MARKETING SEGMENTATION FOR AN ELECTRIC VEHICLE STARTUP IN INDIA

Name: G. Chandra Sekhar

Date: 28/09/2024

1. Problem Statement:

An Electric Vehicle (EV) startup in India faces a crucial decision: who to target. The diverse Indian market offers numerous possibilities, but choosing the right segment is essential for success. This project tackles this challenge through market segmentation analysis. By understanding different customer groups (geographic, demographic, etc.), we will assess their needs and the competition. This will help us identify the 'sweet pot': the segment most likely to embrace the startup's EVs. Considering data limitations and market dynamics, we will develop a targeted entry strategy, positioning the startup for long-term growth in the electrifying Indian market.

2. Data Collection:

To initialize the implementation of the market segmentation analysis for our EV startup's Indian launch, I started with the data acquisition efforts. Through meticulous research, I delved into various data sources available on the internet to gather appropriate and relevant data for the project. This comprehensive data collection exercise lays the groundwork for the next crucial step: identifying the most promising segment for our startup's successful entry into the electrifying Indian EV market.

Websites used for collecting the data:

- https://www.kaggle.com/
- https://www.data.gov.in/
- https://datasetsearch.research.google.com/
- https://trends.google.com/trends/explore

Dataset that I used for the project:

- **Dataset link**
- The above dataset specifies the total no. of vehicles registered in India from January 2014- July, 2023. The has been categorized into fuel variant of the vehicle registered.
- Analysing this data would give an idea about the purchasing trends in the Indian Market and how it has changed over the years.

Columns:

- Only CNG
- Diesel
- Diesel/Hybrid
- Dual Diesel/CNG
- Electric (BOV)
- Ethanol
- LPG Only
- Petrol
- Petrol/CNG
- Petrol/Ethanol
- Petrol/Hybrid
- Petrol/LPG
- Solar
- Fuel cell Hydrogen
- LNG
- Methanol
- Dual Diesel/LNG

3. Exploratory Data Analysis:

An Exploratory Data Analysis or EDA is a thorough examination meant to uncover the underlying structure of a data set and is important for a company because it exposes trends, patterns, and relationships that are not readily apparent.
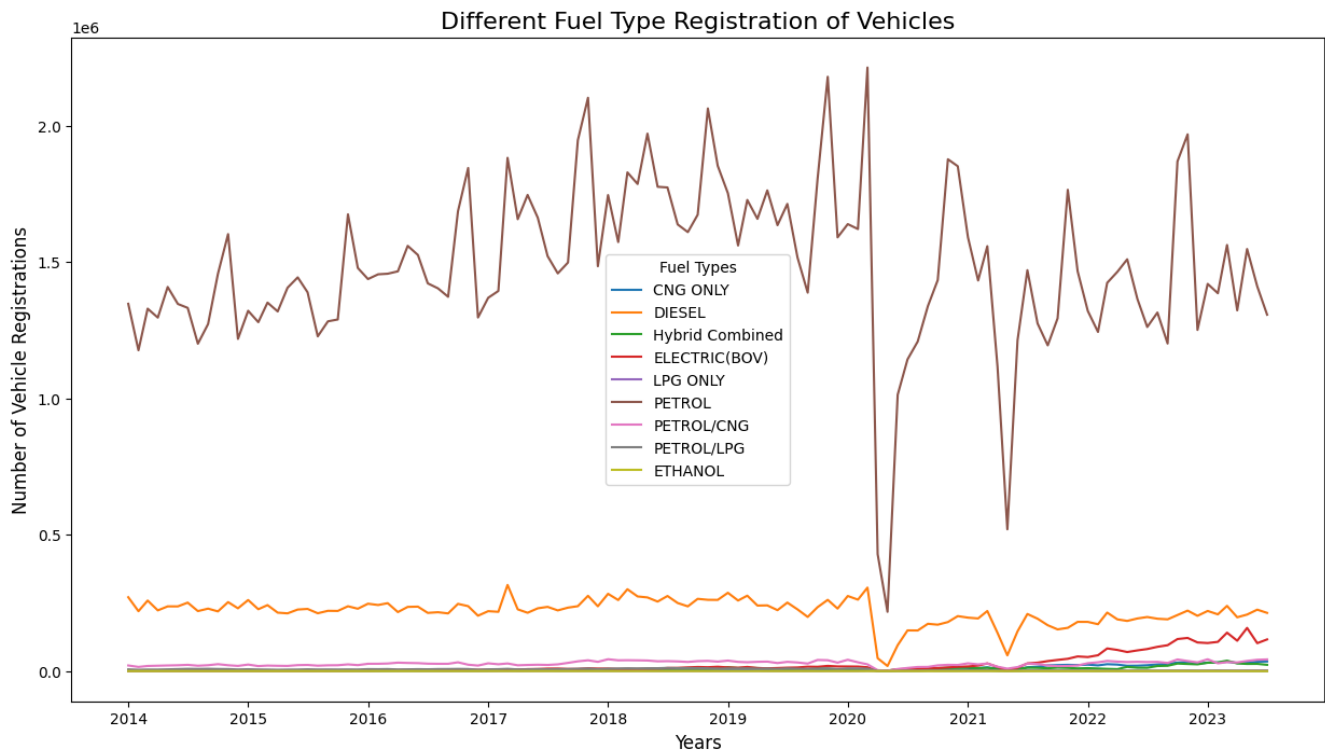
1. Line Plot of all columns data:

