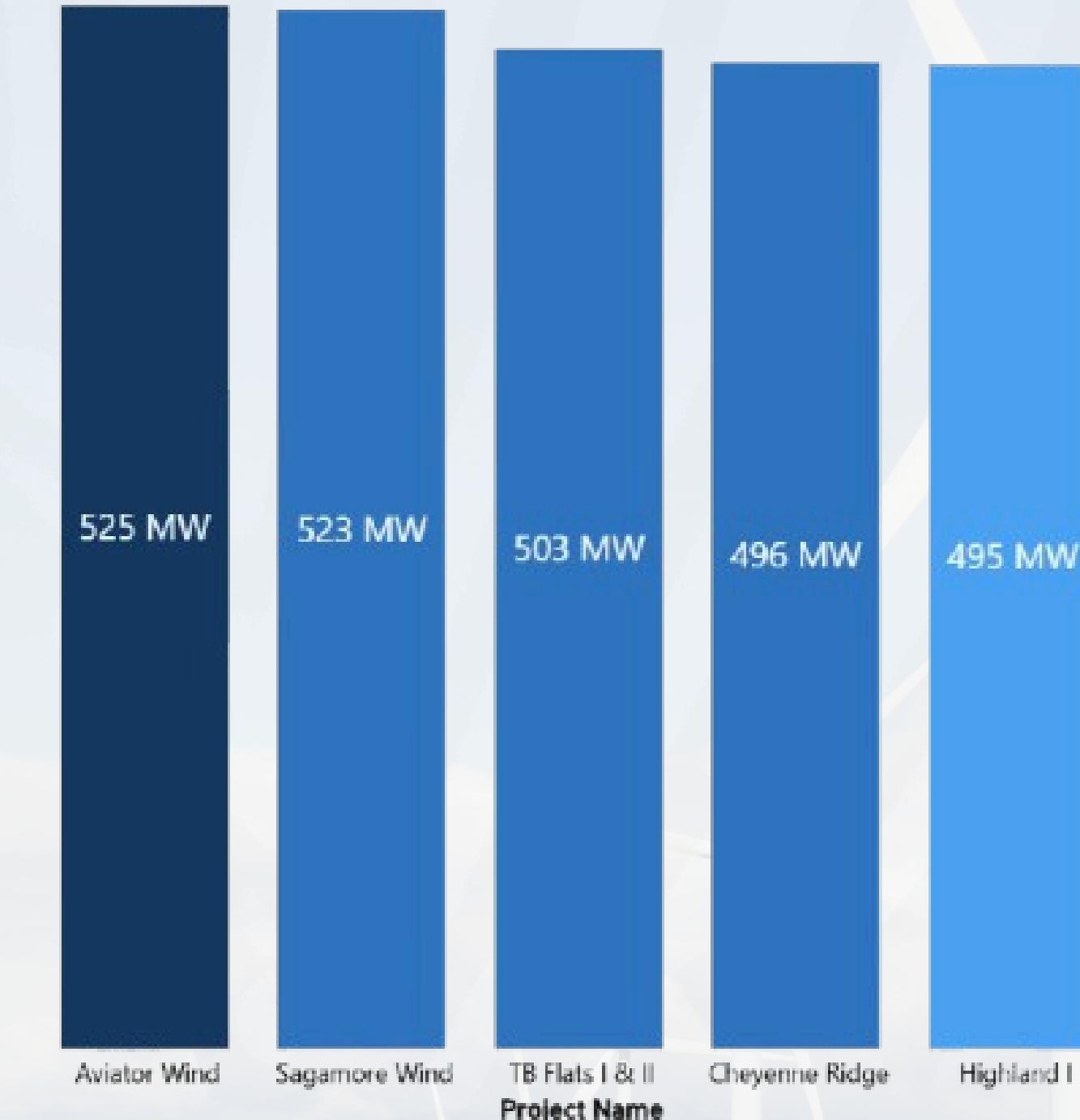


GE Wind; Total of 29K, most popular in Texas (8K).
Vestas; Total of 16K, also most popular in Texas (3K).

Manufacturers Market Share

Top 5 Wind Power Projects by Cumulative Capacity

Manufacturers ● GE Wind ● Siemens ● Vestas



The Top 3 manufacturers were solely responsible for the Top 5 Wind Power Projects with the highest cumulative capacity!

