# **Electric Vehicle Data Analysis – Project Summary**

## **Introduction**

Electric vehicles (EVs) are rapidly gaining popularity as a sustainable alternative to traditional gasoline-powered cars. This project analyzes EV adoption trends in the U.S. using a Tableau dashboard, offering insights into market growth, vehicle efficiency, and geographical distribution. The study includes both Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs) to provide a comprehensive view of the EV landscape.

## **Dataset Overview**

The dataset contains information on 150,413 electric vehicles, including model year, manufacturer, electric range, and Clean Alternative Fuel Vehicle (CAFV) incentive eligibility. It provides a rich source of data to explore EV market trends, technological advancements, and consumer preferences.

## **Problem Statement**

The primary objective of this analysis is to understand EV market trends by answering key questions:

1. How has the adoption of EVs grown over the years?
2. What is the market share of BEVs versus PHEVs?
3. What is the average electric range of EVs?
4. Which states have the highest EV adoption rates?
5. How do government incentives impact EV adoption?

## **Key Performance Indicators (KPIs)**

* **Total Vehicles**: 150,413 EVs recorded in the dataset.
* **Average Electric Range**: 67.83 miles.
* **Total BEV Vehicles**: 116,745 (77.6% of total).
* **Total PHEV Vehicles**: 33,668 (22.4% of total).
* **CAFV Eligibility**: 62,887 vehicles (41.81%) are eligible for incentives, 69,697 (46.34%) have unknown eligibility status, and 17,829 (11.85%) are ineligible.
* **Top EV Manufacturers**: Tesla, Nissan, Chevrolet, Ford, and BMW are the leading manufacturers.

## **Dashboard Overview**

The Tableau dashboard provides interactive visualizations for an in-depth analysis of EV trends. Key components include:

### **1. Total Vehicles by Model Year (2010 Onwards)**

* **Visualization**: Line/Area Chart
* **Insights**: EV adoption has shown an exponential increase in recent years, particularly after 2015, indicating a surge in consumer interest and improved infrastructure.

### **2. Total Vehicles by State**

* **Visualization**: Map Chart
* **Insights**: Certain states, such as California, have significantly higher EV adoption rates. This suggests a strong correlation between state policies, incentives, and consumer adoption.

### **3. Top 10 Total Vehicles by Make**

* **Visualization**: Bar Chart
* **Insights**: Tesla leads the market, contributing a significant portion of total EV sales, followed by Nissan and Chevrolet. This highlights Tesla’s dominance and the increasing competition among other automakers.

### **4. Total Vehicles by CAFV Eligibility**

* **Visualization**: Pie/Donut Chart
* **Insights**: A large percentage of EVs (46.34%) have unknown CAFV eligibility, while 41.81% are eligible for incentives. This suggests the need for more transparent information on government incentive programs.

### **5. Top 10 Total Vehicles by Model**

* **Visualization**: Treemap
* **Insights**: The Tesla Model Y and Model 3 are the most popular EV models, reflecting consumer preference for long-range, high-performance electric cars.

## **Filters and Interactivity**

Users can filter the dashboard by:

* **EV Type (BEV/PHEV)**
* **Model**
* **State**
* **CAFV Eligibility** These interactive elements allow for a customized exploration of the dataset.

## **Key Insights from the Analysis**

1. **Growth in EV Adoption**: The number of electric vehicles has grown rapidly since 2015, with a sharp increase in recent years. This can be attributed to technological advancements, cost reductions, and government incentives.
2. **Dominance of BEVs Over PHEVs**: BEVs make up 77.6% of total EVs, indicating a clear consumer preference for fully electric vehicles over hybrid alternatives.
3. **Tesla’s Market Leadership**: Tesla dominates the EV market, accounting for a majority of vehicles. The Model Y and Model 3 are the most popular models, showing strong brand loyalty and consumer trust.
4. **Geographical Trends**: States like California have significantly higher EV adoption rates, likely due to state incentives, infrastructure investments, and consumer awareness.
5. **Range Limitations**: The average electric range is 67.83 miles, highlighting the need for continued advancements in battery technology to improve EV usability.
6. **Incentive Awareness Gap**: A large portion of EVs have unknown CAFV eligibility, indicating potential gaps in public awareness regarding government incentives.

## **Implementation**

* **Data Cleaning & Preprocessing**: Standardized formats and handled missing values.
* **Dashboard Development**: Created in Tableau with dynamic KPIs and interactive filters.
* **Insights Generation**: Extracted key patterns and trends from visualizations.

## **Conclusion**

This project provides a comprehensive analysis of the electric vehicle market, highlighting adoption trends, manufacturer dominance, and the impact of incentives. The Tableau dashboard serves as a valuable tool for policymakers, businesses, and researchers to make data-driven decisions about EV adoption and infrastructure development.