Fig1. Fuel Type Registrations of Vehicles

Based upon the graph, we can see that:

- Petrol vehicles consistently have the highest registrations throughout the time period, indicating their dominance in the market.
- Diesel vehicle registrations remain relatively stable over time, suggesting a consistent demand for diesel powered vehicles.
- Electric vehicles show an increasing trend in registrations over time, indicating a growing interest or adoption of electric mobility, from late 2021 onwards.
- The increasing trend in EV registrations suggests a potential shift in the market toward cleaner and more sustainable transportation options.

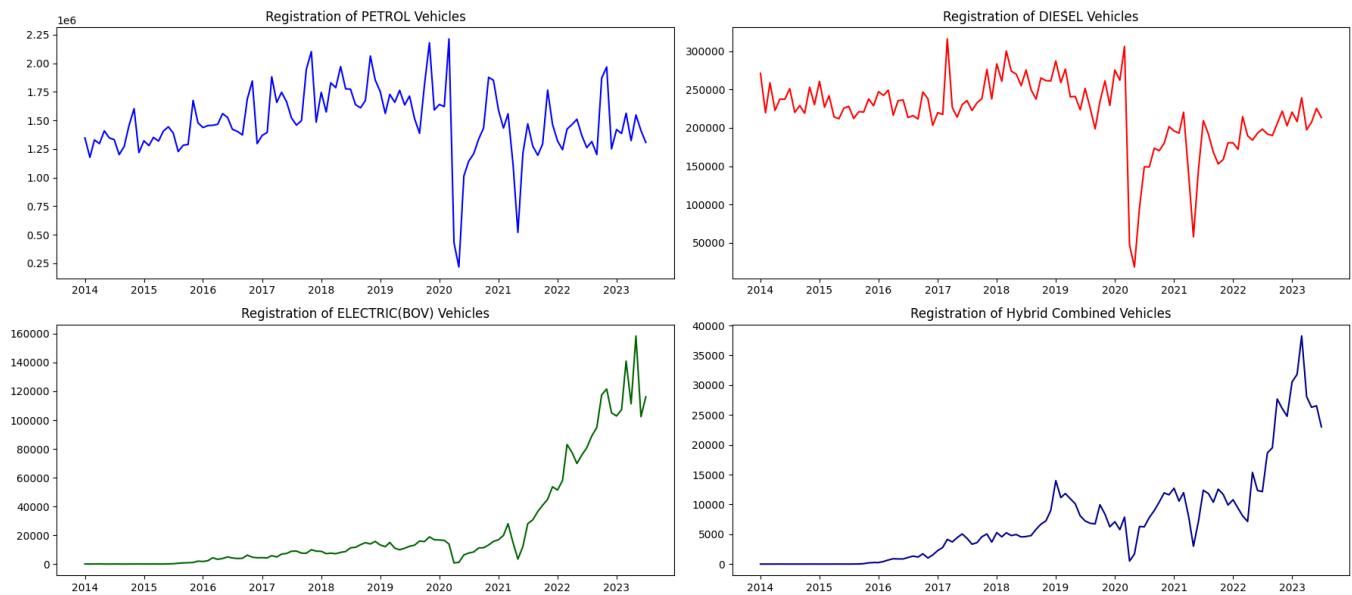## 2. Line Plot of 4 different categories of Vehicle registrations:

