Electric Vehicle Market Analysis Report

Prepared by: Srishti Patil & Tanush Bhaskar Shetty

1. The Dataset

The initial data set contained some variables that needed cleaning. We removed null values for City, County, Postal code, Legislative District and other key attributes.

The key columns utilized for the analysis are state, county, model, make & CAFV eligibility.

Data Source : https://www.kaggle.com/datasets/ratikkakkar/electric-vehicle-population-data

2. Problem Statement

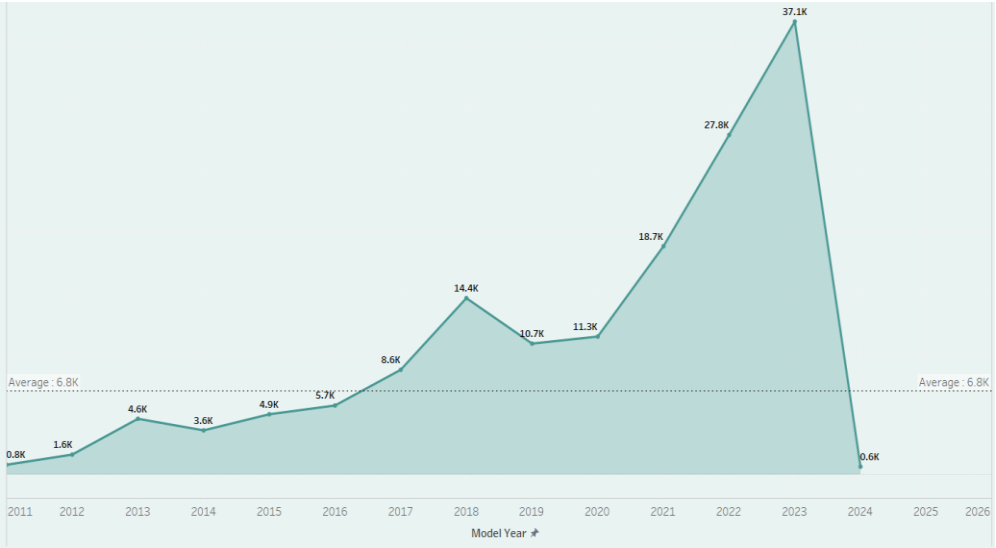
The analysis focuses on key performance indicators (KPIs) and visualizations to assess the current landscape and trends in electric vehicles (EVs), including both **Battery Electric Vehicles (BEVs)** and **Plug-in Hybrid Electric Vehicles (PHEVs)**.

3. Key Performance Indicators (KPIs)

1. **Total Vehicles**:
    - Provides the overall count of electric vehicles (EVs), highlighting market size and growth potential.
    - Includes differentiation between **BEVs** and **PHEVs**.
2. **Average Electric Range**:
    - Measures the technological advancements and efficiency of EVs based on their electric range.
3. **BEV vs. PHEV Analysis**:
    - Total BEV vehicles and total PHEV vehicles analyzed to understand consumer preferences for fully electric vehicles versus hybrid solutions.