Expectation Maintenance Period



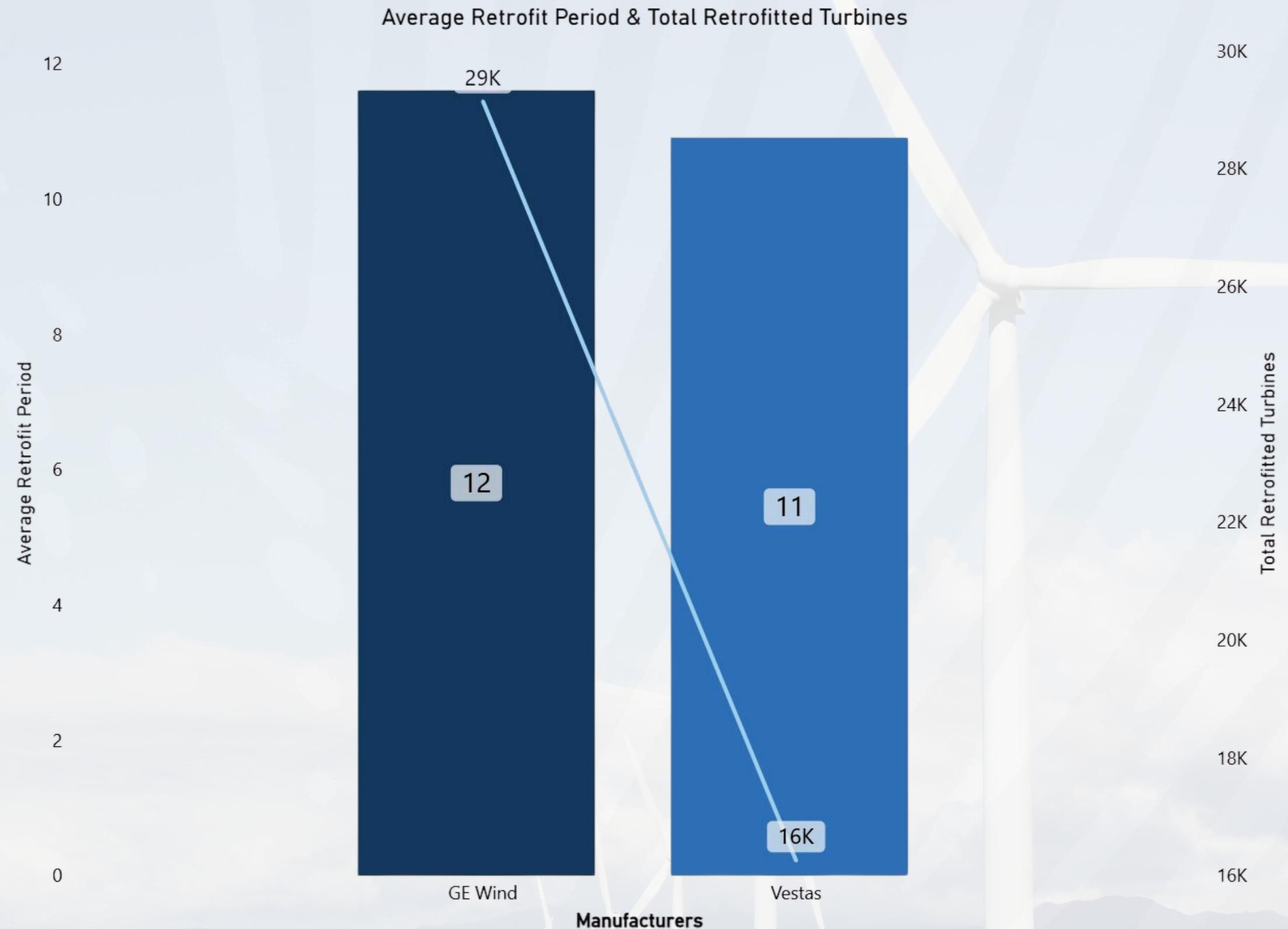
Retrofit History

Manufacturers ● GE Wind ● Vestas



In our data, the earliest wind project of Vestas was in 1982, while GE Wind's earliest project was in 2001; hence the gap in the retrofit timeline!