Fig2. Line plot of 4 different categories of Vehicle registrations

- Out of all the four variants of fuel type, the registrations of Electric Vehicles and Hybrid Vehicles show a noticeable increasing trend over the time period and seems to suggest a growing market in the near future.
- The upward trend may indicate a shift in consumer preferences towards more sustainable and environmentally friendly transportation options.
- The consistent demand for the remaining vehicles suggests a stable market presence, possibly driven by specific industry requirements or consumer preferences.

3. Correlation Matrix of top 4 fuel type vehicle:
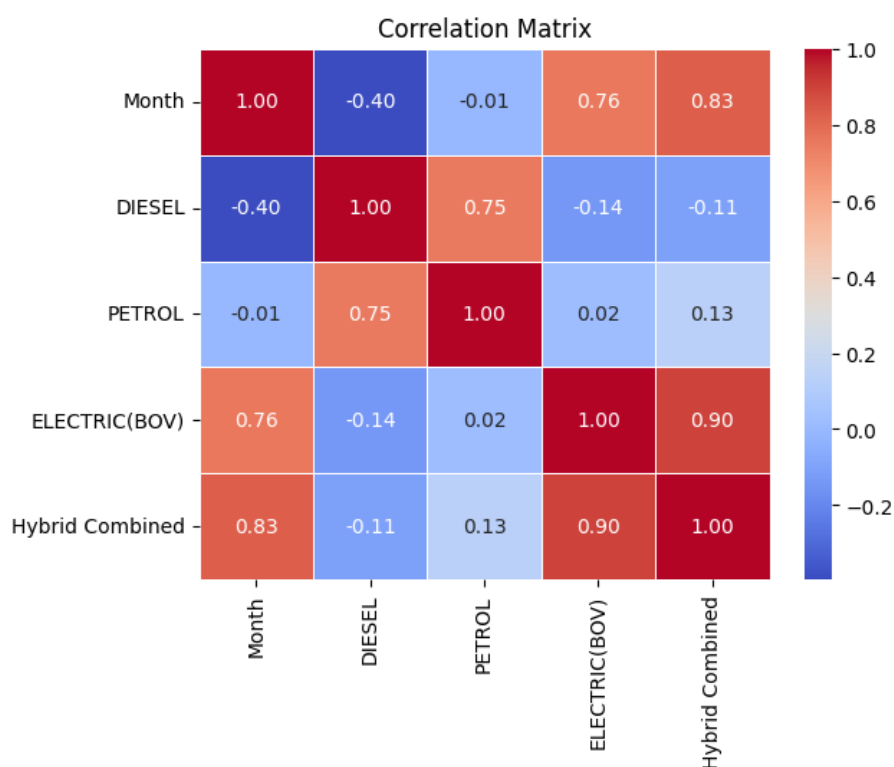
- **Strong Positive Correlation** exists between 'ELECTRIC(BOV)' and 'Hybrid Combined' (0.9).
- **Strong Negative Correlation** exists between 'DIESEL' and 'Hybrid Combined' (-0.14).
- **Moderate Positive Correlation** exists between 'DIESEL' and 'PETROL' (0.75).

