**Power BI Project Report**

**Electric Cars Data Analysis:**

**1. Project Overview**

The goal of this project is to analyse the **Electric Vehicle (EV) population dataset** to uncover insights about adoption trends, vehicle types, manufacturers, states, and ranges. The report also studies **CAFV (Clean Alternative Fuel Vehicle) eligibility**, cost (MSRP), and EV performance across regions.

This project provides **data-driven insights** to policymakers, EV manufacturers, and energy utilities for promoting electric mobility and planning infrastructure.

**Problem statement:**

**KPI’S Requirement**

1. Total EVs:

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

1. Electric Range:

* Determine the average electric range of the electric vehicles in the dataset to gauge the technological advancements and efficiency of the EVs.
* Determine maximum and minimum electric range of the electric vehicles in the dataset.

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

* Identify and analyse 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.

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

* Identify and analyse 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.

1. City and State with Most EVs:

* Identify City and State with most EVs to get region with biggest size of EV business.

**2. Dataset Description**

* **Source**: Electric\_Vehicle\_Population\_Data.csv
* **Key Columns**:
* VIN (1-10) → Unique identifier
* County, City, State → Geographic info
* Postal Code, Legislative District
* Make → Manufacturer (Tesla, Nissan, Chevrolet, etc.)
* Model, Model Year
* Electric Vehicle Type (BEV – Battery EV, PHEV – Plug-in Hybrid EV)
* Electric Range (in miles/km)
* Base MSRP (price)
* CAFV Eligibility (Clean Fuel Vehicle program status)

**3. Data Cleaning & Preparation (in Power BI)**

* Removed duplicates based on VIN.
* Standardized categorical columns (Make, Model, CAFV Eligibility).
* Created calculated columns:
  + **Total EVs** = COUNT of VIN.
  + **EV Type %** = Distribution of BEV vs PHEV.
  + **Average Range (Km)**.
  + **Average MSRP**.

**4. Dashboards & Visualizations**

**Dashboard 1 - EV Population Overview**

* **Total EVs:** 150K+
* **Distribution by Make:** Tesla dominates with **69K EVs**, followed by Nissan (13K) and Chevrolet (12K).
* **Distribution by Model:** Model Y (29K) and Model 3 (28K) are top.
* **EVs by State (Map):** Higher adoption in coastal and urban states.
* **BEV vs PHEV:**
  + BEV - 117K (78%)
  + PHEV - 34K (22%)

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AI-generated content may be incorrect.📌 **Insight**: Tesla leads EV adoption, and BEVs dominate the market.

**Dashboard 2 – Electric Range & Cost Analysis**

* **Average Electric Range:** 67.88 km
* **Top Manufacturer by Range:** Jaguar (204 km).
* **Base MSRP vs Range:**
  + BEVs - lower MSRP, higher range.
  + PHEVs - higher MSRP, lower range.
* **Range by EV Type:**
  + BEV Average range: 78.61 km
  + PHEV Average range: 30.66 km

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AI-generated content may be incorrect.📌 **Insight**: BEVs provide better value (longer range at lower cost). Luxury makers (Jaguar) offer the longest ranges.

**Dashboard 3 – Geographic Analysis**

* **State with Most EVs:** Washington (WA) → 150K EVs
* **City with Most EVs:** Seattle → 25K EVs
* **Top Counties:** King (79K), Snohomish (17K), Pierce (12K).
* **EV Distribution:** also analysed by Postal Code & Legislative District.
* **Make Distribution by City:**
  + Seattle - Tesla leads with 10K EVs
  + Other cities like Bellevue, Redmond, Vancouver also contribute heavily.

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AI-generated content may be incorrect.📌 **Insight**: Washington, especially Seattle metro, is a **key EV hub** in the US.

**Dashboard 4 – EV Growth & CAFV Eligibility**

* **EVs by Model Year:** Strong growth post-2015, peaking around 2020–2022.
* **CAFV Eligibility:**
  + 46% → Eligible
  + 42% → Unknown
  + 12% → Not eligible (low battery range).
* **Electric Utilities:** Puget Sound Energy serves most EVs (56K).
* **Range by CAFV:** Eligible vehicles have higher ranges (>150 km).

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AI-generated content may be incorrect.📌 **Insight**: Policy-driven incentives (CAFV eligibility) align with longer-range EVs, encouraging adoption.

**5. Key Insights**

1. **Tesla dominates** the EV market in both sales and range.
2. **Washington (Seattle metro)** is the largest EV adoption region.
3. **BEVs are more cost-efficient** than PHEVs (better range & lower cost).
4. EV adoption **spiked after 2015**, showing maturity in the market.
5. **CAFV eligibility** boosts EV adoption, especially for long-range models.

**6. Business Recommendations**

* **Government & Policy Makers**: Expand CAFV programs nationwide to push adoption.
* **Manufacturers**: Focus on BEVs as they dominate both market share and customer preference.
* **Utilities**: Increase charging infrastructure in EV hotspots (Seattle, Bellevue, Redmond).
* **Consumers**: BEVs (Tesla, Nissan, Chevrolet) offer the best balance of cost and range.