“Electric Vehicle Population Analysis using Tableau”

PROJECT REPORT

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Introduction

Electric Vehicles (EVs) are transforming the global automobile industry. Unlike traditional vehicles powered by fossil fuels, EVs run on electricity, making them cleaner and more sustainable. They play a crucial role in reducing greenhouse gas emissions, lowering dependency on oil, and supporting the shift toward renewable energy.

Over the past decade, EV adoption has grown rapidly due to:

- **Technological advancements** → higher battery capacity, improved range.
- **Government policies & incentives** → subsidies, tax benefits, and CAFV eligibility.
- **Consumer demand** → increasing awareness of environmental impact and fuel savings.

This project uses a dataset of **150,000+ registered EVs** to analyze:

- Growth trends over the years.
- The balance between **Battery Electric Vehicles (BEVs)** and **Plug-in Hybrid Electric Vehicles (PHEVs)**.
- The role of **states, manufacturers, and models** in shaping adoption.
- The impact of **CAFV incentives** on consumer choices.
- 👉 ***In short, this project provides a data-driven understanding of how EVs are spreading, which brands are leading, and where adoption is strongest.***

Project Objectives

1. Measure the **total EV population**.
2. Compare **Battery Electric Vehicles (BEV) vs Plug-in Hybrid Electric Vehicles (PHEV)**.
3. Analyze **EV adoption trends by model year**.
4. Identify **top states, makes, and models**.
5. Assess impact of **CAFV (Clean Alternative Fuel Vehicle) eligibility**.

KPI’S Requirement

1. Total Vehicles:

- ❏ Understand the overall landscape of electric vehicles, encompassing both BEVs and PHEVs, to assess the market's size and growth.

2. Average Electric Range:

- ❏ Determine the average electric range of the electric vehicles in the dataset to gauge the technological advancements and efficiency of the EVs.

3. Total BEV Vehicles and % of Total BEV Vehicles:

- ❏ Identify and analyze the total number of Battery Electric Vehicles (BEVs) in the dataset.
- ❏ Calculate the percentage of BEVs relative to the total number of electric vehicles, providing insights into the dominance of fully electric models.

4. Total PHEV Vehicles and % of Total PHEV Vehicles:

- ❏ Identify and analyze the total number of Plug-in Hybrid Electric Vehicles (PHEVs) in the dataset.
- ❏ Calculate the percentage of PHEVs relative to the total number of electric vehicles, offering insights into the market share of plug-in hybrid models.

Charts Requirements

1.Total Vehicles by Model Year (From 2010 Onwards):

- ❏ Visualization: Line/ Area Chart
- ❏ Description: This chart will illustrate the distribution of electric vehicles over the years, starting from 2010, providing insights into the growth pattern and adoption trends.

2. Total Vehicles by State:

- ❏ Visualization: Map Chart
- ❏ Description: This chart will showcase the geographical distribution of electric vehicles across different states, allowing for the identification of regions with higher adoption rates.

3. Top 10 Total Vehicles by Make:

- ❏ Visualization: Bar Chart
- ❏ Description: Highlight the top 10 electric vehicle manufacturers based on the total number of vehicles, providing insights into the market dominance of specific brands.

4. Total Vehicles by CAFV Eligibility:

- ❏ Visualization: Pie Chart or Donut Chart
- ❏ Description: Illustrate the proportion of electric vehicles that are eligible for Clean Alternative Fuel Vehicle (CAFV) incentives, aiding in understanding the impact of incentives on vehicle adoption.

5. Top 10 Total Vehicles by Model:

- ❏ Visualization: Tree map
- ❏ Description: Highlight the top 10 electric vehicle models based on the total number of vehicles, offering insights into consumer preferences and popular models in the market.

Dataset Overview

- **Source:** ***Electric_Vehicle_Population_Data.csv***
- **Records: 1,50,413**
- **Columns: VIN, Make, Model, Year, EV Type, Electric Range, State, CAFV Eligibility, etc.**
- **Tools Used: Tableau Desktop Public Edition**

Key Metrics (KPIs)

- Total Vehicles: 1,50,413
- Avg. Electric Range: 67.83 miles
- BEVs: 1,16,745 (77.6%)
- PHEVs: 33,668 (22.4%)

📌 Insight: *Fully electric vehicles dominate the dataset.*

Adoption Trend – By Model Year

- From 2011 → 2023, steady growth observed.
- 2011: ~800 vehicles
- 2023: 37,100 vehicles (highest in dataset).
- 2024 has incomplete data (~600 vehicles).

📌 Insight: *Sharp growth in EV adoption in the last 5 years.*

EVs by State

- Washington dominates dataset (most vehicles recorded).
- California has strong adoption: **15,012 vehicles**.
- Other states have smaller numbers.

📌 **Insight:** ***Adoption is concentrated in a few states with strong EV policies.***

Top 15 Makes

- **Tesla:** 68,939 (48.15%)
- **Nissan:** 13,497 (9.43%)
- **Chevrolet:** 12,024 (8.40%)
- **Ford:** 7,601 (5.31%)
- Others: BMW, Kia, Toyota, Volkswagen, Volvo.

📌 **Insight:** ***Tesla dominates with nearly half of all EVs***.

Top Models

- **Tesla Model Y:** 28,501 (18.95%)
- **Tesla Model 3:** 27,082 (18.0%)
- Nissan Leaf and Chevrolet Bolt also popular.