4. **Percentage wise Vehicle Registrations by Fuel Type (2017-2023):**

Percentage-wise Vehicle Registrations by Fuel Type (2017-2023)
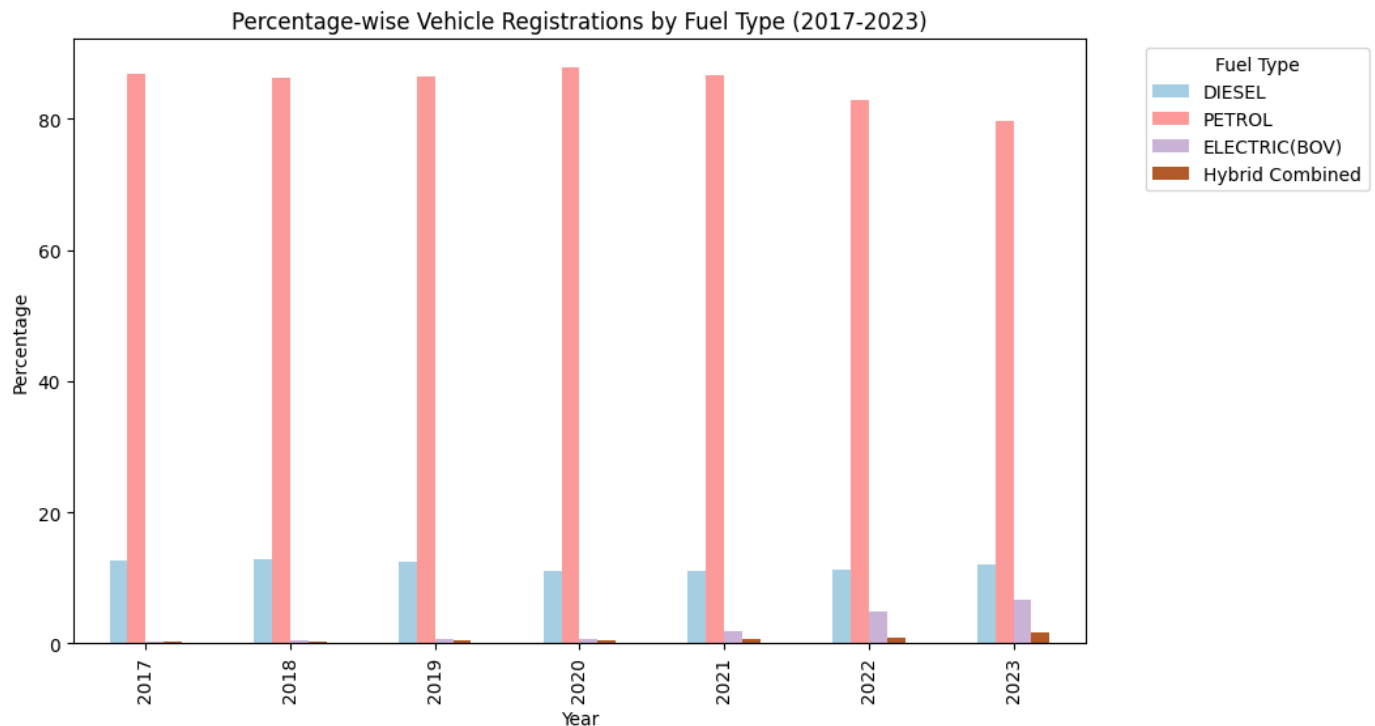
- Petrol vehicles are the dominant type of vehicles registered in the India, with a significant majority ranging from 85-90% each year.

- Diesel registrations have declined consistently over the years, dropping to around 10-15%.

- Electric vehicles are making modest gains, increasing from about 1% in 2017 to around 6.7% in 2023.

- Hybrid vehicles have maintained a stable percentage, accounting for less than 5% of registered vehicles each year.