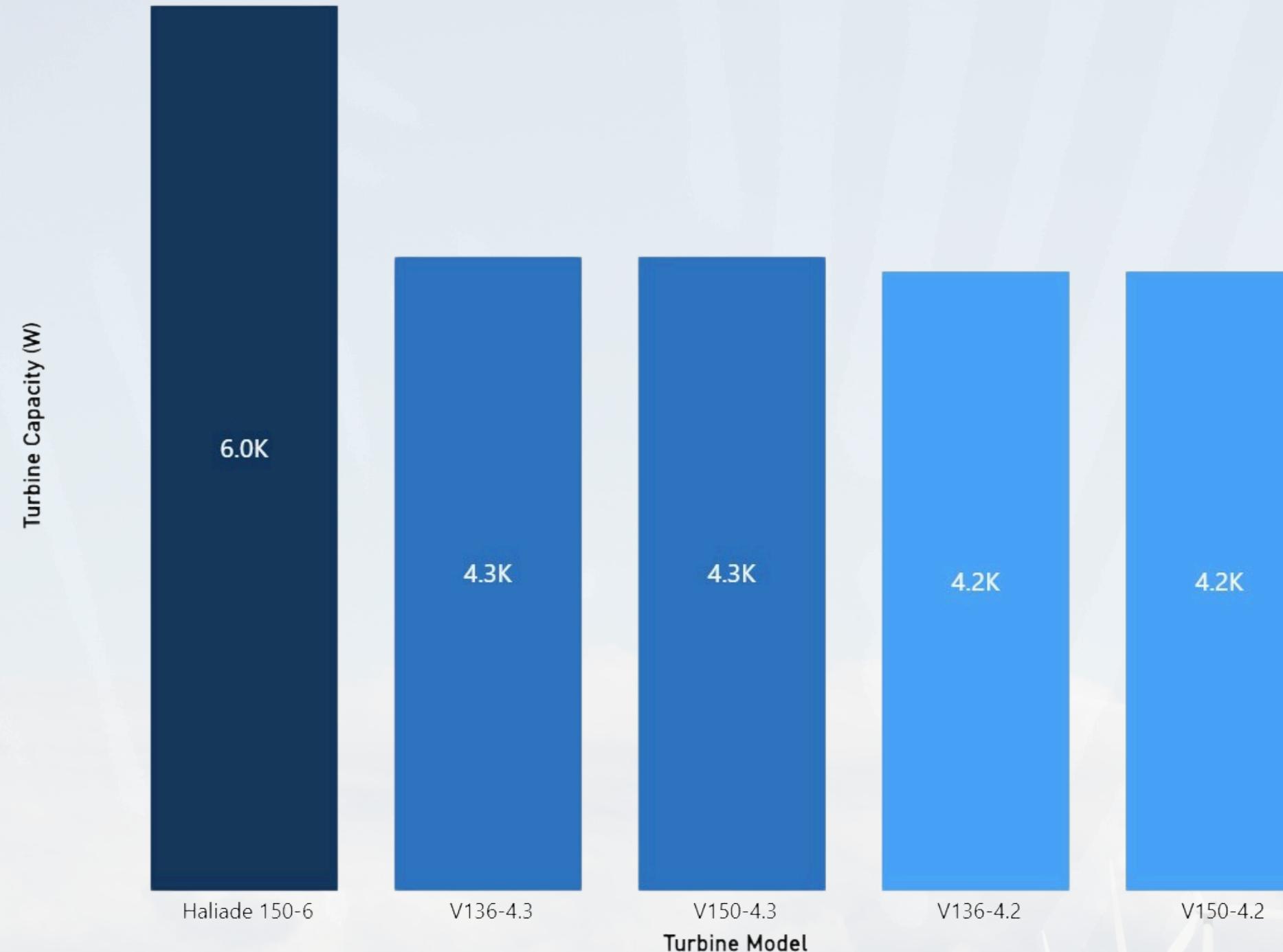
Expectation Maintenance Period



Average lifespan of a Wind Turbine: 20 years.
Meaning it takes either Manufacturer more than half the average lifespan until needing to retrofit!