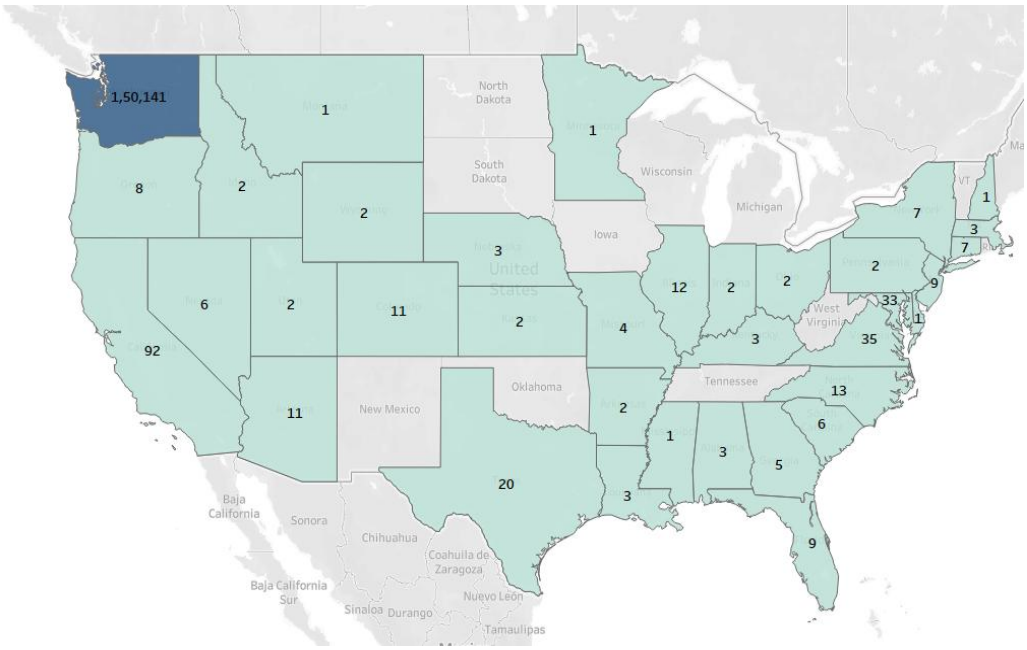
4. Data Analysis and Insights

4.1. Total Vehicles by Model Year



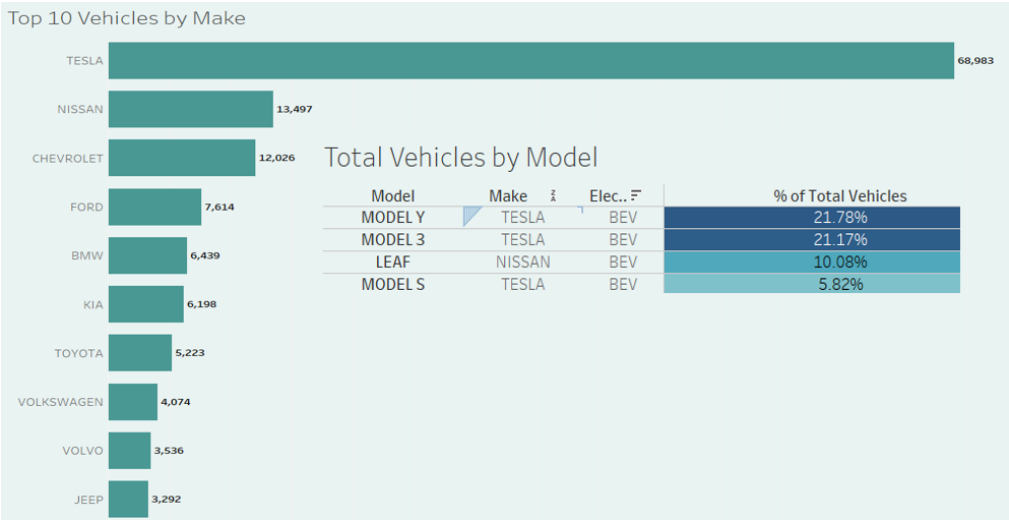
- **Trend**: EV adoption accelerated significantly post-2010, peaking in **2023** with **37,079 vehicles**.
- **Growth**:
    - Early years (1996–2009) showed minimal EV adoption.
    - Between 2010–2016, a steady rise occurred, crossing **8,500 vehicles in 2016**.
    - **Exponential Growth**: From **2018–2023**, adoption surged rapidly, reflecting increased availability and consumer acceptance.

4.2. Total Vehicles by State



- **Geographic Concentration**:
    - **Washington State** leads with **1,150,141 vehicles**, showing significant adoption.
    - Other states like **Texas (20)** and **Virginia (35)** also contribute prominently.
- **Observation**: Central and northern states display much lower adoption, suggesting uneven geographic distribution.