4. Profiling Segments:

1. Elbow Curve:
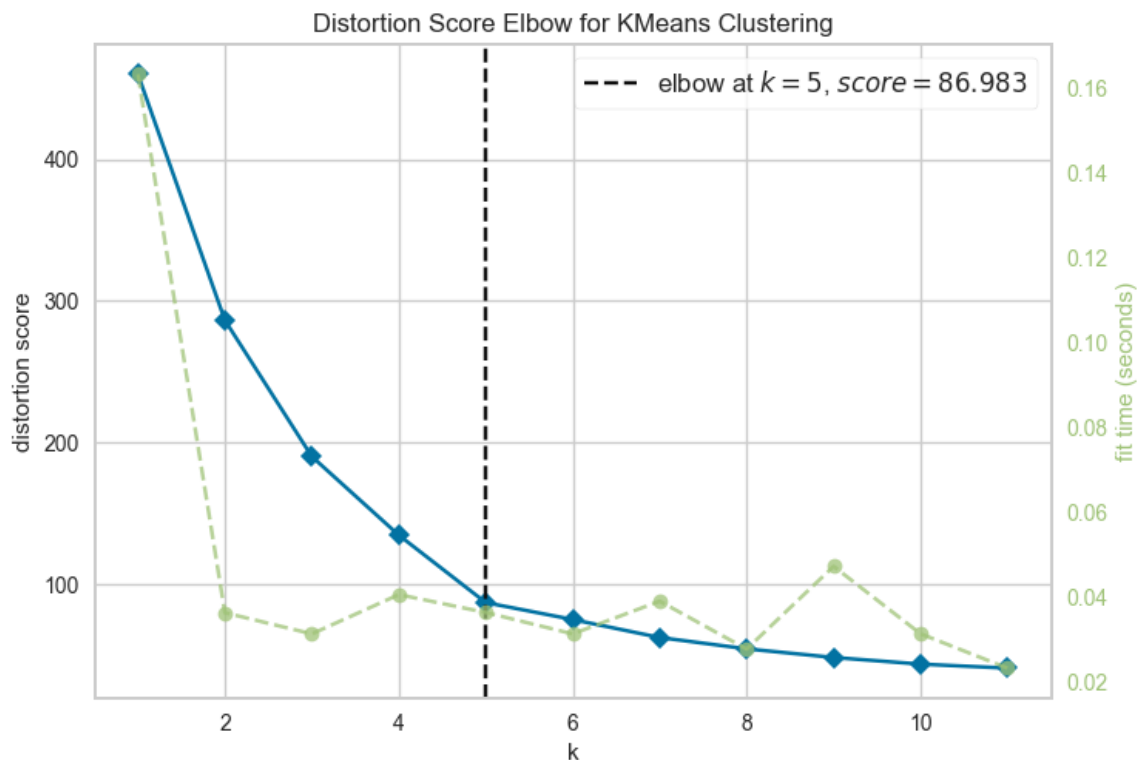
- There is a clear and sharp elbow around k=5, where the decrease in distortion score starts to slow down significantly. This suggests that adding more clusters beyond k=5 does not provide a substantial improvement in clustering quality.
- Based on the elbow method, the optimal number of clusters for the given data is likely k=5. This means that the KMeans algorithm can effectively group the data points into five distinct clusters with minimal distortion.