Top Performing Turbine Models

Top 5 Wind Turbine Models by Capacity



Turbine Model Specifications

Haliade 150-6

150m	106m	181m
Rotor Diameter	Hub Height	Total Height

V136-4.2

136m	105m	173m
Rotor Diameter	Hub Height	Total Height

V136-4.3

136m	105m	173m
Rotor Diameter	Hub Height	Total Height

V150-4.2

150m	105m	180m
Rotor Diameter	Hub Height	Total Height

V150-4.3

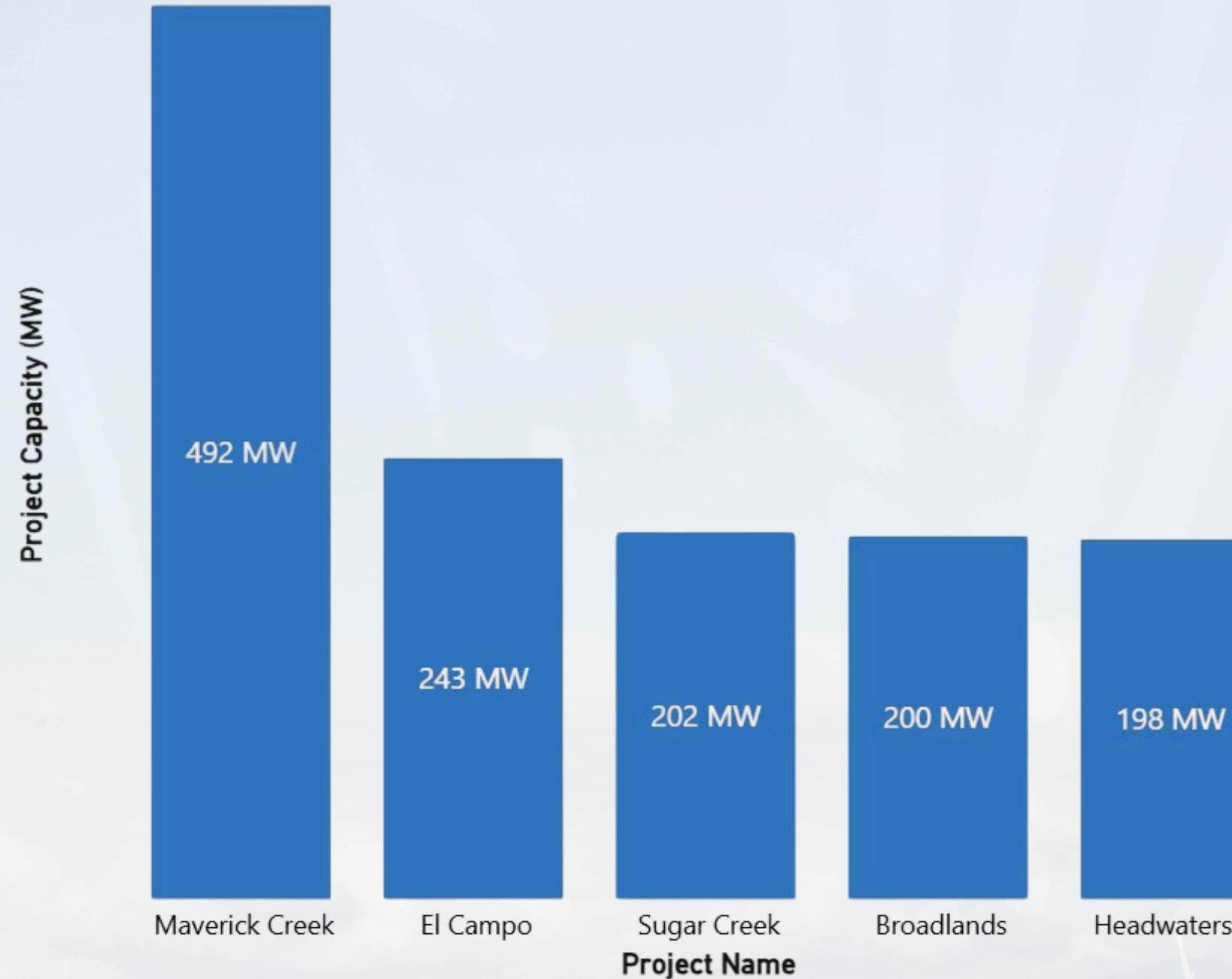
150m	105m	180m
Rotor Diameter	Hub Height	Total Height

Among the Top 5 Wind Turbines by capacity, GE Wind's Haliade Model is leading in 1st place, while Vestas's models have secured the 2nd to 5th leading positions.

