# Electric Vehicle (EV) Market Analysis Project Report

## 1. Project Charter

This project aims to perform an in-depth analysis of the Electric Vehicle (EV) market using data sourced from the EV.ipynb notebook.   
The analysis focuses on understanding the global trends, market size, vehicle distribution, and adoption patterns across different regions.  
The project leverages Python-based data analytics techniques and visualization tools to derive insights and provide strategic recommendations for business decision-making.

\*\*Project Objectives:\*\*

- To analyze EV adoption trends across various countries and regions.  
- To identify top manufacturers and models based on base MSRP and registrations.  
- To explore time-based trends in EV growth.  
- To perform geographical and market segmentation analysis for future predictions.

\*\*Scope:\*\*

The scope of this analysis includes data cleaning, exploratory data analysis (EDA), visualization, and market size estimation for EVs globally.   
Further modeling and forecasting will be added in future iterations.

\*\*Stakeholders:\*\*

- Data Analysts and Business Analysts  
- Automotive Industry Decision Makers  
- Policy Makers in the Electric Mobility Sector  
- Research and Development Teams in EV companies

\*\*Expected Deliverables:\*\*

- Cleaned and structured EV dataset.  
- Interactive dashboards and visualizations.  
- Analytical and strategic market insights report.  
- Recommendations for business and policy decisions.

## 2. Data Dictionary

The dataset contains various attributes related to Electric Vehicles. Below is the preliminary data dictionary extracted from the notebook:

|  |  |  |
| --- | --- | --- |
| Column Name | Description | Data Type |
| Make | Manufacturer name of the EV | String |
| Model | Specific model of the EV | String |
| Model Year | Year of manufacture or release | Integer |
| Electric Range | Range in miles on a full charge | Integer |
| Base MSRP | Manufacturer suggested retail price | Float |
| County | Geographical region or registration location | String |
| City | City of registration | String |

Additional columns, if any, will be updated in future versions of the report.

## 3. Data Cleaning Report

Data cleaning was performed in Python using Pandas. The following actions were taken:  
- Removed duplicate rows to ensure unique entries per vehicle.  
- Handled missing values using median imputation for numeric columns and mode for categorical ones.  
- Standardized text data for 'Make', 'Model', and 'City' fields.  
- Converted data types to ensure numerical columns were in the correct format.  
Further details and transformation logs will be added as the dataset evolves.

## 4. Exploratory Data Analysis (EDA) Report

Exploratory Data Analysis was conducted to derive meaningful patterns and insights from the dataset.   
Key findings from the EDA performed in the EV.ipynb notebook include:

- \*\*Top Manufacturers:\*\* Tesla, Nissan, and Chevrolet dominate the market with the highest number of registered EVs.  
- \*\*Geographical Distribution:\*\* High adoption rates observed in major metropolitan counties.  
- \*\*Model Year Trend:\*\* A steady increase in EV adoption from 2015 to 2023, indicating market growth momentum.  
- \*\*Price Distribution:\*\* Base MSRP ranges widely, with premium models above $80,000 showing a smaller but consistent demand.

Visualizations included:

- Histogram showing vehicle distribution by county.  
- Line chart showing EV adoption trends by model year.  
- Bar chart highlighting top EV manufacturers based on base MSRP.  
- Heatmap (to be added) representing EV adoption density across different cities.

## 5. Modeling Report

This section will include details on predictive modeling once implemented.  
Future scope includes regression models for price prediction, classification models for adoption likelihood, and clustering for segmentation analysis.

## 6. Market Analysis Report

The market analysis focuses on understanding the current landscape and future potential of the Electric Vehicle industry.  
Based on the EDA:  
- The EV market has shown exponential growth, especially in developed nations.  
- Government incentives and environmental regulations have accelerated adoption rates.  
- Tesla remains the leader in innovation, while new entrants are disrupting price segments.

\*\*Strategic Recommendations:\*\*  
- Encourage partnerships with charging infrastructure companies.  
- Expand into mid-range pricing segments to attract new adopters.  
- Increase R&D investments in battery efficiency and cost reduction.

## 7. Code Repository

All source code and analysis scripts are stored in the project repository, including:  
- EV.ipynb: Primary notebook for analysis and visualization.  
- ev\_data\_cleaning.py: Data preprocessing scripts.  
- ev\_visualization.py: Visualization and plotting utilities.  
- config.yaml: Project configuration and file path settings.

## 8. Presentation Slides

A summary slide deck will be created using PowerPoint or Power BI for stakeholder presentations.  
It will include charts, insights, and recommendations.

## 9. Technical Appendix

This appendix will document additional technical details such as:  
- Data processing workflows  
- SQL queries used for extraction (to be added)  
- Mathematical formulas or statistical techniques  
- References and bibliographic sources