2. Heat Map: Clusters Vs Vehicle Type:
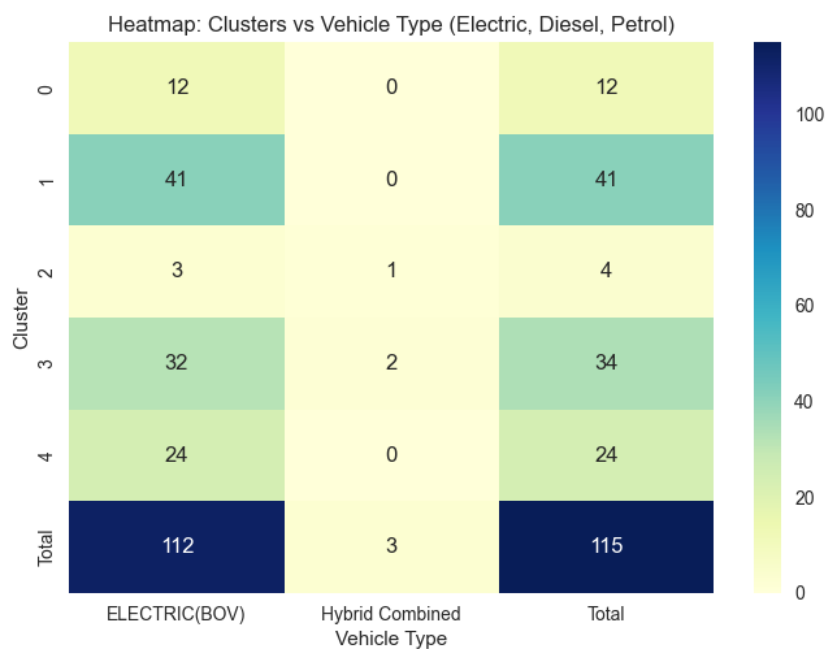
Based on the above heatmap, here are some observations:

- **Cluster 0:** This cluster is dominated by Electric vehicles, with a significantly higher count compared to Diesel and Petrol vehicles.
- **Cluster 1:** This cluster has a more balanced distribution of vehicle types, with Petrol vehicles having the highest count, followed by Electric and Diesel vehicles.
- **Cluster 2:** This cluster is primarily composed of Diesel vehicles, with a very low count of Electric and Petrol vehicles.
- **Cluster 3:** This cluster has a moderate count of Electric vehicles, followed by Diesel and Petrol vehicles.

3. **Target Segmentation for the Clusters formed:**

Simple segment evaluation plot for the Electrical data set
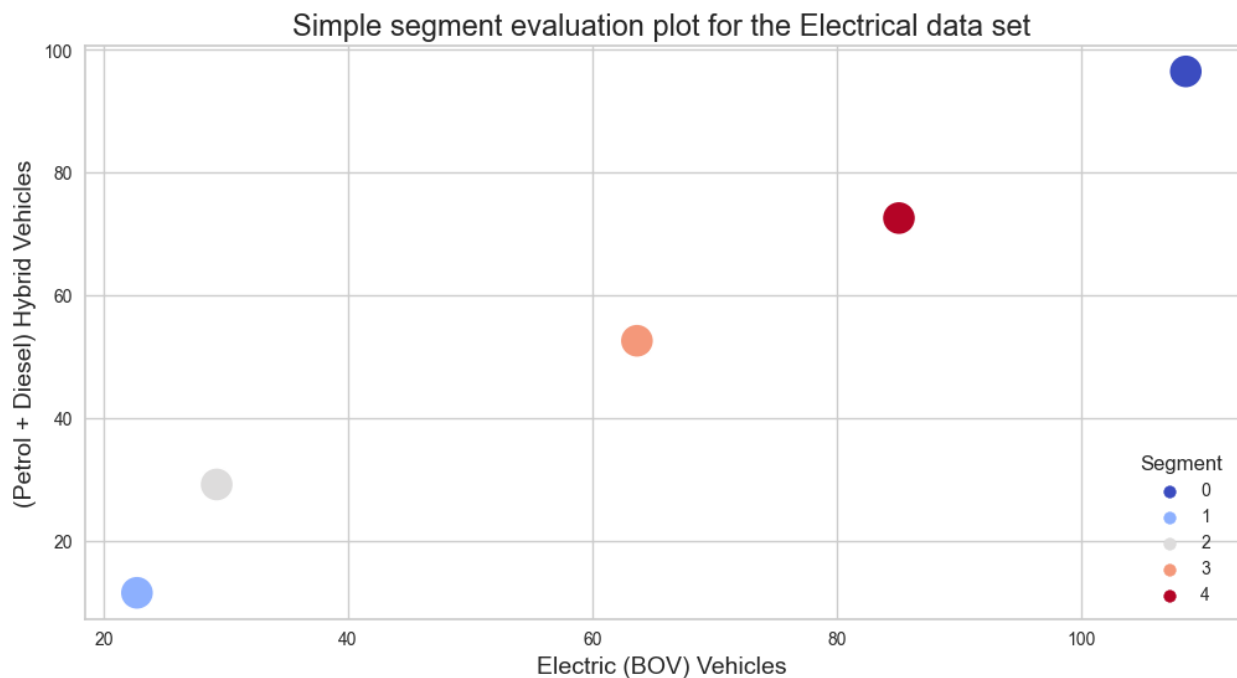
Electric (BOV) Vehicles: This refers to Battery Operated Vehicles, which encompass pure electric cars and electric two-wheelers.