4.3. Market Dominance and Consumer Preferences

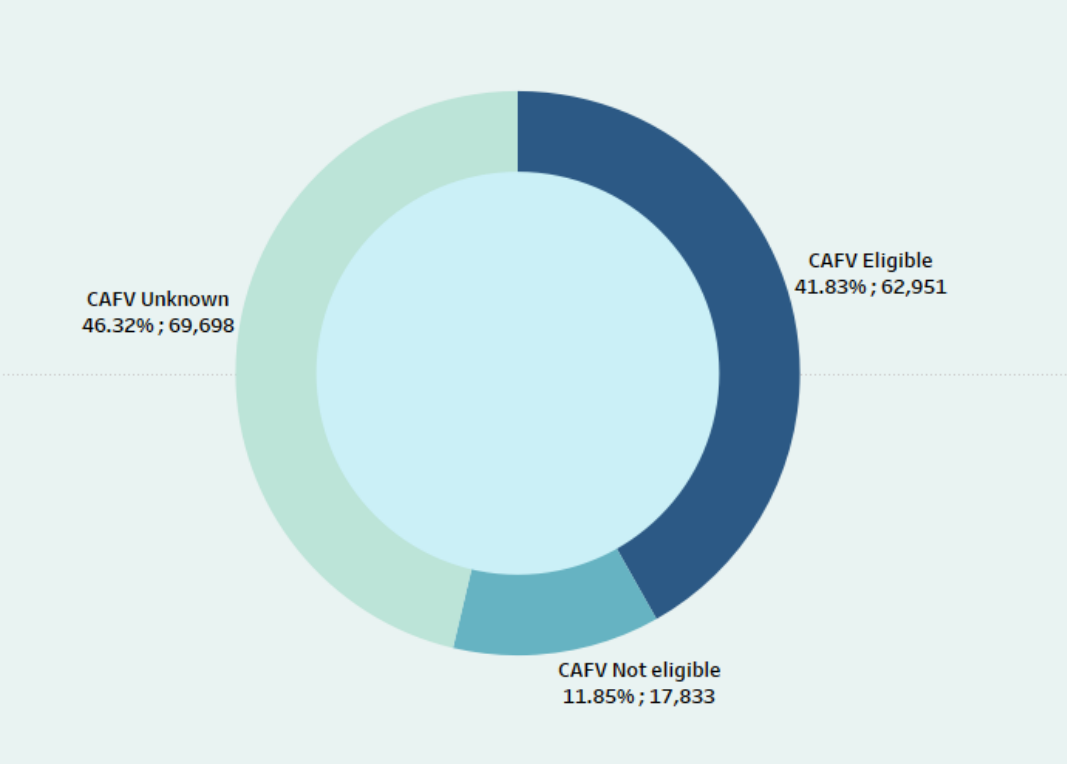


Top Vehicle Makes:

- **Tesla** dominates with **68,983 vehicles**, far ahead of other makes like **Nissan (13,497)** and **Chevrolet (12,026)**.

- **Popular Models**:
  - Tesla **Model Y** and **Model 3** are the most preferred, each capturing ~**21%** of total vehicles.
  - Nissan's **Leaf** is a notable competitor with **10.08%**.