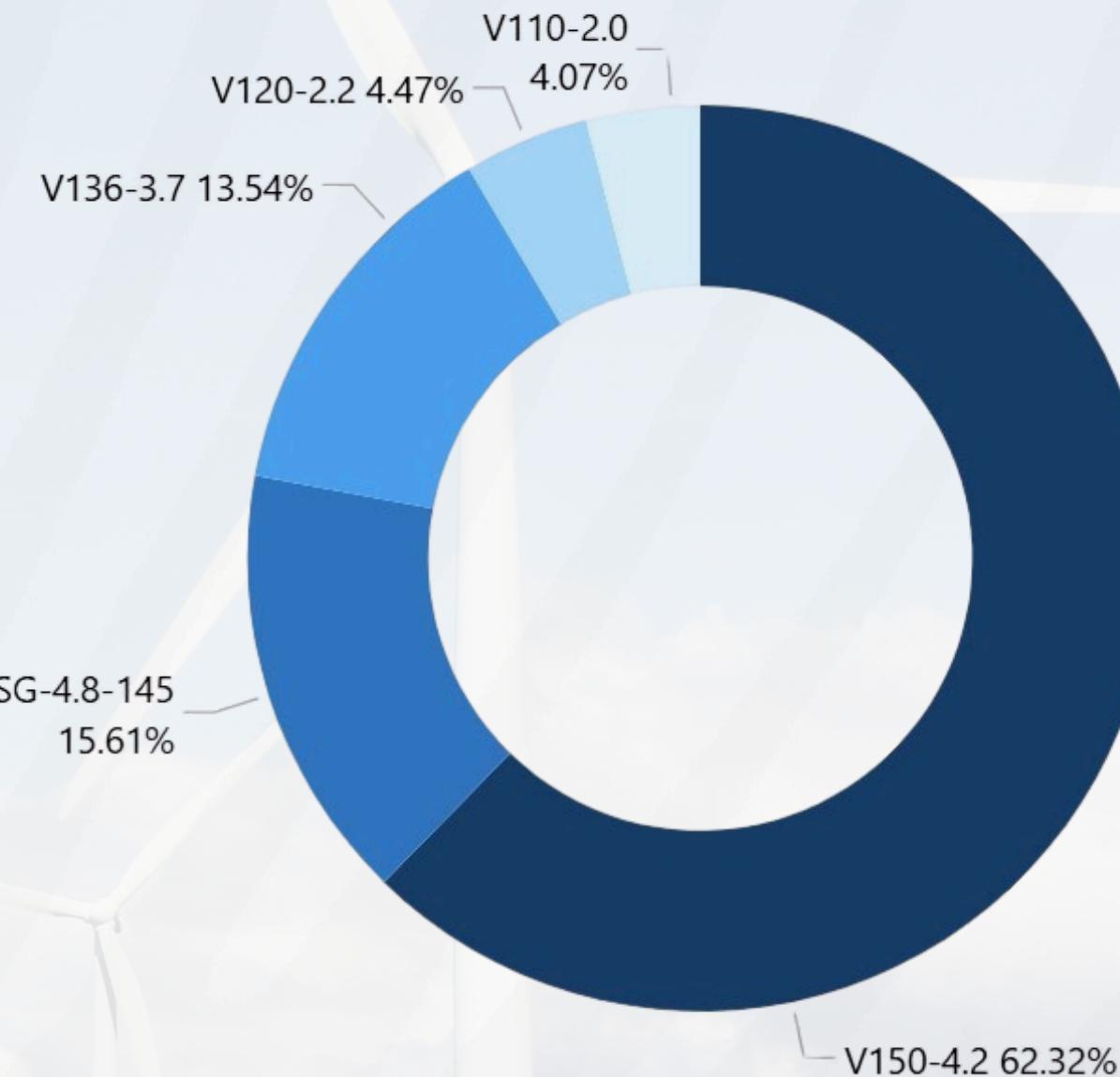
Top Performing Turbine Models



Top 5 Wind Power Projects by Cumulative Capacity
(Including our Top 5 Turbine Models)