(Petrol + Diesel) Hybrid Vehicles: These are vehicles that combine an electric motor with a traditional gasoline or diesel engine.

- The data points are spread across all four quadrants of the graph, suggesting that there is a diversity in terms of both electric and hybrid vehicle adoption across the identified segments.
- There seems to be a concentration of points in the lower left and upper right quadrants. This could imply that some segments have a preference for either electric or hybrid vehicles, while others have a more balanced mix.

Target Segments:

- **Target Segment 0:** Prioritize marketing EVs' environmental benefits and lower running costs. Ensure easy access to charging infrastructure information.
- **Segment 4:** Address price concerns and highlight the flexibility of having both hybrid and electric options.
- **Segment 1:** Offer a diverse range of EV and hybrid options cater to various needs and budgets. Emphasize fuel efficiency and the evolving charging infrastructure landscape.

- **Segments 2 and 3:** Focus on the practicality and reliability of hybrids while acknowledging the growing appeal of EVs. Address range anxiety concerns.

4. Project GitHub Link:

GitHub Link:
https://github.com/Chandrasekhar2970/Feynn_Labs_Projects/tree/main/Project%20-%202.2

5. Conclusion:

The segmentation analysis, guided by the K-Means algorithm, has yielded five distinct clusters of potential EV customers in India, each characterized by unique preferences for fuel types. This differentiation provides valuable insights for our EV startup's targeted entry strategy, highlighting opportunities to maximize customer satisfaction and market penetration.

- Cluster 0, demonstrating a strong preference for electric vehicles, represents a significant target segment. This cluster values environmental benefits, lower running costs, and readily accessible charging infrastructure information. Focusing marketing efforts on these key aspects will be critical for attracting and retaining this segment.
- Cluster 4, while exhibiting a preference for hybrid vehicles, also displays a positive attitude towards electric vehicles. This cluster presents an opportunity to emphasize the flexibility and cost-effectiveness of both hybrid and electric options, addressing price concerns and highlighting the benefits of each technology.
- Cluster 1, demonstrating a balanced preference for fuel types, represents a diverse segment with varying needs and budgets. A diverse range of EV and hybrid options, coupled with clear communication about fuel efficiency and the evolving charging infrastructure landscape, will be key for capturing this segment's attention.
- Clusters 2 and 3, exhibiting a strong preference for diesel vehicles, represent more conservative segments. Our strategy here should emphasize the practicality and reliability of hybrids while acknowledging the growing appeal of EVs. Addressing range anxiety concerns and highlighting the long-term benefits of switching to electric or hybrid vehicles will be crucial for engagement.

By tailoring marketing efforts, product development initiatives, and customer service strategies to the specific needs and preferences of each cluster, our EV startup can enhance customer satisfaction, loyalty, and brand perception. Ultimately, leveraging these insights from customer segmentation will enable us to optimize resources, maximize market penetration, and establish a competitive edge in the dynamic Indian EV market landscape.