📌 **Insight:** ***Tesla's Model Y and Model 3 lead the market.***

Interactive Features (Filters)

- **Filters Used in Dashboard:**
  - Model Year
  - Make
  - EV Type (BEV / PHEV)
  - State
- **Why Important?**
  - Makes dashboard **interactive**.
  - Helps answer specific questions.
  - Example: *“How many Teslas were registered in California after 2020?”*

📌 ***Filters make the dashboard flexible and user-friendly.***

Insights & Findings

- EV adoption is **steadily increasing**, especially after 2017.
- **BEVs are preferred** over PHEVs.
- **Tesla is the market leader** in both make and model.
- Adoption is **concentrated in a few states**.
- **CAFV incentives** encourage adoption but more data is needed.

Conclusion

The analysis of **150,000+ Electric Vehicles (EVs)** provides valuable insights into adoption patterns and market trends:

- 📈 **Adoption Growth:** EV usage has steadily increased since 2011, with a sharp rise in the last five years, showing consumer confidence in clean technology.
- ⚡ **BEVs Lead the Market:** Battery Electric Vehicles make up nearly **78%** of the dataset, highlighting a shift away from hybrid dependence.
- 🚗 **Tesla Dominance:** Tesla emerges as the **undisputed market leader**, both in terms of total vehicles and top-selling models (Model Y & Model 3).
- 🌍 **Geographic Concentration:** Adoption is highest in **states like Washington and California**, showing the impact of supportive state policies and infrastructure.
- 🎯 **Policy Influence:** Nearly **42% of vehicles qualify for CAFV incentives**, confirming that **government policies play a crucial role** in accelerating EV adoption.

👉 **Final Thought:**

This project clearly shows that EVs are not just a trend, but the **future of transportation**. As technology advances, battery ranges improve, and infrastructure expands, EV adoption will continue to grow — paving the way for a **greener, cleaner, and more sustainable future.**

ELECTRIC VEHICLE DATA ANALYSIS

(CAFV) Eligibility
(All)

EV Type
(All)

Model
(All)

State
(All)

Total Vehicles
150,413

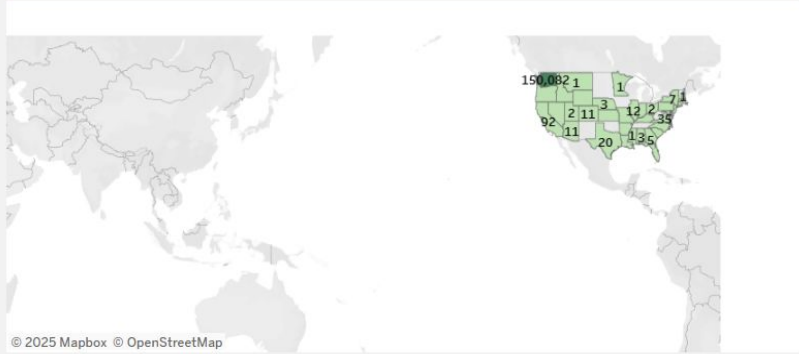
Avg Electric Range
67.83 Miles

Total BEV Vehicles
116,745
% of Total :77.6%

Total PHEV Vehicles
33,668
% of Total :22.4%

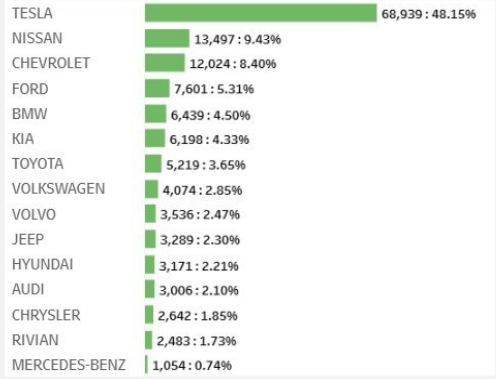
Total Vehicles by Model Year

Total Vehicles by State

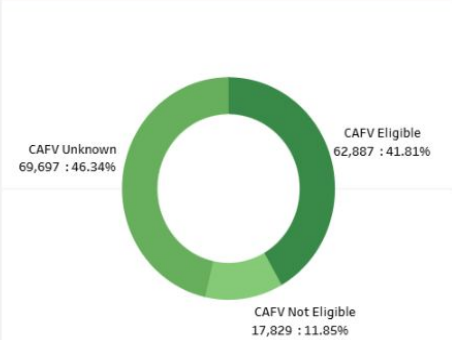


Top 15 Total Vehicles by Make

Top N 1



Total Vehicles by CAFV Eligibility



Total Vehicles By Model

Model	Make	EV Type	Total Vehicles	% of Total
MODEL Y	TESLA	BEV	28,501	18.95%
MODEL 3	TESLA	BEV	27,708	18.42%
LEAF	NISSAN	BEV	13,187	8.77%
MODEL S	TESLA	BEV	7,609	5.06%
BOLT EV	CHEVROLET	BEV	5,732	3.81%
MODEL X	TESLA	BEV	5,114	3.40%
VOLT	CHEVROLET	PHEV	4,890	3.25%
ID.4	VOLKSWAGEN	BEV	2,999	1.99%
NIRO	KIA	BEV	1,854	1.23%
		PHEV	1,022	0.68%
PACIFICA	CHRYSLER	PHEV	2,642	1.76%
WRANGLER	JEEP	PHEV	2,626	1.75%
MUSTANG MACH-E	FORD	BEV	2,619	1.74%
PRIUS PRIME	TOYOTA	PHEV	2,527	1.68%