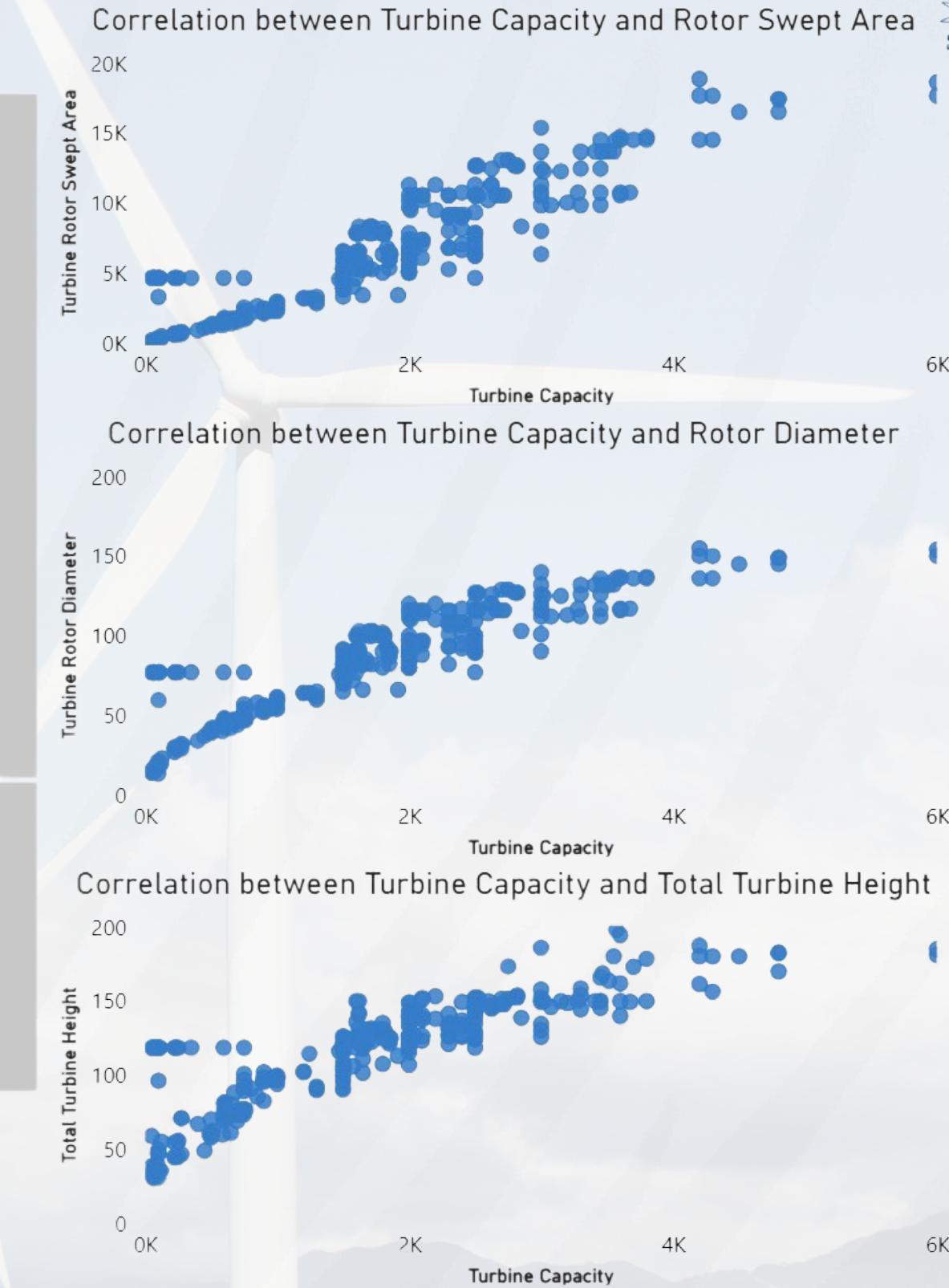
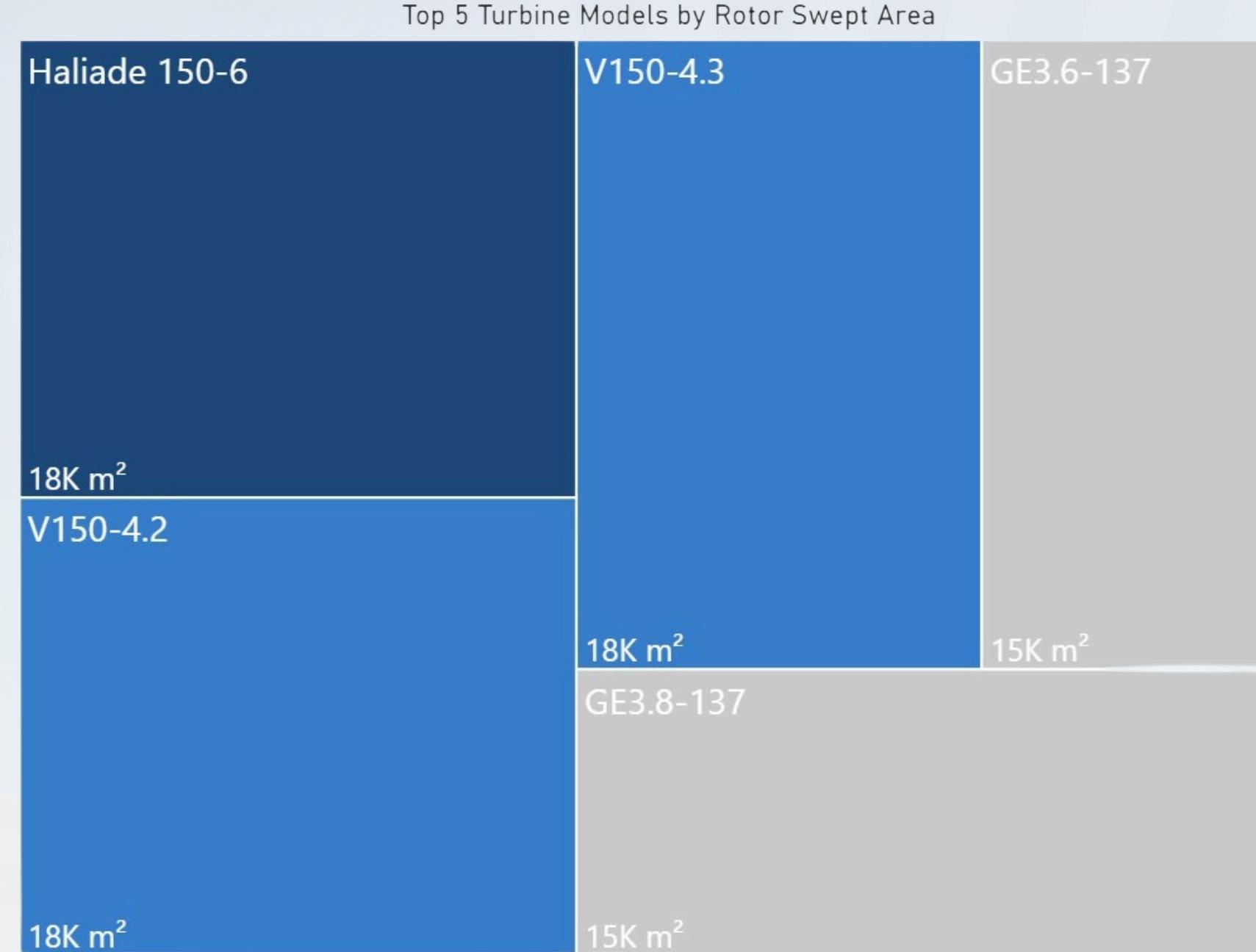


Turbine Model Capacity Share in the Maverick Creek Project



The Maverick Creek Project had the 6th highest cumulative capacity.
Vestas' V150-4.2 Turbine Model contributed around 62% of that capacity!

Influential Factors on Turbine Energy Generation



Rotor Swept Area, Rotor Diameter, and Total Turbine Height are all positively correlated with Turbine Capacity!

RECOMMENDATIONS



Vestas®

“LEADING MANUFACTURERS”

RECOMMENDATIONS



Haliade 150-6



Total Height: 181m

Height: 106m

Rotor Diameter: 150m

Rotor Swept Area: 18Km²

Capacity: 6KW

Turbine Type: offshore



V150-4.2



Total Height: 180m

Height: 105m

Rotor Diameter: 150m

Rotor Swept Area: 18Km²

Capacity: 4.2KW

Turbine Type: onshore

LIMITATIONS



Many Null Values for the Retrofit History

Limited the scope of turbine maintenance analysis.



Lack of Energy Ratio Factors

Factors that influence power generation of turbines (wind speed and air density).



Lack of Actual Energy Output

Data analysis was performed based on ideal power generation scenario.



THANK YOU