4.4. CAFV (Clean Alternative Fuel Vehicle) Eligibility



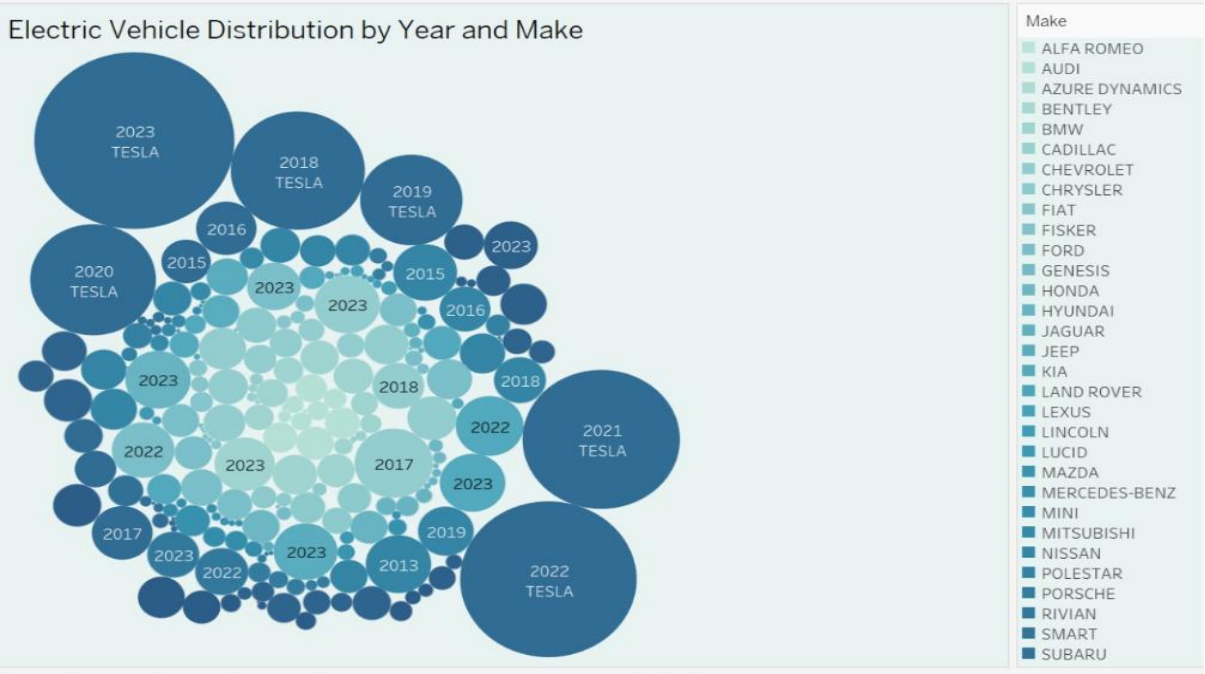
- **CAFV Eligibility Distribution**:
  - **41.83%** of vehicles are **CAFV Eligible**, supporting clean fuel initiatives.
  - **11.85%** are **Not Eligible**, while **46.32%** fall under the **Unknown** category.
- **Key Insight**: A significant portion remains unclassified, indicating potential data gaps.

4.5. Geographical Distribution of EVs by County

	Electric Vehicle Type	
County	BEV	PHEV
King	25,020	7,147
Snohomish	5,104	1,551
Pierce	3,318	1,347
Clark	2,662	1,158
Thurston	1,725	665
Kitsap	1,629	633
Whatcom	1,366	453
Spokane	1,044	596
Benton	527	313
Island	555	210

- **King County** leads EV adoption with:
  - **25,020 BEVs** and **7,147 PHEVs**.
- **Top 3 Counties**:
  - **Snohomish (5,104 BEVs)** and **Pierce (3,318 BEVs)** follow King County in EV adoption.
- **Observation**: Adoption is concentrated in urban counties, with BEVs consistently outperforming PHEVs.

4.6. EV Distribution by Year and Make



- **Tesla Leadership**:
  - Tesla dominates EV distribution across recent years (2018–2023).
  - Largest contributions are observed in **2023** and **2022**.
- **Diverse Manufacturers**:
  - Other makes like **Chevrolet, Nissan, BMW, Hyundai**, and **Kia** show increasing representation.
- **Trend**: The EV market is growing both in volume and diversity of manufacturers.

5. Summary of Findings

1. **Exponential Growth**:
   - EV adoption has grown rapidly, with the largest uptick occurring in **2023**.
2. **Market Dominance**:
   - Tesla leads in both total vehicles and individual models, specifically **Model Y** and **Model 3**.
3. **Geographic Concentration**:
   - Washington State and King County are the largest adopters of EVs.
4. **Technology Preference**:
   - **BEVs** significantly outnumber **PHEVs**, highlighting consumer preference for fully electric vehicles.
5. **Data Gaps**:
   - The high percentage of **CAFV Unknown** vehicles suggests an opportunity to improve classification and reporting.

6. Conclusion

The electric vehicle market is experiencing rapid growth, driven primarily by Tesla and a consumer shift toward fully electric vehicles (BEVs). Geographic and manufacturer-level insights reveal areas of strength and opportunities for further expansion, particularly in underrepresented regions.

7. Future work

1. **Address Data Gaps**: Improve classification of CAFV eligibility to provide a clearer market picture.
2. **Focus on Underrepresented Regions**: Expand EV infrastructure and adoption efforts in central and northern states.
3. **Support BEV Adoption**: Encourage technological advancements and policies that accelerate BEV dominance.