Problem Statement:

A leading global automotive manufacturer is planning to expand its electric and hybrid vehicle portfolio in India. While the company has captured a significant share in its home market, its presence in the new region remains minimal. To support strategic expansion, the regional leadership has initiated a comprehensive market study to understand the existing landscape of electric and hybrid vehicles in the target country.

As part of this initiative, the data analytics team has been tasked with performing a detailed analysis using available sales and market data. The team will:

- Import and structure multiple CSV files into a **MySQL** database, ensuring the data is clean, normalized, and relationally modeled (e.g., sales, revenue, time).
- Connect the MySQL database to **Power BI** to build an interactive and insightful data model that accurately reflects relationships among the imported tables.
- Design a dashboard in Power BI based on business requirements specified in an "Ad-hoc Requests" document, enabling stakeholders to make data-driven decisions on product launches and market strategy.

Electric Vehicle Market Insights - (2022–2024)

India's electric vehicle (EV) market has experienced significant momentum between 2022 and 2024. Over this period, a total of **2 million EVs** were sold, accounting for a **3.61% penetration rate** out of the **57 million total vehicle sales** in the country. This adoption rate, while still in early stages compared to global benchmarks, is accelerating at a rapid pace — reflected by a **remarkable EV sales CAGR of 93.91%**. In contrast, the overall vehicle sales CAGR stands at 13.56%, underlining the fast-growing consumer and commercial interest in EVs.

◆ Maker Performance – Leaders vs. Laggards

OLA Electric emerged as the volume leader with **489K units sold**, followed by **TVS (273K)**, **Ather Energy (204K)**, **Hero Electric (170K)**, and **Ampere (167K)**. These top five collectively demonstrate strong brand presence and affordability in the 2-wheeler EV segment. From a revenue standpoint, however, the hierarchy shifts — **Tata Motors leads the pack with ₹133.4 billion**, significantly ahead of **Mahindra & Mahindra (₹61.7B)** and **OLA Electric (₹41.6B)**. This indicates that while OLA and others lead in volume, Tata Motors captures higher value sales through premium and 4-wheeler offerings.

Notably, **Hero Electric** is experiencing a **negative CAGR of -58.52%**, reflecting a significant downturn possibly due to intensified competition, supply chain issues, or lack of innovation. On the other hand, **TVS** and **OLA Electric** boast CAGRs of **330.8%** and **373.2%** respectively, highlighting successful scaling strategies. In the bottom tier, **BMW India**, **Volvo Auto India**, and **Mercedes-Benz AG** show very low volumes — although BMW has shown a **1140.97% CAGR**, likely reflecting small base effects rather than sustained growth.

◆ Temporal Sales Trends

Monthly and quarterly analysis reveals strong **seasonal peaks in March and November**, aligning with traditional vehicle purchase festivals and year-end fiscal activities. Quarterly volume trends for the top five makers display a recovery after a dip in Q2, suggesting increasing consumer confidence and supply stabilization.

◆ State-Level Insights – Penetration & Growth

Goa leads the country in EV penetration with a rate of **9.84%**, followed by **Karnataka (7.84%)**, **Delhi (6.76%)**, **Maharashtra (6.64%)**, and **Meghalaya (6.49%)**. These states have benefited from progressive EV policies, urban infrastructure, and early adopter demographics. In contrast, states like **Sikkim, Nagaland, Arunachal Pradesh**, and **Jharkhand** have penetration rates below 0.5%, signaling large untapped markets.

In terms of volume growth, smaller states dominate. **Meghalaya recorded a CAGR of 476.63%**, **Tripura 229.5%**, and **Nagaland 200%** in EV sales volume. While absolute sales numbers are still modest, these growth rates suggest rising awareness and policy-driven acceleration in non-metro regions.

◆ Future Outlook – 2030 Projections

Projected EV sales by 2030 show a clear state-wise opportunity landscape. **Maharashtra is expected to lead with 15.26 million EVs**, followed by **Kerala (11.86M)**, **Gujarat (7.5M)**, and **Karnataka (6.84M)**. These figures are heavily driven by the 2-wheeler segment, which remains the dominant category. However, **4-wheelers are gradually increasing**, particularly in urban states where personal mobility demand and infrastructure readiness align.